



Fresno County Multi-Jurisdictional Hazard Mitigation Plan

May 2018



Fresno County Multi-Jurisdictional Hazard Mitigation Plan

May 2018



Cover Photo Credits:

Lake of the Lone Indian, The Armchair Explorer, www.thearmchairexplorer.com/california/sierra-national-forest

San Joaquin Valley Agricultural Lands, Limoneira buys 757 acres of orchards in San Joaquin Valley, Staff Report, Thursday, December 3, 2015, <https://www.pacbiztimes.com/2015/12/03/limoneira-buys-757-acres-of-orchards-in-san-joaquin-valley/>

Clovis Flooding, ABC 30 News, <http://abc30.com/news/map-widespread-flooding-reported-on-the-east-side-of-fresno-and-clovis/1699471>

Wildfire, Sierra News Online, <https://sierranewsonline.com/wildfire-in-fresno-county-prompts-health-caution/>

Fresno County Line, Geocaching, https://www.geocaching.com/geocache/GC22X5Q_fresno-monterey-co-line-priest-valley-quadrangle?guid=9bc54552-7fc5-48ac-ad4a-23e5851c90b9



EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Fresno County and the other participating jurisdictions developed this multi-jurisdictional hazard mitigation plan to make the County and its residents less vulnerable to future hazard events. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that Fresno County would be eligible for the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance Grants, including Pre-Disaster Mitigation and Hazard Mitigation Grant programs as well as lower flood insurance premiums (in jurisdictions that participate in the National Flood Insurance Program's Community Rating System).

The plan was originally developed in 2007-2008 and FEMA approved in 2009. The plan was comprehensively updated in 2017-2018. The County followed a planning process in alignment with FEMA guidance during its original development and update, which began with the formation of a hazard mitigation planning committee (HMPC) comprised of key county, city, and district representatives and other stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to Fresno County, assessed the County's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The County is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Floods, wildfires, severe weather, drought, and agricultural hazards are among the hazards that can have a significant impact on the County.

Based on the risk assessment, the HMPC identified goals and objectives for reducing the County's vulnerability to hazards. To meet identified goals and objectives, the plan recommends a number of mitigation actions that include actions specific to each participating jurisdiction. This plan has been formally adopted by the County and the participating jurisdictions and will be updated every five years at a minimum.



TABLE OF CONTENTS

Chapters

1 Introduction	1.1
1.1 Purpose	1.1
1.2 Background and Scope	1.1
1.3 Plan Organization	1.3
1.3.1 Jurisdictional Annexes	1.3
2 Community Profile	2.1
2.1 History	2.1
2.2 Geography and Climate	2.2
2.3 Economy	2.2
2.4 Population	2.6
2.5 Development Trends	2.7
3 Planning Process	3.1
3.1 Background on Mitigation Planning in Fresno County	3.1
3.2 What's New in the Plan Update	3.1
3.3 Local Government Participation	3.4
3.4 The 10-Step Planning Process	3.6
3.4.1 Phase 1: Organize Resources	3.7
3.4.2 Phase 2: Assess Risks	3.17
3.4.3 Phase 3: Develop the Mitigation Plan	3.18
3.4.4 Phase 4: Implement the Plan and Monitor Progress	3.19
4 Risk Assessment	4.1
4.1 Hazard Identification: Natural Hazards	4.2
4.1.1 Methodology and Results	4.2
4.1.2 Disaster Declaration History	4.5
4.2 Hazard Profiles	4.8
4.2.1 Agricultural Hazards	4.10
4.2.2 Avalanche	4.15
4.2.3 Dam Failure	4.16
4.2.4 Drought	4.23
4.2.5 Earthquake	4.32
4.2.6 Flood	4.48
4.2.7 Human Health Hazards: Epidemic/Pandemic	4.77
4.2.8 Human Health Hazards: West Nile Virus	4.81
4.2.9 Landslide	4.84
4.2.10 Soil Hazards	4.88
4.2.11 Soil Hazards: Expansive Soils	4.95
4.2.12 Soil Hazards: Land Subsidence	4.98
4.2.13 Severe Weather: General	4.102
4.2.14 Severe Weather: Extreme Temperatures	4.105
4.2.15 Severe Weather: Fog	4.113
4.2.16 Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind	4.118
4.2.17 Severe Weather: Winter Storm	4.129

4.2.18 Severe Weather: Tornado	4.132
4.2.19 Volcano	4.136
4.2.20 Wildfire	4.143
4.3 Vulnerability Assessment.....	4.155
4.3.1 Fresno County Vulnerability and Assets at Risk	4.156
4.3.2 Vulnerability of Fresno County to Specific Hazards	4.189
4.4 Human-Caused Hazards	4.248
4.4.1 Hazard Identification and Profiles: Human-Caused Hazards	4.248
4.4.2 Asset Inventory and Vulnerability Assessment	4.262
4.5 Fresno County’s Mitigation Capabilities.....	4.266
4.5.1 Fresno County’s Regulatory Mitigation Capabilities	4.266
4.5.2 Fresno County’s Administrative/Technical Mitigation Capabilities	4.290
4.5.3 Fresno County’s Fiscal Mitigation Capabilities	4.296
5 Mitigation Strategy	5.1
5.1 Goals and Objectives	5.1
5.2 Identification and Analysis of Mitigation Actions	5.4
5.2.1 Prioritization Process.....	5.6
5.3 Mitigation Action Plan	5.7
5.3.1 Progress on Previous Mitigation Actions	5.8
5.3.2 Continued Compliance with NFIP.....	5.10
5.3.3 Updated Mitigation Action Plan.....	5.11
6 Plan Adoption	6.1
7 Plan Implementation and Maintenance	7.1
7.1 Implementation.....	7.1
7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance.....	7.2
7.2 Maintenance/Monitoring	7.3
7.2.1 Maintenance/Monitoring Schedule.....	7.3
7.2.2 Maintenance Evaluation Process	7.3
7.2.3 Incorporation into Existing Planning Mechanisms.....	7.5
7.2.4 Continued Public Involvement	7.6

Annexes

Annex A: City of Clovis

Annex B: City of Coalinga

Annex C: City of Firebaugh

Annex D: City of Fowler

Annex E: City of Fresno

Annex F: City of Kerman

Annex G: City of Kingsburg

Annex H: City of Mendota

Annex I: City of Sanger

Annex J: City of Selma

Annex K: City of Reedley

Annex L: City of San Joaquin

Annex M: Fresno Metropolitan Flood Control District

Annex N: Lower San Joaquin Levee District

Annex O: Kings River Conservation District

Annex P: Sierra Resource Conservation District

Annex Q: Westlands Water District

Appendices

Appendix A: Adoption Resolutions

Appendix B: Hazard Mitigation Planning Committee

Appendix C: Mitigation Categories, Alternatives, and Selection Criteria

Appendix D: References

Appendix E: Planning Process



1 INTRODUCTION

1.1 Purpose

Fresno County, along with 17 participating jurisdictions, prepared this local multi-jurisdictional hazard mitigation plan to better protect the people and property of the County from the effects of hazard events. This plan underwent a comprehensive update in 2017-2018 building upon the plan that was originally developed in 2009. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to make Fresno County and participating jurisdictions eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, and Flood Mitigation Assistance (FMA). This plan also meets the planning requirements of the National Flood Insurance Program's Community Rating System (CRS), in order to earn points under CRS Activity 510, which could lower flood insurance premiums in CRS communities.

1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated through planned mitigation.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005). An update to this report in 2017 (Natural Hazard Mitigation Saves: 2017 Interim Report) indicates that mitigation grants funded through select federal government agencies, on average, can save the nation \$6 in future disaster costs, for every \$1 spent on hazard mitigation.

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. This plan documents

Fresno County's hazard mitigation planning process, identifies relevant hazards and vulnerabilities, and provides strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability in Fresno County.

The Fresno County Multi-Jurisdictional Hazard Mitigation Plan is a multi-jurisdictional plan that geographically covers everything within Fresno County's jurisdictional boundaries (hereinafter referred to as the planning area). Unincorporated Fresno County and the following communities and special districts participated in the planning process; an asterisk "*" indicates jurisdictions added to the plan during the 2017-2018 update:

- City of Clovis
- City of Coalinga
- City of Firebaugh*
- City of Fowler*
- City of Fresno
- City of Kerman
- City of Kingsburg
- City of Mendota
- City of Reedley*
- City of San Joaquin*
- City of Sanger
- City of Selma
- Fresno Metropolitan Flood Control District
- Lower San Joaquin Levee District
- Sierra Resource Conservation District/Highway 168 Fire Safe Council
- Kings River Conservation District*
- Westlands Water District*

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). Because the Fresno County planning area is subject to many kinds of hazards, access to these programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical

community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Fresno County planning area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and becoming eligible for mitigation-related federal funding.

1.3 Plan Organization

The Fresno County Multi-Jurisdictional Hazard Mitigation Plan is organized as follows:

- Chapter 2: Community Profile
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Jurisdictional Annexes
- Appendices

1.3.1 Jurisdictional Annexes

Each jurisdiction participating in this plan developed its own annex, which provides a more detailed assessment of the jurisdiction's unique risks as well as their mitigation strategy to reduce long-term losses. Each jurisdictional annex contains the following:

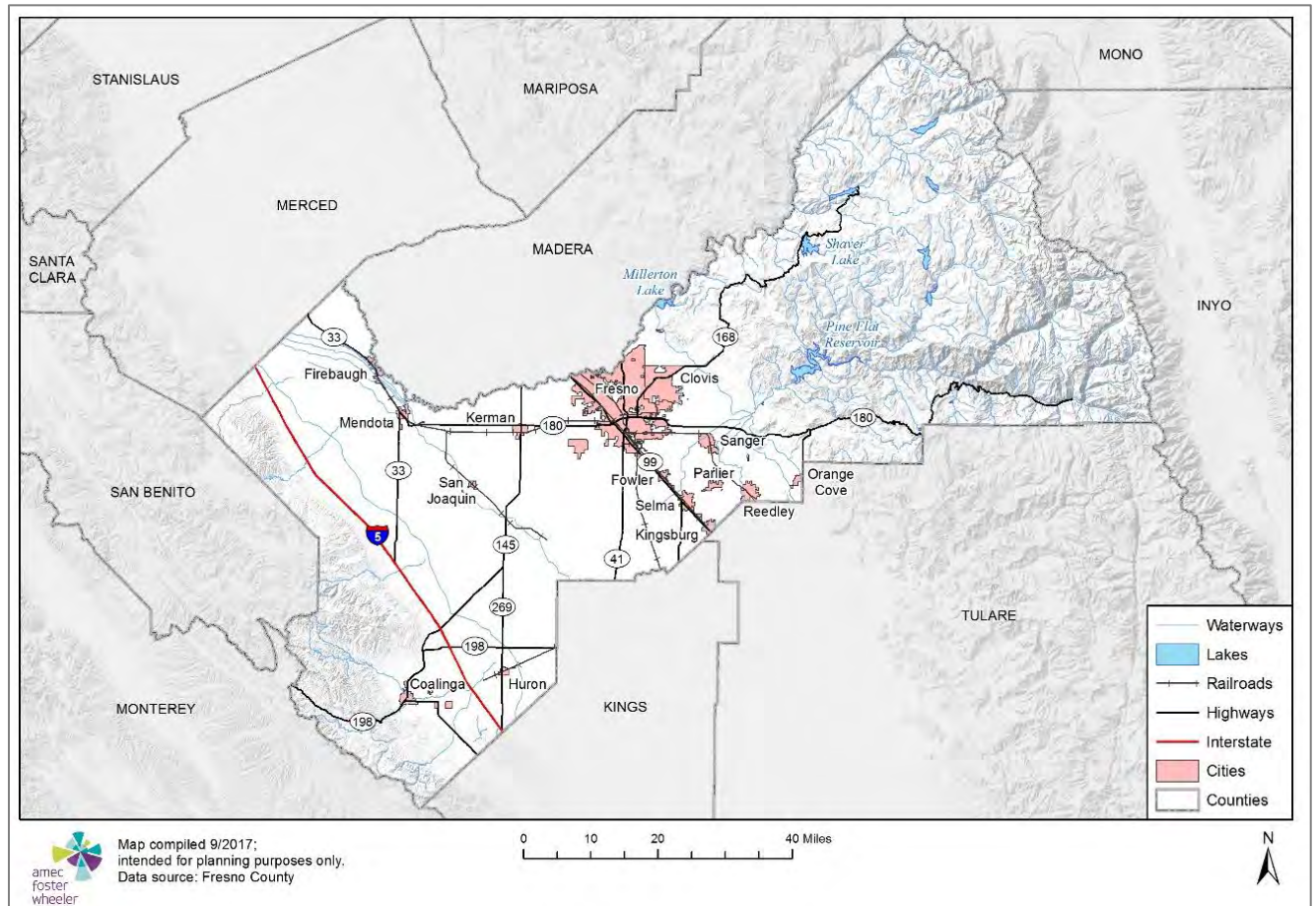
- Community profile summarizing geography and climate, history, economy, and population;
- Hazard risk information for geographically specific hazards or unique vulnerabilities;
- Hazard map(s) at an appropriate scale for the jurisdiction, if available;
- Number and value of buildings, critical facilities, and other community assets located in hazard areas, if available;
- Vulnerability information in terms of future growth and development in hazard areas;
- A capability assessment describing existing regulatory, administrative, technical, and fiscal resources and tools as well as outreach efforts and partnerships and past mitigation projects; and
- Mitigation actions specific to the jurisdiction.



2 COMMUNITY PROFILE

Fresno County is illustrated in Figure 2.1.

Figure 2.1 Fresno County Base Map



2.1 History

When the first European settlers came to the Fresno area in the early 1800s, the Yokuts tribe was living on the valley floor and in the foothills along the San Joaquin and the Kings Rivers. The Monache tribe lived further up the rivers. After the initial Spanish explorers came, others began to arrive, including trappers, hunters, and miners. Kit Carson, the famous mountain man, explored the area during the 1840s. Named for the Spanish word for ash or ash tree, Fresno County was created in 1856, yet its present day boundaries were not established until 1909.

The County was a part of the mining boom of California from its early years until the mid-1860s. Once gold fever subsided, the County turned to livestock and general farming, which received its

impetus from the arrival of the Central Pacific Railroad in 1872. As more water became available, the County shifted from general farming to orchards and vineyards.

2.2 Geography and Climate

California's 10th largest county, Fresno County covers an area of over 6,000 square miles in central California. It is approximately 200 miles north-northwest of Los Angeles and approximately 160 miles southeast of San Francisco.

The County is located near the center of California's San Joaquin Valley and is part of the Great Central Valley, one of the state's distinct physical regions. The County's topography is characterized by broad, flat valley floors that generally slope from southeast to northwest; foothills and moderately high mountains (Coast Ranges) in the west; and foothills and high mountains (Sierra Nevada) in the east. Approximately 55 percent of the County is mountainous, and 45 percent is valley land. Elevations range from 100 to 400 feet on the valley floor to 4,000 feet in the Coast Ranges and more than 14,000 feet in the Sierra Nevada. There are two major rivers in Fresno County, both which originate in the Sierra Nevada: the San Joaquin and Kings rivers.

The climate varies among the County's three regions. Summers are long, hot, and dry in the valley; moderate to hot in the Coast Ranges; and relatively cool in the high elevations of the Sierra Nevada. There is little precipitation in the County during the summer. Winters in the valley and Coast Ranges are short and mild with light rain in the valley and moderate rainfall in the Coast Ranges. In the Sierra Nevada, winters vary from short and mild with frequent rain and some snow to moderately severe with frequent snow. Most of the seasonal precipitation occurs between October and April. More specific information about Fresno County's climate can be found in Chapter 4 Risk Assessment.

2.3 Economy

Agriculture is Fresno County's primary industry and is a driving force in the County's economy. Fresno County is the third largest agricultural county in the state, with a total gross production value of over \$7 billion. The county leads the State in tomato processing, accounting for over 30 percent of the State's total production, and chickens, with nearly 50 percent of the State's total production, followed by Merced with 26 percent. Fresno County ranks second in production of almonds, with 17 percent of the State's total production, grapes, with 13 percent, cattle and calves, with 13 percent, pistachios, with 23 percent, and tangerines, with 32 percent. The ten leading crops, in order of dollar value, were grapes, cotton, almonds, tomatoes, turkeys, cattle, milk, plums, oranges, peaches, and nectarines.

The 2014 Fresno County Agricultural Commissioner's Report includes a comparison of gross production value of crops by year. The Agricultural Commissioner's Report shows that field crops and fruit and nut crops experienced the most dramatic change in the percentage of total profits between 1994 and 2014. From 1994 to 2014, field crops dropped from 21.4 to 4.6 percent of the

total gross production value of crops harvested, and during that same period fruit and nut crops grew from 32.2 to 49.0 percent.

Agriculture accounts for the largest portion of jobs in Fresno County; However, since 1990, the percentage of agriculture-related jobs has continuously fallen. In 1990 agriculture-related jobs accounted for over 50 percent of the total jobs within the top ten ranking industries. By 2000, there was a decrease, with agriculture-related jobs falling to approximately 47 percent of those total jobs. By 2013, the percentage had decreased to approximately 36 percent. The 2006 Fresno County Agricultural Crop and Livestock Report states that while the agricultural economy is improving, the industry struggles with labor shortages during peak harvest periods, increased production expenses, and hazard-related losses (drought, frost, hail, rain, and excessive heat).

Fresno County farm employment represents 13.2 percent of the total countywide employment, compared to 2.5 percent of statewide employment. Within the Valley, San Joaquin County had the lowest unemployment rate (8.8 percent) and Tulare County had the highest (12.2 percent), with Fresno County falling in between (10.3 percent). Fresno County has slightly more service-related employment than the rest of the San Joaquin Valley. The total goods-producing employment (e.g., mining, construction, and manufacturing) represented 12.3 percent of the total nonfarm employment, which is just slightly lower than the state and also lower than that of the San Joaquin Valley, at 12.7 and 13.8 percent, respectively

Beyond agriculture and farming, the healthcare field has shown robust growth in Fresno County. Between 1990 and 2013, employment in ambulatory health services more than doubled, with an average annual growth rate of 3.4 percent. The hospital sector has also grown, with an annual growth rate of 1.4 percent from 1990 to 2013. Additionally, employment in the administrative and support services sector increased at an average annual rate of 3.9 percent between 1990 to 2013.

When looking at total employment within the entire Valley, Fresno County ranked highest, with 33 percent of total employment, followed by Kern and San Joaquin counties with 30 and 23 percent, respectively. Though Fresno County has the highest percentage of jobs, the number of jobs grew much faster in other counties, at 1.6 percent average annual growth rate between 2010 and 2014, in comparison to Kern, Madera, and Merced counties which during the same period grew at rates of 3.0 percent, 2.3 percent and 2.0 percent, respectively.

While Fresno County's total employment was the highest among San Joaquin Valley counties, the unemployment rate fell in the middle. San Joaquin County had the lowest unemployment rate in December 2015 (8.8 percent) and Tulare County had the highest (12.2 percent), with Fresno County at 10.3 percent, a rate very similar to other counties in the Valley. All counties in the San Joaquin Valley had unemployment rates significantly higher than that of the state average of 5.8 percent.

In relation to the state and neighboring counties, Fresno County has a lower population to jobs ratio, which may indicate a lack of available jobs to match the skills of the county's residents or reflect the number of residents who work outside the county but who can afford the cost of housing

in the County as opposed to the higher cost housing in the Bay Area. Education levels are also lower; approximately 20 percent of the county population with a bachelor's degree or higher, compared to over 30 percent of the statewide population.

Comprehensive economic data available for Fresno County comes from the U.S. Census Bureau by way of the American Community Survey. Select estimates of economic characteristics for Fresno County are shown in Table 2.1.

Table 2.1 Fresno County Economic Characteristics

Characteristic	Fresno County
In civilian labor force, total, percent of population age 16 years+	60.9
In civilian labor force, female, percent of population age 16 years+	54.6
Total accommodation and food services sales, 2012 (\$1,000)	1,226,169
Total health care and social assistance receipts/revenue, 2012 (\$1,000)	5,325,615
Total retail sales, 2012 (\$1,000) (c)	9,117,752
Median household income (in 2015 dollars), 2010-2014	45,233
Per capita income in past 12 months (in 2015 dollars), 2010-2014	20,408
Persons in poverty, percent	26.8
Total employer establishments, 2015	16,350
Total employment 2015	374,564
Total annual payroll (\$1,000), 2015	10,056,124
Total employment, percent change 2014-2015	2.0

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

The median household income for Fresno County has increased over the past nine years, from about \$41,900 in 2005 to \$45,233 in 2015. In comparison with other San Joaquin Valley counties, the median household income is somewhat low. The County falls significantly short of the state median household income (\$61,900), as well as other counties in the San Joaquin Valley (\$52,000 in San Joaquin County and \$51,000 in Stanislaus County).

More recent data from the California Employment Development Department indicates that, in 2015, there were 432,146 people in the Fresno County labor force. Of these, 374,564 were employed; 57,137 were not. The unemployment rate was 13.2 percent. Areas with seasonal economies, such as the County's agriculture industry, tend to have higher unemployment.

Table 2.2 illustrates the breakdown of employment by industry in Fresno County in 2016, and Table 2.3 compares the distribution of employment in Fresno County to the San Joaquin Valley and State of California. The best available data on industry is compiled by Fresno County Economic Development Corporation using US Economic Census information from 2012. This information is also included in the 2040 Fresno County General Plan.

Table 2.2 Fresno County's Employment by Industry, 2016

Industry	# Employed	% Employed
Educational Services, and Health Care, and Social Assistance	89,768	23.6
Retail Trade	40,404	10.6
Agriculture, Forestry, Fishing and Hunting, and Mining	38,340	10.1
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	33,510	8.8
Professional, Scientific, and Management, and Administrative and Waste Management Services	31,818	8.4
Manufacturing	28,025	7.4
Public Administration	23,284	6.1
Construction	20,259	5.3
Other Services, Except Public Administration	19,208	5.0
Transportation and Warehousing, and Utilities	18,381	4.8
Finance and Insurance, and Real Estate and Rental and Leasing	18,293	4.8
Wholesale Trade	14,526	3.8
Information	4,805	1.3
Totals	380,621	100.0

Source: U.S. Census Bureau American Community Survey, 2012-2016 5-Year Estimates, www.census.gov/

Table 2.3 Annual Employment by Industry*-- California, Fresno, and San Joaquin Valley*

Sector/Industry	California		Fresno		San Joaquin Valley	
	Avg Emp	% of Total	Avg Emp	% of Total	Avg Emp	% of Total
Total Farm	399,100	2.5%	48,900	13.2%	196,400	13.7%
Total Nonfarm	14,706,300	90.3%	292,600	79.2%	1,124,100	78.6%
Goods Producing						
Mining and Logging***	30,500	0.2%	300	0.1%	51,800	4.6%
Construction	589,900	4.0%	12,200	4.2%		
Manufacturing	1,252,100	8.5%	23,600	8.1%	103,300	9.2%
Subtotal Goods Producing	1,872,500	12.7%	36,100	12.3%	155,100	13.8%
Trade, Transportation, and Utilities						
Wholesale Trade	675,700	4.6%	12,800	4.4%	44,900	4.0%
Retail Trade	1,572,300	10.7%	33,800	11.6%	137,900	12.3%
Transportation, Warehousing, Utilities	487,300	3.3%	11,600	4.0%	52,500	4.7%
Subtotal Trade, Transportation, Utilities	2,735,300	18.6%	58,200	19.9%	235,300	20.9%
Service Providing						
Information	435,100	3.0%	3,800	1.3%	11,500	1.0%
Financial Activities	773,500	5.3%	12,800	4.4%	41,600	3.7%
Professional and Business Services	2,238,200	15.2%	28,000	9.6%	102,000	9.1%
Education Services (Private), Health Care, Social Assistance	2,172,100	14.8%	51,100	17.5%	174,000	15.5%
Leisure and Hospitality	1,598,700	10.9%	28,000	9.6%	101,200	9.0%
Other (excluding Private Household Workers)	504,700	3.4%	10,600	3.6%	35,100	3.1%
Government	2,376,300	16.2%	64,100	21.9%	256,100	22.8%
Subtotal Service Producing	10,098,600	68.7%	198,400	67.8%	721,500	64.2%
Total Employment	16,281,000	100.0%	369,300	100.0%	1,430,500	100.0%

*Employment reflects number of jobs. Data is not seasonally adjusted.

**Includes Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare Counties.

***The total number and percentage for San Joaquin Valley is higher than the actual estimate; numbers for Kern, Fresno, and San Joaquin County included construction numbers separately from Mining and Logging but the other five counties did not. Therefore, the total for Mining and Logging jobs in San Joaquin Valley also includes construction jobs.
Source: California Employment Development Department, 2012.

2.4 Population

Fresno County is one of the largest, fastest growing, and most diverse counties in California. It is the state's 10th most populous county according to the California Department of Finance. Fresno County's population is projected to grow by 606,200 over the 45-year period, an increase of 61.8 percent overall and an average annual rate of 1.1 percent. The county's rate falls between the San Joaquin Valley (76.1 percent overall and 1.4percent annually) and California (32.8percent overall and 0.6percent annually).

Overall, Fresno County has a younger population than the rest of California. Minors (under 18) account for 29.3 percent of the population, while seniors (age 65 and above) account for 10.6 percent of the population. Approximately 30.6 percent of the population in Fresno County cities is under 18, compared with 26.2 percent in unincorporated areas (U.S. Census Bureau, 2014 American Community Survey).

Fresno County residents have completed less formal education than residents of California as a whole, with 50.6 percent of the population in Fresno County attaining education levels beyond a high school diploma, compared with 60.8 percent of the population in California (U.S. Census Bureau, 2014 American Community Survey).

Population estimates for the years 2010-2016 for each of the incorporated towns and the unincorporated County are provided in Table 2.4.

Table 2.4 Fresno County Population 2010-2016*

	2010	2011*	2012*	2013*	2014*	2015*	2016*
County Total	932,463	940,496	946,844	953,762	963,151	972,130	979,915
City of Clovis	96,210	97,452	98,560	99,656	101,980	103,926	106,583
City of Coalinga	18,067	18,047	16,812	16,736	16,412	16,521	16,598
City of Firebaugh	7,373	7,474	7,639	7,773	7,935	8,084	8,176
City of Fowler	5,305	5,434	5,655	5,785	5,908	6,006	6,083
City of Fresno	496,879	500,897	505,261	508,971	514,376	518,503	522,053
City of Huron	6,755	6,754	6,763	6,777	6,789	6,812	6,941
City of Kerman	13,641	13,894	14,314	14,338	14,376	14,463	14,594
City of Kingsburg	11,411	11,512	11,601	11,668	11,702	11,774	11,807
City of Mendota	11,179	11,356	11,382	11,381	11,377	11,398	11,418
City of Reedley	23,669	23,968	24,304	24,562	24,858	25,092	25,273
City of Sanger	24,303	24,467	24,542	24,625	24,716	24,857	25,007
City of San Joaquin	3,927	3,965	3,974	3,991	4,010	4,008	4,011
City of Selma	23,317	23,445	23,775	24,160	24,2345	24,349	24,597

Source: U.S Census Bureau American Community Survey 5-Year Estimates <http://factfinder.census.gov/>

*Estimate

Select demographic and social characteristics for Fresno County from the 2012-2016 American Community Survey are shown in Table 2.5.

Table 2.5 Fresno County Demographic and Social Characteristics, 2016

Fresno County	
Population	
Population estimates, 2016	963,160
Population, percent change- 2010 (estimates base) to 2016	3.5
Population, Census, 2010	930,450
Age and Sex	
Persons under 5 years, percent	8.2
Persons under 18 years, percent	28.9
Persons 65 years and over, percent	11.2
Female persons, percent	50.1
Race and Hispanic Origin	
White alone, percent	61.6
Black or African American alone, percent	5.0
American Indian and Alaska Native alone, percent	1.0
Asian alone, percent	9.9
Native Hawaiian and Other Pacific Islander alone, percent	0.2
Two or More Races, percent	3.9
Hispanic or Latino, percent	52.0
White alone, not Hispanic or Latino, percent	30.8
Education	
High school graduate or higher, percent of persons age 25 years+	73.8
Bachelor's degree or higher, percent of persons age 25 years+	19.7

Source: U.S. Census Bureau, 2010 Decennial Census, 2016 Population Estimates, American Community Survey 2012-2016 5-Year Estimates, <http://factfinder2.census.gov/>

2.5 Development Trends

The California Department of Finance (DOF) forecasts population growth from 2015 through 2060 for the eight counties in the San Joaquin Valley and for California overall. Fresno County's population is projected to grow by 606,200 over the 45-year period, an increase of 61.8 percent overall and an average annual rate of 1.1 percent. The growth rate is expected to be higher over the first few decades before tapering-off in the later decades. Fresno County's rate falls between the San Joaquin Valley (76.1percent overall and 1.4percent annually) and California (32.8 percent overall and 0.6 percent annually). Fresno County's growth rate through 2060 is expected to be lower than all other San Joaquin Valley counties, except Stanislaus County (59.0percent overall and 1.0 percent annually).

Since 1960, Fresno County's population has shifted from the county's unincorporated area to the county's cities, with the incorporated-unincorporated split changing from 50.2percent to 49.8percent in 1960 to 82.5percent to 17.5percent in 2015. Fresno County's population and anticipated growth is mostly concentrated in and around the county's cities. The Fresno metropolitan area has absorbed much of the county's population growth, either through annexations or new development. Over 53 percent of the county's population now resides in the City of Fresno and almost 11 percent resides in Clovis. Between 1960 and 2015, the population of unincorporated Fresno County decreased by 11,670 from 182,120 to 170,450, a reduction of 6.4 percent.

The FCOG projections indicate an increasing percentage of employment growth occurring in Fresno County's cities, compared with the unincorporated areas. Between 2015 and 2050, 91.8 percent of the employment growth is projected to occur in city spheres of influence. This will result in 16.8 percent of the county's employees located in the unincorporated area by 2050. The fastest-growing sectors will be construction (3.8 percent annually), professional and business services (3.1 percent annually), and educational services, health care, and social assistance (3.2 percent annually).



3 PLANNING PROCESS

Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

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

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 Background on Mitigation Planning in Fresno County

The primary purpose of the Fresno County Multi-Jurisdictional Hazard Mitigation Plan (LHMP) update is to reduce or eliminate long-term risk to people and property from natural hazards and their effects on the Fresno County, California planning area. Fresno County recognized the need and importance of a Local Hazard Mitigation Plan (LHMP) and initiated its development in 2007 after receiving a grant from the Federal Emergency Management Agency (FEMA), which served as the primary funding source for this plan. The original LHMP was developed in 2007-2008 and received FEMA approval in 2009. Additional details on the original planning effort can be referenced in the 2009 Plan.

The plan underwent a comprehensive update in 2017-2018. The planning process followed during the update was similar to that used in the original plan development utilizing the input from a multi-jurisdictional Hazard Mitigation Planning Committee (HMPC). Amec Foster Wheeler was procured to assist with the update in 2017. The process is described further in this section and documented in Appendix E.

3.2 What's New in the Plan Update

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

The updated LHMP complies with Federal Emergency Management Agency (FEMA) guidance and California Office of Emergency Services guidelines for Local Hazard Mitigation Plans. The update followed the requirements noted in the Disaster Mitigation Act (DMA) of 2000 and the 2013 Local Hazard Mitigation Planning Handbook.

This HMP update involved a comprehensive review and update of each section of the 2009 plan and includes an assessment of the progress of the participating communities in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Only the information and data still valid from the 2009 plan was carried forward as applicable into this HMP update.

Also to be noted, Section 7 Plan Implementation of this plan update identifies key requirements for updating future plans including:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Document hazard events and impacts that occurred within the five-year period;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate documentation of continued public involvement;
- Incorporate documentation to update the planning process that may include new or additional stakeholder involvement;
- Incorporate growth and development-related changes to building inventories;
- Incorporate new project recommendations or changes in project prioritization;
- Include a public involvement process to receive public comment on the updated plan prior to submitting the updated plan to Cal OES/FEMA; and
- Include re-adoption by all participating entities following FEMA approval.

These requirements and others as detailed throughout this plan were addressed during the 2017-2018 plan update process.

Plan Section Review and Analysis – 2018 Update

During the 2017-2018 plan update, the HMPC updated each of the sections of the previously approved plan to include new information. Amec Foster Wheeler developed a summary of each section in the plan and guided the HMPC through the elements that needed updating during the kickoff meeting in July 2017. This included analyzing each section using FEMA’s local plan update guidance (2013) to ensure that the plan met the latest requirements. The HMPC and Amec Foster Wheeler determined that nearly every section of the plan would need revision to align the plan with the latest FEMA planning guidance and requirements. A summary of the changes in this plan update is highlighted in the table below

Table 3.1 Fresno County Hazard Mitigation Plan Update Highlights

Plan Section	Summary of Plan Review, Analysis, and Updates
1. Introduction	Updated language to describe purpose and requirements of the Fresno County Multi-Jurisdictional Hazard Mitigation Plan update process. Identified new participating jurisdictions.
2. Community Profile	Updated with recent census data and current economy description
3. Planning Process	Described and document the planning process for the update, including coordination among agencies Described how 2009 plan was integrated with/into other planning efforts. Removes 2009 planning process info. Described any changes in participation in detail. Described 2017-2018 public participation process Described updates to the Hazard Mitigation Planning Committee
4. Risk Assessment	Revisited former hazards list for possible modifications. Reviewed the County and City of Fresno's CRS participation Updated list of disaster declarations to include recent data. Updated tables to include recent National Center for Environmental Information data. Updated past occurrences for each hazard to include recent data. Updated critical facilities identified from the 2009 plan. Updated growth and development trends to include recent Census and local data sources. Updated historic and cultural resources using local/state/national sources. Updated property values for vulnerability and exposure analysis, using updated building information based on assessor's data. Updated estimate flood losses using the latest Fresno County Digital Flood Insurance Rate Map (DFIRM) and assessor's data. Updated National Flood Insurance Program (NFIP) data and Repetitive Loss structure data from the previous plan. Incorporated new hazard loss estimates since 2009, as applicable. Used updated GIS inventory data to assess wildfire threat to the County Updated HAZUS-MH Level I earthquake vulnerability analysis data Updated information regarding specific vulnerabilities to hazards, including maps and tables of specific assets at risk, specific critical facilities at risk, and specific populations at risk. Updated maps in plan where appropriate. Reviewed mitigation capabilities and update to reflect current capabilities.
5. Mitigation Strategy	Indicated what projects have been implemented that may reduce previously identified vulnerabilities. Updated Chapter 5 based on the results of the updated risk assessment, completed mitigation actions, and implementation obstacles and opportunities since the completion of the 2009 plan. Reviewed and updated goals and objectives based on HMPC input. Revised to include more information on the Community Rating System (CRS) categories of mitigation measures (structural projects, natural resource protection, emergency services, etc.) and how they are reviewed when considering the options for mitigation. Included updated information on how actions are prioritized. Reviewed mitigation actions from the 2009 plan and develop a status report for each; identified if actions have been completed, deleted, or deferred/carried forward. Updated priorities on actions. Identified examples of successful implementation to highlight positive movement on actions identified in 2009 plan. Identified and detailed new mitigation actions proposed by the HMPC.

Plan Section	Summary of Plan Review, Analysis, and Updates
6. Plan Adoption	Plan will be re-adopted as part of the update process
7. Plan Maintenance	Reviewed and updated procedures for monitoring, evaluating, and updating the plan. Revised to reflect current methods. Updated the system for monitoring progress of mitigation activities by identifying additional criteria for plan monitoring and maintenance.
Jurisdictional Annexes	Developed annexes for new participating jurisdictions in 2017-2018. Updated previous participants' annexes with recent Census data. Updated past event history and hazard loss estimates. Added new maps and updated old maps as needed. Updated mitigation actions from 2009 and added new mitigation actions.
Appendices	Updated references. Updated planning process documentation. Updated mitigation alternatives analyzed in the process. Public participation plan updated Plan Adoption.

3.3 Local Government Participation

In the 2017-2018 plan update, the following jurisdictions participated in the planning process and will be adopting the updated plan following FEMA approval. Changes in participation during the 2017-2018 are denoted below by an asterisk '*' which indicates jurisdictions added to the plan during the update process. This included four municipalities and two special districts. Only one municipality (Huron) that participated in the 2009 plan did not participate in the update and no longer has an annex specific to them.

Lead Jurisdiction:

- Fresno County

Municipalities:

- City of Clovis
- City of Coalinga
- City of Firebaugh*
- City of Fowler*
- City of Fresno
- City of Kerman
- City of Kingsburg
- City of Mendota
- City of Reedley*
- City of San Joaquin*
- City of Sanger
- City of Selma

Special Districts:

- Fresno Metropolitan Flood Control District
- Lower San Joaquin Levee District
- Sierra Resource Conservation District/Highway 168 Fire Safe Council
- Kings River Conservation District*
- Westlands Water District*

**indicates new to plan in 2017-2018*

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC
- Detail areas within the planning area where the risk differs from that facing the entire area
- Identify potential mitigation actions
- Formally adopt the plan

For the Fresno County planning area's HMPC, "participation" meant the following:

- Providing facilities for meetings
- Attending and participating in the HMPC meetings
- Completing and returning Amec Foster Wheeler Data Collection worksheets or reviewing and jurisdictional annexes
- Collecting and providing other requested data (as available)
- Identifying mitigation actions for the plan
- Reviewing and providing comments on plan drafts
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan
- Coordinating, and participating in the public input process
- Coordinating the formal adoption of the plan by the governing boards

The County and all jurisdictions with annexes to this plan and seeking FEMA approval met all of these participation requirements. In most cases one or more representatives for each jurisdiction attended the multi-jurisdictional meetings described in Table 3.2, Schedule of Planning Meetings, and also brought together a local planning team to help collect data, identify mitigation actions and implementation strategies, and review and provide data on annex drafts. In some cases, the jurisdictions had limited capacity to attend or had conflicts with HMPC meetings; in these cases, side-bar phone calls and emails were used to provide input into the process. Appendix E provides additional information and documentation of the planning process.

3.4 The 10-Step Planning Process

Amec Foster Wheeler established the planning process for the Fresno County Multi-Jurisdictional Hazard Mitigation Plan using the DMA planning requirements and FEMA’s associated guidance. The original FEMA planning guidance is structured around a four-phase process:

- 1) Organize Resources
- 2) Assess Risks
- 3) Develop the Mitigation Plan
- 4) Implement the Plan and Monitor Progress

Into this process, Amec Foster Wheeler integrated a more detailed 10-step planning process used for FEMA’s Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of major grant programs including: FEMA’s Hazard Mitigation Grant Program, Pre-Disaster Mitigation program, Flood Mitigation Assistance Program, and flood control projects authorized by the U.S. Army Corps of Engineers.

In 2013, FEMA released the Local Mitigation Planning Handbook that has become the official guide for local governments to develop, update and implement local mitigation plans. While the requirements under §201.6 have not changed, the Handbook provides guidance to local governments on developing or updating hazard mitigation plans to meet the requirements under the Code of Federal Regulations (CFR) Title 44 – Emergency Management and Assistance §201.6, Local Mitigation Plans for FEMA approval and eligibility to apply for FEMA Hazard Mitigation Assistance grant programs. It also offers practical approaches, tools, worksheets and local mitigation planning examples for how communities can engage in effective planning to reduce long-term risk from natural hazards and disasters. The Handbook complements and liberally references the Local Mitigation Plan Review Guide (October 1, 2011), which is the official guidance for Federal and State officials responsible for reviewing local mitigation plans in a fair and consistent manner.

Table 3.1 shows how the modified 10-step process fits into FEMA’s four-phase process, and how these elements correspond to the tasks in the FEMA Mitigation Planning Handbook.

Table 3.2 Fresno County Hazard Mitigation Planning Process

FEMA's 4-Phase DMA Process	Modified 10-Step CRS Process	FEMA Local Mitigation Planning Handbook Tasks
1) Organize Resources		
201.6(c)(1)	1) Organize the Planning Effort	1: Determine the planning area and resources
201.6(b)(1)	2) Involve the Public	2: Build the planning team - 44 CFR 201.6 (C)(1)
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies	3: Create an outreach strategy - 44 CFR 201.6(b)(1)
		4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3)
2) Assess Risks		
201.6(c)(2)(i)	4) Identify the Hazards	5: Conduct a risk assessment - 44 CFR 201.6 (C)(2)(i) 44 CFR 201.6(C)(2)(ii)&(iii)
201.6(c)(2)(ii)	5) Assess the Risks	
3) Develop the Mitigation Plan		
201.6(c)(3)(i)	6) Set Goals	6: Develop a mitigation strategy - 44 CFR 201.6(c)(3)(i); 44 CFR 201(c)(3)(ii) and 44 CFR 201.6(c)(3)(iii)
201.6(c)(3)(ii)	7) Review Possible Activities	
201.6(c)(3)(iii)	8) Draft an Action Plan	
4) Implement the Plan and Monitor Progress		
201.6(c)(5)	9) Adopt the Plan	7: Review and adopt the plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan	8: Keep the plan current
		9: Create a safe and resilient community - 44 CFR 201.6(c)(4)

3.4.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

The 2017-2018 planning process and update of the LHMP was formally initiated in April and May of 2017 under the coordination of the Fresno County Office of Emergency Services (OES) as the lead entity. Amec Foster Wheeler worked with the OES staff to establish the framework and organization for development of the plan. Amec Foster Wheeler assisted OES with coordination with other governmental agencies and public process elements to develop the updated LHMP for the Fresno County Operational Area. Organizational efforts were initiated with a series emails to inform and educate jurisdictions within the County of the purpose and need for an update to the countywide hazard mitigation plan. Representatives from participating jurisdictions and HMPC members to the 2009 plan were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is included in Appendix B. Email invitations were sent to all city managers (15) and fire chiefs, county departments; and all special districts in the County. The HMPC was re-established as a result of this effort.

Hazard Mitigation Planning Committee

The HMPC, which included key County, city, and other local government and stakeholder representatives, updated the plan with leadership from the County's emergency services manager and facilitation by Amec Foster Wheeler. The following participated on the HMPC:

Fresno County

- Agriculture Department
- CAO
- Public Health Department
- Public Health -Environmental Health and Safety
- Fresno County Fire Protection District
- Internal Services Department
- Information Technology Services Department
- Office of Emergency Services (Lead)
- Public Works - Development Services
- Public Works and Planning Department
- Public Works - Roads
- Sheriff's Department

Participating Jurisdictions

- City of Clovis
 - Fire
- City of Coalinga
 - Fire
- City of Fresno
 - Office of Emergency Services
- City of Firebaugh
- City of Fowler
- City of Kerman
 - Police
 - Public Works
- City of Kingsburg
 - Fire
- City of Mendota
- City of Reedley
- City of San Joaquin
- City of Sanger
 - Fire
- City of San Joaquin
- City of Selma
- Fresno Metropolitan Flood Control District

- Lower San Joaquin Levee District
- Sierra Resource Conservation District – in cooperation with Oak to Timberline Fire Safe and Highway 168 Fire Safe Council
- Westlands Water District

Other Government and Stakeholder Representatives:

- California Department of Water Resources
- California Department of Forestry and Fire (CAL FIRE: Fresno County)
- Fresno Irrigation District*
- Fresno Mosquito District
- Kings River Conservation District*
- San Joaquin Valley Resource Conservation Development
- U.S. Army Corps of Engineers Pine Flat
- U.S. Forest Service – Sierra National Forest*
- U.S. Bureau of Reclamation*

A list of the primary HMPC representatives for each jurisdiction and a complete list of participating HMPC members are included in Appendix B. The jurisdictions participated in all elements of the planning process in accordance with the definition of participation noted previously in Section 3.3 Local Government Participation. Each jurisdiction also utilized the support of many other support staff in order to collect and provide requested data and conduct timely reviews of the draft documents. Note that the above list of HMPC members also includes several other government and stakeholder representatives that contributed to the planning process. Specific participants from these other agencies are also identified in Appendix B.

Planning Meetings

The planning process officially began with a kick-off meeting on July 12, 2017. The meeting covered the scope of work and an introduction to the DMA requirements. Participants were provided with a Local Hazard Mitigation Plan Update Guide, which included worksheets to facilitate the collection of information necessary to support update of the plan. Using FEMA guidance, Amec Foster Wheeler designed these worksheets to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. A copy of Amec Foster Wheeler’s Local Hazard Mitigation Plan Update Guide for this project is included in Appendix E. The County and each jurisdiction seeking FEMA approval of their plan completed and returned the worksheets in either the Local Hazard Mitigation Plan Update Guide, or the Jurisdictional Annex Template (described further below) to Amec Foster Wheeler for incorporation into the plan document.

During the planning process, the HMPC communicated through face-to-face meetings, email, telephone conversations, and a project-based website. Draft documents were posted on this website so that the HMPC members could easily access and review them. The HMPC formally met three

times during the planning period (July 12, 2017 – November 16, 2017). The purposes of these meetings are described in Table 3.2. In addition to these meetings some jurisdictions held meetings with subcommittees to discuss the needed input for the plan update. An example is a meeting with County OES and other department representatives on August 15, 2017. In a couple cases some municipalities were not able to attend the planning workshops due to scheduling conflicts or limited staff capacity. The County emergency manager and the planning consultant worked with the jurisdictions individually in those cases to obtain necessary information and input into the planning process. This was done through direct emails from the planning consultant and follow-up phone conversations with the consultant and County emergency manager where necessary.

Table 3.3 Schedule of Planning Meetings

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #1	Kick-off meeting: introduction to DMA, the planning process, and hazard identification	July 12, 2017	Clovis
HMPC #2	Hazard Identification, Risk Assessment, and Mitigation Goals/Strategy	October 6, 2107	Clovis
HMPC #3	Development and prioritization of mitigation action recommendations	November 16, 2017	Clovis

During the kickoff meeting, a template for the jurisdictional annexes was distributed. Similar to the Local Hazard Mitigation Plan Update Guide described above, this template included blank tables and other directional information to facilitate the collection of key jurisdictional information for jurisdictions that would be new to the plan in 2017-2018. A copy of the Jurisdictional Annex Template is included in Appendix E. A project Google drive was used to coordinate the population of the templates and receive edits to existing jurisdictional annexes. Each jurisdiction with an annex in this plan provided data as requested in the annex template and reviewed and commented on the draft annexes throughout the development of the plan. Information each jurisdiction reviewed and updated included jurisdictional hazards and vulnerabilities, growth and development trends, capabilities, progress on previously identified mitigation actions and new mitigation actions. The information was provided directly through the edits to the draft annexes and in emails exchanged with the planning consultant.

Agendas for each of the meetings and lists of attendees are included in Appendix E.

Planning Step 2: Involve the Public

Involving the public assures support from the community at large and is a part of the planning process. Early discussions with the Fresno County OES established the initial plan for public involvement in the plan update. Public outreach began early in the process with a public survey and a meeting held in November 2017 to inform the public of the purpose of the DMA and the hazard mitigation planning process for the Fresno County planning area.

At the kick-off meeting, the HMPC discussed additional options for public involvement and agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities included press releases, website postings, flyer development and distribution, public meetings, and the collection of public comments on the draft plan. The Fresno County Multi-Jurisdictional Hazard Mitigation Plan was also discussed on the local radio during interview with the County OES manager.

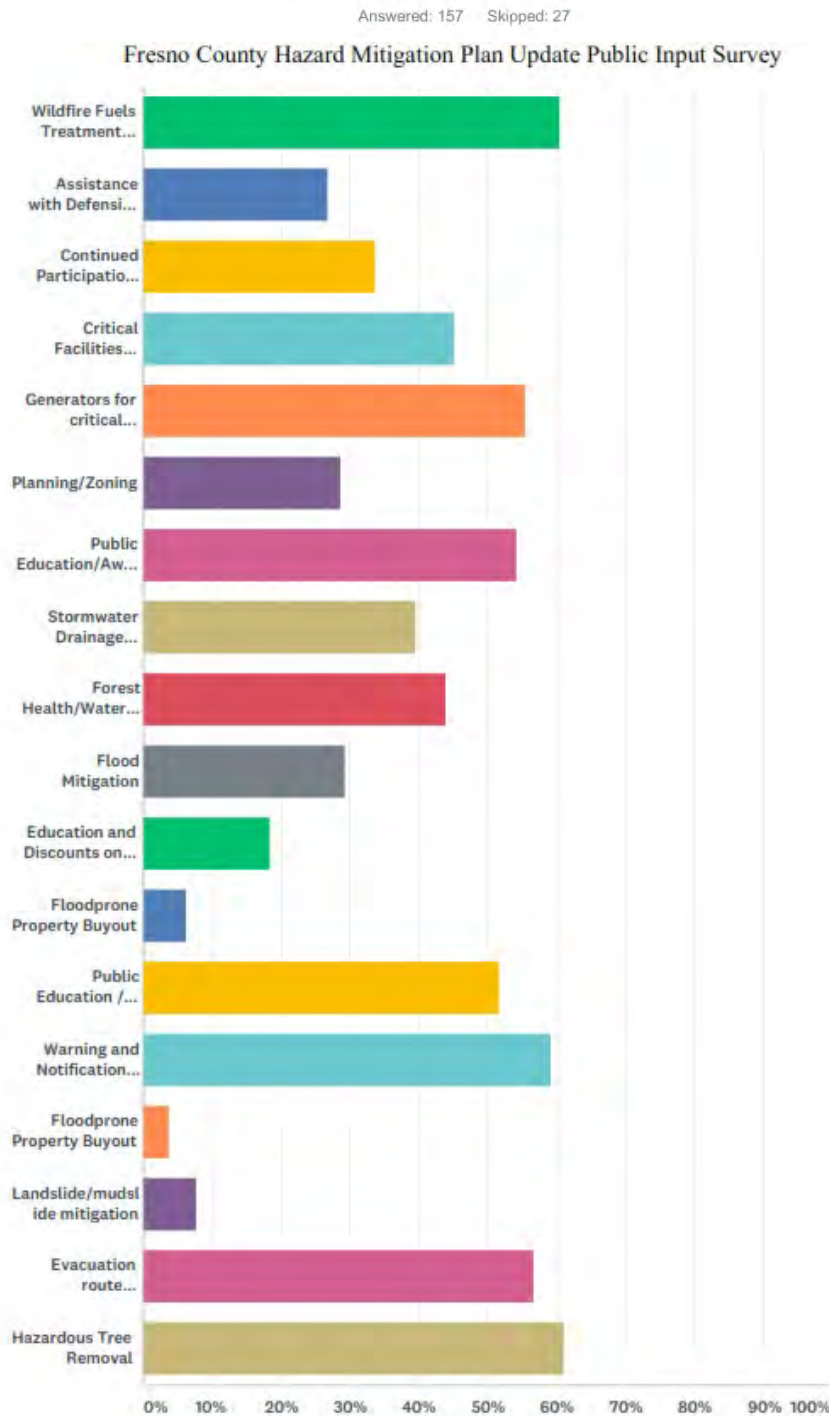
A public involvement ‘backgrounder’ document (see Appendix E) was prepared and presented to the HMPC at the kickoff meeting. The document outlines the FEMA definition of hazard mitigation, explains why hazard mitigation is important, gives some background on hazard mitigation plans and the process of updating the plans, and finally offers information on how the public can become involved in the process. This backgrounder was used as handout at various public meetings and events as a mechanism to outreach and engage the public in the planning process for the update. An example of a public meeting where the flyer was distributed was a commissioner’s meeting on personal disaster preparedness held November 13, 2017. Hardcopy versions of a public survey discussed below were also distributed.

During the plan update’s drafting stage, an online public survey was developed as a tool to gather public input. A hardcopy version was also developed. The survey was for the public to provide feedback to the Fresno County multi-jurisdictional Hazard Mitigation Planning Committee on reducing hazard impacts. The survey provided an opportunity for public input during the planning process, prior to finalization of the plan update. The survey gathered public feedback on concerns about hazards and input on strategies to reduce their impacts. The survey was released in November and closed on December 31st. The HMPC provided links to a public survey by distributing it using social media, email, and posting the link on websites.

One hundred eighty four (184) people filled out the survey online and in hardcopy (which was faxed or scanned and emailed). Results showed that the public perceives the most significant hazards to be drought, tree mortality and wildfire. Wildfire fuels treatment projects, evacuation route development and hazardous tree removal were cited as the most popular mitigation actions. A summary of the survey data can be found in Appendix E.

Figure 3.1 Example of Public Survey Response

Q3 The following types of mitigation actions may be considered in Fresno County. Please indicate the types of mitigation actions that you think should have the highest priority in the updated Fresno County Multi-Hazard Mitigation Plan.



A public meeting that was held during the draft-plan development and prior to finalizing the plan is noted in Table 3.3. Eight citizens attended and learned about the plan update process; hazards and vulnerabilities identified in the plan were discussed. Example press releases and sign in sheets are located in Appendix E. Prior to finalizing the plan the draft was available online on the Fresno County OES website. The draft plan was advertised through social media, mass emailing and an advertisement in the Fresno Bee. An electronic comment form was provided with the draft plan. Three comments were received and are documented in Appendix E. Some of these comments resulted in minor changes to the plan (corrections or clarifications in Chapters 3 and 4). One comment noted that long-term power outages or electro-magnetic pulse events were not directly addressed in the plan. The plan was not revised specific to this comment since power disruption is accounted for as a consequence of many hazards identified in the plan, including severe weather, earthquake, landslide and wildfire, and the mitigation strategy does include projects related to enhancing backup power. The public outreach activities described here were conducted with participation from and on behalf of all jurisdictions participating in this plan.

Table 3.4 Public Meeting Schedule

Meeting Topic	Meeting Date	Meeting Location
Public education and feedback Meeting: risk assessment overview, mitigation project options overview, an update on planning process, and public survey	November 16, 2017	Clovis

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, state, federal, and local agencies and organizations were invited to participate as stakeholders in the process. Stakeholders could participate in various ways, either by contributing input at HMPC meetings, being aware of planning activities through an email group, providing information to support the effort, or reviewing and commenting on the draft plan. Based on their involvement in other hazard mitigation planning efforts, status in the County, and interest as a neighboring jurisdiction, representatives from the following agencies were invited to participate as stakeholders in the process:

- California Department of Forestry and Fire Protection (CAL FIRE: Fresno County)*
- California Department of Water Resources
- California Governor’s Office of Emergency Services*
- California Department of Transportation CAL Trans
- Fresno Irrigation District*
- Fresno Metropolitan Flood Control District*
- Fresno Mosquito District
- Highway 168 Fire Safe Council
- Lower San Joaquin Levee District*
- Madera County Office of Emergency Services
- Table Mountain Rancheria

- U.S. Army Corps of Engineers Pine Flat
- U.S. Bureau of Reclamation*
- Westlands Water District*

* Participated on HMPC

The HMPC also used technical data, reports, and studies from the following agencies and groups in the development and update of this plan:

- Bureau of Land Management
- California Department of Forestry and Fire Protection*
- California Department of Parks and Recreation Office of Historic Preservation
- California Department of Transportation
- California Geological Survey
- Fresno County Agricultural Department*
- Fresno County Health Department*
- Fresno County Information Technology/Geographic Information Systems Department*
- Fresno County Internal Services Department*
- Fresno County Land Use Department
- Fresno County Public Works and Planning Department*
- National Oceanic and Atmospheric Administration National Climatic Data Center
- National Register of Historic Places
- Natural Resource Conservation Service
- National Weather Service
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- US Sierra National Forest*
- Western Regional Climate Center

* Participated on HMPC

The majority of the listed stakeholders were invited to participate in the planning process, which included an invitation to the kickoff meeting. Several opportunities were provided for the above groups to participate in the planning process. At the beginning of the planning process, invitations were extended to these groups to actively participate on the HMPC.

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as identifying any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. Phone calls and emails were used during plan development to directly coordinate with key individuals representing other regional programs.

As noted by the asterisks next to the above names, many of these groups found it beneficial to participate on the HMPC. Others assisted in the process by providing data directly as requested in

the Local Hazard Mitigation Plan Update Guide or through data contained on their websites. Further as part of the both HMPC and public outreach processes, all groups were invited to review and comment on the plan prior to submittal to CA-OES and FEMA.

As part of the public review and comment period for the draft plan, key agencies were again specifically solicited to provide any final input to the draft plan document. This input was solicited both through membership on the HMPC and by direct emails to key groups and associations to review and comment on the plan. As part of this targeted outreach, these key stakeholders were also specifically invited to attend the HMPC and public meeting to discuss any outstanding issues and to provide input on the draft document and final mitigation strategies.

In summary, several opportunities were provided for the groups listed above to participate in the planning process. At the beginning of the planning process, invitations were extended to these groups to actively participate on the HMPC. Specific participants from these groups are detailed in Appendix B. Others assisted in the process by providing data directly as requested or through data contained on their websites or as maintained by their offices. Further as part of the public outreach process, all groups were invited to attend the public meetings and to review and comment on the plan prior to submittal to Cal OES and FEMA. In addition, as part of the review of the draft plan, key agency stakeholders were contacted and their comments specifically solicited. Emergency managers in adjacent counties (Kings, Inyo, Madera, Merced, Mono, Monterey, San Benito and Tulare) were contacted by the County emergency manager via email and asked to provide comments on the public review draft of the plan. Kern County Emergency Management was also notified of the draft plan. No comments were received.

This process accomplished as part of planning steps two and three in the FEMA Local Mitigation Planning Handbook.

Other Community Planning Efforts and Hazard Mitigation Activities

The coordination and synchronization with other community planning mechanisms and efforts are vital to the success of this plan. To have a thorough evaluation of hazard mitigation practices already in place, appropriate planning procedures should also involve identifying and reviewing existing plans, policies, regulations, codes, tools, and other actions are designed to reduce a community's risk and vulnerability from natural hazards. Fresno County uses a variety of mechanisms to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible, comprehensive document that weaves the common threads of a community's values together. The development and update of this plan involved a comprehensive review of existing plans, studies, reports, and initiatives from Fresno County and each participating municipality that relate to hazards or hazard mitigation. A high level summary of the key plans, studies and reports is summarized in the table below. Information on how they informed the update are noted and incorporated where applicable.

Table 3.5 Summary of Review of Key Plans, Studies and Reports

Plan, Study, Report Name	How Plan informed LHMP
Update to the Fresno County General Plan Policy Document (revised public review draft 2016)	<ul style="list-style-type: none"> Reviewed goals and policies and integrated related information to inform capability assessment and risk assessment
Update to the Fresno County General Plan Background Report and Safety Element and (draft 2016)	<ul style="list-style-type: none"> Incorporated relevant hazard information from this element of the General Plan to inform the risk assessment Updated references associated with safety element and background report, specifically those that address geologic conditions, floods, and hazardous materials Reviewed Chapter 2 <i>Demographic and Employment</i> and incorporated information into the Community Profile of this plan update
Municipal General Plans	<ul style="list-style-type: none"> Reviewed goals and policies and integrated related information to inform capability assessment and risk assessment See jurisdictional annexes for specific references
Fresno County Flood Insurance Study	<ul style="list-style-type: none"> Reviewed for information on past floods and flood problems to inform risk assessment (Chapter 4) Utilized Digital Flood Insurance Rate Maps effective January 2016 to update maps and flood risk assessment in Chapter 4.
State of California Multi-Hazard Mitigation Plan (draft 2018)	<ul style="list-style-type: none"> Reviewed information on climate change and hazard assessment data to ensure consistency with this plan update Reviewed list of hazards to inform risk assessment (Chapter 4) Reviewed goals for consistency during the update of the Fresno Multi-jurisdictional Hazard Mitigation Plan
NOAA National Centers for Environmental Information- State Climate Summaries	<ul style="list-style-type: none"> Reviewed information on climate change to inform risk assessment (Chapter 4)

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Appendix D References provides a detailed list of references used in the preparation of this plan update. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate. More details on the incorporation of existing plans, studies, reports and technical information, including policies, regulations, plans and programs that were used for the LHMP update are included in Chapter 4, Section 4.5, Capability Assessment as well as the jurisdictional annexes.

During the 2017-2018 update this LHMP update was coordinated with the following planning efforts that were ongoing at the time:

- Fresno County General Plan Update - The HMP utilized information from the ongoing update of the General Plan that is anticipated to be approved in 2018. This included referencing

information from the 2016 Revised Background Report and Safety Element. Members of the Amec Foster Wheeler consulting team included Mintier Harnish which was the consultant updating the General Plan. The references to the General Plan policies in Section 4.5 of this plan were reviewed by Mintier Harnish and Department of Public Works staff to reflect recent changes that will be in the updated General Plan. The HMP will be incorporated by reference into the Safety Element in accordance with Assembly Bill (AB) 2140.

- 2017 update of Fresno County Operational Area Master Emergency Services Plan
- The Central California Irrigation District (CCID) Hazard Mitigation Plan is a plan that was developed in 2017 in an adjacent jurisdiction and included participation of staff from Fresno County OES in a planning meeting.

2009 Mitigation Plan Inclusion in Other Planning Mechanisms

Chapter 7 Plan Implementation and Maintenance in the 2009 Plan recommended the incorporation of the hazard mitigation plan recommendations and their underlying principles into other County and City plans and mechanisms. The following is a list of plans that the 2009 LHMP was integrated into, or cross referenced. In some cases communities have deferred this for future planning mechanisms, as discussed in the Chapter 7 Plan Implementation and Maintenance.

Table 3.6: 2009 Mitigation Plan Inclusion in Other Planning Mechanisms

Jurisdiction	Planning Mechanism
Fresno County	Fresno County Operational Area, Master Emergency Services Plan- used to inform Hazard Vulnerability Assessment
	Incorporated by reference into the Safety Element in accordance with Assembly Bill (AB) 2140.
Clovis	Incorporated by reference into the Safety Element in accordance with Assembly Bill (AB) 2140.
Coalinga	Deferred for incorporation by reference in future planning mechanisms, where applicable
Fresno	Deferred for incorporation by reference in future planning mechanisms, where applicable
Huron	Deferred for incorporation by reference in future planning mechanisms, where applicable
Kerman	Deferred for incorporation by reference in future planning mechanisms, where applicable
Kingsburg	Deferred for incorporation by reference in future planning mechanisms, where applicable
Mendota	Deferred for incorporation by reference in future planning mechanisms, where applicable
Sanger	Deferred for incorporation by reference in future planning mechanisms, where applicable
Selma	Deferred for incorporation by reference in future planning mechanisms, where applicable
Fresno Metropolitan Flood Control District	Deferred for incorporation by reference in future planning mechanisms, where applicable
Lower San Joaquin Levee District	Deferred for incorporation by reference in future planning mechanisms, where applicable
Sierra Resource Conservation District	Highway 168 Fire Safe Council CWPP - Cross references the LHMP and mitigation projects

3.4.2 Phase 2: Assess Risks

Planning Step 4: Identify the Hazards

Amec Foster Wheeler led the HMPC in an effort to review the list of hazards identified in the 2009 plan and document all the hazards that have, or could, impact the planning area, including documenting recent drought, flood, wildfire and winter storm events. Data collection worksheets were used in this effort to aid in determining hazards and vulnerabilities and where risk varies across the planning area. The profile of each of these hazards was then updated in 2017 with information from the HMPC and additional sources. Web resources, existing reports and plans, and existing GIS layers were used to compile information about past hazard events and determine the location, previous occurrences, probability of future occurrences, and magnitude/severity of each hazard. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities where data permitted. A more detailed description of the hazard identification and risk assessment process and the results are included in Chapter 4 Risk Assessment.

Planning Step 5: Assess the Risks

After updating the profiles of the hazards that could affect the County, the HMPC collected information to describe the likely impacts of future hazard events on the participating jurisdictions. This step included two parts: a vulnerability assessment and a capability assessment.

Vulnerability Assessment—Participating jurisdictions updated their assets at risk to natural hazards—overall and in identified hazard areas. These assets included total number and value of structures; critical facilities and infrastructure; natural, historic, and cultural assets; and economic assets. The HMPC also analyzed development trends in hazard areas. The latest DFIRM was used to refine the estimate flood losses during the update, where available for the NFIP participating communities.

Capability Assessment— The HMPC also conducted a capability assessment update to review and document the planning area’s current capabilities to mitigate risk and vulnerability from natural hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC can assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. This information for the County is included in Section 4.5 and in the respective jurisdictional annexes. This addressed FEMA planning task 4: Review community capabilities - 44 CFR 201.6 (b)(2)&(3).

Results of the risk assessment were presented and comments discussed at the second meeting of the HMPC in November 2017.

A more detailed description of the risk assessment process and the results are included in Chapter 4 Risk Assessment.

3.4.3 Phase 3: Develop the Mitigation Plan

Planning Step 6: Set Goals

Amec Foster Wheeler facilitated a discussion session with the HMPC to review the 2009 plan's goals and objectives. The HMPC discussed definitions and examples of goals, objectives, and actions and considered the goals of the state hazard mitigation plan and other relevant local plans when reviewing and revising the goals and objectives. The resulting updated goals and objectives are presented in Chapter 5 Mitigation Strategy.

Planning Step 7: Review Possible Activities

Amec Foster Wheeler facilitated a discussion at an HMPC meeting to review the alternatives for mitigating hazards. This included a brainstorming session with the HMPC to identify a comprehensive range of mitigation actions for each identified hazard, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. More specifics on the process and the results of this collaborative process are captured in Chapter 5 Mitigation Strategy.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, Amec Foster Wheeler produced a complete first draft of the plan. This complete was shared electronically with the HMPC for review and comment. Other agencies were invited to comment on this draft as well. HMPC and agency comments were integrated into the second draft, which was advertised and distributed to collect public input and comments. Amec Foster Wheeler integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the California Office of Emergency Services and FEMA Region IX to review and approve, contingent upon final adoption by the governing boards of each participating jurisdiction.

3.4.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was adopted by the governing boards of each participating jurisdiction on the dates included in the adoption resolutions in Appendix A: Adoption Resolutions. The final plan will be included in the safety element of the County General Plan and result in the County's eligibility for Assembly Bill (AB) 2140. This adoption makes the jurisdiction eligible for consideration for part or all of its local costs on eligible public assistance to be provided by State share funding through the California Disaster Assistance Act.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the plan update process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and updating and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as hazard(s) addressed, lead manager and priority, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within the Fresno County planning area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and of mitigation in Fresno County, and is addressed further in Chapter 7. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Chapter 7.

Implementation and Maintenance Process: 2009 Plan

The 2009 LHMP included a process for implementation and maintenance which was generally followed, with some variation. Implementation of the plan including the status of mitigation actions is captured in Chapter 5 and the jurisdictional annexes. In general the County and participating jurisdictions have made progress in the implementation of the plan. Successes of note are detailed in Chapter 5. An updated implementation and maintenance chapter can be referenced in Chapter 7.



4 RISK ASSESSMENT

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

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. “It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.”

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction’s potential risk to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (FEMA 386-2, 2002), which breaks the assessment into a four-step process:

- 1) Identify hazards
- 2) Profile hazard events
- 3) Inventory assets
- 4) Estimate losses

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1 Hazard Identification: Natural Hazards** identifies the natural hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 4.2 Hazard Profiles** discusses the threat to the planning area and describes previous occurrences of hazard events and the likelihood of future occurrences.
- **Section 4.3 Vulnerability Assessment** assesses the County’s total exposure to natural hazards, considering assets at risk, critical facilities, and future development trends.
- **Section 4.4 Human-Caused Hazards** identifies the areas most susceptible to potential human-caused hazard events by evaluating the locations of hazardous materials facilities and transportation routes.
- **Section 4.5 Capability Assessment** inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability.

This risk assessment covers the entire geographical extent of Fresno County. Since this plan is a multi-jurisdictional plan, the HMPC was required to evaluate how the hazards and risks vary from jurisdiction to jurisdiction. While these differences are noted in this chapter, they are expanded upon in the annexes of the participating jurisdictions. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Fresno County planning area.

4.1 Hazard Identification: Natural Hazards

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type...of all natural hazards that can affect the jurisdiction.

The Fresno County HMPC conducted a hazard identification study to determine the hazards that threaten the planning area.

4.1.1 Methodology and Results

Using existing natural hazards data and input gained through planning meetings during both the 2009 LHMP and 2017-2018 update, the HMPC agreed upon a list of natural hazards that could affect Fresno County. Hazards data from the California Governor's Office of Emergency Services (CA-OES), FEMA, the National Oceanic and Atmospheric Administration, and many other sources were examined to assess the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries and property and economic damage. The natural hazards evaluated as part of this plan include those that occurred in the past or have the potential to cause significant human and/or monetary losses in the future. The potential for loss and impacts from the hazards are analyzed further in Section 4.3 Vulnerability Assessment.

In alphabetical order, the natural hazards identified and investigated for the Fresno County Multi-Jurisdictional Hazard Mitigation Plan include:

- Agricultural Hazards
- Avalanche
- Dam Failure
- Drought
 - Tree Mortality
- Earthquake
- Flood
- Human Health Hazards
 - Epidemic/Pandemic
 - West Nile Virus
- Landslide

- Severe Weather
 - Extreme Temperatures
 - Extreme Cold/Freeze
 - Extreme Heat
 - Fog
 - Heavy Rain/Thunderstorm/Hail/Lightning/Wind
 - Winter Storm
 - Tornado
- Soil Hazards
 - Erosion
 - Expansive Soils
 - Land Subsidence
- Volcano
- Wildfire

During the 2017-18 LHMP update the HMPC reviewed the list of hazards and confirmed that the original list identified in the 2009 plan was valid. Significant tree deaths have occurred in the Sierras and foothills due to long term drought and insect infestations since the 2009 LHMP. This issue is addressed in the plan update as a consequence and sub-hazard of the drought hazard. It is also noted in the wildfire hazard as it exacerbates the fuel loads. The widespread tree mortality also increases the potential for wind fall hazards.

The HMPC eliminated the natural hazards listed below from further consideration in this risk assessment because they occur rarely or not at all in Fresno County.

- Coastal Erosion
- Coastal Storm
- Hurricane
- Tsunami

Overall Hazard Significance Summary

Overall hazard significance was based on a combination of Geographic Extent, Probability and Potential Magnitude/Severity as defined below. The individual ratings are based on or interpolated from the analysis of the hazards in the sections that follow. During the 2017-18 Fresno County LHMP update the individual ratings and significance of the hazards was revisited and updated. Subsidence, as a subset of soil hazards, has become more of an issue due to heavy groundwater withdrawal during the severe multi-year drought 2012-2017. It may also be exacerbating flood hazards by lowering levee heights in some areas. This hazard's significance was changed from low to medium.

Table 4.1 Fresno County Hazard Significance

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Negligible	High
Avalanche	Limited	Likely	Limited	Low
Dam Failure	Extensive	Occasional	Critical	High
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Negligible	High
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Limited	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Winter Storm	Limited	Highly Likely	Negligible	Medium
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Significant	Likely	No Data	Medium
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	High
Hazardous Materials	Significant	Highly Likely	Limited	High
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability		
Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year.				

<p>Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.</p> <p>Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.</p> <p>Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p>	<p>Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability</p> <p>Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance</p> <p>Low: minimal potential impact</p> <p>Medium: moderate potential impact</p> <p>High: widespread potential impact</p>
--	---

4.1.2 Disaster Declaration History

One method the HMPC used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the planning area. Federal and/or state disaster 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. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

A USDA declaration will result in the implementation of the Emergency Loan Program through the Farm Services Agency. This program enables eligible farmers and ranchers in the affected county as well as contiguous counties to apply for low interest loans. A USDA declaration will automatically follow a major disaster declaration for counties designated major disaster areas and those that are contiguous to declared counties, including those that are across state lines. As part of an agreement with the USDA, the SBA offers low interest loans for eligible businesses that suffer economic losses in declared and contiguous counties that have been declared by the USDA. These loans are referred to as Economic Injury Disaster Loans.

Fresno is among the many counties in California that are susceptible to disaster. Details on federal and state disaster declarations were obtained by the HMPC, FEMA, and CA-OES and compiled in chronological order in Table 4.1. A review of state and federal declared disasters indicates that Fresno County received 23 state declarations between 1950 and July 2016, 14 of which also received federal disaster declarations. Of the 22 state declarations, 15 were associated with severe winter storms, heavy rains, or flooding; 4 were for freeze; 1 was for drought; 1 was for earthquake; and 2 were for wildfire. USDA declarations for the planning area are discussed in Section 4.2.1 Agricultural Hazards.

This disaster history (combined federal and state) suggests that Fresno County experiences a major event worthy of a disaster declaration every 2.7 years. The County has a 39 percent chance of receiving a disaster declaration in any given year. With the exception of the declarations for earthquake and wildfire, every declaration resulted directly or indirectly from severe weather. Similarly, most disaster-related injuries to people and damage to property and crops resulted from severe weather.

Table 4.2 Fresno County's State and Federal Disaster Declarations, 1950-2017

Hazard Type	Disaster #	Year	State Declaration	Federal Declaration	Location	Damage*
Floods	CDO 50-01	1950	11/21/50	--	Fresno County (statewide)	9 deaths; \$32,183,000
Floods	DR-47	1955	12/22/55	12/23/55	Fresno County (statewide)	74 deaths; \$200,000,000
Unseasonal and Heavy Rainfall	--	1957	5/20/57	--	Fresno County (other cherry producing areas)	2 injuries; \$6,000,000
Storm & Flood Damage	--	1958	4/2/58	4/4/58	Fresno County (statewide)	13 deaths \$24,000,000
Unseasonal and Heavy Rainfall	--	1959	9/17/59	--	Fresno County (other Tokay grape producing areas)	2 deaths \$100,000
Abnormally Heavy and Continuous Rainfall	--	1963	2/14/64	--	Fresno County (and 50 other counties)	--
1969 Storms	OEP 253-DR-CA	1969	1/25/69	1/26/69	Fresno County (and 39 other counties)	47 deaths 161 injuries \$300,000,000
Freeze and Severe Weather Conditions	--	1972	4/17/72	--	Fresno County (and 16 other counties)	\$111,517,260
Drought	--	1976	2/9/76	--	Fresno County (and 30 other counties)	\$2,664,000,000
Rains Causing Agricultural Losses	--	1982	10/26/82	--	Fresno County (and 10 other counties)	\$345,195,974
Winter Storms	DR-682	1982/1983	3/15/83	2/9/83	Fresno County (and 43 other counties)	\$523,617,032
Coalinga Earthquake	DR-682	1983	5/02/83	5/3/83	Fresno County	No deaths 47 injuries \$31,076,300
Storms	DR-758	1986	2/26/86	2/18/86	Fresno County (and 38 other counties)	13 deaths 67 injuries \$407,538,904
Wildland Fires	--	1987	9/03/87	--	Fresno County (and 23 other counties)	3 deaths 76 injuries \$18,000,000
Freeze	DR-894	1990	1/11/91	2/11/91	Fresno County (and 32 other counties)	\$856,329,675

Hazard Type	Disaster #	Year	State Declaration	Federal Declaration	Location	Damage*
Late Winter Storms	DR-979	1992	1/21/93	1/15/93	Fresno County (and 23 other counties)	20 deaths 10 injuries \$600,000,000
Severe Winter Storms	DR-1044	1995	1/17/95	1/13/95	Fresno County (and 44 other counties)	11 deaths \$741,400,000
Late Winter Storms	DR-1046	1995	--	1/10/95	Fresno County (and all other counties except Del Norte)	17 deaths \$1,100,000,000
January 1997 Floods	DR-1155	1997	1/5/97	1/4/97	Fresno County (and 46 other counties)	8 deaths \$1,800,000,000
Severe Winter Storms and Flooding	DR-1203	1998	--	2/9/98	Fresno County (and 39 other counties)	17 deaths \$550,000,000
Freeze	DR-1267	1998-1999	--	2/7/99	Fresno County (and 7 other counties)	--
Severe Freeze	DR-1689	2007	--	3/14/07	Fresno County (and 11 other counties)	\$1,400,000,000
Goose Fire	FM-5140	2016	7/30/16	8/8/16	Fresno County	--
Floods	CDO 50-01	1950	11/21/50	--	Fresno County (statewide)	9 deaths; \$32,183,000
Floods	DR-47	1955	12/22/55	12/23/55	Fresno County (statewide)	74 deaths; \$200,000,000
Unseasonal and Heavy Rainfall	--	1957	5/20/57	--	Fresno County (other cherry producing areas)	2 injuries; \$6,000,000
Storm & Flood Damage	--	1958	4/2/58	4/4/58	Fresno County (statewide)	13 deaths \$24,000,000
Unseasonal and Heavy Rainfall	--	1959	9/17/59	--	Fresno County (other Tokay grape producing areas)	2 deaths \$100,000
Abnormally Heavy and Continuous Rainfall	--	1963	2/14/64	--	Fresno County (and 50 other counties)	--
1969 Storms	OEP 253-DR-CA	1969	1/25/69	1/26/69	Fresno County (and 39 other counties)	47 deaths 161 injuries \$300,000,000
Freeze and Severe Weather Conditions	--	1972	4/17/72	--	Fresno County (and 16 other counties)	\$111,517,260
Drought	--	1976	2/9/76	--	Fresno County (and 30 other counties)	\$2,664,000,000
Rains Causing Agricultural Losses	--	1982	10/26/82	--	Fresno County (and 10 other counties)	\$345,195,974

Hazard Type	Disaster #	Year	State Declaration	Federal Declaration	Location	Damage*
Winter Storms	DR-682	1982/1983	3/15/83	2/9/83	Fresno County (and 43 other counties)	\$523,617,032
Coalinga Earthquake	DR-682	1983	5/02/83	5/3/83	Fresno County	No deaths 47 injuries \$31,076,300
Storms	DR-758	1986	2/26/86	2/18/86	Fresno County (and 38 other counties)	13 deaths 67 injuries \$407,538,904
Wildland Fires	--	1987	9/03/87	--	Fresno County (and 23 other counties)	3 deaths 76 injuries \$18,000,000
Freeze	DR-894	1990	1/11/91	2/11/91	Fresno County (and 32 other counties)	\$856,329,675
Late Winter Storms	DR-979	1992	1/21/93	1/15/93	Fresno County (and 23 other counties)	20 deaths 10 injuries \$600,000,000
Severe Winter Storms	DR-1044	1995	1/17/95	1/13/95	Fresno County (and 44 other counties)	11 deaths \$741,400,000
Late Winter Storms	DR-1046	1995	--	1/10/95	Fresno County (and all other counties except Del Norte)	17 deaths \$1,100,000,000
January 1997 Floods	DR-1155	1997	1/5/97	1/4/97	Fresno County (and 46 other counties)	8 deaths \$1,800,000,000
Severe Winter Storms and Flooding	DR-1203	1998	--	2/9/98	Fresno County (and 39 other counties)	17 deaths \$550,000,000
Freeze	DR-1267	1998-1999	--	2/7/99	Fresno County (and 7 other counties)	--
Severe Freeze	DR-1689	2007	--	3/14/07	Fresno County (and 11 other counties)	\$1,400,000,000
Goose Fire	FM-5140	2016	7/30/16	8/8/16	Fresno County	--

Source: California Governor's Office of Emergency Services, www.oes.ca.gov/

*Damage amount and deaths and injuries reflect totals for all impacted counties

4.2 Hazard Profiles

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

The hazards identified in Section 4.1 Hazard Identification: Natural Hazards are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources, such as those mentioned in

Section 4.1. These profiles set the stage for Section 4.3 Vulnerability Assessment, where the vulnerability is quantified, where possible, for each of the priority hazards.

Each hazard is profiled in the following format:

- **Hazard/Problem Description**—This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Fresno County planning area. Where known, this includes information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or secondary effects.
- **Extent** – This section gives a description of the potential strength or magnitude of the hazard as it pertains to Fresno County. The geographic extent or location of the hazard is also discussed.
- **Past Occurrences**—This section contains information on historical incidents, including impacts where known. The extent or location of the hazard within or near the Fresno County planning area is also included here. Historical incident worksheets were used to capture information from participating jurisdictions on past occurrences.
- **Likelihood of Future Occurrence**—The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of an event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:
 - **Highly Likely**—Near 100 percent chance of occurrence in next year or happens every year.
 - **Likely**—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less.
 - **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years.
 - **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.
- **Climate Change Considerations** - This describes the potential for climate change to affect the frequency and intensity of the hazard in the future

Section 4.3 Vulnerability Assessment has more detail on the County’s total exposure to natural hazards, considering assets at risk, critical facilities, and future development trends. Where feasible the vulnerability of people, property, critical facilities, the natural environment and future development are considered for each hazard.

The following sections provide profiles of the natural hazards that the HMPC identified in Section 4.1 Identifying Hazards. The hazards follow alphabetically.

4.2.1 Agricultural Hazards

Hazard/Problem Description

Located in the Central San Joaquin Valley, Fresno County's farming and agricultural industry is ranked as the top agriculture-producing county in California and the country. Farming and agriculture-related businesses are a significant component of the local economy and are responsible for no less than one out of every three jobs. According to the Fresno County Agricultural Commissioner the County has approximately 678,103 acres of prime agricultural land, 404,083 acres of farmland of statewide importance, and 825,276 acres of grazing land (see table below).

Table 4.3 Fresno County's Farmland Inventory, 2012

Soil Category	Acres
Prime Farmland	678,103
Farmland of Statewide Importance	404,083
Unique Farmland	33,653
Farmland of Local Importance	131,341
Grazing Land	825,276
Urban and Built-Up Land	124,025
Water	4,915
Other Land	116,094

Source: Fresno County Agricultural Commissioner 2017

According to the 2015 Fresno County Agricultural Crop and Livestock Report, the total gross value of agricultural commodities in Fresno County in 2015 was \$6.6 billion, exceeding the six billion dollar mark for the fifth consecutive year, though down from 2014's record of \$7,069 billion. This value represents a 6.55 percent decrease from the 2014 production value of \$7.069 billion. The County's leading agricultural products included almonds, grapes, tomatoes, poultry, cattle and calves, tomatoes, milk, peaches, garlic, mandarins and oranges. The report notes that the decrease from 2014 may be attributed to a number of factors, including no allocation of surface water in 2014 and 2015.

Fresno's top ten crops have seen a shift between 1995 and 2015; though the crops have mostly remained constant, their ranks in the county have changed in the intervening 20 years.

Table 4.4 Fresno County's Ten Leading Crops

Crop	2015 Rank	2015 Dollar Value	2014 Rank	2005 Rank	1995 Rank
Almonds	1	\$1,205,730,000	1	2	7
Grapes	2	\$896,295,000	2	1	2
Poultry	3	\$561,146,000	3	7	3
Cattle and Calves	4	\$551,989,000	5	5	8
Tomatoes	5	\$520,146,000	6	4	4

Crop	2015 Rank	2015 Dollar Value	2014 Rank	2005 Rank	1995 Rank
Milk	6	\$436,765,000	4	3	5
Peaches	7	\$223,597,000	9	8	12
Garlic	8	\$198,800,000	8	14	11
Mandarins	9	\$197,622,000	+		
Oranges	10	\$153,811,000	11	10	10

*Includes turkey, chickens, ducks, geese and game birds

+Not previously combined for ranking purposes

Source: State of California Department of Conservation Farmland Mapping and Monitoring Program, www.conservation.ca.gov/

According to the HMPC, agricultural losses occur on an annual basis and are usually associated with severe weather events, including heavy rains, floods, hail, freeze, and drought. The State of California Multi-Hazard Mitigation Plan attributes most of the agricultural disasters statewide to drought, freeze, and insect infestations. Other agricultural hazards include fires, crop and livestock disease, noxious weeds, and contamination of animal food and water supplies.

Fresno County is threatened by a number of insects that, under the right circumstances, can cause severe economic and environmental harm to the agricultural industry. Insects of concern to plants and crops include the medfly, peach fruit fly, Mexican fruit fly, guava fruit fly, oriental fruit fly, melon fly, gypsy moth, Japanese beetle, glassy-winged sharpshooter, paper wasp, and Turkestan roach. Livestock disease can also cause large-scale economic losses in any area that raises large amounts of livestock.

Noxious weeds, which are any plant that is or is liable to be troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species and that is difficult to control or eradicate, are also of concern. Noxious weeds within the planning area include yellow starthistle, purple loosestrife, and Japanese dodder.

Noxious weeds have been introduced in the planning area by a variety of means, including through commercial nurseries. An absence of natural controls combined with the aggressive growth characteristics and unpalatability of many of these weeds allows these weeds to dominate and replace more desirable native vegetation. Negative effects of weeds include the following:

- Loss of wildlife habitat and reduced wildlife numbers
- Loss of native plant species
- Reduced livestock grazing capacity
- Increased soil erosion and topsoil loss
- Diminished water quality and fish habitat
- Reduced cropland and farmland production
- Reduced land value and sale potential

Another threat to the agricultural industry is the wild hogs that run free in the eastern and western foothills of the County. These wild hogs can cause extensive agricultural crop and property damage to farm and private land. Wild hogs are known to carry and transmit 30 different diseases both to

humans and livestock. E. coli contamination of leafy vegetables has been linked to wild hogs foraging in vegetable fields.

In addition to issues associated with wild hogs, the proper management of other wildlife within the planning area is of significant concern to the County Department of Agriculture. Wildlife such as coyotes, ground squirrels, and others can cause extensive livestock, crop, and property damage. Such wildlife is also known to carry and transmit disease (e.g., bubonic plague and rabies) to livestock and domestic animals as well as to humans.

According to the Fresno County Operational Area Master Emergency Services Plan, the consequences of agricultural disasters to the planning area include ruined plant crops, dead livestock, ruined feed and agricultural equipment, monetary loss, job loss, and possible multi-year effects (i.e., trees might not produce if damaged, loss of markets, food shortages, increased prices, possible spread of disease to people, and loss or contamination of animal products). When these hazards cause a mass die-off of livestock, other issues arise that include the disposal of animals, depopulation of affected herds, decontamination, and resource problems. Those disasters related to severe weather may also require the evacuation and sheltering of animal populations. Overall, any type of severe agricultural disaster can have significant economic impacts on the agricultural community as well as the entire Fresno County planning area.

Extent

Historically, Fresno County has received disaster declarations from the USDA for a variety of incident types, including drought, hail, rain, cold and wind. Fresno County's agriculture industry is a multi-billion dollar enterprise; a long-term, widespread agricultural hazard could have impacts in the hundreds of millions of dollars, if not billions of dollars.

Past Occurrences

Based on information from the USDA, Fresno County received 16 USDA disaster declarations between 1991 and 2007 (see). All the declarations were associated with drought or severe weather events; none were related to agricultural disease.

Table 4.5 Fresno County's USDA Disaster Declarations

Incident Type	Incident Date	Damage (\$)
Short Term Drought	2009	164,893,718
Severe Spring Storms: Rain, Hail, High Winds	6/4 & 5/2009	4,533,107
Lack of Chill Hours	2014	53,534,295
Severe Long-Term Drought	2012 through 2016	Not Quantified

Source: Fresno County Department of Agriculture

Between January and August of 2017, Fresno County had received one additional USDA Declaration in January for drought. Historical occurrences identified by the HMPC include the following:

Fresno County

- **1970s**—A local outbreak of scabies occurred.
- **1991**—There was an outbreak of bovine tuberculosis in Fresno County.
- **1997/1998**—One bird in downtown Fresno was discovered with exotic Newcastle disease, a contagious and fatal viral disease affecting all species of birds that does not affect humans. The bird and all chickens within a one-kilometer radius were destroyed.
- **1998**—Freeze resulted in almost \$70 million in losses, including crop loss, broken water pipes and water damage, damaged water treatment plants, and damaged fire sprinkler systems. Other impacts included almost 18,000 applications for services and assistance and over 1,700 unemployment insurance claims filed.
- **1999**—Severe weather caused a crop loss of over \$89 million.
- **2006**—Fresno County growers were impacted by adverse spring weather with \$21 million in losses.
- **2006**—Twenty-one days of over 100 degrees, including three days over 113 degrees, caused crop, livestock, poultry, and milk production losses of \$93 million.
- **2008**—A Fresno County dairy was quarantined after state and federal agriculture officials found bovine tuberculosis in five cows.
- **2009** -Short term drought with no or little allocation to the west side. Springtime hail brought damage to trees along the Kings River corridor.
- **2012 Through 2016** – Long-term western states drought. Billions in losses.
- **2014** – Warm winter and spring brought a lack of chill hours affecting fruit set in cherry crop.

Neighboring Counties

- **2002**—Merced County had an outbreak of avian influenza H5 (which is different from the severe variety found in Asia).
- **2002/2003**—After more than 10 years without a case of bovine tuberculosis in California, two dairy herds in Tulare County and one in Kings County were infected with bovine tuberculosis. All three herds were quarantined, 152,000 cattle were tested, 8,000 cattle destroyed, and the affected premises were cleaned and disinfected.
- **2002/2003**—There was an outbreak of exotic Newcastle disease in Southern California.

According to data provided by the USDA Risk Management Agency (RMA), \$558,702,249 in indemnities were paid in Fresno County between 2008 and 2017, averaging \$5,587,022 over the ten-year period.

Table 4.6 Top Ten RMA Indemnities in Fresno County 2008-2017

Year	Commodity	Damage Cause	Affected Acres	Indemnity Amount
2014	Cotton	Irrigation Supply Failure	40,958	\$39,247,461
2015	Cotton	Irrigation Supply Failure	39,877	\$36,446,882
2015	Pistachios	Heat	8,938	\$33,815,833
2016	Cotton	Irrigation Supply Failure	31,659	\$2,916,344

Year	Commodity	Damage Cause	Affected Acres	Indemnity Amount
2009	Cotton	Irrigation Supply Failure	18,032	\$14,973,864
2015	Almonds	Excess Moisture/Precipitation/Rain	9,122	\$14,721,498
2013	Cotton	Irrigation Supply Failure	14,033	\$12,208,450
2009	Cotton	Irrigation Supply Failure	16,185	\$10,543,189
2015	Almonds	Heat	6,417	\$8,374,283
2016	Almonds	Excess Moisture/Precipitation/Rain	6,987	\$7,906,123

Source: USDA Risk Management Agency

Of these payments, \$2,755,872 were for damages caused by insects, with damages to cotton, dry beans, tomatoes, alfalfa seed and navel oranges; the average annual payment for indemnities related to insect damage is \$145,046 per year.

Table 4.7 Indemnities Paid for Insect Damage in Fresno County 2008-2017

Year	Commodity	Damage Cause	Affected Acres	Indemnity Amount
2008	Cotton	Insects	308	\$17,743
2008	Cotton	Insects	823	\$199,777
2008	Dry Beans	Insects	153	\$30,911
2008	Tomatoes	Insects	195	\$42,254
2008	Tomatoes	Insects	313	\$277,015
2010	Alfalfa Seed	Insects	201	\$51,102
2011	Cotton	Insects	62	\$53,030
2011	Alfalfa Seed	Insects	286	\$220,726
2013	Tomatoes	Insects	745	\$151,477
2013	Navel Oranges	Insects	15	\$3,672
2014	Cotton	Insects	31	\$16,250
2014	Dry Beans	Insects	141	\$58,601
2014	Dry Beans	Insects	86	\$47,924
2014	Tomatoes	Insects	1,443	\$289,636
2014	Alfalfa Seed	Insects	17	\$10,069
2015	Tomatoes	Insects	704	\$371,869
2015	Alfalfa Seed	Insects	297	\$389,272
2016	Tomatoes	Insects	396	\$452,035

Source: USDA Risk Management Agency

In the same timeframe, \$3,729,991 in indemnities were paid for damages caused by plant disease, with damages to tomatoes, cotton, onions and grapes; the average annual payment for indemnities related to plant disease between 2008 and 2017 was \$177,619 per year.

Table 4.8 Indemnities for Plant Disease in Fresno County 2008-2017

Year	Commodity	Damage Cause	Affected Acres	Indemnity Amount
2008	Fresh Market Tomatoes	Plant Disease	215	\$109,429
2010	Tomatoes	Plant Disease	765	\$382,840
2012	Cotton	Plant Disease	56	\$11,508

Year	Commodity	Damage Cause	Affected Acres	Indemnity Amount
2012	Tomatoes	Plant Disease	300	\$158,964
2013	Tomatoes	Plant Disease	153	\$223,531
2013	Tomatoes	Plant Disease	2,854	\$1,450,955
2013	Tomatoes	Plant Disease	137	\$227,479
2014	Onions	Plant Disease	90	\$100,193
2014	Dry Beans	Plant Disease	149	\$54,061
2014	All Other Crops	Plant Disease	35	\$10,120
2015	Onions	Plant Disease	37	\$32,667
2015	Fresh Market Tomatoes	Plant Disease	112	\$81,769
2015	Tomatoes	Plant Disease	270	\$420,489
2016	Onions	Plant Disease	130	\$200,706
2016	Table Grapes	Plant Disease	30	\$92,066
2016	Table Grapes	Plant Disease	33	\$274,862
2016	Grapes	Plant Disease	19	\$7,024
2016	Tomatoes	Plant Disease	197	\$54,312
2017	Table Grapes	Plant Disease	12	\$12,956
2017	Table Grapes	Plant Disease	1	\$3,352
2017	Grapes	Plant Disease	6	\$4,840

Source: USDA Risk Management Agency

Likelihood of Future Occurrences

Highly Likely—As long as the hazards discussed in this section continue to be an ongoing concern to the Fresno County planning area, the potential for agricultural losses remains.

Climate Change Considerations

As climate change has progressed, noticeable changes have occurred with the climate and weather patterns across the globe. Weather events have become more numerous and more severe. Changes in weather patterns can have dramatic impacts on the ecosystem, including agriculture systems; more severe impacts can be expected into the future.

4.2.2 Avalanche

Hazard/Problem Description

Avalanches occur when loading of new snow on a slope increases stress at a rate faster than strength develops, and the slope fails. Critical stresses develop more quickly on steeper slopes and where deposition of wind-transported snow is common. The vast majority of avalanches occur during and shortly after storms. This hazard generally affects a small number of people, such as snowboarders, skiers, and hikers, who venture into backcountry areas during or after winter storms. Roads and highway closures, damaged structures, and destruction of forests are also a direct result of avalanches. Avalanches typically occur above 8,000 feet and on slopes ranging between 25 and 50 degrees incline. The eastern portion of Fresno County is in the Sierra National Forest in a high alpine environment and has potential for areas above 8,000 on slopes ranging between 25 and 50

degrees incline. The combination of steep slopes, abundant snow, weather, snowpack, and an impetus to cause movement creates avalanches. Areas prone to avalanche hazards include hard to access areas deep in the backcountry. Avalanche hazards exist in eastern Fresno County in the Sierras, where combinations of the above criteria occur.

Extent

Based on this information, the geographic extent rating for avalanches in Fresno County is **limited**. Occasional death and injury might occur to persons in the backcountry.

Past Occurrences

Historically, avalanches occur within the County between the months of December and April, following snowstorms. According to the HMPC, there has been some historical avalanche activity involving people, but specific details are unknown.

Likelihood of Future Occurrences

Likely—Injuries and loss of life from an avalanche are usually due to people recreating in remote areas at the wrong time. Given the topography and amount of snow falling on an annual basis in eastern Fresno County, avalanches will continue to occur, but damage from avalanches should continue to be limited.

Climate Change Considerations

In the future the likelihood and nature of avalanches may be affected by climate change. As winter is taking longer to descend, weaker snow accumulates at the very bottom of the snow pack. As more snow piles on top of the weak layer, and temperatures remain warm, the upper, moisture-laden layers become vulnerable to sliding, and create a delicate situation. More extreme precipitation events that deposit large amounts of snow in a short period of time could also periodically increase the potential for large avalanches.

4.2.3 Dam Failure

Hazard/Problem Description

Dams are manmade structures built for a variety of uses, including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they usually are engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

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

- Earthquake
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage or piping or rodent activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth-rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously: the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach: a flood wave will build gradually to a peak and then decline until the reservoir is empty. And, a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

Extent

According to the Fresno County Operational Area Master Emergency Services Plan, there are several hundred dams in Fresno County constructed for flood control, irrigation storage, electrical generation, recreation, and stock watering purposes. The Homeland Security Infrastructure Program 2015 Freedom database identifies 52 dams from the National Inventory of Dams that are located in or are of significance to Fresno County. Of these dams, 33 are considered high hazard, 5 are significant hazard, and 14 are low hazard. Crane Valley and Mazanita Diversion dams are located in Madera County; however, they pose a threat to Fresno County based on the topography and hydrological flow characteristics of the area. Table 4.9 details the dams affecting Fresno County. The majority of these dams are in the San Joaquin River or Kings River watersheds in the eastern part of the county. Both incorporated and unincorporated areas are at risk of damage from flooding in the event of a dam failure, however, the City of Fresno, Clovis, Sanger and the eastern unincorporated county are at greater risk. Generally, the areas at risk are large urban and rural areas downstream and below the dams on the valley floor. There have not been any failures of major dams in Fresno County; future failures are more likely to occur with smaller dams, with minimal or no damage potential.

Based on this information, the geographic extent rating for dam failure in Fresno County is Extensive.

Table 4.9 Fresno County Dam Characteristics

Hazard	Dam Name	Downstream City	Owner Name	Dam Type	Capacity (Acre-Feet)
H	Alluvial Drain Detention	Clovis	Fresno Metropolitan Flood Control District	Earth	1,152
H	Balsam Meadow Forebay Main	Big Creek	Southern California Edison Company	Rockfill	1,960
H	Big Creek Dam No. 1	Big Creek	Southern California Edison Company	Concrete/Gravity/Arch	89,800
H	Big Creek Dam No. 2	Big Creek	Southern California Edison Company	Concrete/Gravity/Rockfill	89,800
H	Big Creek Dam No. 3	Big Creek	Southern California Edison Company	Concrete/Gravity/Rockfill	89,800
H	Big Creek Dam No. 6	Big Creek	Southern California Edison Company	Concrete/Arch	1,726
H	Big Creek Dam No. 7	Auberry	Southern California Edison Company	Concrete/Gravity	35,000
H	Big Dry Creek	Clovis	Fresno Metropolitan Flood Control District	Earth	49,661
H	Courtright	Balch Camp	Pacific Gas And Electric Company	Rockfill	134,342
H	Crane Valley	North Fork	Pacific Gas And Electric Company	-	45,410
H	Fancher Creek	Clovis	Fresno Metropolitan Flood Control District	Earth	24,300
H	Fancher Creek Detention	Fresno	Fresno Metropolitan Flood Control District	Earth	2,959
H	Florence Lake	Mono Hot Springs	Southern California Edison Company	Concrete/Multi-Arch	68,000
H	Fresh Water Pond	-	Avenal Aggregates	Earth	4
H	Friant	-Fresno	U S Bureau Of Reclamation	Gravity	520,500
H	Friant Dike 3	Fresno	U S Bureau Of Reclamation	Earth	555,500
H	Friant Millerton Road Embankment A	Fresno	U S Bureau Of Reclamation	Earth	555,500
H	Giffen Reservoir	Centerville	Harris Farms Inc	Earth	1,244
H	Hume Lake	-	Forest Service	Multi-Arch	1,410
H	Little Panoche Detention	Oro Loma	U S Bureau Of Reclamation	Earth	13,240
H	Mammoth Pool	Big Creek	Southern California Edison Company	Earth	122,175
H	Manzanita Diversion	North Fork	Pacific Gas And Electric Company	Concrete/Arch	168
H	Mendota Diversion	Firebaugh	Central Calif Irr Dist	Buttress	3,000
H	Pine Flat Dam	Sanger	Cespk	Gravity	1,000,000
H	Redbank	Fresno	Fresno Metropolitan Flood Control District	Earth	2,975
H	Redbank Creek Detention Basin	Fresno	Fresno Metropolitan Flood Control District	Earth	-
H	Sand Creek	Orange Cove	Tulare Co Resources Mgmt Agency	Earth	1,500
H	Sequoia Lake	Miramonte	Y M C A Inc	Earth	2,370
H	Shaver Dike	Shaver Lake	Southern California Edison Company	Concrete/Earth	135,568

Hazard	Dam Name	Downstream City	Owner Name	Dam Type	Capacity (Acre-Feet)
H	Shaver Lake	Shaver Lake	Southern California Edison Company	Concrete/Gravity/Arch	135,568
H	Silt Pond	Coalinga	Granite Construction	Earth	25
H	Vermilion	Mono Hot Springs	Southern California Edison Company	Earth	140,000
H	Wishon Main	Wishon Village	Pacific Gas And Electric Company	Rockfill	133,600
S	Balch Afterbay	Balch Camp	Pacific Gas And Electric Company	Concrete/Arch	325
S	Balch Diversion	Balch Camp	Pacific Gas And Electric Company	Concrete/Arch	1,295
S	Big Creek Dam No. 5	Big Creek	Southern California Edison Company	Concrete/Arch	74
S	Mud	San Joaquin	James Irrigation District	Earth	304
S	Wishon Auxiliary No. 1	Wishon Village	Pacific Gas And Electric Company	Concrete/Gravity	133,600
L	Balsam Meadow Forebay Dike	Big Creek	Southern California Edison Company	Earth	1,960
L	Bear Creek Diversion	Mono Hot Springs	Southern California Edison Company	Concrete/Arch	103
L	Big Creek Dam No. 3a	Big Creek	Southern California Edison Company	Concrete/Gravity/Rockfill	89,800
L	Big Creek Dam No. 4	Big Creek	Southern California Edison Company	Concrete/Arch	100
L	Chilkoot	Bass Lake	Pacific Gas And Electric Company	Rockfill	308
L	Kerckhoff	Friant	Pacific Gas And Electric Company	Concrete/Arch	4,252
L	Lemoore Div Weir	Hardwick	Lemoore Canal And Irrig Co	Buttress	50
L	Mono Creek Diversion	Mono Hot Springs	Southern California Edison Company	Concrete/Arch	45
L	Portal Forebay Dike	Mono Hot Springs	Southern California Edison Company	Earth	390
L	Portal Forebay Main	Mono Hot Springs	Southern California Edison Company	Earth/Rockfill	390
L	Reynolds Weir	None	Laguna Irrigation Dist	Buttress	260
L	San Joaquin No. 3 Forebay	North Fork	Pacific Gas And Electric Company	Earth	20
L	Stinson Weir	Burrel	Stinson Canal And Irrig Co	Buttress	50
L	Wishon Forebay	Friant	Pacific Gas And Electric Company	Earth	69

Source: HSIP Freedom, 2015; National Inventory of Dams

Note: 1 acre-foot=326,000 gallons

Hazard: H=High, S=Significant, L=Low

Both unincorporated and incorporated areas of the County are identified on dam failure inundation maps included in the County's dam failure evacuation plan. The inundation areas for each of the dams are generally downstream and include large rural and urban areas on the valley floor below the dams. Adjacent jurisdictions could also be affected by a dam failure in Fresno County. These include, depending on the dam involved, the Counties of Tulare, Kings, Madera, and Merced.

Figure 4.1 illustrates the locations of identified dams of concern within Fresno County, and illustrates their water routes.

Figure 4.1 Fresno County's Dams of Concern and Capacity

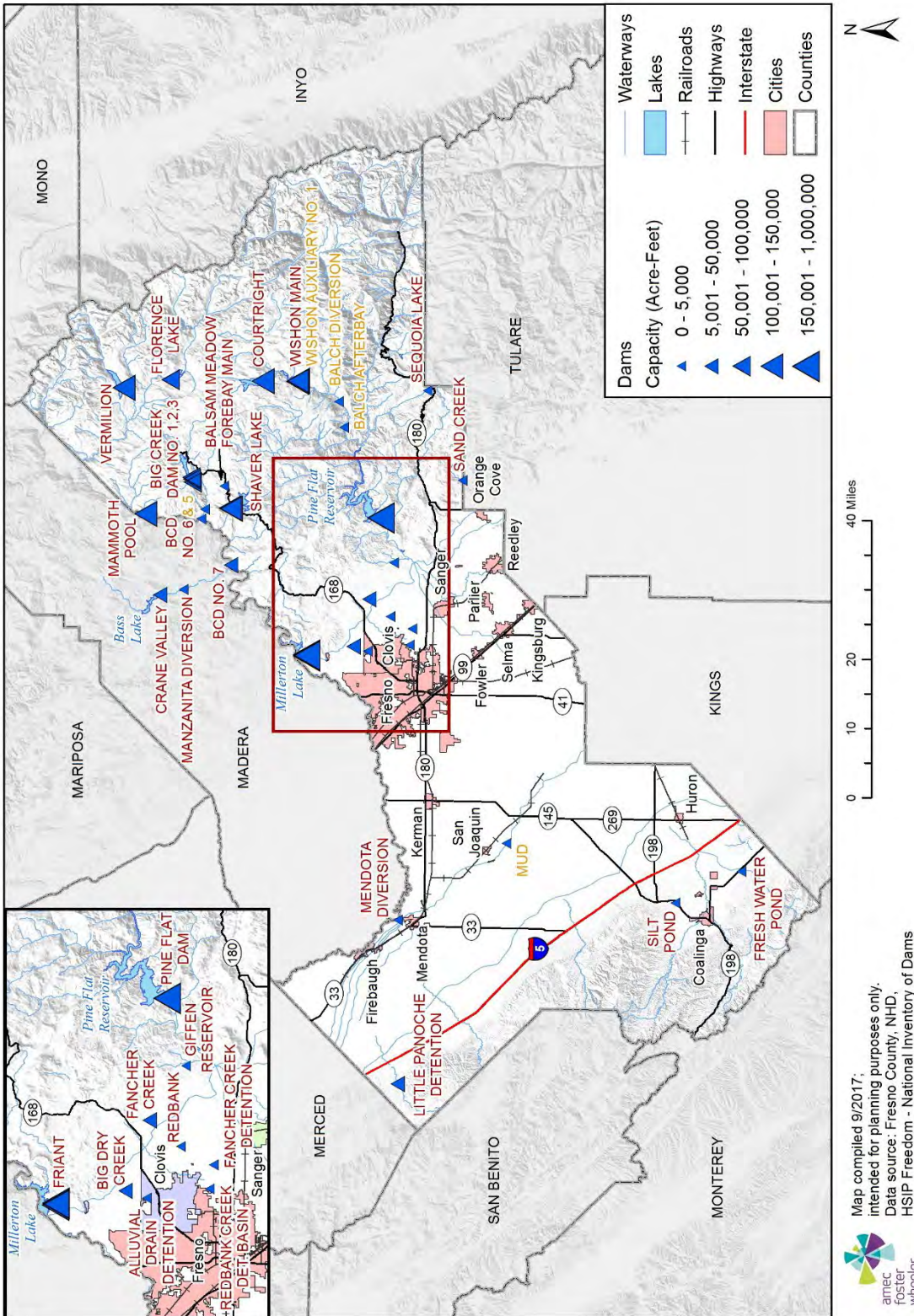


Figure 4.2 Fresno County Dams by Hazard Class

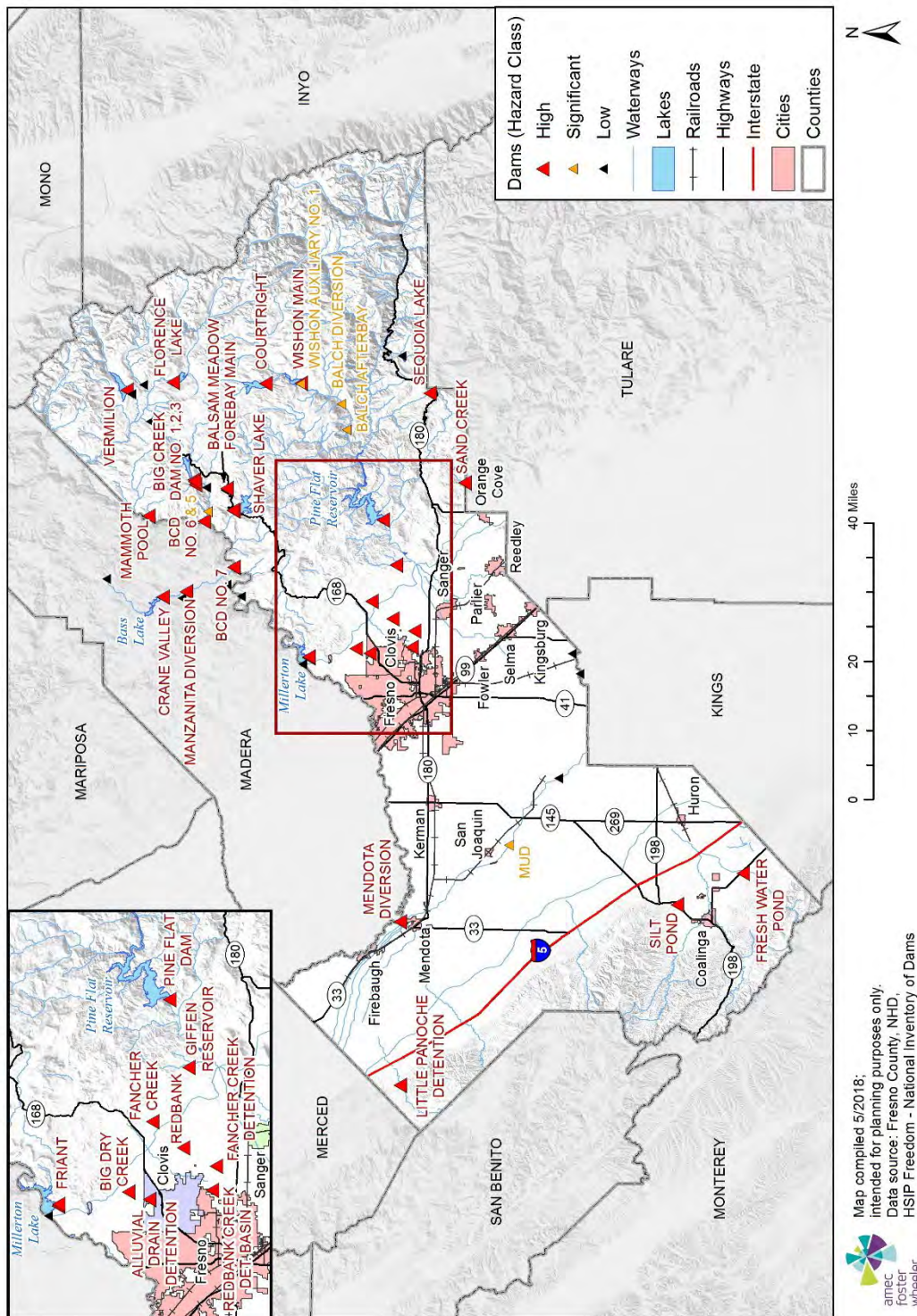
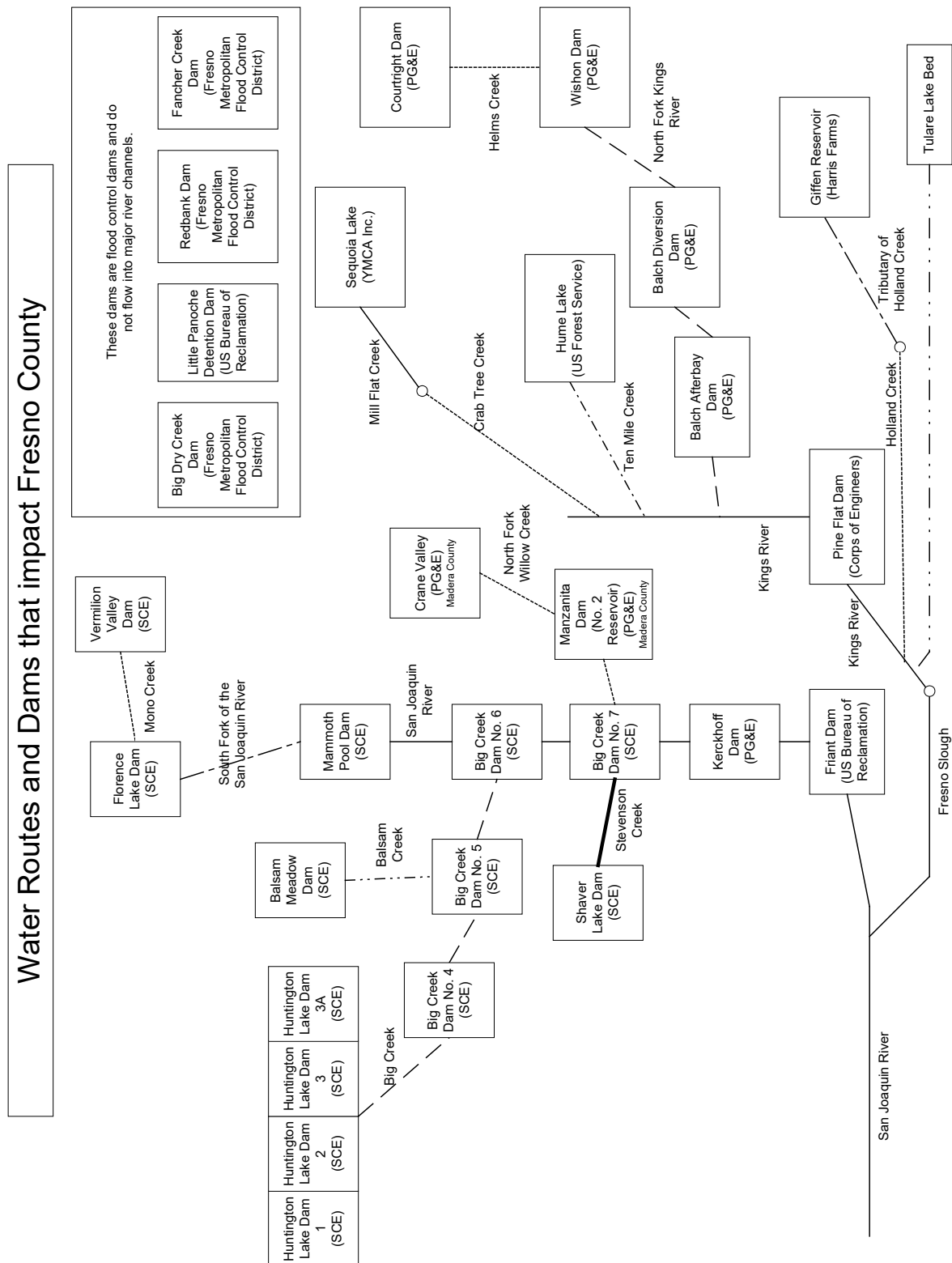


Figure 4.3 Water Routes and Dams that Impact Fresno County



Source: Fresno County Operational Area Dam Failure Evacuation Plan, 2003

Past Occurrences

According to the Fresno County Operational Area Master Emergency Services Plan, there were 14 dam failures in Fresno County between 1976 and 1983, but all were earthen dams on private property. None of the County's 23 major dams were involved. The failures were due to inadequate rodent and vegetation control, unauthorized and inadequate construction, and failure to consult an engineer. The main impacts from these failures were silting of downstream waters, properties, and dams; flooded or undermined roadways; and eroded embankments. Main losses were flooding of a residence and construction lumber washed downstream. In 1986, Friant Dam experienced a small, uncontrolled release. The lock on a drum gate opened, releasing 3,000 cubic feet per second. No major flooding resulted.

Likelihood of Future Occurrences

Occasional—The County remains at risk to dam failures from numerous dams under a variety of ownership and control and of varying ages and conditions. Given the high number of dams in the County and the history of past dam failures, the potential exists for future dam failures in the Fresno County planning area, but the likelihood of this is low. Nonetheless, it should be noted that there have not been any failures of major dams in the County. Uncontrolled or controlled release flooding below dams due to excessive rain or runoff are more likely to occur than failures.

Climate Change Considerations

The potential for climate change to affect the likelihood of dam failure is not fully understood at this point in time. With a potential for more extreme precipitation events a result of climate change, this could result in large inflows to reservoirs. However, this could be offset by generally lower reservoir levels if storage water resources become more limited or stretched in the future due to climate change, drought and/or population growth.

4.2.4 Drought

Hazard/Problem Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

Drought is a complex issue involving many factors—it occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological** drought is defined by a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.
- **Agricultural** drought occurs when there is inadequate soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought and can affect livestock and other dry-land agricultural operations.
- **Hydrological** drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snow pack, and as lake, reservoir, and groundwater levels. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes, and reservoirs. Therefore, hydrological measurements tend to lag behind other drought indicators.
- **Socio-economic** drought occurs when physical water shortages start to affect the health, well-being, and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product.

The California Department of Water Resources (DWR) says the following about drought:

“One dry year does not normally constitute a drought in California. California’s extensive system of water supply infrastructure—its reservoirs, groundwater basins, and inter-regional conveyance facilities—mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.”

The drought issue in California is further compounded by water-rights. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between farming and federally protected fish habitats in California is part of this issue.

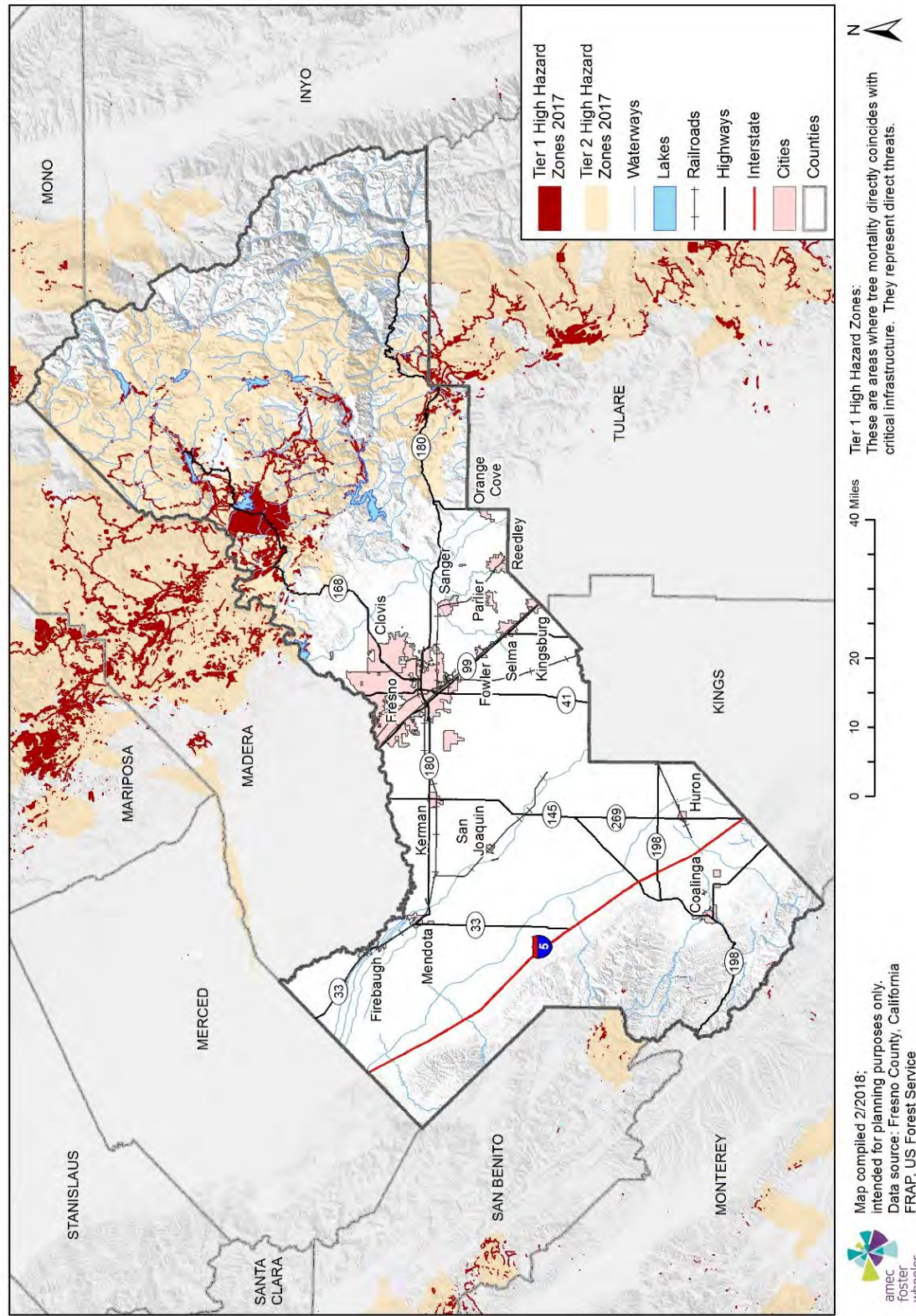
Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the planning area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down, which results in reduced water availability. Voluntary water conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

Tree Mortality

The HMPC identified tree mortality as an additional drought impact of significance to Fresno County during the 2018 update. In recent years, due to the multi-year drought throughout the planning area and state-wide, a vast number of trees have been (and continue to be) impacted within Fresno County foothill and mountain communities and beyond. Standing dead trees could fall and pose a risk to people, buildings, power lines, roads and other infrastructure. In addition, drought-impacted trees become susceptible to diseases and insect infestations (bark beetle) further adding to the risk of tree mortality and related potential impacts.

The location, extent, and probability of occurrence for tree mortality can be viewed as sub-set to the drought hazard. Those areas of the natural environment susceptible to drought comprise a larger area, since tree mortality is related to other sub-factors specific to the species impacted such as tree age and soil composition. Figure 4.4 illustrates the extent of impact of drought and tree mortality in Fresno County. The Tier 1 High Hazard Zones (as indicated in red) depict areas where tree mortality directly coincides with critical infrastructure.

Figure 4.4 Fresno County Drought Related Tree Mortality Hazards



Extent

Given the historical occurrence of severe drought impacts throughout Fresno County and across the state, the HMPC understands that drought will continue to pose a high degree of risk to the entire planning area, potentially impacting crops, livestock, water resources, the natural environment at large, buildings and infrastructure (from land subsidence), and local economies. In addition, although drought affects the entire planning equally, the potential impacts may be variable and specific to each jurisdiction, depending on contextual factors such as the degree of assets and activities historically impacted by drought within each jurisdiction, such as the agricultural and parks and tourism industries.

Figure 4.5 and Figure 4.6 provide “snapshots in time” of the drought conditions in California in January 2018 and August 2015 (during the period of the last drought in Fresno County from 2013 - 2017). The snapshots selected are instrumental in depicting both the historic and potential change in drought’s geographic range and severity in Fresno County (circled in red and yellow respectively).

Note: The Drought Monitor maps integrate data from several sources including the Palmer Drought Index, Soil Moisture Models, U.S. Geological Survey Weekly Stream flows, Standardized Precipitation Index, and Satellite Vegetation Health Index.

Figure 4.5 U.S. Drought Monitor for California: January 23, 2018

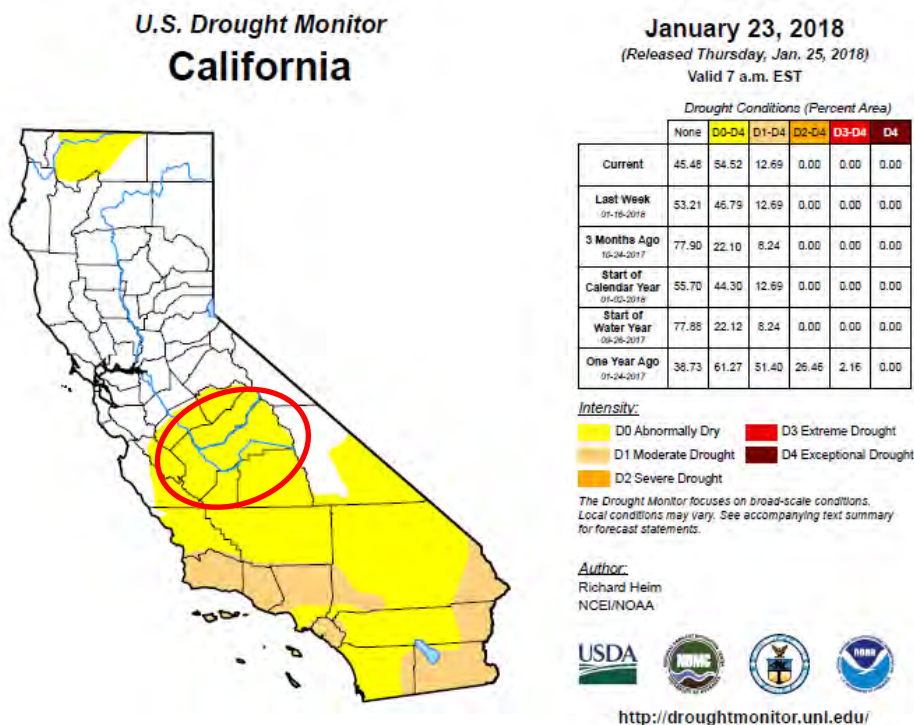
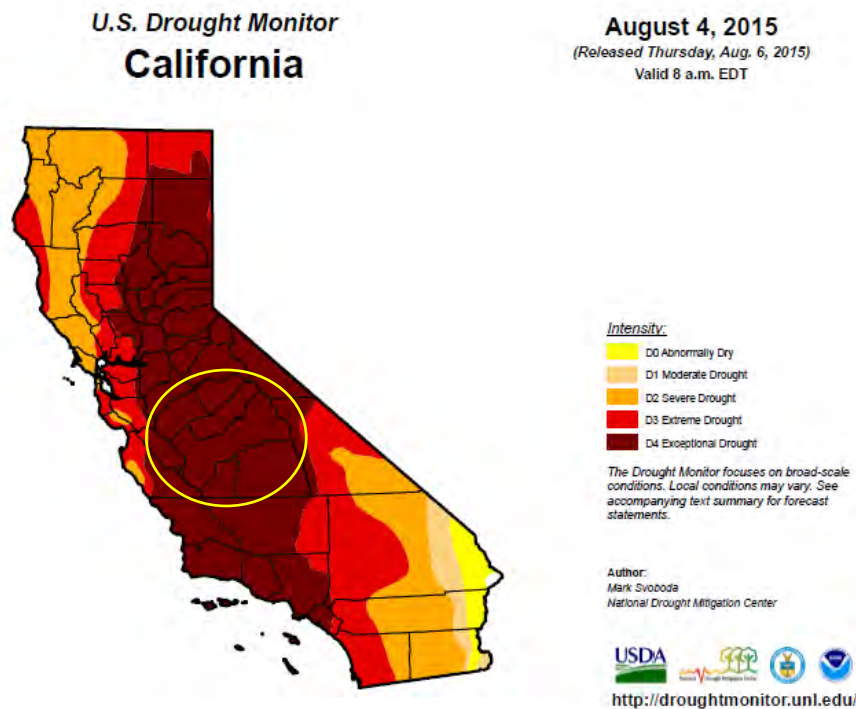


Figure 4.6 U.S. Drought Monitor for California: August 4, 2015



Tree Mortality Extent

According to the CA Department of Forestry and Fire Protection (FRAP), the California Tree Mortality Task Force (TMTF), and the US Forest Service's Aerial Detection Survey mapping project, over 100 million trees have died throughout the state (2012-2016), with significant losses taking place within Fresno County with an ongoing high probability of occurrence. The Tree Mortality Task Force mapping effort (see previous map) identifies Tier 1 and Tier 2 risk zones in order to fully capture the extent of tree mortality risk to populations, buildings, infrastructure, and natural resources. Tier 1 are those areas that directly coincide with critical infrastructure, and which pose a direct threat to people and assets operating in these areas. Tier 2 are areas defined by watersheds (HUC 12, average of 24,000 acres) and which have a significant degree of tree mortality coinciding with significant community and natural resource assets. (Source: <http://calfire.ca.gov>)

Based on the mapping as well as input from the LHMPC, the extent of the risk in Fresno County comprises approximately 15% - 20% of the total planning area, with areas of greatest risk being located roughly within the eastern third of the county within and around both foothill and mountain communities at elevations between 3,000 and 7,500 feet, with greatest impact to pine tree species. In addition, the mapping project identifies vulnerable populations, buildings, and infrastructure, and (Tier 2) broader fire risk areas, as well as numerous other supporting information layers to assist public and private land owners in preparing for, and mitigating the causes of, and risks associated with tree mortality.

Past Occurrences

Historically, California has experienced multiple severe droughts. According to the DWR, droughts exceeding three years are relatively rare in Northern California, and the region is the geographic source of much of the state's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large Northern California reservoirs. The table below compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to drought periods in 1976-77, and 1987-92. It does not include the 2012-2017 (California's most recent multi-year drought). The driest single year of California's measured hydrologic record was 1977.

Table 4.10 Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys

Drought Period	Sacramento Valley Runoff		San Joaquin Valley Runoff	
	(maf*/yr)	(% Average 1901-96)	(maf*/yr)	(% Average 1906-96)
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47

Source: California Department of Water Resources, www.water.ca.gov/

*Million acre-feet

The HMPC identified the following droughts as having significant impacts on the planning area:

- **1976**—A federal disaster declaration was declared as a result of a drought affecting Fresno County and much of California.
- **1987-1992**—Fresno County also suffered adverse effects resulting from this statewide drought.
- **2002**—Abnormally dry to moderate drought conditions lingering from 2001 into 2002 reduced rangeland grasses and feed for cattle. Losses to rangeland and loss of feed were estimated at \$2.5 million. An estimated 850,000 acres were affected in both the east and west side of the valley. A USDA disaster declaration on November 22 made low interest loans available to family-size operations.
- **2008** – Drought impacted Fresno County of most of the Central valley, resulting in significant crop damage. In addition, the drought not only impacted agriculture, but the economy of the planning area in general, where small towns were especially hard hit, including job loss and the need for food-supply assistance provided by the state.
- **2012 – 2017** – Drought produced severe impacts to water wells throughout the planning area, with a high number of wells running dry. Land subsidence due to increased groundwater pumping also occurred in areas of the San Joaquin Valley including Fresno County. Crop damage was widespread as well. Water allotments were drastically reduced in many towns and water agencies, with extremely high costs for procuring water. In addition, job loss occurred with many families requiring food supply assistance, and water supply assistance provided to home owners with dry wells. According to a report released by [UC Davis Center for Watershed Sciences](#), the 2014 California drought cost the state's agriculture industry about \$1

billion in lost revenue, with a total statewide economic cost of the drought calculated to be \$2.2 billion. The 2014 drought, the report says, is responsible for the greatest water loss ever seen in California agriculture - about one third less than normal. The report calls the groundwater situation in California "a slow-moving train wreck." Spring snowpack at Donner Summit reached record low levels in 2014, exceeded in 2015 by a remarkable April 1 snow-water-equivalent value of only 5% of average. Decreased precipitation since contributed to near-record low levels in the Shasta Reservoir. The ongoing drought has contributed to declines in Fresno County crop values, based on information from an article in the Fresno Bee. Fresno County's overall gross value fell 2.2 percent to \$6.4 billion in 2013, and with the reduction lost its status as the number one agricultural county in California. The Fresno County Agricultural Commissioner noted the drought -- one of the worst in state history -- has pinched the production of several west side field crops including cotton, corn silage and barley. The field crop category fell by 42 percent (Source: <https://statesummaries.ncics.org/ca>).

Likelihood of Drought Occurrences

Likely —Historical drought data for the Fresno County planning area and the Central Valley region indicate there have been five significant droughts in the last 79 years. This equates to a drought every 15.8 years on average or a 6.3 percent chance of a drought in any given year. Based on this data, droughts will likely affect the planning area.

Likelihood of Tree Mortality Occurrence

Based on information from the LHMPC, Cal Fire, and the Governor's Tree Mortality Task Force, established in 2015, it is a certainty that tree mortality resulting from drought and insect infestation will continue in the future, though the degree to which it occurs depends on future rainfall levels and other factors. Some of the current challenges include how to eradicate the bark beetle, dead tree removal strategies, how to utilize the wood once it is removed, and how to restore the forests to a sustainable ecosystem (http://frap.fire.ca.gov/projects/projects_drought).

Climate Change Considerations

In California, rising temperatures are projected to increase the average lowest elevation at which snow falls, reducing water storage in the snowpack, particularly at those lower mountain elevations which are now on the margins of reliable snowpack accumulation. Higher spring temperatures will also result in earlier melting of the snowpack. The shift in snow melt to earlier in the season is critical for California's water supply because flood control rules require that water be allowed to flow downstream and that water cannot be stored in reservoirs for use in the dry season.

Climate change will likely adversely impact the ability of watersheds and ecosystems to deliver important ecosystem services. There is a broad range of climate change impacts that affect water resources in California. These changes may limit the natural capacity of healthy forests to capture water and regulate stream flows. Peterson et al., (2008) report that Sierra Nevada mountain winters and springs are warming, and on average, precipitation as snowfall relative to rain is decreasing.

A warming climate with reduced snowpack will result in earlier snowmelt and will subsequently reduce downstream water availability during summer and early fall.

Source: <http://frap.fire.ca.gov/data/assessment2010/pdfs/3.1water.pdf>; p. 139

As such, Fresno County potentially has less capacity to address future drought (and wildfire) risk related to climate change due to projected temperature increases and shortages in water; ground-water withdrawals have been occurring at a deficit rate of one to two million acre feet per year, where the impacts of drought include decreased availability of water for agriculture and environmental uses. In forested and other vegetated areas, prolonged drought decreases the moisture content of forest fuels and increases the risk of high severity wildfires.

Source: <http://frap.fire.ca.gov/data/assessment2010/pdfs/3.1water.pdf>; p. 139

California is the single most productive agricultural state with Fresno County and the San Joaquin Valley being a key factor to such productivity. The agricultural industry relies heavily on reservoir water supplied by snowmelt and rainfall runoff. Yearly variations in snowpack depths have implications for water availability as snowmelt from the winter snowpack feeds a network of reservoirs. Spring snowpack at Donner Summit reached record low levels in 2014, exceeded in 2015 by a remarkable April 1 snow-water-equivalent value of only 5% of average. Decreased precipitation since 2011 has contributed to near-record low levels in the Shasta Reservoir.

Source: <https://statesummaries.ncics.org/ca>

As such, the HMPC understands that high degree of risk posed by drought will be exacerbated by greater climate variation in the future, which, in this case, means greater variation and uncertainty regarding the availability of water supplies which are already under tremendous stress. The HMPC will continue to explore solutions for mitigating the drought hazard by accessing the best available data and resources on climate change and its relationship to drought.

Table 4.11 Summary of Climate Change Impacts on Water Resources

Resource	Type of Impact	Description
Sea Level	Direct	Sea level is rising and will likely impact coastal areas
Soil Moisture	Direct	Prolonged dry seasons can lead to decreases in soil moisture; drier vegetation
Vegetation	Indirect	Longer and more intense fire season with increased extent of area burned
Stream Conditions	Direct	Increases in water temperature; potential effects on fish
Snowpack	Indirect	Increases in temperature will lead to decreases in snowpack
Runoff	Direct	Warmer temperatures are likely to lead to a shift in peak runoff from spring to winter and a likely decrease in summer baseflow
Hydropower	Indirect	Decreased summer flows resulting from earlier snowmelt and a shift

Resource	Type of Impact	Description
		in peak runoff could affect hydropower generation during summer months
Precipitation	Direct	Warmer winter temperatures will result in a greater percentage of precipitation falling as rain rather than as snow
Groundwater	Indirect	Reduction in snowpack and extended periods of drought are likely to increase dependency on groundwater

Source: <http://frap.fire.ca.gov/data/assessment2010/pdfs/3.1water.pdf> p. 140

4.2.5 Earthquake

Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see discussion in Extent section). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Seismic Hazards

Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. The degree of damage depends on many interrelated factors. Among these are the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction. The following analysis of seismic hazards from the Fresno County General Plan Background Report (2000) discusses some of these factors in more detail.

Ground Shaking

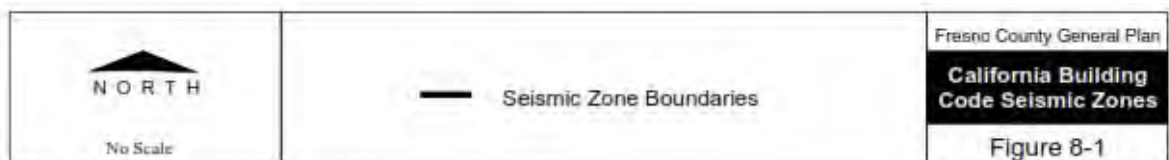
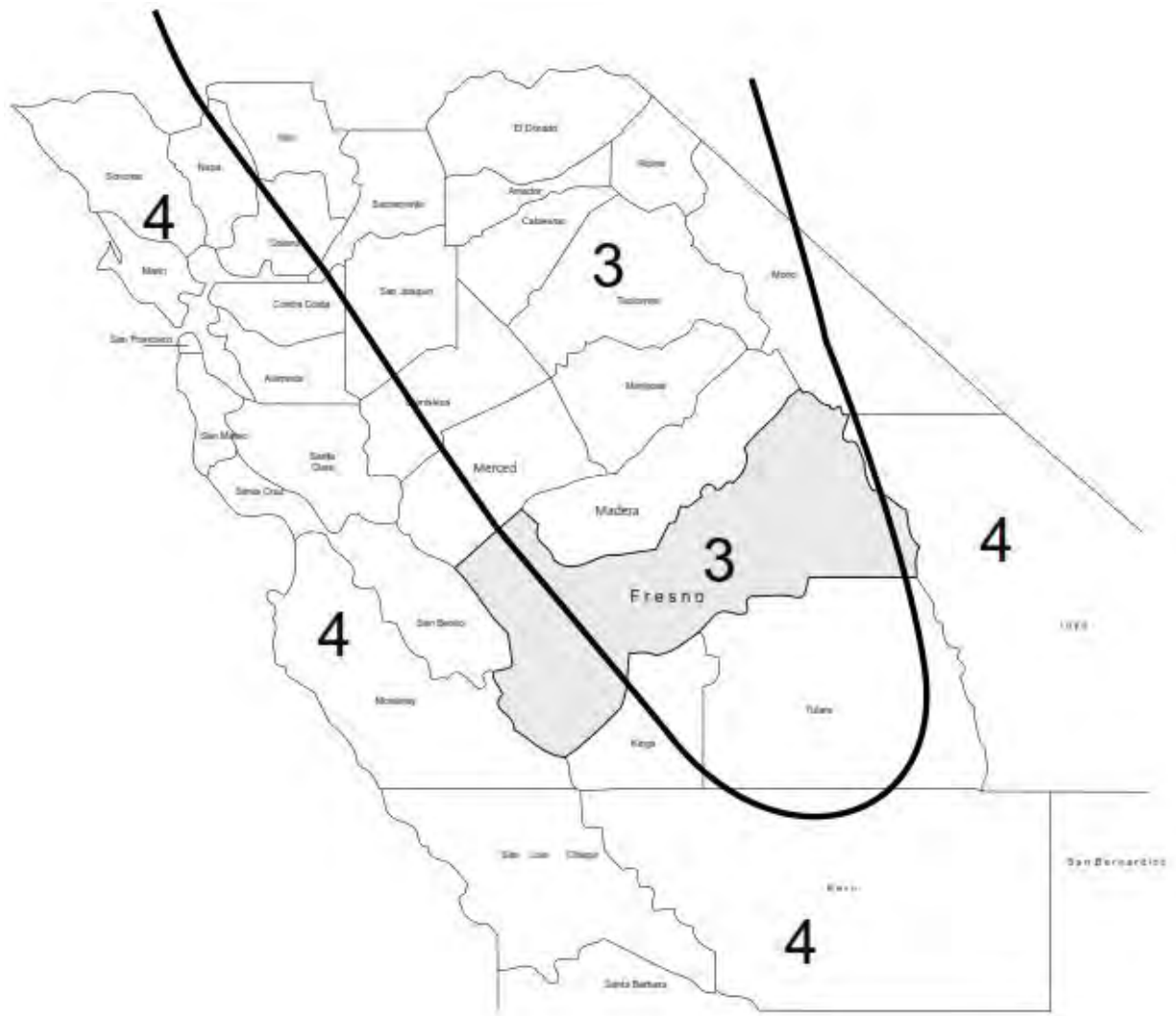
When movement occurs along a fault, the energy generated is released as waves, which cause ground shaking. Ground shaking intensity varies with the magnitude of the earthquake, the distance from the epicenter, and the type of rock or sediment through which the seismic waves move. The geological characteristics of an area thus can be a greater hazard than its distance to the earthquake epicenter.

Although most of Fresno County is situated within an area of relatively low seismic activity, the faults and fault systems that lie along the eastern and western boundaries of Fresno County, as well as other regional faults, have the potential to produce high-magnitude earthquakes throughout the

County. A high-magnitude earthquake on one of these faults could cause moderate intensity ground shaking in Fresno County. The valley portion of Fresno County is located on alluvial deposits, which tend to experience greater ground shaking intensities than areas located on hard rock. Therefore, structures in the valley areas would tend to suffer greater damage from ground shaking than those located in the foothill and mountain areas.

Most of Fresno County, from approximately Interstate 5 east, is located in Seismic Zone 3, as defined by the most recent California Uniform Building Code. Areas in the Coast Range and foothills and a small area along the Fresno County-Inyo County boundary are located in Seismic Zone 4 (Figure 4.7).

Figure 4.7 California Building Code Seismic Zones



SOURCE: California Code of Regulations, Title 24, Figure 23-2, 1991; Structural Engineers Association of California, Seismology Committee, Recommended Lateral Force Requirements and Tentative Commentary, 1988, Figure 2A

Source: Fresno County General Plan, 2017

Seismic Structural Safety

Older buildings constructed before building codes were established, and even newer buildings constructed before earthquake-resistance provisions were included in the codes, are the most likely to be damaged during an earthquake. Buildings one or two stories high of wood-frame construction are considered to be the most structurally resistant to earthquake damage. Older masonry buildings without seismic reinforcement (unreinforced masonry) are the most susceptible to the type of structural failure that causes injury or death.

The susceptibility of a structure to damage from ground shaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions, which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings.

Other potentially dangerous conditions include, but are not limited to, building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices. Such features could be damaged or destroyed during strong or sustained ground shaking.

Liquefaction Potential

Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. Areas most prone to liquefaction are those that are water saturated (e.g., where the water table is less than 30 feet below the surface) and consist of relatively uniform sands that are loose to medium density. In addition to necessary soil conditions, the ground acceleration and duration of the earthquake must be of sufficient energy to induce liquefaction. Scientific studies have shown that the ground acceleration must approach 0.3g before liquefaction occurs in a sandy soil with relative densities typical of the San Joaquin alluvial deposits.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, tilting, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted.

No specific countywide assessments to identify liquefaction hazards have been performed. Areas where groundwater is less than 30 feet below the surface are primarily in the valley. However, soil types in the area are not conducive to liquefaction, because they are either too coarse or too high in clay content. Areas subject to 0.3g acceleration or greater are located in a small section of the Sierra Nevada along the Fresno-Inyo border and along the Coast Range foothills in western Fresno County. However, the depth to groundwater in such areas is greater than in the valley, which would

minimize liquefaction potential as well. Detailed geotechnical engineering investigations would be necessary to more accurately evaluate liquefaction potential in specific areas and to identify and map the areal extent of locations subject to liquefaction.

Settlement

Settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence is not available. The only urban area directly affected by settlement is the City of Coalinga. Fluctuating groundwater levels may have changed the local soil characteristics. Sufficient subsurface data is lacking to conclude that settlement would occur during a large earthquake; however, the data is sufficient to indicate that the potential exists.

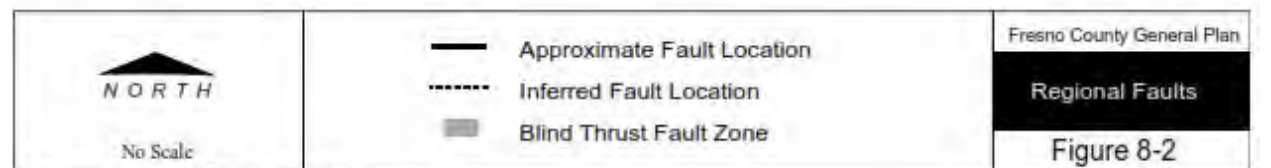
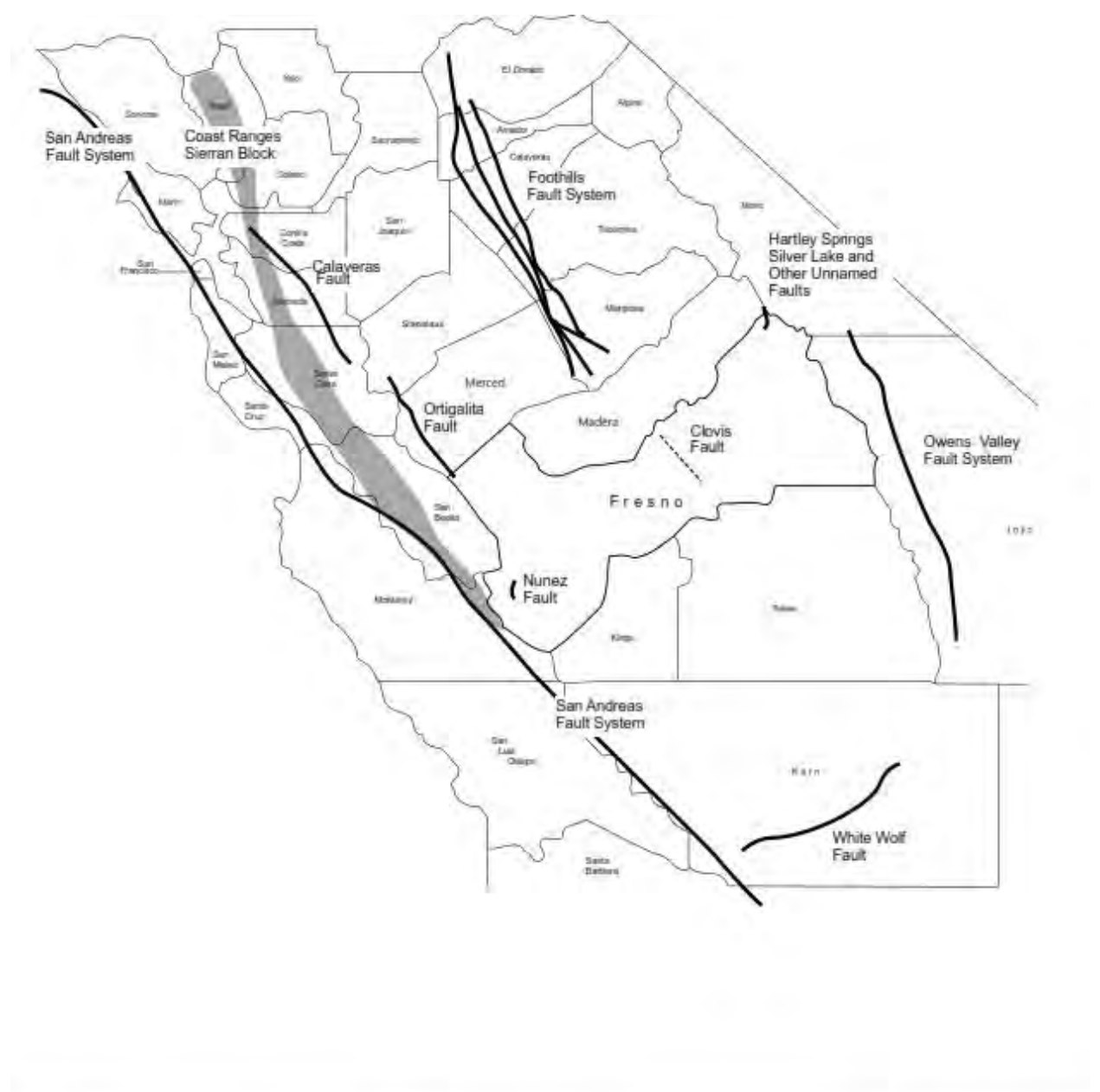
Other Hazards

Earthquakes can also cause seiches, landslides, and dam failures. A seiche is a periodic oscillation of a body of water resulting from seismic shaking or other causes that can cause flooding. Earthquake-induced seiches are not considered a risk in Fresno County. Earthquakes may cause landslides, particularly during the wet season, in areas of high water or saturated soils. The most likely areas for earthquake-induced landslides are the same areas of high landslide potential discussed in Section 4.2.9 Landslide. Finally, earthquakes can cause dams to fail (see Section 4.2.3 Dam Failure).

Faults

An active fault is defined by the California Geological Survey as one that has had surface displacement within the last 11,000 years (Holocene). This does not mean, however, that faults having no evidence of surface displacement within the last 11,000 years are necessarily inactive. For example, the 1975 Oroville earthquake, the 1983 Coalinga earthquake, and the 1987 Whittier Narrows earthquake occurred on faults not previously recognized as active. Potentially active faults are those that have shown displacement within the last 1.6 million years (Quaternary). An inactive fault shows no evidence of movement in historic (last 200 years) or geologic time, suggesting that these faults are dormant.

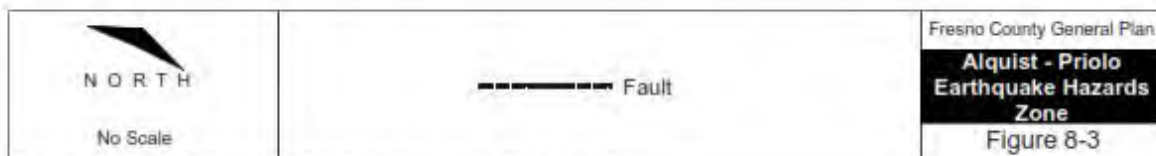
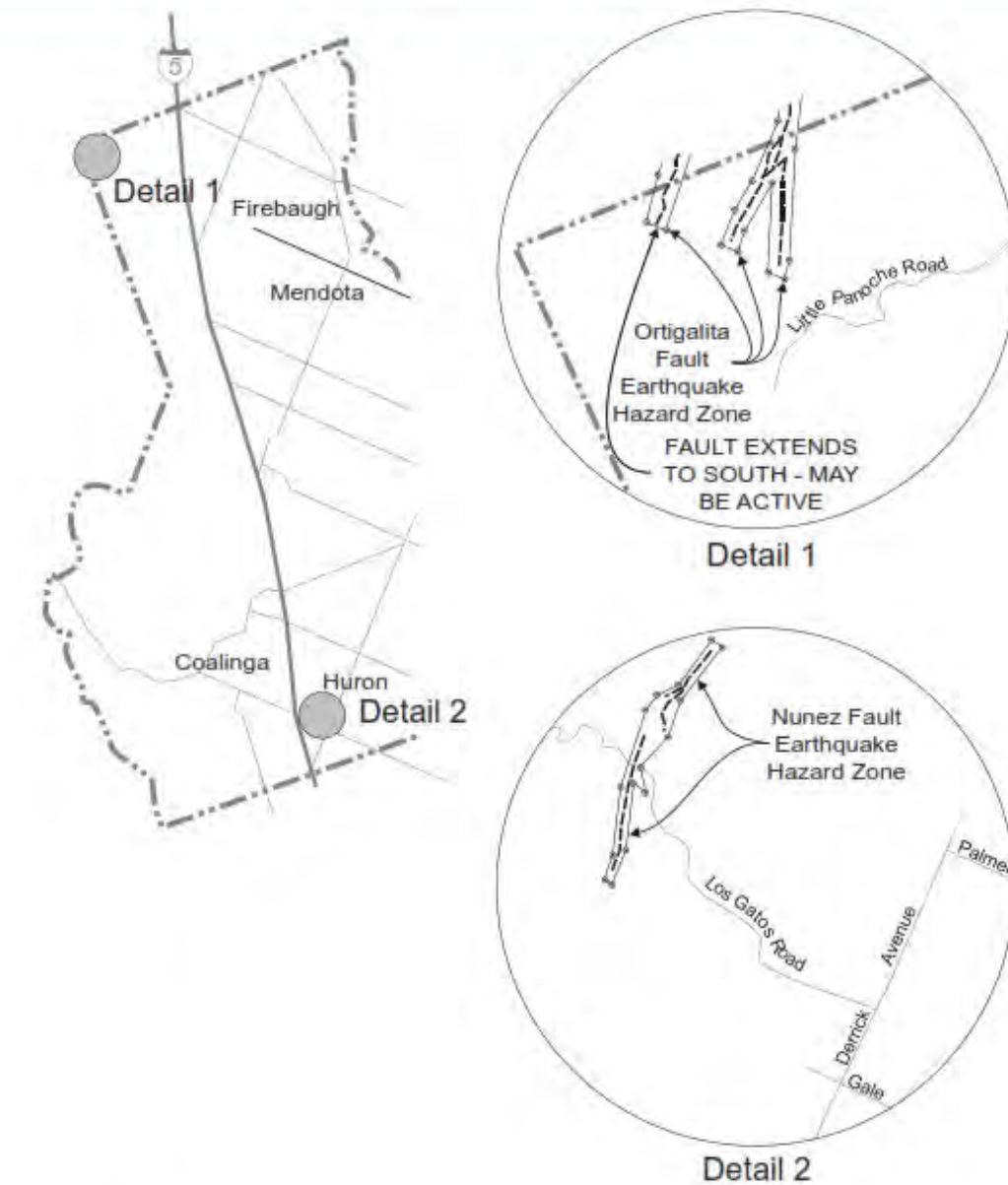
There are a number of active and potentially active faults within and adjacent to Fresno County. Faults within Fresno County and major active and potentially active faults in the region are illustrated in Figure 4.8 and Figure 4.9.



SOURCE: California Division of Mines and Geology, Fault Activity Map of California and Adjacent Areas, Scale 1:750,000. Geologic Data Map No. 6, 1994.

Source: Fresno County General Plan, 2017

Figure 4.9 Alquist-Priolo Earthquake Fault (Hazards) Zones



Source: Alquist Priolo Special Studies Zones Fresno Area Plates I and II

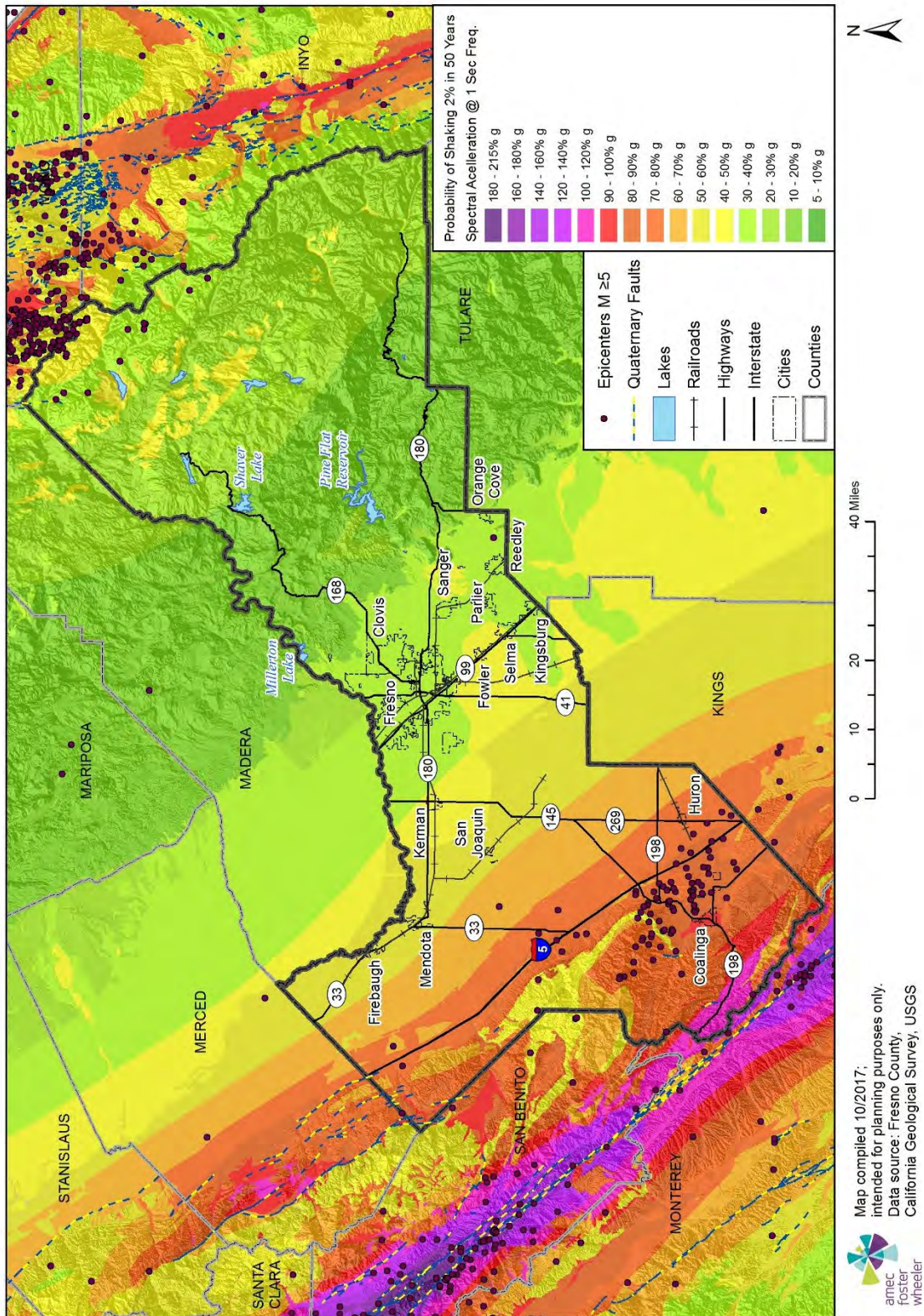
Source: Fresno County General Plan, 2017

- **Clovis Fault**—The northwest-trending Clovis fault is believed to be approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a few miles south of Fancher Creek. The Clovis fault is considered a pre-Quaternary fault or fault without recognized Quaternary displacement. This fault is not necessarily inactive.
- **Hartley Springs Fault, Silver Lake Fault (Parker Lake Fault), Unnamed Faults**—Holocene and Quaternary faults are present in the vicinity of Duck Lake in the northeastern part of Fresno County, a few miles south of Mammoth Lakes.
- **Unnamed Inferred Faults**—Relative or apparent upward and downward displacement, which are interpreted as inferred faults, occur in an area located a few miles south of Helm, extending southeast to approximately Lanare (between Fresno Slough and Crescent Ditch). As with the Clovis fault, there is no apparent Quaternary displacement; however, the possibility for fault movement in this area cannot be completely eliminated.
- **Nuñez Fault**—The Nuñez fault is located approximately six to seven miles northwest of Coalinga. The Nuñez fault experienced surface rupture during the 1983 Coalinga earthquake and is designated an earthquake fault zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994. No structure for human occupancy may be built within an earthquake fault zone until geologic investigations demonstrate that the site is free of fault traces that are likely to rupture with surface displacement. Special development standards associated with Alquist-Priolo requirements would be necessary for development in this area.
- **Ortigalita Fault**—The Ortigalita fault zone is approximately 50 miles long, originating near Crow Creek in western Stanislaus County and extending southeast to a few miles north of Panoche in western Fresno County. Most of the fault is considered active due to displacement during Holocene time and is designated an earthquake fault zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994. The southernmost extension of the fault lies in Fresno County.
- **The San Andreas Fault**—The San Andreas fault lies to the west and southwest of Fresno County. In the southwestern part of the County, the fault is roughly parallel to and a few miles west of the County line. This fault is considered active and is of primary concern in evaluating seismic hazards throughout western Fresno County, although effects of earthquakes along the San Andreas fault could occur farther east as well.
- **Sierra Nevada Fault Zone (Owens Valley Fault Zone)**—Approximately 12 miles east of the eastern Fresno County boundary lies the Owens Valley fault zone. This northwest-trending fault zone is a lengthy and complex system containing active and potentially active faults. Historically, this fault has been the source of seismic activity in Madera County to the north.
- **Foothills Fault System**—The southern part of the Foothills Fault System, located approximately 70-80 miles north of the City of Fresno, includes the Bear Mountains fault and the Melones fault zone, as well as numerous smaller, but related faults. According to the California Geological Survey data, these faults have not shown any activity during the last 1.6 million years; however, geologic investigations of the seismic safety of the Auburn Dam site suggest these faults are potentially active. Therefore, the possibility exists that earthquakes could occur on these faults.

- **White Wolf Fault**—The White Wolf fault is located approximately 100 miles south of western Fresno County. The fault was not considered active until 1952, when movement along it generated a series of damaging earthquakes in the Bakersfield (Kern County) area.
- **Coast Range-Sierran Block Boundary**—Recent evidence suggests that faults along the western boundary of the Central Valley may be more active than once believed. According to the California Geological Survey, asymmetrical folds have recently been identified on the eastern slopes of the Coast Range, which includes western Fresno County. Such folds can hide faults that show no surface rupture. These faults and folds, which are part of a large system called the Coast Range-Sierran Block Boundary, are similar to the faults/folds identified as the cause of the 1983 Coalinga earthquake. Therefore, faults beneath the Central Valley once believed to be inactive are now believed to be active and capable of generating large magnitude earthquakes.

Figure 4.10 is an earthquake shaking map of Fresno County that is based on the 2% probability of occurrence in 50 years, based on analyses of these faults, soils, topography, groundwater, and the potential for earthquake shaking sufficiently strong to trigger landslide and liquefaction. It represents worst-case ground shaking and supports the conclusion that the Fresno County planning area is at risk to future damaging earthquake hazards, especially in the western and northeastern portions of the County.

Figure 4.10 Earthquake Shaking Potential for Fresno County

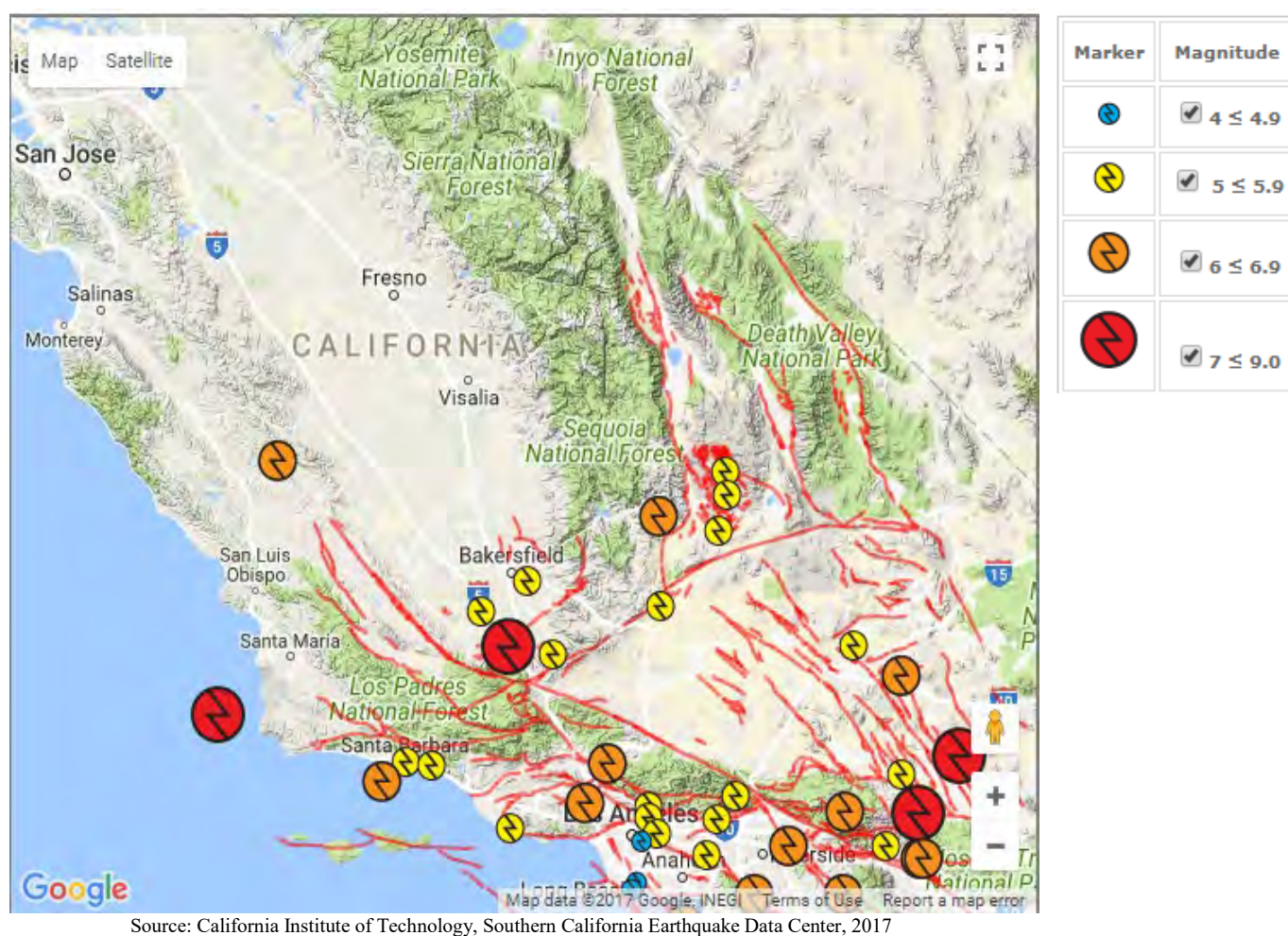


Seismic risk is not limited to identified faults. A significant fraction of small to moderately large earthquakes occur on faults not previously recognized. Such earthquakes are characterized as “background seismicity” or “floating earthquakes,” which mean that the expected sources and locations of such earthquakes are unknown.

Extent

Figure 4.11 shows the location of faults and past earthquake epicenters in Southern California. Since earthquakes affect large areas the earthquake hazard extent within city limits is considered significant, potentially impacting 50-100% of the planning area.

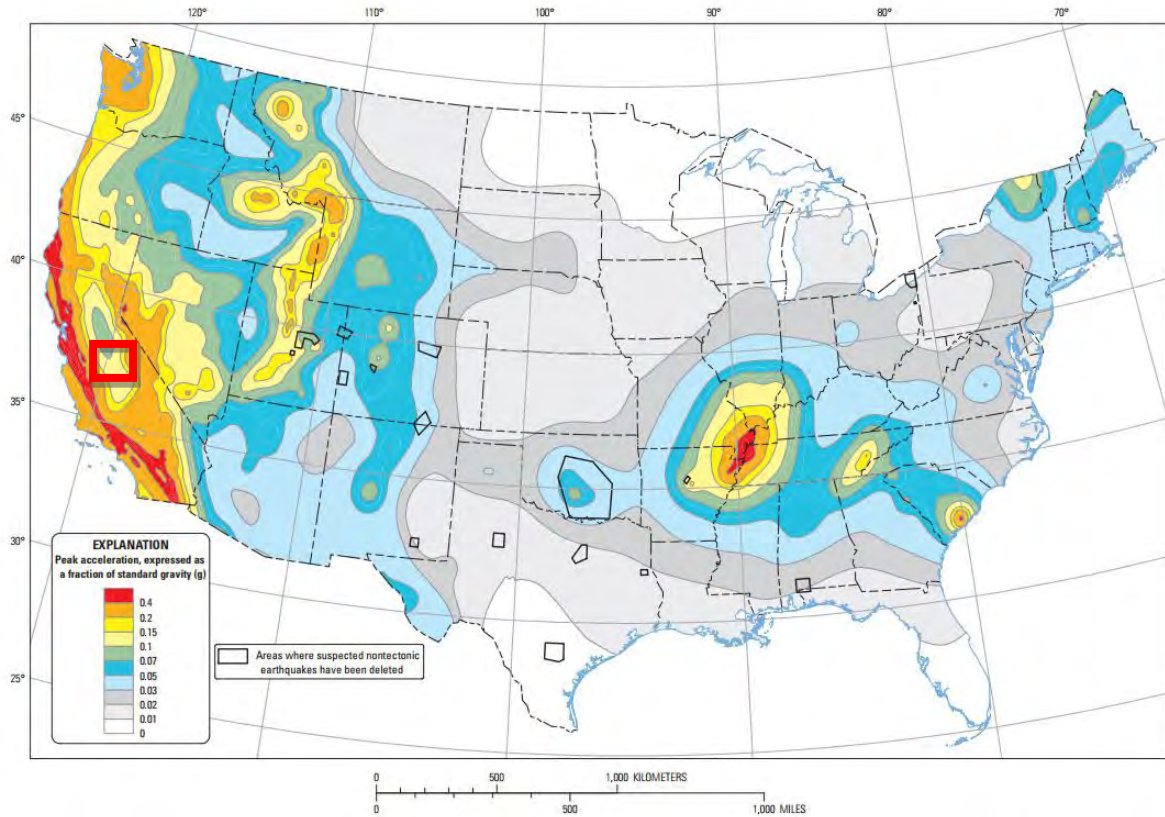
Figure 4.11 Southern California Earthquake and Fault Map



The U.S. Geological Survey (USGS) issues National Seismic Hazard Maps as reports every few years. These maps provide various acceleration and probabilities for time periods. Figure 4.12 depicts the peak horizontal acceleration (%g) with 10% probability of exceedance in 50 years for the planning region. The figure demonstrates that the city falls in the 3%g area. This data indicates that the expected severity of earthquakes in the region is fairly limited, as damage from earthquakes

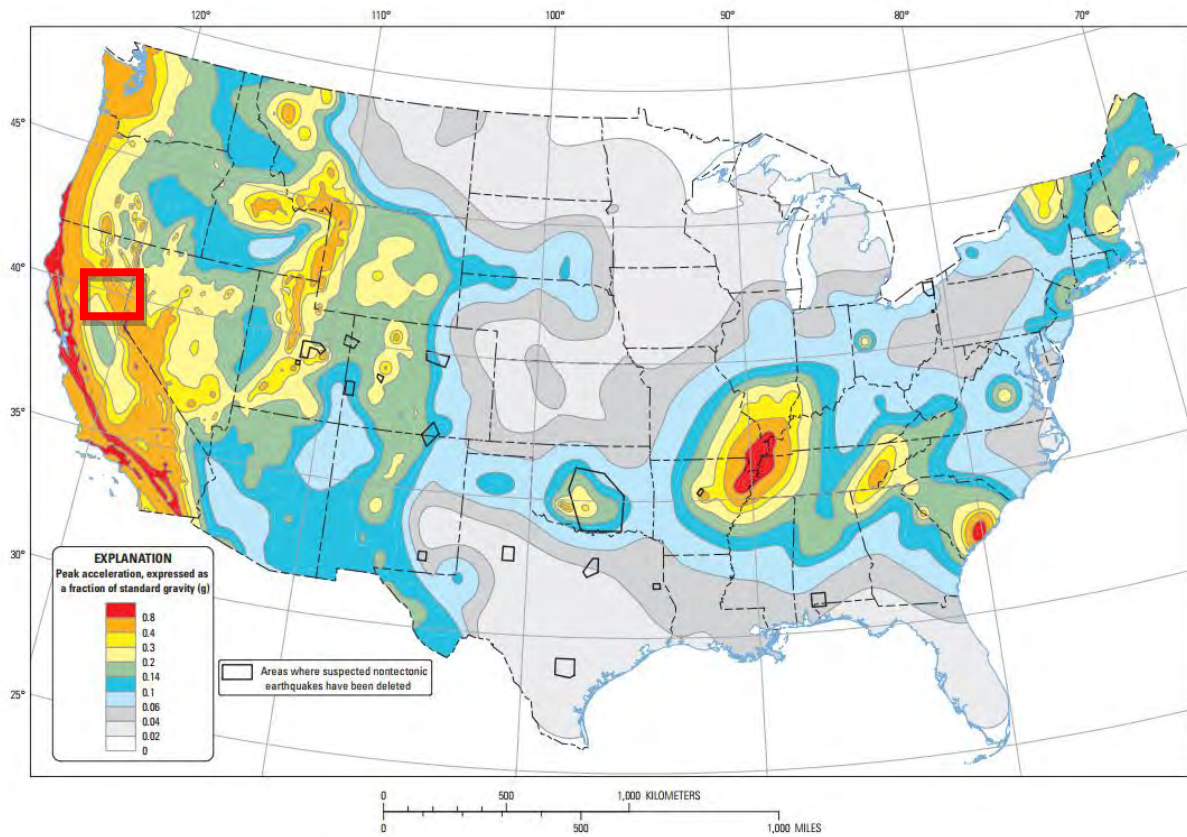
typically occurs at peak accelerations of 30%g or greater. However, as demonstrated by the HAZUS modeling documented earlier, the potential, though remote, does exist for damaging earthquakes.

Figure 4.12 Peak Horizontal Acceleration with 10% Probability of Occurrence in 50 Years



Source: USGS National Seismic Hazard Maps – 2014 Long-term Model.

Figure 4.13 Peak Horizontal Acceleration with 2% Probability of Occurrence in 50 Years



Source: USGS National Seismic Hazard Maps – 2014 Long-term Model.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Seismologists have developed several magnitude scales; one of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Moment Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is Intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface based on felt or observed effects. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Intensity is measured with the Modified Mercalli Intensity (MMI) scale. The table below compares Magnitude and the felt effects associated with the MMI scale. Damage typically occurs in MMI VII or above, and some areas of the County are susceptible to this level of shaking.

Table 4.12 Richter Scale Measurements and Associated Characteristics

Magnitude	Mercalli Intensity	Effects	Frequency
Less than 2.0	I	Microearthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I to II	Felt slightly by some people; damages to buildings.	Over 1M per year
3.0-3.9	II to IV	Often felt by people; rarely causes damage; shaking of indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to VI	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally, no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VIII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year
6.0-6.9	VII to X	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicentral area.	100 to 150 per year
7.0-7.9	VIII<	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII<	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year
9.0 and Greater	VIII<	At or near total destruction - severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

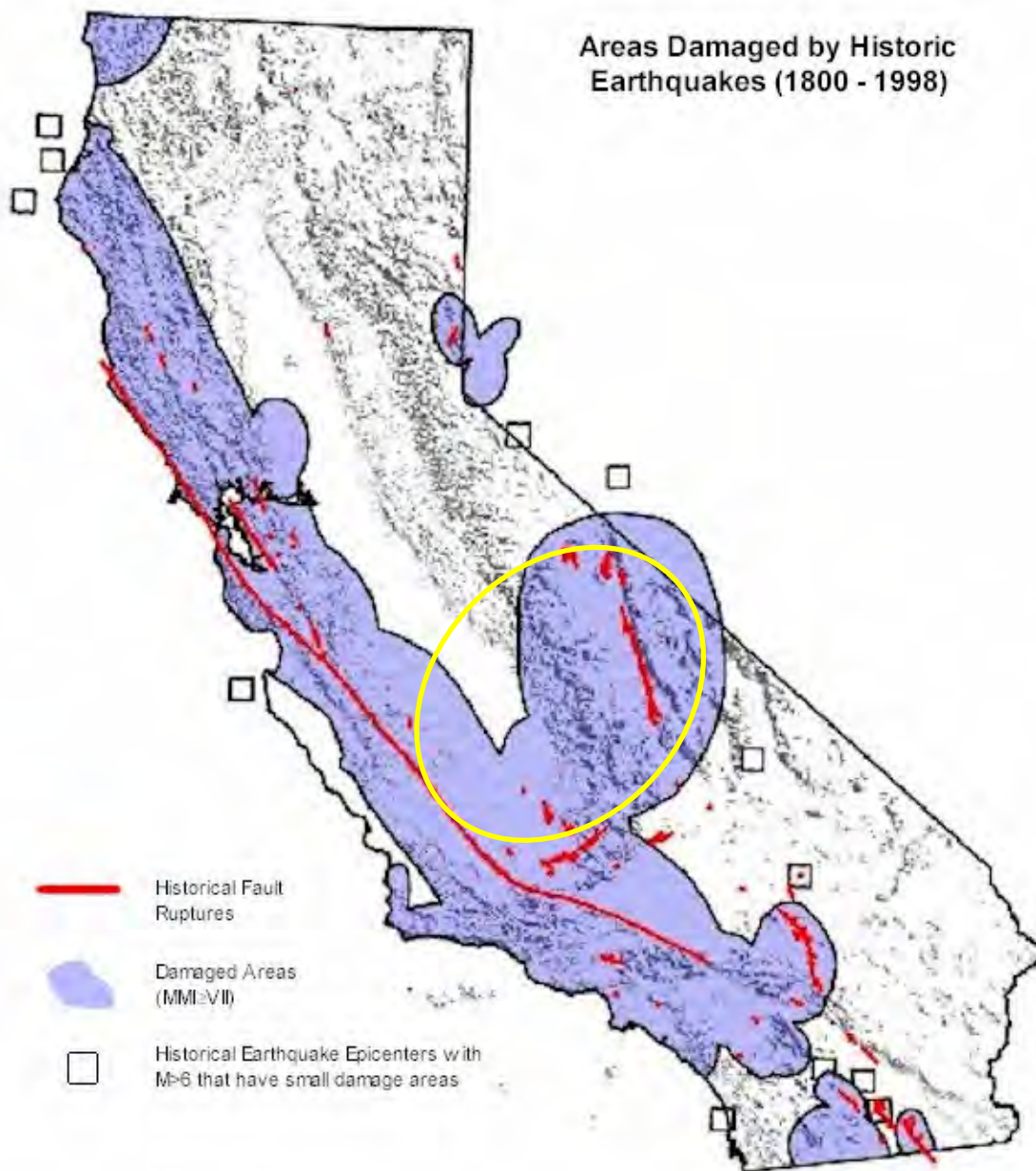
Past Occurrences

Earthquakes have occurred in Fresno County in the past. Figure 4.14 illustrates areas of California damaged by earthquakes between 1800 and 1998. According to the Fresno County Operational Area Master Emergency Services Plan, the California Geological Survey has identified a minimum of four magnitude 5.0 or greater earthquakes that caused damaging shaking in Fresno County between 1800 and 1999. Details on some of these events follow.

- **1983**—In Coalinga, a surface rupture occurred along the Nuñez fault. The main shock was 6.7 on the Richter scale. The surface rupture was determined not to be the cause of the main shock; instead, a blind thrust fault concealed deep within a complex fold-and-thrust belt at the western end of the San Joaquin Valley was identified as the cause. Approximately 800 buildings were destroyed, and 1,000 people were left homeless. No deaths resulted, but 47 people were injured. Private homeowner losses exceeded \$25 million. Public agency losses were roughly \$6 million. The commercial section of Coalinga was heavily damaged; however, most schools and the hospital received only slight damage. Local, state, and federal declarations resulted.
- **August 4, 1985**—A magnitude 6.0 earthquake occurred, centered about 10.5 kilometers east of Coalinga.

It is unknown to what extent earthquakes occurring outside of the planning area were felt by Fresno County residents.

Figure 4.14 Areas Damaged by Historical Earthquakes, 1800-1998



Source: California Geological Survey, www.consrv.ca.gov/CGS/rghm/psha/ofr9608/index.htm#Faults%20in%20California

Likelihood of Future Occurrences

Occasional—According to the Fresno County Operational Master Emergency Services Plan, the faults and fault systems that lie along the eastern and western boundaries of Fresno County, as well as other regional faults, have the potential to produce high magnitude earthquakes throughout the County. Based on the Alquist-Priolo Earthquake Fault Zone chart, Fresno County would be affected by earthquake activity in the Alcalde Hills and Ortigalita Peak faults. There are also

several faults in the vicinity of Coalinga that could cause problems in the future. These include the Nuñez fault, about ten kilometers northwest of Coalinga, the Coalinga fault, 5 kilometers northeast of Coalinga; and the New Idria fault, approximately 21 kilometers northwest of Coalinga. In addition, there are many faults in neighboring counties that could potentially affect Fresno County. Specifically, the U.S. Geological Survey is predicting an earthquake at the community of Parkfield in Monterey County, approximately 15 miles southwest of Coalinga.

Climate Change Considerations

While climate change is not expected to directly affect earthquake frequency or intensity; it could exacerbate indirect impacts of earthquakes (e.g., climate change will increase the frequency and intensity of extreme precipitation events, increasing the probability of landslides and liquefaction events during an earthquake).

4.2.6 Flood

Hazard/Problem Description

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss and are usually caused by weather events. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Certain health hazards are also common to flood events. Standing water and wet materials in structures can become breeding grounds for microorganisms such as bacteria, mold, and viruses. This can cause disease, trigger allergic reactions, and damage materials long after the flood. When floodwaters contain sewage or decaying animal carcasses, infectious disease becomes a concern. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts.

The area adjacent to a channel is the floodplain. Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to the area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. In addition to the standard 100-year and 500-year flood maps, the California Department of Water Resources (CA DWR) has initiated a program that covers areas at risk of a 200-year flood. After propositions IE and 84 were passed in 2006, funding became available to support the Central Valley Floodplain Evaluation and Delineation (CVFED) program. To assist DWR with fulfilling new California code requirements, the CVFED Program provides new maps delineating the 100-year, 200-year and 500-year floodplains for areas receiving protection from the State federal flood protection system in the Central Valley.

The potential for flooding can change and increase through various land use changes and changes to land surface, which can result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

The Fresno County planning area is susceptible primarily to three types of flooding: localized, riverine, and dam failure flooding.

- **Localized flooding**—Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems. The term “flash flood” describes localized floods of great volume and short duration. This type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour.
- **Riverine flooding**—Riverine flooding, defined as when a watercourse exceeds its “bank-full” capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Fresno County planning area, riverine flooding is largely caused by heavy and continued rains, sometimes combined with snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. The warning time associated with slow rise floods assists in life and property protection.
- **Dam failure flooding**—Flooding from failure of one or more upstream dams is also a concern to the Fresno County planning area. A catastrophic dam failure could easily overwhelm local response capabilities and require mass evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result, and there could be associated health concerns as well as problems with the identification and burial of the deceased. Dam failure is further addressed in Section 4.2.3 Dam Failure.

Eastern and Central Fresno County

Eastern Fresno County extends from the Sierra Nevada foothills to the Great Western Divide. It is located primarily in the Sierra Nevada, where precipitation falls mainly as snow. The region is characterized by small local watersheds and draining to the reservoirs upstream of Millerton and

Pine Flat reservoirs. Flows originating in the mountains and foothills contribute to the drainage and flooding problems on the valley floor.

Central Fresno County includes the area between the valley floor around Fresno Slough and eastward to the Sierra Nevada foothills, including Millerton Reservoir to Pine Flat Reservoir. The geographic area of central Fresno County runs along the Sierra Nevada foothills at elevations around 500 feet, and slopes down to the Fresno Slough on the valley floor, and drains gently to the north. This area is the population center of the County; thus, most storm drainage and flood control systems are largely designed to protect urban development. Average annual precipitation in the central Fresno County area varies from 6 inches near Mendota to about 70 inches upstream.

The western slope of the Sierra Nevada drains into central Fresno County via the San Joaquin and Kings rivers and small creeks and stream systems. The Fresno Slough, also known as the North Fork of the Kings River, is connected to the San Joaquin River by the James Bypass, a manmade canal. It directs floodwater from the Kings River to the San Joaquin River. Three dams have been constructed to control flows on the rivers. These dams are Friant and Mendota dams on the San Joaquin River and Pine Flat Dam on the Kings River. Pine Flat Dam is operated primarily for flood control purposes. Friant Dam was constructed and is managed by the U.S. Bureau of Reclamation as part of the Central Valley Project. Although Friant Dam does serve to reduce release volumes in the main San Joaquin River channel, it was not sited, designed, or engineered for the purpose of flood control. Mendota Dam is operated primarily for irrigation.

In addition to the flood control facilities on the San Joaquin and Kings rivers, a number of reservoirs and detention basins have been constructed on streams east of the Fresno-Clovis area to prevent urban flooding. These facilities include Redbank Dam and the Redbank-Fancher Creeks Flood Control Project. The Redbank-Fancher Creeks Flood Control Project consists of two dams (Big Dry Creek Dam and Fancher Creek Dam), three detention basins (Redbank Creek, Pup Creek, and Alluvial Drain detention basins), and various canals to convey discharges around developed areas. The Friant-Kern Canal draws water from Millerton Reservoir at Friant Dam and flows south along the foothills toward Bakersfield.

The rivers, streams, and flood control systems of eastern and central Fresno County are described in further detail below. Table 4.13 summarizes the location, capacity, and managing agency for each steam system and flood control facility in eastern and central Fresno County.

San Joaquin River

The San Joaquin River forms the boundary between Fresno and Madera counties. It flows from the Great Western Divide in the Sierra Nevada southwest along the northern border of Fresno County where it is joined by flows from the North Fork of the Kings River. From there, the river flows northwest up the San Joaquin Valley toward the Delta. Friant Dam, which serves to regulate river flows, is the most significant of the dams on the San Joaquin River. Several dams are located upstream of Friant Dam.

The storage capacity of Millerton Reservoir (formed by Friant Dam) is 520,500 acre-feet. The Central Valley Project Friant Unit consists of Friant Dam and Millerton Reservoir; the Friant-Kern Canal, which runs south to Kern County; and the Madera Canal, which runs northwesterly to Madera County. Releases from Friant Dam to the San Joaquin River and the Friant-Kern Canal provide service to water users within Fresno County.

This storage capacity of Millerton Reservoir is inadequate for full flood protection during wet years, and emergency releases may result in flooding problems downstream. The U.S. Army Corps of Engineers (the Corps) has evaluated the operational plans for all the dams in the San Joaquin River system to determine the possibility of coordinated releases to reduce the likelihood of coincident peak flows downstream with some success. However, in 1997, emergency releases from Friant Dam combined with large storm events and several levee breaks contributed to flooding along the San Joaquin River. Not designed for purposes of flood control, any flood control capability of the Friant Unit is incidental to its function as a diversion facility. The Madera Canal, also part of this unit, also serves to release runoff volumes from the San Joaquin River.

The Friant-Kern Canal carries irrigation water from Millerton Reservoir southeast to Kern County. The average annual delivery from the canal is about one million acre-feet with a design capacity of 5,000 cubic feet per second (cfs). There is a spillway into the Kings River just upstream of a double barrel 24 ½-foot diameter siphon under the river. Although the canal was constructed by the Bureau of Reclamation and is normally managed by the Friant-Kern Water Users Authority, floodwater in the canal is managed by the Corps. During times of flooding, water from the Friant-Kern Canal may not be releasable to the Kings River since the Corps may not want additional flows on the river.

Mendota Pool is a 5,000-acre-foot reservoir created by Mendota Dam located just outside City of Mendota on the San Joaquin River. The primary function of the dam is storage of irrigation water for agriculture; however, the water level in the pool also functions to maintain water levels in the Mendota Wildlife Management Area. Mendota Pool provides little or no flood protection. Mendota Dam contains flow from the San Joaquin River as well as discharge and releases from the Kings River via the Fresno Slough and James Bypass. The Delta-Mendota Canal conveys Delta water to Mendota Pool from the north, and several irrigation channels divert flows from it. The Bureau of Reclamation, in coordination with the Central California Irrigation District, manages this system, which is part of the Central Valley Project, and they have proposed replacing the existing dam with a new dam, which may raise the water level in the pool.

Southern California Edison and Pacific Gas and Electric own and operate a number of dams and reservoirs on the San Joaquin River and its tributaries upstream of Friant Dam. The most notable of these are Edison Lake and Florence Lake. These upstream storage facilities are operated for the production of electric energy and have a combined capacity of about 609,530 acre-feet. Their operation does affect the flow of water into Millerton Reservoir and subsequently the timing and availability of releases to Friant Unit contractors. None of these storage facilities are designed or operated for flood control, and the Corps currently has no jurisdiction over releases from these

structures. Cumulative flood releases from the upper San Joaquin River dams could overwhelm Friant Dam.

From Friant to Gravelly Ford, the San Joaquin River is part of the Designated Floodway Program administered by the State Reclamation Board. Land use restrictions and river management practices allow the river to meander, flood the overbanks, and remain in a relatively natural state. Downstream of Gravelly Ford, the river is confined by levees. The design capacity of the San Joaquin River from Friant Dam to Chowchilla Bypass is in excess of 8,000 cfs, while the channel capacity downstream is reduced. The major San Joaquin River “choke point” in Fresno County is the reach near Mendota and Firebaugh, which has a channel capacity of 8,000 cfs. Beyond that point, San Joaquin River channel capacity continues to decrease for some distance due to lack of annual flooding and natural channel clearing since Friant Dam was constructed. Further downstream, the river channel has been deepened and widened by historical flows of the Merced and Tuolumne rivers and other tributaries.

In addition to releases from Friant Dam, two uncontrolled streams, Cottonwood Creek and Little Dry Creek, add significantly to the river flows below Friant during heavy precipitation. Historically, large areas within the Central Valley were within the river’s floodplain. Development has encroached on the floodplain and the flow is now confined to a relatively narrow channel constrained by levees, which reduce the carrying capacity of the river. Most of the flow from Friant Dam is diverted to the Chowchilla Bypass, which branches off the San Joaquin River about 11 river miles upstream from Mendota Dam. Over time, encroachment of vegetation, substantial sedimentation, and land subsidence has considerably reduced channel capacity. Erosion, seepage, and prolonged high water compromise levee integrity. Downstream of the Chowchilla Bypass, the river is not confined by levees (within Fresno County) and generally carries no more than 2,500 cfs.

Flood control measures constructed along the main stem of the river have impacted riparian and wetland wildlife habitat areas. Levee construction and sediment and vegetation removal can damage streamside vegetation, divert floodwater from wetlands and riparian areas, and reclaim natural wetlands for other uses.

Kings River

The Kings River originates high in the Sierra Nevada Mountains near the Inyo County line and flows southwest through the central part of Fresno County and into Tulare County at Reedley. It has a large drainage basin, which includes most of Kings Canyon National Park and most of the area between Shaver and Florence lakes in the north to the Fresno/Tulare County border in the south. North of Hanford, the river branches, and the south fork flows southward to the Tulare Lakebed. The north fork joins Fresno Slough, which conveys flows north to the San Joaquin River at Mendota Pool. Several sloughs and canals branch off the river and are used for water storage and to convey irrigation water.

The Kings River flows are regulated by Pine Flat Dam, completed in 1954 for flood control purposes. Pine Flat Reservoir has a storage capacity of approximately one million acre-feet. The flood control functions of the facility are managed by the Corps while the releases for irrigation diversion are managed by the Kings River Water Association. There are additional reservoirs upstream of Pine Flat that are owned and operated by Pacific Gas and Electric for the purpose of hydroelectric power generation. These facilities have a combined storage capacity of about 252,000 acre-feet. Two uncontrolled creeks, Hughes Creek and Mill Creek, flow into the Kings River below Pine Flat Dam. Pine Flat Reservoir has adequate storage capacity to avoid emergency releases in most storm events, but these downstream creeks can add significant flow to the river.

Downstream of Pine Flat Dam, the Kings River is managed for flood control by the Kings River Conservation District in cooperation with the Corps, the California Department of Water Resources (DWR), and local irrigation districts. Releases from Pine Flat Dam and flows from Hughes Creek and Mill Creek provide the majority of the river's flow. Numerous sloughs and irrigation canals branch off the Kings River. The capacity of the river is more than 13,000 cfs. The Kings River flood control facilities include many miles of levees in central Fresno County.

There are three weirs on the river: Army Weir, Crescent Weir, and Stinson Weir. Army Weir is located where the north and south forks branch off the natural river just upstream from State Route 41. Crescent Weir is located at the Crescent Bypass southwest of 22nd and Excelsior Avenues. The Crescent Bypass flows to Fresno Slough. Stinson Weir is located near the confluence of Murphy Slough and Fresno Slough at Elkhorn Avenue. Normal flows are held by these weirs in the main channel. During storm events, as much as 4,750 cfs is diverted to the North Fork and the San Joaquin River. As much as 3,200 cfs can then be diverted to the Crescent Bypass. Any flow above approximately 10,000 cfs is divided equally between the north and south forks.

In practice, the flow of the Kings River is carefully managed using analysis of anticipated weather, upstream flows, and ability of downstream users to receive the water. Significant adjustment may be necessary, and a variety of operations options are considered, including storing or routing water through alternate sloughs or requesting users to accept additional water. Fresno Slough and the James Bypass are normally dry except for groundwater seepage and irrigation returns. Flow is diverted to the South Fork only in very wet years.

Sand and gravel extraction has occurred along both the San Joaquin River and the Kings River in Fresno County, although most of this aggregate mining has occurred outside of the main river channels. The hydrologic effect of the mining and subsequent reclamation activity has generally been to increase the overall hydraulic capacity of the rivers to accommodate major flood events.

Eastern County Streams

There are many creeks and lakes in the high Sierra Nevada within Fresno County, all of which eventually feed into either the Kings River or the San Joaquin River. In addition, several creeks drain the foothill areas and flow into developed areas in central Fresno County. Most of these streams (i.e., Redbank, Fancher, Dry, and Dog creeks) have been controlled by efforts of the Corps

and the Fresno Metropolitan Flood Control District to protect the City of Fresno from damage of flooding from a 200-year storm. Other creeks, such as Wahtoke Creek, are uncontrolled. Some streams in foothill areas of southeastern Fresno County are tributaries to the Orange Cove Stream Group and to Sand Creek, which is a tributary to the Kaweah River.

Flood control efforts along some of these eastern Fresno County streams include the following:

- **Redbank Reservoir**—Redbank Reservoir, formed by Redbank Dam, is located on Redbank Creek north of Shaw Avenue. The reservoir has a gross pool capacity of 1,030 acre-feet, and receives water from the Redbank Creek watershed. The reservoir is operated for flood control by the Fresno Metropolitan Flood Control District.
- **Redbank-Fancher Creeks Flood Control Project**—This project consists of a system of two dams, three detention basins, and canals to protect developed areas in and around the City of Fresno from a 200-year storm. The project was built by the Corps and is managed and operated by the Fresno Metropolitan Flood Control District. Fancher Creek Reservoir has a capacity of 9,712 acre-feet and retains water from Fancher and Hog creeks and some flows from Redbank Creek. Fancher Dam diverts flows via canals around Fresno. Redbank Creek Detention Basin (940 acre-feet) contains local flows from Redbank Creek downstream from Redbank Dam. The Alluvial Drain and Pup Creek detention basins have capacities of 305 and 559 acre-feet, respectively, and can each regulate discharges into Dry Creek at 25 cfs.
- **Big Dry Creek Reservoir**—Big Dry Creek Reservoir, with a capacity of 30,200 acre-feet, retains flows from Big Dry Creek and Dog Creek and diverts flows via Little Dry Creek to the San Joaquin River at a rate of up to 700 cfs. During a flood event, water is not typically released from Big Dry Creek Dam; however, during a severe flood event, it may be necessary to do so.

Table 4.13 Major Flood Control Facilities and Stream Systems in Eastern and Central Fresno County

Facility/Water Body	Location	Capacity	Managing Agency
Millerton Reservoir*	17 miles northeast of SR 99 on the San Joaquin River in the north central part of the county	520,500 acre-ft ¹	U.S. Bureau of Reclamation
Pine Flat Reservoir	16 miles northeast of Sanger on the Kings River in the east central part of the county	1,000,000 acre-ft ¹	U.S. Army Corps of Engineers
Mendota Pool	On the San Joaquin River at Mendota where the river turns north and Fresno Slough joins the river in the northwestern part of the country	5,000 acre-ft ²	U.S. Bureau of Reclamation
Big Dry Creek Reservoir	West of Friant-Kern Canal and north of Tollhouse Road on Big Dry Creek	30,200 acre-ft ¹	Fresno Metropolitan Flood Control District
Redbank Reservoir	7 miles east of Clovis, 3 miles southwest of the Friant-Kern Canal between Dog Creek and Fancher Creek in the central part of the county	1,030 acre-ft	Fresno Metropolitan Flood Control District
Fancher Creek Reservoir	East of the Friant-Kern Canal at the confluence of Fancher and Hog creeks	9,712 acre-ft ¹	Fresno Metropolitan Flood Control District
Redbank Creek Detention Basin	On Redbank Creek north of McKinley Avenue and west of DeWolf Avenue	940 acre-ft ¹	Fresno Metropolitan Flood Control District
Pup Creek Detention Basin	On Pup Creek south of Herndon Avenue and east of Temperance Avenue	559 acre-ft ¹	Fresno Metropolitan Flood Control District
Alluvial Drain Detention Basin	On Alluvial Drain west of Temperance Avenue and north of Nees Avenue	305 acre-ft ¹	Fresno Metropolitan Flood Control District
Eastern and Central Fresno County 1997	Flows from the Sierra Nevada southwest along the northern border of the county to Mendota where it turns to flow to the northwest. Forms the border between Fresno and Madera counties	8,000 cfs ^{1**} (Friant Dam to Chowchilla) 2,500 cfs ^{1,4} (to Mendota) 4,500 cfs ^{1,4} (Mendota Dam to Sand Slough)	U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, and Local Irrigation Districts
Kings River	Flows from the Sierra Nevada to Sanger and Reedley and into Kings County boundary to Army Weir above Hwy 41 where the normal flow is diverted to the North Fork. Excess flows are diverted to Tulare Lakebed	13,000 cfs ^{3**}	Kings River Conservation District
Fresno Slough & James Bypass	A seasonal waterway system which connects the Kings River near Laton and Lemoore NAS to the San Joaquin River at Mendota Pool during flood events	4,750 cfs ¹	U.S. Army Corps of Engineers
Friant-Kern Canal	Flows southeasterly from Millerton Lake through Orange Cove continuing on to Bakersfield. Crosses five feet below Kings River via a 24.5 ft diameter 3,000 ft siphon	5,000 cfs ¹	Friant-Kern Water Users' Authority, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers
Millerton Reservoir*	17 miles northeast of SR 99 on the San Joaquin River in the north central part of the county	520,000 acre-ft ¹	U.S. Bureau of Reclamation
Holland Creek Diversion Channel	South of the Friant-Kern Canal where it crosses Trimmer Springs Road	Peak channel capacity is 1,044 cfs	Fresno Metropolitan Flood Control District

Fancher Creek Detention Basin	Southwest corner of McKinley Avenue and McCall Avenue	Ultimate capacity is 1,802 ac/ft.	Fresno Metropolitan Flood Control District
Pup-Enterprise Detention Basin	East side of DeWolf Avenue, just south of Herndon Avenue	Ultimate capacity is 200 ac/ft.	Fresno Metropolitan Flood Control District
Big Dry Creek Detention Basin	North of Freeway 168 and Dakota Avenue	Ultimate capacity is 251 ac/ft.	Fresno Metropolitan Flood Control District
Dry Creek Extension Basin	Northwest corner of Annadale Avenue and Brawley Avenue	Ultimate capacity is 854 ac/ft.	Fresno Metropolitan Flood Control District

Source: Fresno County General Plan, 2017; Fresno Metropolitan Flood Control District

Note: The numbers provided in this table are design capacity and actual river capacity may vary significantly

*Friant Dam/Millerton Reservoir is not sited, designed, or operated to function as a flood control facility, and any such capability is incidental to its function as a diversion facility

¹U.S. Army Corps of Engineers

²Central California Irrigation District

³Kings River Conservation District

⁴River channel capacity is difficult to define due to significant changes in the river conditions over time, variance in channel conditions and geometry along a given river reach, and assumptions made in developing hydraulic models

Western County Streams

Western Fresno County consists of the Coast Range within which lies the County's western boundary with San Benito and Monterey counties and the San Joaquin Valley area between the Range and the Fresno Slough. Interstate 5 and the California Aqueduct pass in a north-south direction through western Fresno County. A complex system of streams drains the eastern slope of the Coast Range into the valley and the Fresno Slough. Western Fresno County is significantly different from the rest of the County in climate and character.

Western Fresno County is largely unpopulated. The major land uses are agriculture and grazing. The region is quite dry, with an average annual rainfall of only six to eight inches, yet the stream systems are prone to high flows and flooding because they drain very large watersheds. The soils in the Coast Range are subject to erosion. As a result, stormwater runoff typically carries large volumes of sediment and naturally occurring minerals, such as selenium, arsenic, boron, and asbestos, which is undesirable to downstream users.

Western Fresno County contains five major stream systems that flow from the Coast Range as described further below. The location, capacity, and managing agency for each stream system and associated flood control facility is summarized in Table 4.13.

- **Little Panoche Creek**—Little Panoche Creek, located in the northwestern corner of Fresno County, is managed for flood control purposes by the DWR. The DWR operates and maintains a detention dam and reservoir (Little Panoche Reservoir) on the creek. The facility was constructed by the Bureau of Reclamation to provide flood protection for the California Aqueduct. It was designed for a 100-year storm and has a storage capacity of 820 acre-feet. When storage levels in the reservoir exceed 820 acre-feet, the dam's uncontrolled spillway releases water. The creek flows under Interstate 5 and the California Aqueduct. Little Panoche Creek ends at a retention basin on the eastside of the aqueduct. When the retention basin fills

with stormwater during high flows, stormwater is pumped into the aqueduct. The reservoir also serves as a wildlife preserve.

- **Panoche Creek**—Panoche Creek is located just south of Little Panoche Creek in northwestern Fresno County. It flows under Interstate 5 and across the California Aqueduct. The estimated 100-year peak flow for Panoche Creek is 22,000 cfs. On the east side of the aqueduct, the water is not channelized and flows overland. During high creek flows, stormwater floods vast tracks of agricultural land and portions of the City of Mendota.
- **Tumey Gulch and Arroyo Ciervo**—Tumey Gulch and Arroyo Ciervo are located in central western Fresno County and flow easterly from Ciervo Mountain. The estimated 100-year peak flow is 3,600 cfs for Tumey Gulch and is 900 cfs Arroyo Ciervo. No flood control facilities exist on the streams; however, the California Aqueduct obstructs their eastward flow. During periods of high stream flow, sediment laden floodwater may form ponds on the west side of the aqueduct. These ponds may spill stormwater and sediment into the aqueduct during storm events.
- **Cantua Creek System**—This creek system includes Arroyo Hondo, Cantua Creek, Salt Creek, Martinez Creek, and Domingue Creek in central western Fresno County. These creeks drain the east side of Joaquin Ridge, crossing Interstate 5 between Kamm Road and Fresno-Coalinga Road. The estimated 100-year peak flow from the Cantua Creek system is 8,300 cfs. As with Tumey Gulch and Arroyo Ciervo, stormwater from the Cantua Creek system ponds on the east side of the California Aqueduct during periods of high flow, dumping large quantities of sediment and storm runoff into the aqueduct. Cantua Creek has inundated Interstate 5 during large storm events.
- **Arroyo Pasajero Stream System**—The Arroyo Pasajero stream system encompasses the largest drainage area in the western San Joaquin Valley. The major creeks in the system are Los Gatos, Warthan, Jacalitos, and Zapato-Chino creeks. They flow through the City of Coalinga and under Interstate 5 to a small ponding basin on the west side of the California Aqueduct. Arroyo Pasajero carries large quantities of sediment containing naturally occurring asbestos. During flood events, the system may damage the aqueduct and Interstate 5. Floodwater may also wash asbestos fibers into the aqueduct.

Major Sources of Flooding/Problem Areas

Flooding is a natural occurrence in the Central Valley because it is a natural drainage basin for thousands of watershed acres of Sierra Nevada and Coast Range foothills and mountains. FEMA's Flood Insurance Study for the County, effective January 20, 2016, describes several types of primary flood problems.

General rainfall floods can occur in Fresno County during winter and spring months. This type of flood results from prolonged heavy rainfall over tributary areas and is characterized by high peak flows of moderate duration. Flooding is more severe when antecedent rain has resulted in saturated ground conditions; when the ground is frozen and infiltration is minimal; or when rain on snow in the high elevations on the east side adds snowmelt to rain flood runoff.

Snowmelt floods on the San Joaquin and Kings rivers and their higher elevation tributaries can be expected to occur any time from April through June. Although snowmelt flooding is of much larger volume and longer duration than rain flooding, it does not have the high peak flows characteristic of rain floods. Snowmelt flood runoff is sometimes augmented by late spring rains on the snowfields or lower elevation tributary watersheds.

Cloudburst storms sometimes lasting as long as three hours can occur any time from late spring to early fall and may occur as an extremely severe sequence within a general rainstorm. Cloudbursts are high-intensity storms that can produce floods characterized by high peak flows, short duration of flood flows, and small volume of runoff. In some areas, especially where drainage basins are small, cloudbursts can produce peak flows substantially larger than those of general rainstorms. Cloudburst storms usually cover small areas and would not generally affect flood flows or flood stages on the San Joaquin or Kings rivers. Generally, only the upper reaches of the smaller streams are affected by cloudbursts.

In urban areas, flood problems intensify because open land available to absorb rainfall and runoff is being used for new development, which increases the amount of paved areas (i.e., impervious surfaces). The decrease in the amount of open land increases the volume of water that must be carried away by waterways. Urban development in some areas of Fresno County has been substantial in recent years and is expected to continue.

Eastern and Central Fresno County Flood Problem Areas

Most flood issues in eastern and central Fresno County are associated with the San Joaquin River, Kings River, and several other stream systems.

San Joaquin River System

The San Joaquin River from Gravelly Ford to the Chowchilla Bypass outside Fresno County is confined by a levee system. The design capacity of the river is 5,000 cfs, which is considered a safe carrying capacity with three feet of allowable freeboard. Over time, encroachment of vegetation, substantial sedimentation, and land subsidence has considerably reduced channel capacity. Erosion, seepage, and prolonged high water compromise levee integrity. Levee maintenance is generally under the jurisdiction of local reclamation districts. Uncontrolled flooding from the San Joaquin River between the Chowchilla Bypass and Dos Palos tends to flow into Madera County north of Mendota.

The Mendota Pool area has shown evidence of significant subsidence, possibly affecting levee height, river invert (i.e., bottom of low-flow channel), as well as the pool depth. The flooding hazards in the region are from Panoche Creek to the west into Madera County downstream from Mendota Pool. It was reported in 1997 (Fresno County General Plan Background Report) that the Mendota Dam is of limited usefulness for flood control purposes. Construction of a new dam at Mendota has been contemplated to improve flood control capabilities of the lower reaches of the San Joaquin.

The flooding potential from creeks and streams between the San Joaquin and Kings Rivers in the east has been substantially eliminated within the last few years by the completion of the Redbank-Fancher Creeks Flood Control Project. This has resulted in a decrease in the areas designated in the 100-year floodplain. However, as noted in the Fresno County General Plan Background Report, the 100-year storm event flows have increased from 18,000 cfs to 24,500 cfs in the San Joaquin River over last few decades (due to increasing intensity of storms and statistical analysis of the meteorologic/hydrologic database for the San Joaquin River).

Kings River System

Uncontrolled creeks within the Kings River system, notably Mill Creek, continue to challenge management of Pine Flat Dam and Kings River flood control during consecutive large storm events. In 1997, water was not released from Pine Flat due to large flows in Mill Creek, which pushed the limits of the system. If another large event had occurred before Pine Flat Reservoir releases could provide adequate storage space and the Mill creek watershed was still saturated, rapid runoff in Mill Creek and an emergency spill at Pine Flat would have overwhelmed the system. In the event of a major release from Pine Flat Dam, downstream flooding would occur over agricultural lands near the riverbanks and possibly within the Cities of Reedley and Kingsburg.

Western Fresno County Flood Problem Areas

Flood issues in western Fresno County are varied in scope and unique in nature. Many creeks prone to high flows and significant erosion are found in the area, but most of the region is unpopulated, so flooding in many areas poses little threat to life or personal property. Major facilities that are subject to flooding include Interstate 5 and the California Aqueduct. Urban areas subject to flooding include the communities of Coalinga, Huron, and Mendota. Important wetland habitat in the Mendota Wildlife Management Area is also subject to flooding and may be impacted by sediments carried by flood flows from these creeks.

During large storm events, the California Aqueduct is flooded by high flows from Arroyo Pasajero. Consequently, the Bureau of Reclamation, the Corps, and the DWR are coordinating efforts to relieve the threat of flooding from this stream system. Other stream systems obstructed by the aqueduct may pose a flooding hazard during periods of high flow when ponds form on the west side of the aqueduct. The streams carry large amounts of sediment. When ponds fill with sediment, water and sediment spill into the aqueduct.

Various stream systems also flood developed areas in western Fresno County during storm events. Creeks that feed into Arroyo Pasajero flow through the City of Coalinga, creating flood hazards and preventing development in impacted areas. Downstream, Arroyo Pasajero is prone to flooding the road into the City of Huron. After crossing the California Aqueduct, Panoche Creek flows overland and floods both agricultural land and portions of the City of Mendota.

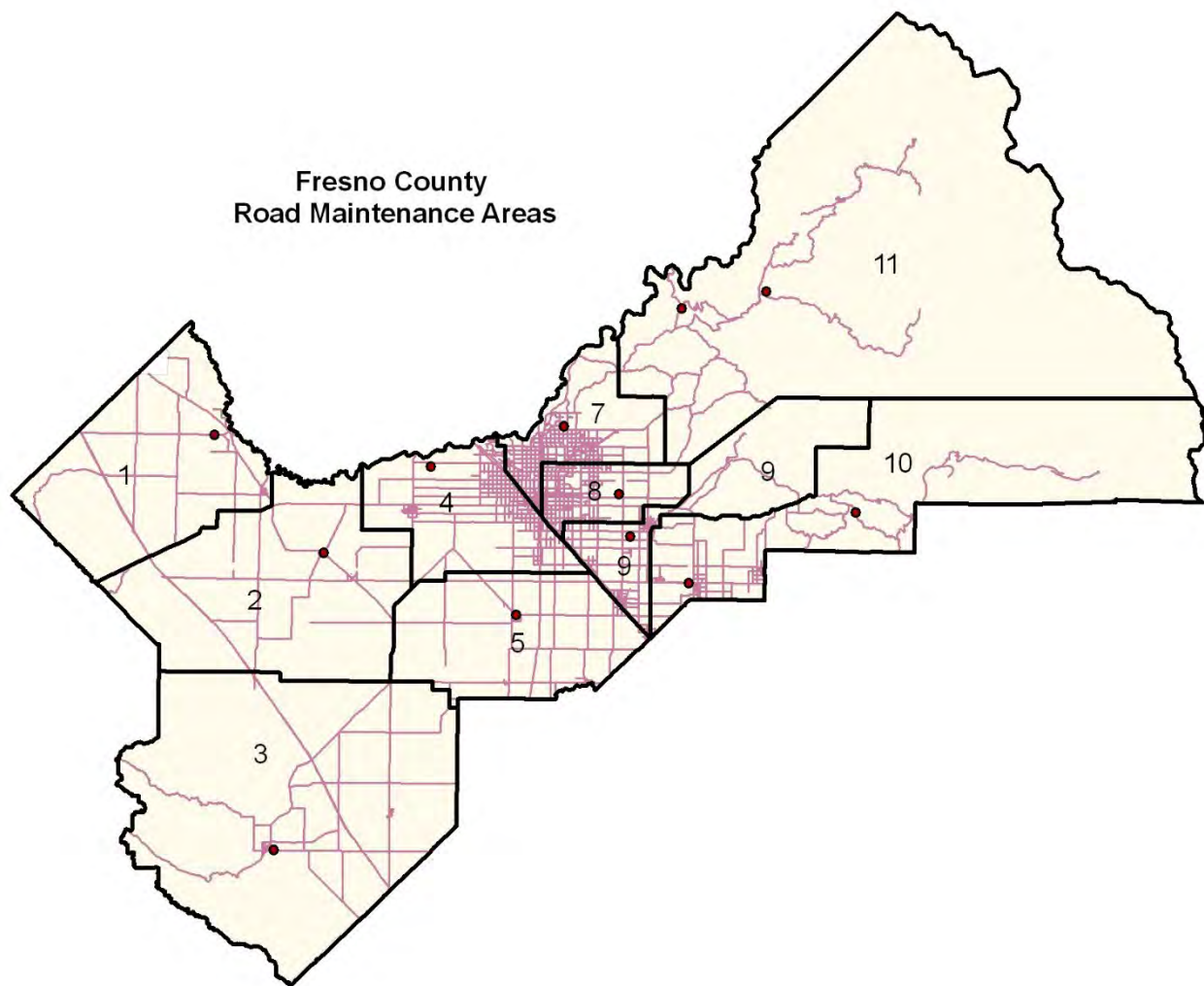
The Mendota Wildlife Management Area receives water from Panoche Creek, which drains into Mendota Pool. During storm events, the sediments carried in Panoche Creek contain high levels

of selenium and arsenic, which may degrade the water quality in the Mendota Wildlife Management Area.

Localized Flooding Problem Areas

Localized flooding also occurs throughout the County with several areas of primary concern. According to the Fresno County Department of Public Works, numerous roads throughout the County are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. The amount and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. Flooding problems are tracked by road maintenance area (see Figure 4.15) and noted below.

Figure 4.15 Fresno County's Road Maintenance Areas



Source: Fresno County Public Works and Planning

A-1 Firebaugh Area

The following roads in Area #1 are subject to flooding in heavy rains and flooding signs are required.

- Washoe at Delta Mendota Canal southeast of Bridge
- Herndon at Russell
- Belmont from San Diego to Fairfax
- Shaw between Milux and Russell
- Washoe .01 miles north of California
- Shields at Fairfax southwest corner
- Russell 1.9 miles south of Shields
- Little Panoche, numerous areas 1.3 miles west of Interstate 5 to C/L
- Milux at Bullard, west side
- Bullard east of Milux numerous areas to Fairfax
- Althea 1 mile west of Russell
- Hudson at Merrill northeast corner
- Fairfax at Valeria southwest corner
- Fairfax .02 miles south of Valeria
- Oxalis .04 miles west of Ormsby

A-2 Tranquility

Areas that flood east of James Road:

- Butte, American to North
- American, Denver to El Dorado
- El Dorado, American to Colorado
- Marin, Adams South .2 miles
- Sumner, Colorado to Placer
- Yuba, Manning to Colorado
- Parilier, Placer to Yuba
- Springfield, Colorado to Plumas
- Springfield, Colusa to Sutter
- Huntsman, Colorado to El Dorado
- Floral, Colorado to Graham
- Rose, Colorado to Trinity
- Napa, at drain ditch crossing (Nebraska)?
- Kamm, Placer to Yuba

Areas that flood west of James Road:

- San Mateo north of State Route 180
- Sante Fe at San Benteo
- Jefferson Amador to Tuolumne
- Lincoln James Rd. to Calaveras
- Mt. View San Mateo to Monterey
- Clarkson San Mateo to Amador
- Amador Clarkson to Elkhorn
- Elkhorn Amador to Sonoma
- Sonoma Elkhorn to Mt. Whitney
- Kamm State Route 33 to Interstate 5
- Manning Aqua Duct to Interstate 5
- Douglas south of Manning .1 mile
- Douglas north of Manning 1 mile
- San Diego Adams to American
- Jensen San Diego to Washoe

A-3 Coalinga

- Mt. Whitney

- Coalinga-Mendota Road
- Parkfield
- Collwell east and west
- Boone
- Alcalde Road

A-4 Biola

- Dickenson Avenue, Herndon to Barstow
- Dickenson Avenue, south of North Avenue, east side
- Belmont Avenue, Grantland to Howard Avenue, various locations
- Shields Avenue, Westlawn to Bishop Avenue, various locations
- Shields Avenue west of State Route 145, various locations
- Shaw Avenue west of State Route 145, various locations
- Dower Avenue, Shields Avenue to Shaw Avenue, various locations
- Henderson north of South Avenue, east side
- Brawley south of Lincoln
- Elm Avenue between Morton and Clayton Avenue.
- Adams-Clovis Avenue to State Route 99
- Central at Blyth to Cornelia
- Grantland south of Shaw, east side
- Grantland south of Belmont to RXR tracks, east side

A-5 Caruthers

- Floral west of Temperance
- Fowler at Davis
- McCall south of Clarkson
- Fowler north of Elkhorn
- Temperance south of Conejo
- Dewolf north of Mt. View
- Clovis north of Nebraska
- Harlan between Maple and Chestnut

A-7 Fresno-Clovis

- Copper between Minnewawa and Fowler
- Copper near Armstrong
- Armstrong between Copper and International
- International between Flower and Armstrong
- Fowler between International and Shepherd
- Behymer between Willow and Minnewawa
- Behymer between Minnewawa and Fowler

- Sunnyside between Teague and Nees
- Teague between Fowler and Armstrong
- Marion between Teague and Nees
- Shaw between McCall and Leonard
- Academy between Herndon and Shaw
- Sierra between Academy and Del Rey
- Herndon between Academy and Madsen
- Madsen between Herndon and Shepherd
- Shepherd between SH 168 and Academy
- Shepherd between Fowler and Armstrong
- Gettysburg between Van Ness and Wishon
- Sierra between Forkner and Van Ness Extension
- College between Swift and Santa Ana

A-8 Fresno-Sanger

This is not a complete list as there are many locations that pool at the shoulder or just onto the road. Large or back to back storms can change all.

- | | |
|----------------------------------|--|
| • Jensen at Sierra Vista | • Zediker south of Belmont |
| • Shields/Locan | • Tulare west of Zediker |
| • National east of Minnewawa | • Newmark north of Belmont |
| • Monticeto/Rogers | • Macdonough north of Belmont |
| • Fowler at Princeton | • Newmark north of Highway 180 |
| • Butler east of Locan | • California east of Dockery |
| • Gettysburg/Greenwood | • McCall/Tulare |
| • McKinley west of Bethel | • Tulare east of McCall |
| • McKinley at Leonard | • Indianola at Jensen |
| • Indianola south of Highway 180 | • Olive/Zediker |
| • Dewolf/Church | • Thompson north of Dakota |
| • Bond/Mayfair Drive North | • Rancho at Butler |
| • Griffith east of Clovis | • Illinois west of Villa |
| • Dakota east of Highland | • Madison west of Clovis |
| • Fowler at Olive | • Grant west of Clovis |
| • Walling north of Kings Canyon | • Washington west of Clovis |
| • Olive east of Hornet | • Easterby Drive South west of Minnewawa |
| • Temperance north of Church | • Easterby Drive North west of Minnewawa |
| • Temperance north of Jensen | • Brown at Jackson |
| • Locan north of Church | |
| • Highland north of Jensen | |

A-9 Sanger-Del Rey

- American between Academy and Armstrong
- Central between McCall and Willow
- Bethel south of Adams 100-500 feet
- Bethel between Manning and Rose
- Willow between North and Jensen
- Nebraska from Academy to city limits and at intersection of Bethel

A-10 Reedley-Dunlap

- Alta at Manning
- Zediker south of Caruthers
- South at Zediker
- Reed at Floral
- Reed at South
- Adams between Zediker and Smith
- Smith at Dinuba
- Hill between Sumner and Adams
- Monson south of Parlier (this might be the City of Orange Cove)

Levee Failure

A levee is a raised area that runs along the banks of a river or canal. Levees reinforce the banks and help prevent flooding. By confining the flow, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the river bank, raising the level of the land around the river. To construct a man-made levee, workers pile dirt or concrete along the river banks, creating an embankment. This embankment is flat at the top, and slopes at an angle down to the water. For added strength, sandbags are sometimes placed over dirt embankments.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structure behind them. A levee system failure or overtopping can create severe flooding and high water velocities. It's important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

There are three primary risks to levee integrity in Fresno County:

- Earthquake failure
- High water failure
- Dry weather failure.

Earthquake Failure

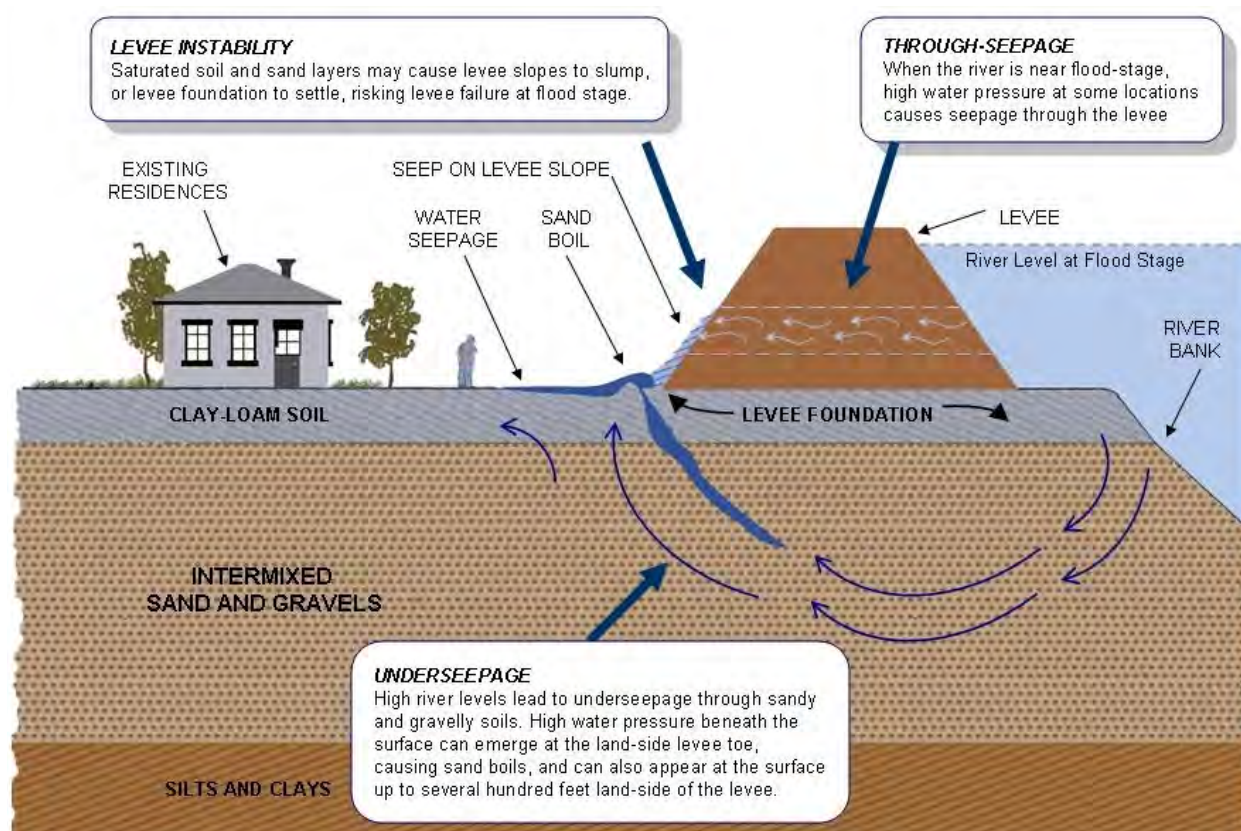
Seismic risk in the Fresno area is characterized as moderate-to-high because of many active faults in the area. Figure 4.11 in Section 4.2.5 Earthquake, illustrates the locations of faults in and surrounding Fresno County. Seismic risk to levees stems from the risk of liquefaction, ground settlement, and cracking.

High Water Failure

High water in the County can overtop levees. High water also increases the hydrostatic pressure on levees and their foundations, causing instability. The risk of through-levee and under-levee seepage failures increases as well.

Under-seepage refers to water flowing under the levee through the foundation materials, often emanating from the bottom of the landside slope and ground surface and extending landward from the landside toe of the levee. Through-seepage refers to water flowing through the levee prism directly, often emanating from the landside slope of the levee. Both conditions can lead to failure by several mechanisms, including excessive water pressures causing foundation heave and slope instabilities, slow progressing internal erosion, and piping leading to levee slumping.

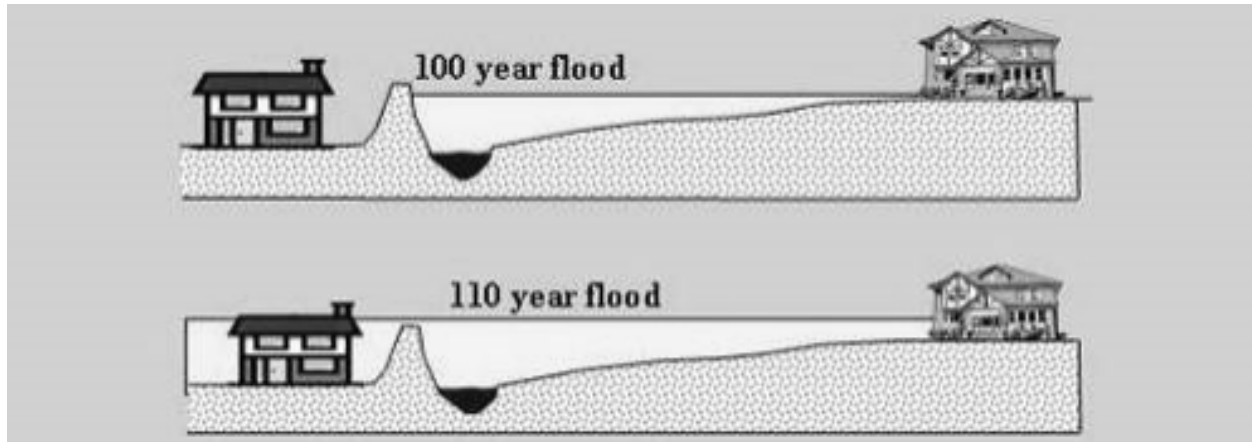
Figure 4.16 Through-Seepage and Under-Seepage During High Water Conditions



Source: USACE

Overtopping failure occurs when the flood water level rises above the crest of a levee. The representation of the failure modes and the evaluation of the probability of levee failures for each mode are discussed in the remaining sections.

Figure 4.17 Flooding from Levee Overtopping



Source: Levees In History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.

http://www.floods.org/ace-files/leveesafety/lss_levee_history_galloway.ppt

Dry Weather Failures

Dry weather, or sunny-day, failures are levee breaches that are not flood or seismic related. These failures typically occur between the end of the late snowmelt from the Sierras, in late May, and the beginning of the rainy season, in early October. Sunny-day failures are addressed separately from flood-induced failures to differentiate between winter and summer events. Aside from seismic events, factors that can cause levee failures in the County in the summer period are different than the factors that can cause winter failures.

Burrowing animal activities and pre-existing weaknesses in the levees and foundation are the key weak links leading to levee failures. This is the case whether or not the failures occur during a high-tide condition. Burrowing animals can cause undue weaknesses by creating a maze of internal and interconnected galleries of tunnels. Tree growth on levees may cause weakness as well.

Under-seepage and through-levee seepage are slow processes that tend to work through time by removing fines from levee and foundation material during episodes of high river levels. Cumulative deterioration through the years can lead to foundations ultimately failing in dry weather by means of uncontrollable internal erosion that leads to slumping and cracking of levees.

Floodplain Mapping

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and

regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping is provided in the following paragraphs. Details on the NFIP and mapping specific to participating jurisdictions are in the jurisdictional annexes.

Flood Insurance Study (FIS)

The FIS develops flood-risk data for various areas of a community that is used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Fresno County FIS is dated January 20, 2016. This study covers both the unincorporated and incorporated areas of the County.

Flood Insurance Rate Map (FIRM)

The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation. The County FIRMs are in the process of being replaced by new digital flood insurance rate maps as part of FEMA's Map Modernization program, which is discussed further below.

Letter of Map Revision (LOMR) and Map Amendment (LOMA)

LOMRs and LOMAs represent separate floodplain studies dealing with individual properties or limited stream segments that update the FIS and FIRM data between periodic FEMA publications of the FIS and FIRM.

Digital Flood Insurance Rate Maps (DFIRM)

As part of their Map Modernization program, FEMA is converting paper FIRMS to digital FIRMS (DFIRMS). These digital maps:

- Incorporate the latest updates (LOMRs and LOMAs),
- Utilize community supplied data,
- Verify the currency of the floodplains and refit them to community supplied base maps,
- Upgrade the FIRMs to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications, and
- Solicit community participation.

Levee Mapping

Also as part of FEMA's Map Modernization program, FEMA is mapping levees within communities, with a primary focus on maps determined to provide a 100-year level of flood

protection. Most of the levees are privately owned, maintained, and operated. Because of the ownership and lack of enforcement for maintenance, most of the levee systems do not meet the current standards for flood protection and are mapped as such.

In August of 2005, FEMA Headquarters' issued Memo 34 *Interim Guidance for Studies Including Levees*. This memo recognizes the risk and vulnerability of communities with levees. The memo mandates the inclusion of levee evaluations for those communities that are undergoing map changes such as the conversion to DFIRMs. No maps can become effective without an evaluation of all levees within a community against the criteria set forth in 44 CFR 65.10 *Mapping of Areas Protected by Levee Systems*. Generally, these levee certification requirements include evaluations of freeboard, geotechnical stability and seepage, bank erosion potential due to currents and waves, closure structures, operations and maintenance, and wind wet and wave run-up. In short, these guidelines require certification of levees before crediting any levee with providing protection from the 1 percent annual event (e.g., the 100-year flood).

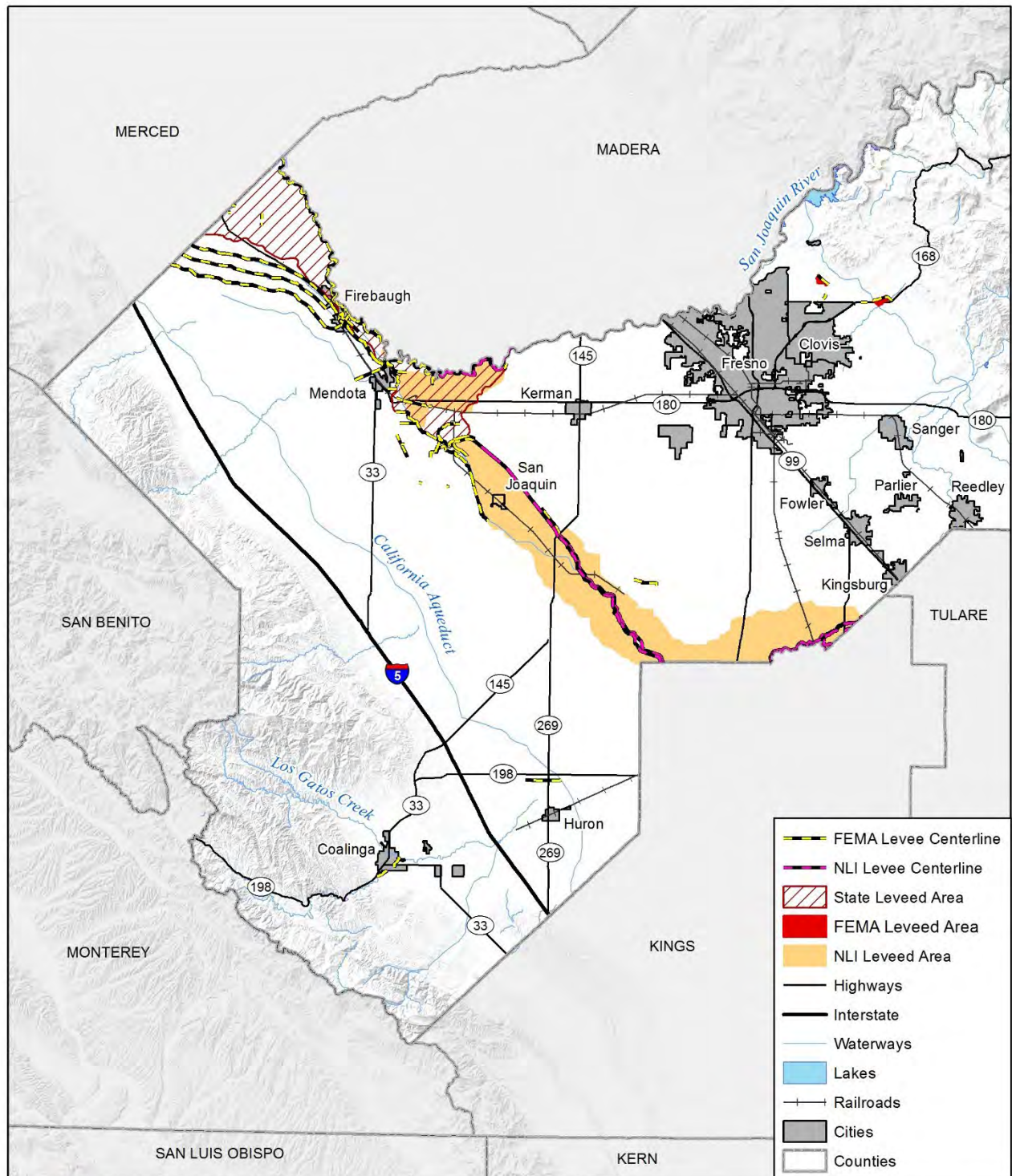
In Fresno County, similar to other locations in California, levees and flood control facilities have been built and are maintained variously by public and private entities, including water, irrigation and flood control districts, other state and local agencies, and private interests. To best address the issue of levees in the DFIRM process, FEMA provided guidance for the issuance of PAL (provisionally accredited levee) agreements that would allow for identified levees to be provisionally accredited for purposes of mapping while communities/levee owners compile and submit data and documentation necessary for full accreditation. Communities have two years from the date of FEMA's initial coordination to submit to FEMA final accreditation data for all PALs. Levees for which such agreements were signed are shown on the final effective FIRM as providing protection from the flood that has a 1-percent-chance of being equaled or exceeded in any given year and labeled as a PAL. Following receipt of final accreditation data, FEMA will revise the FIS and FIRM as warranted.

FEMA-designated 100-year and 500-year floodplains in Fresno County that were updated under the Map Modernization Program and became effective on January 20, 2016. The State of California (DWR) completed levee flood protection zone (LFPZ) maps in December 2008 of areas that may be inundated if a project levee fails (from water surface elevations at the top of the levee, which may be from a storm event even larger than the levee's design storm). The LFPZ map of the San Joaquin River shows a considerable area within Fresno County that may be inundated if the project levees fail. For more information, refer to the 2017 Fresno County General Plan (Draft) for a comprehensive series of inundation maps.

A relatively broad levee flood protection zone (LFPZ) is identified along the San Joaquin River, with depths less than three feet indicated west of the river, but greater than three feet all along the east side of the river. Several areas protected by project levees in the east county would also have inundation areas that are primarily less than three feet, but include some deeper areas.

Fresno County's levee system can be seen in Figure 4.18

Figure 4.18 Fresno County Levee System



Map compiled 10/2017;
intended for planning purposes only.
Data source: Fresno County,
FEMA NFHL (effective 1/20/2016),
National Inventory of Levees, California DWR

0 5 10 20 Miles



Flood Hazard Extent

Fresno County is large and geographically diverse. Water resources in the Fresno County planning area include a number of rivers and streams, artificial waterways, and groundwater sources located throughout the County. The mountainous eastern portion of Fresno County, located primarily in the Sierra Nevada, contains many small mountain lakes and streams that are tributaries to the San Joaquin and Kings rivers, which flow into the Central Valley. The arid western portion of Fresno County is characterized by larger watersheds in the Coast Range that drain stormwater eastward into the valley and the Fresno Slough. Flash floods with depths of several feet can occur in the valleys of the Sierras, while large areas of relatively shallow inundation can occur in the Central Valley.

During winter and spring months, river systems in Fresno County swell with heavy rainfall and snowmelt runoff. To prevent flooding, a wide variety of storm drainage and flood control measures are used throughout the County. These include flood control reservoirs, levee systems, and watershed treatments. In rural areas, the management of reservoir releases, canals, and levee systems reduces the likelihood of flooding and reroutes stormwater around urban areas. In developed areas, storm drainage systems composed of street gutters, inlets, underground storm drains, ponds, pumping stations, and open channels are used to collect and control stormwater runoff. The storm drainage and flood control systems are discussed further in the sections that follow.

Figure 4.19 illustrates natural and manmade waterways in the County. Information on the County's more notable waterways and associated flood control facilities extracted from the Fresno County General Plan Background Report (2017) is included below by region.

Figure 4.19 Waterways in Fresno County

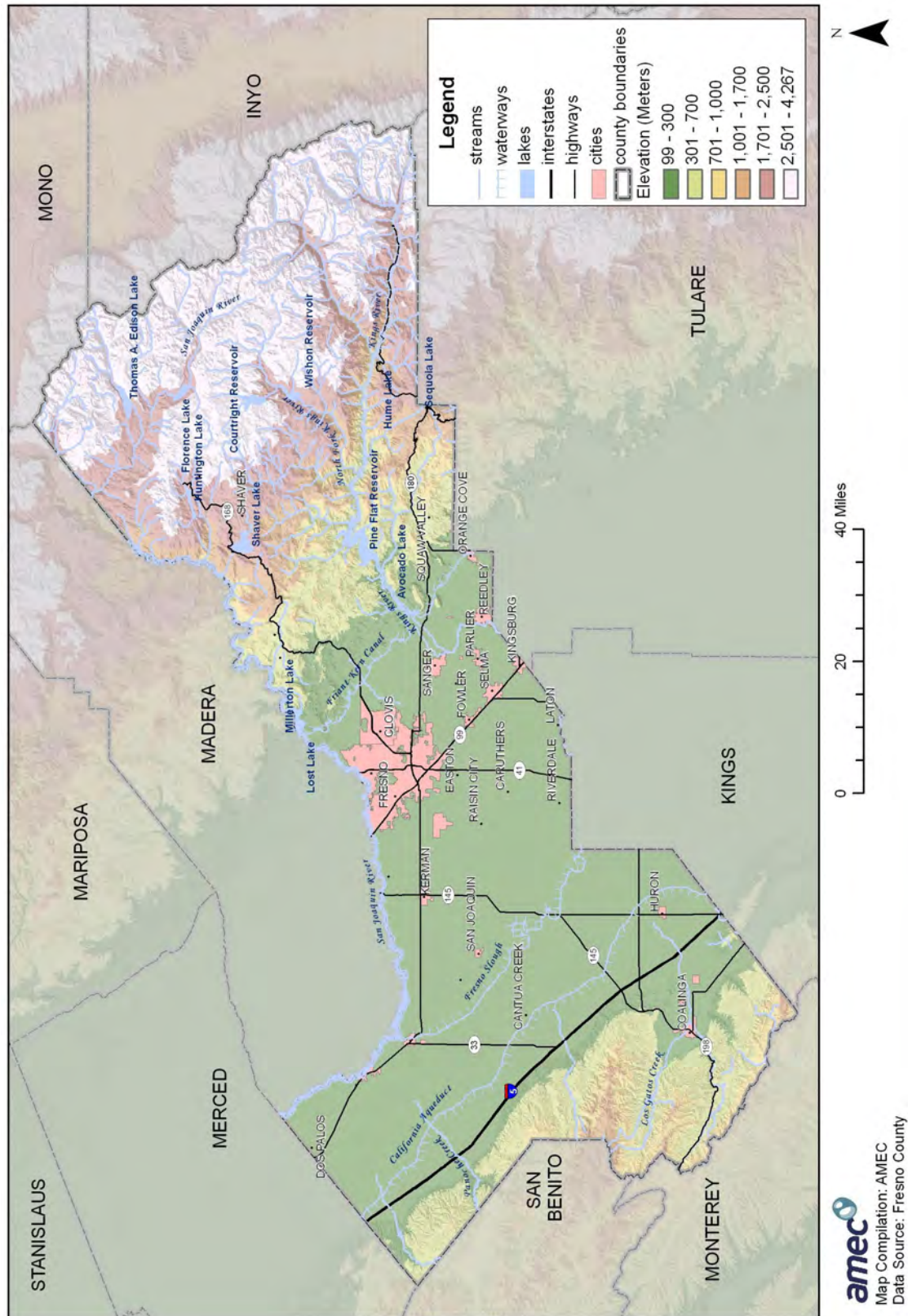
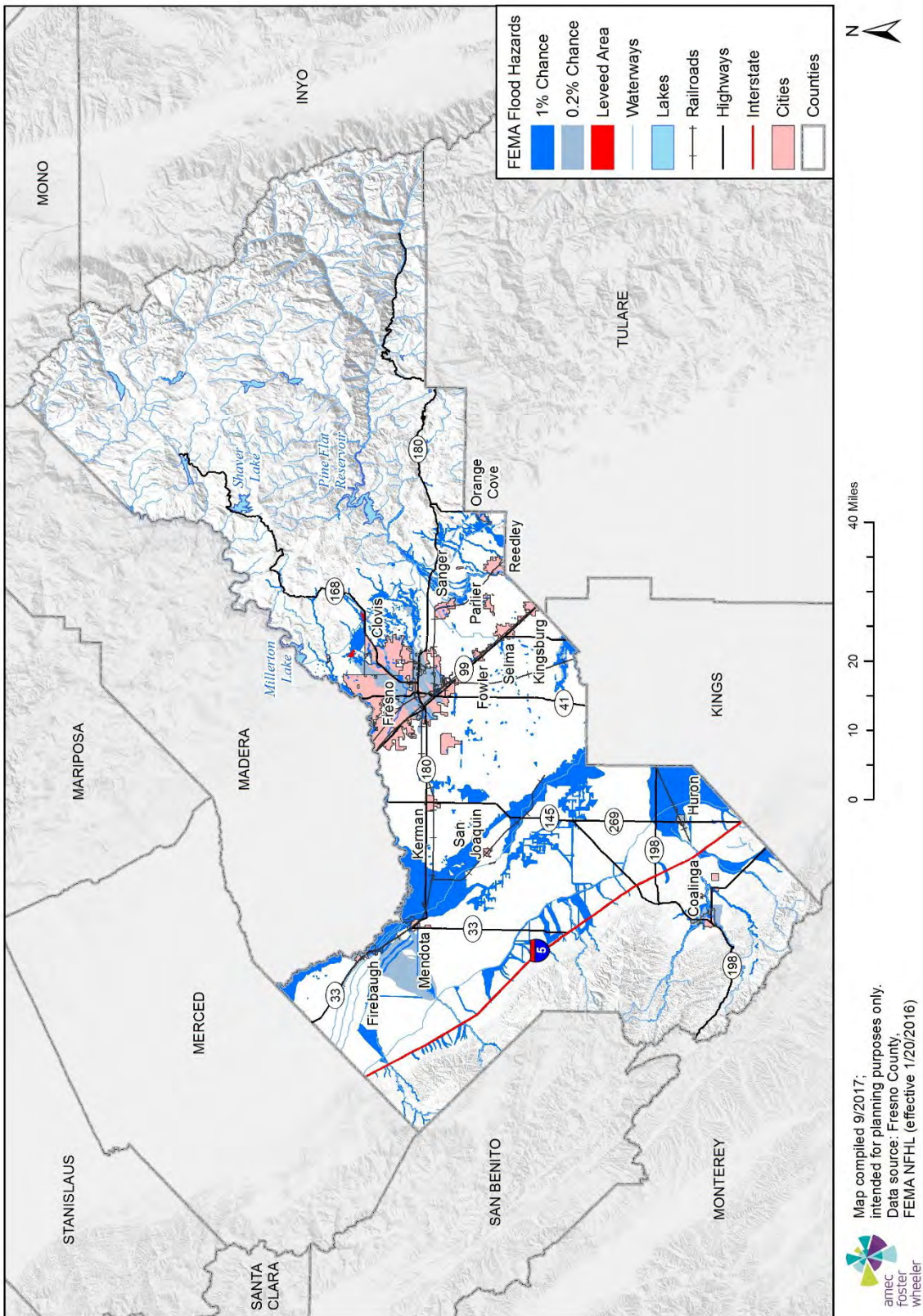


Figure 4.20 illustrates the city's mapped flood hazard areas. Flood hazard areas periodically change to reflect improved and updated mapping techniques as well as areas that may have been altered by flood mitigation projects, typically reflected in the development of Conditional Letters of Map Revision (CLOMR) or Letters of Map Revision (LOMR). More detailed flood hazard maps are included later in this Chapter, in Section 4.3.2.

Figure 4.20 Fresno County Flood Hazards



Levee Failure Extent

The geographic extent of the levee hazard is shown in Figure 4.18 and explained further in the Vulnerability portion of this plan.

Past Occurrences

Fresno County has a long history of flooding, but according to the Fresno County General Plan Background Report, little definitive data is available for specific floods, particularly on the smaller streams. Historical records indicate that nine significant flood events occurred in Fresno County between the 1840s and 1900. A series of river floods during the 1980s and 1990s prompted FEMA to drastically revise its estimate of the 100-year flood flows in the San Joaquin River channel and to develop a new FIRM for the area. Construction of major detention structures in the eastern part of the County along the Fresno County Stream Group enabled FIRMs to be revised in the early 1990s to show a reduced 100-year flood risk from the San Joaquin River to the metropolitan area. The HMPC provided information on more recent flood events, which are detailed below.

- **December 1955**—A rain on snow event caused local and downstream flooding in eastern Fresno County, ultimately affecting the entire valley region. Homes were lost and roads and bridges were damaged or destroyed. Damage to some dam facilities also resulted.
- **1995**—Beginning in January and continuing through the end of March 1995, a series of strong storms caused flooding that resulted in multiple road closures, destroyed a bridge on Interstate 5, displaced 300 to 400 people, damaged crops, and caused the deaths of seven people. Most flooding occurred in the western portion of the County. A local, state, and federal disaster was declared for the County. Twenty homes were damaged; 150 acres submerged. Losses to public facilities were estimated at \$5 million. Agricultural damage and crop losses exceeded \$8.6 million. There was an estimated \$9 million in economic and other damage to businesses. Additionally, Huntington Lake Road and Highway 168 were closed due to snowfall, Highway 180 was closed due to a rock slide, an Interstate 5 bridge over Arroyo Pasajero drainage was washed out (causing the seven deaths), 15 to 20 other County roads were closed at least temporarily, 20 to 40 water systems were unable to serve potable water for various periods of time, and an estimated 300 to 400 people were displaced by flooding (the American Red Cross shelter was open from March 11-18, providing shelter for 57 to 70 people).
- **1997**—A regionwide rain on snow event in high elevations caused local flooding and flooding downstream in the valley. Homes, bridges, roads, and other infrastructure near waterways were damaged. A bridge on Interstate 5 over the Kings River was washed out. Losses to infrastructure were estimated in the hundreds of millions. Other impacts included damage to fisheries and wildlife.
- **1998 (El Niño rain event)**—Starting February 1, 1998, and continuing until June of 1998, Fresno County experienced extreme amounts of rain, resulting in local, state, and federal emergency declarations. Thirty-three days within a 42-day period experienced significant rainfall. Flooding damaged buildings and crops in the area. Property damage included major

damage to five buildings and minor damage to six buildings for a cost of \$378,000 and \$80,000 in damage to public facilities. There was an estimated loss of \$17 million to the farming industry. The primary damage was to tree fruit and row crops. Estimated economic impacts to the community were \$38-48 million. An estimated 15,000 to 20,000 agricultural workers were out of work or on limited work schedules.

- **April 28, 2005 (Parlier Flood)**—A cell of severe weather passed over the City of Parlier dropping up to three inches of rain in 20 minutes. The drainage system could not handle the flow, and approximately 25 homes and businesses were flooded. The City of Parlier declared a local disaster, as did Fresno County. Damage was estimated at \$700,000. Home owners had little or no insurance coverage. In addition, J Street was closed for one day.
- **2005-2006**—Above average rainfall occurred between December 19, 2005, and January 1, 2006. This resulted in flooding of low lying areas throughout the County. Flood control basins were overflowing in several areas, including the Cities of Fresno and Clovis. Property damage included damage to approximately 180 businesses and homes estimated at \$1.4 million within the unincorporated County. Damage to other jurisdictions was estimated at \$611,307. Damage to crops was minimal due to the time of year. Flooding further resulted in a number of road closures, which were one to two weeks in duration.
- **April 5, 2006**—Above average rainfall and snowmelt created excessive run off into the San Joaquin and Kings river drainages on the west side of the County. Levees and river channels were in jeopardy of failing, but held. The DWR sent a flood fight team to coordinate the effort to shore up the system. Construction crews and hand crews were used to shore up the system, make sandbags, and repair leaks. Property and crop damage was minimal due to limited flooding. The most notable damage to cropland was to 200 acres affected by a levee break in the Tranquillity Irrigation District. There was, however, extensive damage to the levee system, canal system, and river channel. Local and state disasters were declared for the County based on the potential damage if the levees, canals, or river channel failed. Extensive work was done on the system during the event by locals and the DWR.
- **July 2006**—Flash floods from thunderstorms in drainages above the north end of Huntington Lake resulted in a variety of damage. This included an estimated \$250,000 in damage to private boats and an estimated \$200,000 in damage to local infrastructure (roads, boat docks, etc.). Other impacts included loss of power for three weeks in some areas, closure of a primary summer road for one week, and closure of Huntington Lake to recreational use for one week. Cleanup costs exceeded \$150,000, and search and rescue costs were estimated at \$25,000.
- **October 29, 2007**-- Newspapers and broadcast meteorologists reported a number of roadways flooded in Northwest Fresno. Numerous vehicles were stranded and water rescues occurred. Heavy rain caused a roof to collapse at an industrial plant on the northwest side of the city. Damages were estimated at 250,000 to the roof structure alone. Total property damage associated with the event amounted to over \$500,000.
- **December 2007**—Heavy rain and snow storms ravaged central California, including the San Joaquin Valley and Fresno metropolitan area. The combination of locally heavy rains and poor drainage areas within the urban and suburban land lead to over \$175,000 in property damage between December 18th and 19th.

- **December 29, 2010--** On the morning of the 29th, heavy rain across the San Joaquin Valley caused widespread urban and poor drainage flooding. Especially hard hit were the metro areas of Fresno, Visalia, and Bakersfield, and the adjacent foothills. Fresno had a record rainfall of 0.92 inch on the 28th, breaking the old record of 0.72 inch, set in 2004. The two-day total at Fresno-Yosemite International Airport was 1.54 inch, which pushed the December rainfall to 5.92 inches for the second wettest December on record for Fresno; the wettest December was in 1955, with 6.73 inches. It was also the coldest low of the year for Fresno, with temperatures dropping below 32 degrees. Property damaged amounted to \$125,000.
- **November 30, 2011--** Fresno set record high minimum temperatures on the last day of the month, establishing the total record for the sixth warmest November. This was also the fourth consecutive month that Fresno ranked in the top 10 warmest months. Fresno had a record rainfall on November 30th of 0.62 inch; the old record was 0.50 inch. As a result of the heavy rainfall, some rock and mud slides occurred as the moisture weakened the soil. Law enforcement reported a rock and mud slide on Highway 168 about 15 miles northeast of Clovis, which closed the road for several hours while authorities cleaned up the debris.
- **February 7, 2017--** Atmospheric river system brought heavy rainfall, flooding, debris flows, and high elevation snowfall to the central California region. Damages were over \$100,000 and the California Highway Patrol reported road closure due to a bridge collapse from heavy rainfall near Sugarloaf Road and Auberry Road just northeast of Meadow Lakes.

Localized Flooding

In addition to the major historical flood events described above, as previously described, the Fresno County planning area remains at risk to annual localized flooding.

Levee Failure Past Occurrence

February 18, 2017—Dry weather debilitated a levee located in the Fresno Slough, where the San Joaquin River and Kings River meet. The levee experienced several small breaks for a few days, posing a danger to nearly 80 homes in the vicinity, forcing hundreds of people to evacuate. Repairs and monitoring lead by Fresno County Public Works and Emergency Management stopped the levee breach.

June 22, 2017—A 15-foot wide breach opened along the Kings River, leading to mandatory evacuations. The Kings River began to flood 25 miles north of Fresno. The levee failure occurred after a prolonged period of warmer-than-average temperatures led to a surge in snowmelt from the nearby Sierra Nevada Mountains.

Likelihood of Future Occurrences

100-Year Flood

Occasional—The 100-year flood is the flood that has a one percent chance in any given year of being equaled or exceeded.

<100-Year Flood/Outside the 100-Year Floodplain

Highly Likely—Based on historical data, flooding events less severe than a 100-year flood and those outside of the 100-year floodplain occur frequently during periods of heavy rains.

Climate Change Considerations

Heavy precipitation events that lead to flooding occur at the short-term time scales of weather, rather than the multi-year time scales of climate that most climate models examine. However, extreme events are, by their very nature, uncommon. Quantifying trends at a given location is quite difficult, and no trends in the historical record of extreme climate events have been definitively detected in Fresno County. Globally, precipitation extremes and their hydrological impacts (e.g., the magnitude of 100-year floods) are expected to get larger because in most places, higher temperatures will result in increased atmospheric water vapor available to form precipitation. The 100-year flood of today might become a more frequent event in the future (i.e., a 50-year event), meaning that current design levels and regulatory practices might be less adequate in the future.

4.2.7 Human Health Hazards: Epidemic/Pandemic

Hazard/Problem Description

Epidemics occur when an infectious disease spreads beyond a local population, lasting longer and reaching people in a wider geographical area. When that disease reaches global proportions, it is considered a pandemic. Several factors determine whether an outbreak will explode into an epidemic or pandemic: the ease with which a microbe moves from person-to-person and the behavior of individuals and societies.

A pandemic flu occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention (CDC) has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation.

Most recently, health professionals are concerned by the possibility of an avian (or bird) flu pandemics associated with H5N1 and H7N9 viruses. Since 2003, rare human H5N1 infections have been reported in Asia, Europe and the Middle East. Infections with H7N9 virus were first reported in China in 2013, and since then China has experienced 4 epidemics. China is currently experiencing their fifth H7N9 epidemic, and as of August 2017, there have been a total of 1,557 human infections with H7N9. Human infections with either virus usually occur after extended exposure to ill birds, and infections result in severe disease and death. No human cases of avian H5N1 or H7N9 have been reported by the CDC in the United States, and the viruses have yet to be detected in U.S. poultry. There has been no sustained human-to-human transmission of avian

H5N1 or H7N9, but the concern is the viruses will evolve and become capable of human-to-human transmission.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Extent

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Since the hazard can affect 50-100% of the planning area it was given an extensive geographic extent rating.

Past Occurrences

There were three acknowledged pandemics in the twentieth century and one has occurred in the twenty-first century:

- **1918-19 Spanish flu (H1N1)**—This flu is estimated to have sickened 20-40 percent of the world's population. Over 20 million people lost their lives. Between September 1918 and April 1919, 500,000 Americans died. The flu spread rapidly; many died within a few days of infection, others from secondary complications. The attack rate and mortality was highest among adults 20-50 years old; the reasons for this are uncertain. By late September 1918, over 35,000 people throughout California had contracted influenza. According to state officials, influenza was most prevalent in the southern part of California, but the death toll was high across the state.
- **1957-58 Asian flu (H2N2)**—This virus was quickly identified due to advances in technology, and a vaccine was produced. Infection rates were highest among school children, young adults, and pregnant women. The elderly had the highest rates of death. A second wave developed in 1958. In total, there were about 70,000 deaths in the United States. Worldwide deaths were estimated between 1 and 2 million.
- **1968-69 Hong Kong flu (H3N2)**—This strain caused approximately 34,000 deaths in the United States and more than 700,000 deaths worldwide. It was first detected in Hong Kong in early 1968 and spread to the United States later that year. Those over age 65 were most likely to die. This virus returned in 1970 and 1972 and still circulates today.
- **2009 H1N1 flu**—This new H1N1 virus was first detected in the United States and has genes not previously identified in people or animals. From April 2009 – April 2010, the CDC estimates about 60.8 million cases, 274,304 hospitalizations and 12,469 deaths in the United States. About 151,700 to 575,400 people worldwide are estimated to have died from the flu,

and most deaths occurred in people under age 65. This is because younger people were less likely to have had prior exposure to a similar H1N1 virus, unlike older generations.

The 21st century has seen four major global disease outbreaks, with Severe Acute Respiratory System (SARS) in 2003, H1N1 in 2009, Middle East Respiratory Syndrome (MERS) in 2012, and Ebola in 2014-2016.

Likelihood of Future Occurrences

Occasional—According to historical data, four influenza pandemics have occurred between 1918 and 2017. This averages out to a pandemic every 25 years or a 4.04 percent chance of a pandemic outbreak in any given year. Although scientists cannot predict when the next influenza or other type of pandemic will occur or how severe it will be, wherever and whenever it starts, everyone around the world will be at risk.

Climate Change Considerations

Research into the impacts of climate change indicates that the greatest impact would be increased spread of disease vectors, especially mosquitoes and other insects. Drawing definitive conclusions about public health risk changes associated with vector-borne illnesses as a result of climate change are complicated by the need to also account for any associated changes in human behavior that would accompany the associated impacts to seasonal and daily weather conditions. For example, increased temperatures could result in more time spent indoors during extreme heat days, which could potentially reduce exposure to disease carrying vectors.

4.2.8 Human Health Hazards: West Nile Virus

Hazard/Problem Description

The impact to human health that wildlife, and more notably, insects, can have on an area can be substantial. Mosquitoes transmit the potentially deadly West Nile virus to livestock and humans alike. West Nile virus first struck the western hemisphere in Queens, New York, in 1999 and killed four people. Since then, the disease has spread across the United States. In 2003, West Nile virus activity occurred in 46 states and caused illness in over 9,800 people. According to the CDC, 2012 was the worst year for West Nile Virus nationally, with 286 fatalities in 48 states attributed to the disease.

In assessing this hazard, the HMPC also discussed Zika virus, which is recently invasive, with the first reported cases in the U.S. occurring in Florida during the summer of 2016, and 5102 Zika cases reported across all 50 states by the end of 2016.

Most humans infected by the West Nile virus have no symptoms. A small proportion develop mild symptoms that include fever, headache, body aches, skin rash, and swollen lymph glands. Less than 1 percent of those infected develop more severe illness such as meningitis or encephalitis,

symptoms of which include headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. Of the few people who develop encephalitis, fewer than 1 out of 1,000 infected die as a result. People over 50 and those with compromised immune systems are the most vulnerable to the virus. Those with Zika virus are highly unlikely to develop serious illness requiring a hospital visit, however Zika virus can cause severe brain defects in infants such as microcephaly along with other morbidity including: miscarriage, stillbirth, and other types of birth defects.

There is no specific treatment for Zika or West Nile virus infection, nor a vaccine to prevent the viruses. Treatment of severe illness includes hospitalization, use of intravenous fluids and nutrition, respiratory support, prevention of secondary infections, and good nursing care. Medical care should be sought as soon as possible for persons who have symptoms suggesting severe illness. People over 50 years of age appear to be at high risk for the severe aspects of the disease.

West Nile virus is a concern in the Fresno County planning area in part because of the agricultural nature of the County and the large areas of standing water created through farming operations. Excess standing water provides a breeding area for mosquitoes. Also contributing to the mosquito population in the County are the beaver dams and ponds, which are large pools of standing water. Zika virus is of minimal concern to the County given that there is no record of Zika virus being transmitted in or near Fresno County.

Within the Fresno County planning area, several mosquito abatement and control districts operate to prevent the spread of the virus through focused efforts on reducing the mosquito population and educating the public. Several types of preventive methods lower mosquito populations to levels that reduce chances for the spread of disease. The County also has an active surveillance program and maintains records for all identified cases of the virus.

Extent

An especially severe mosquito-borne illness outbreak could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Since the hazard can affect 50-100% of the planning area it was given an extensive geographic extent rating.

Past Occurrences

The virus first appeared in California in 2002 with the identification of one human case. In 2003, three human cases occurred in California, and the virus was detected in six southern California counties. By 2004, the virus was in all 58 counties in California; 830 human infections were identified. According to the California West Nile Virus Surveillance Information Center sponsored by the California Department of Health Services, 28 California residents died from the virus in 2004. Most of these deaths were in Southern California.

In 2014, 40 of the 58 California counties reported some West Nile virus activity and 801 human cases were reported, which included 31 deaths from 12 counties (no deaths occurred in Fresno County). In 2015, the number of human cases in California was 782, including 53 deaths from 10 counties (no deaths occurred in Fresno County). In 2016, there were 442 human cases in California, including 19 deaths (no deaths occurred in Fresno County). Table 4.14 summarizes reported West Nile virus cases in Fresno County for the years 2004 through 2017. While West Nile numbers in Fresno County (especially human infections) spiked in 2014, they have since settled back into recorded norms.

Table 4.14 Summary of West Nile Virus in California and Fresno County, 2004-2017*

Year	Humans		Birds		Mosquitoes		Horses		Sentinel Flock	
	CA	Fresno County	CA	Fresno County	CA	Fresno County	CA	Fresno County	CA	Fresno County
2004	830	15	3,232	116	1,136	14	540	21	805	25
2005	935	68	3,046	97	1,242	71	456	33	1,053	85
2006	278	11	1,446	2	832	40	58	5	640	37
2007*	380	17	1,395	114	1,007	61	28	1	510	46
2008	445	3	2569	44	2,003	53			585	24
2009	112	13	515	62	1,063	132			443	17
2010	111	23	416	22	1,305	130			281	7
2011	158	9	688	15	2,087	123			391	0
2012	479	24	1,644	25	2,849	147			540	0
2013	379	7	1,251	12	2,528	66			485	0
2014	801	43	2,442	9	3,340	138			443	0
2015	782	8	1,349	3	3,329	108			449	0
2016	442	14	1,352	6	3,528	185			343	0
2017*	87	1	264	3	2,545	136			155	0

Source: California West Nile Virus Web Site, www.westnile.ca.gov/

*As of September 1, 2017

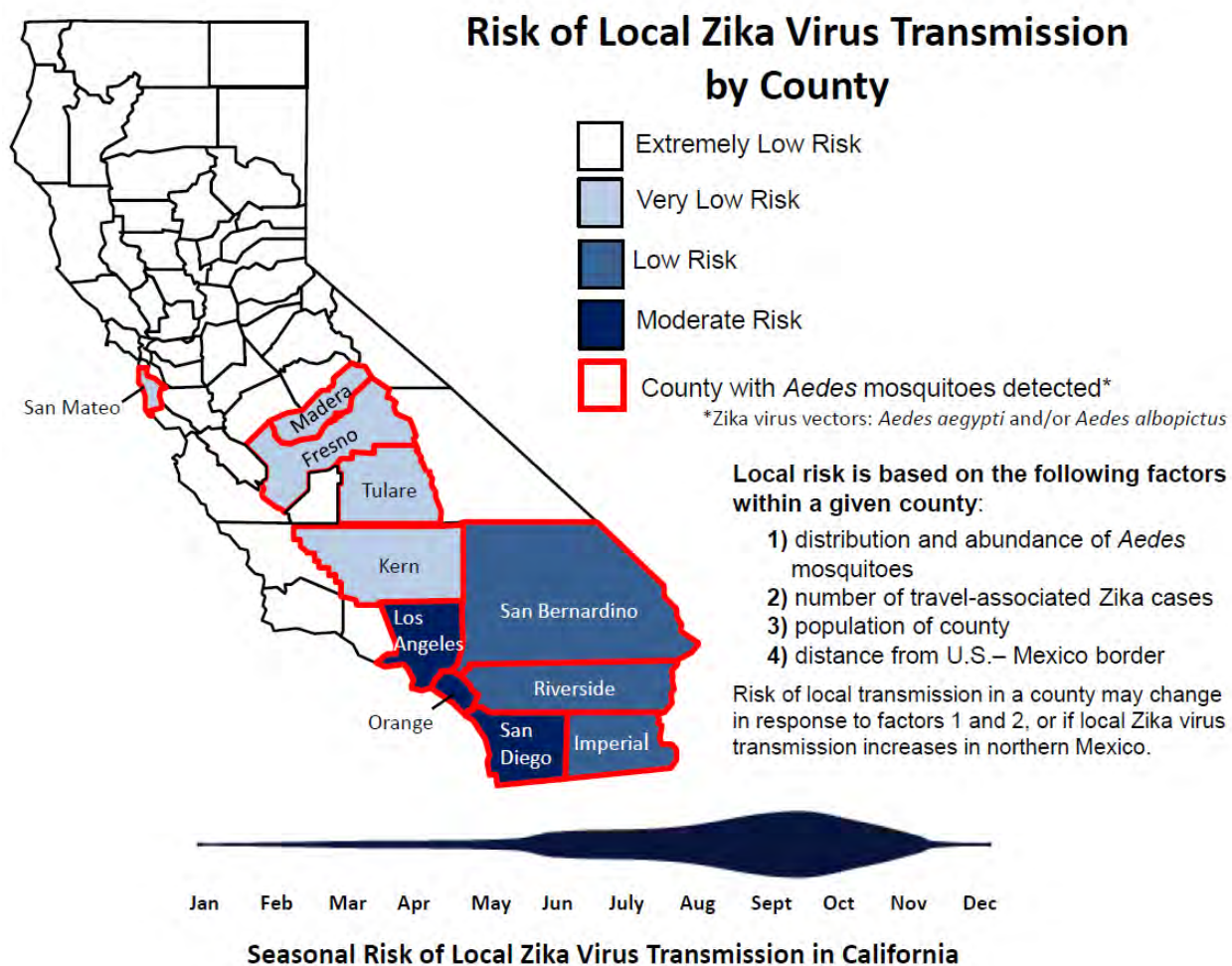
West Nile virus activity in California (and Fresno County) for 2017 is illustrated in Figure 4.21.

[illegible]

Fresno County
Multi-Jurisdictional Hazard Mitigation Plan

From 2015-2017 (as of August 25, 2017), 36 California counties reported 588 travel associated Zika virus cases and of these: 8 were due to sexual transmission, 147 were in pregnant women, and 8 infant cases had birth defects. During this time frame, Fresno County has contributed 8 travel associated cases to the California total. So far in California, Zika virus infections have only occurred in people who were infected during travel, during sexual intercourse with an infected person, or through maternal fetal-transmission. No local virus transmission by mosquitos has been reported in California. The risk of local virus transmission in California and Fresno County is illustrated in Figure 4.22.

Figure 4.22 Zika Virus Transmission Risk in California Counties, 2017



Source: California Department of Public Health, <https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Zika.aspx>

Likelihood of Future Occurrences

Highly Likely—Based on historical data, the Fresno County planning area has experienced 255 human cases of West Nile virus between its discovery in California in 2003, and the end of 2016. This is an average of 20 cases per year. The agricultural nature of much of the planning area

combined with the great potential for standing water to be present throughout the County puts the planning area at future risk of West Nile virus.

Likelihood of Zika virus transmission is very low due to a number of factors, including mosquito abundance, number of travel associated cases, population, and distance from the U.S.-Mexico border. Taking these factors into consideration, CDPH concludes that current conditions in Fresno County present a very low risk for local transmission. As a result, vulnerability to Zika virus is not considered further.

Climate Change Considerations

Milder weather in the current “cold” seasons and warmer weather in the summer could make the county a more suitable habitat for new mosquito species, increasing the potential for additional cases of some mosquito-borne diseases that are already established in the county. At the same time, increases in the precipitation associated with extreme events could increase the habitat suitable for supporting mosquitoes. Drawing definitive conclusions about public health risk changes associated with vector-borne illnesses as a result of climate change are complicated by the need to also account for any associated changes in human behavior that would accompany the associated impacts to seasonal and daily weather conditions. For example, increased temperatures could result in more time spent indoors during extreme heat days, which could potentially reduce exposure to disease carrying vectors.

4.2.9 Landslide

Hazard/Problem Description

Landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability.

The susceptibility of an area to landslides depends on many variables, including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas.

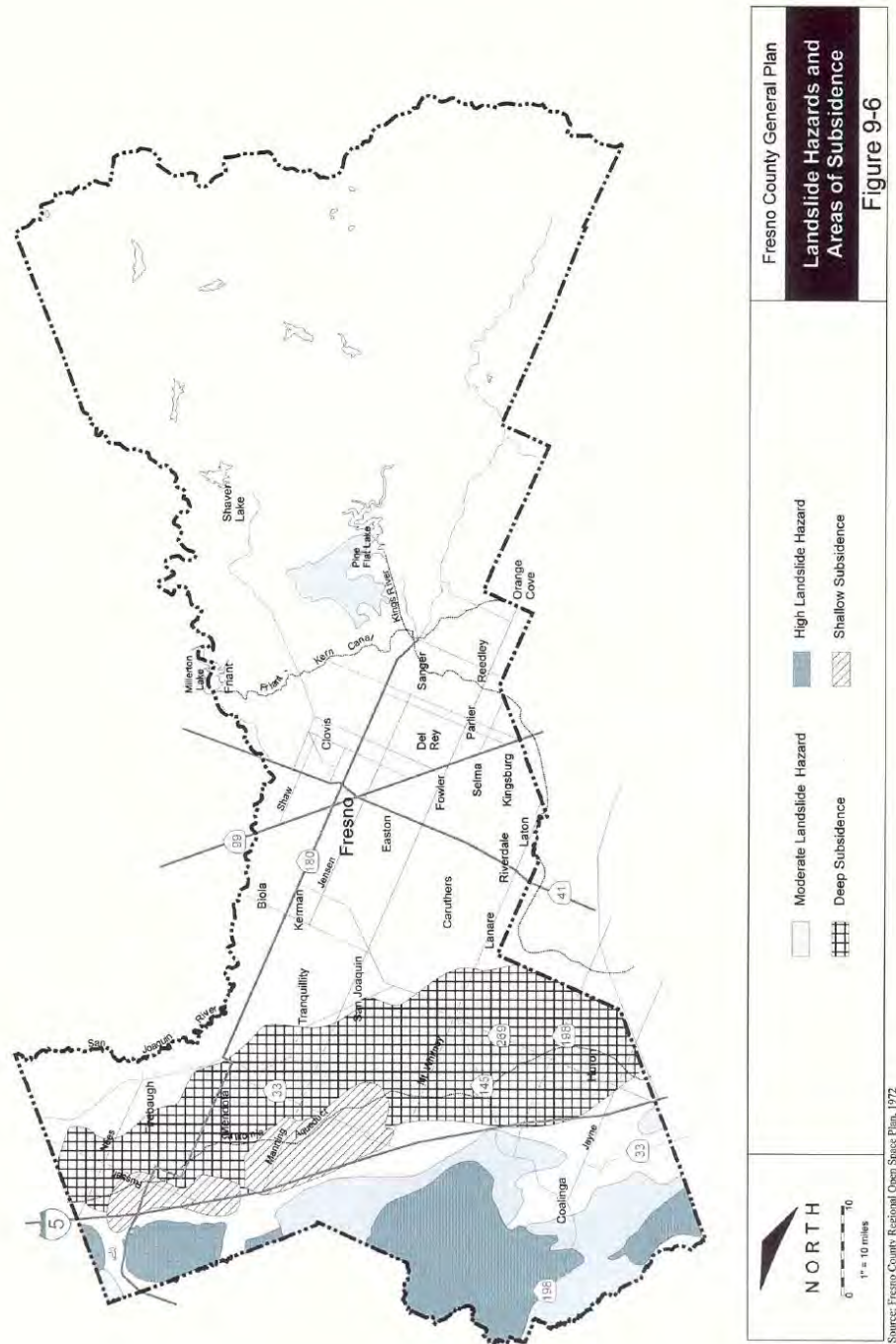
Landslides often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas and cause injuries and death.

Extent

The Fresno County General Plan Background Report describes areas in Fresno County that are particularly prone to landslides. Landslide hazard areas include foothill and mountain areas where fractured and steep slopes are present (i.e., the Sierra Nevada), areas where less consolidated or weathered soils overlie bedrock (e.g., the Coast Range), and areas where inadequate ground cover accelerates erosion (e.g., along the San Joaquin River). According to the background report, areas where steep slopes are present are not generally heavily populated and most are located in federal or state lands. The report further identified State Route 168 in eastern Fresno County and State Route 198 in western Fresno County as areas that could be affected by landslides caused by earthquakes or heavy rains. It also concludes that there is no risk of large landslides in the valley area of the County due to its relatively flat topography. However, there is the potential for small slides and slumping along the steep banks of rivers and creeks.

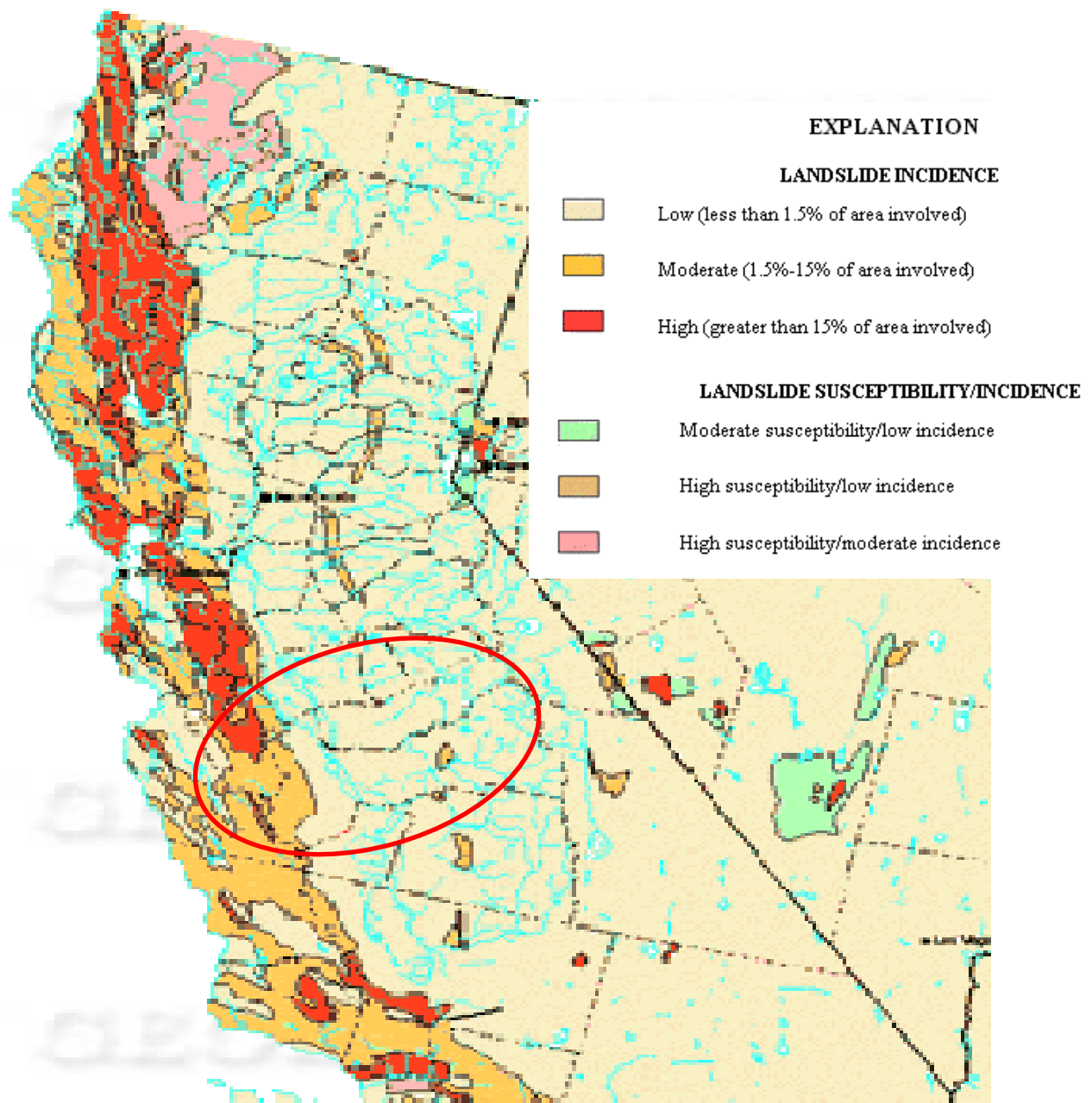
Figure 4.23 is a landslide hazard map from the background report. Figure 4.24 was developed for the State of California Multi-Hazard Mitigation Plan. It indicates that the central and eastern portions of Fresno County are at low risk for landslides and the far west side of the County along the Coast Range is at moderate risk for landslides.

Figure 4.23 Landslide Hazards and Areas of Subsidence in Fresno County



Source: Fresno County General Plan, 2000

Figure 4.24 California's Landslide Risk Zones



Source: State of California Multi-Hazard Mitigation Plan, www.hazardmitigation.oes.ca.gov/
Red oval indicates Fresno County

Past Occurrences

There have been no disaster declarations associated with landslides in Fresno County. Notable landslides of record include the following:

- **1995**—Following a large storm event, a fairly large landslide occurred on Los Gatos Road, a significant local access road west of Coalinga. State geologists determined that catastrophic failure was unlikely, but long-term road maintenance could be compromised due to undercutting of the slope by the creek below the road.

Likelihood of Future Occurrences

Occasional—Based on data provided by the HMPC, minor landslides have occurred in the past, probably over the last several hundred years, as evidenced both by past deposits exposed in erosion gullies and recent landslide events. With significant rainfall, additional failures are likely within the identified landslide hazard areas. Given the nature of localized problems identified within the County, minor landslides will likely continue to impact the area when heavy precipitation occurs, as they have in the past.

Climate Change Considerations

Climate change projections for more intense precipitation events has the potential to increase landslide incidence.

4.2.10 Soil Hazards: Erosion

Hazard/Problem Description

Erosion is the general process whereby rocks and soils are broken down, removed by weathering, or fragmented and then deposited in other places by water or air. The rate of erosion depends on many variables, including the soil or rock texture and composition, soil permeability, slope, extent of vegetative cover, and precipitation amounts and patterns. Erosion increases with increasing slope and precipitation and with decreasing vegetative cover, which includes areas where protective vegetation has been removed by fire, construction, or cultivation. Significant erosion can cause degradation and loss of agricultural land, degradation of streams and other water habitats, and rapid silting of reservoirs.

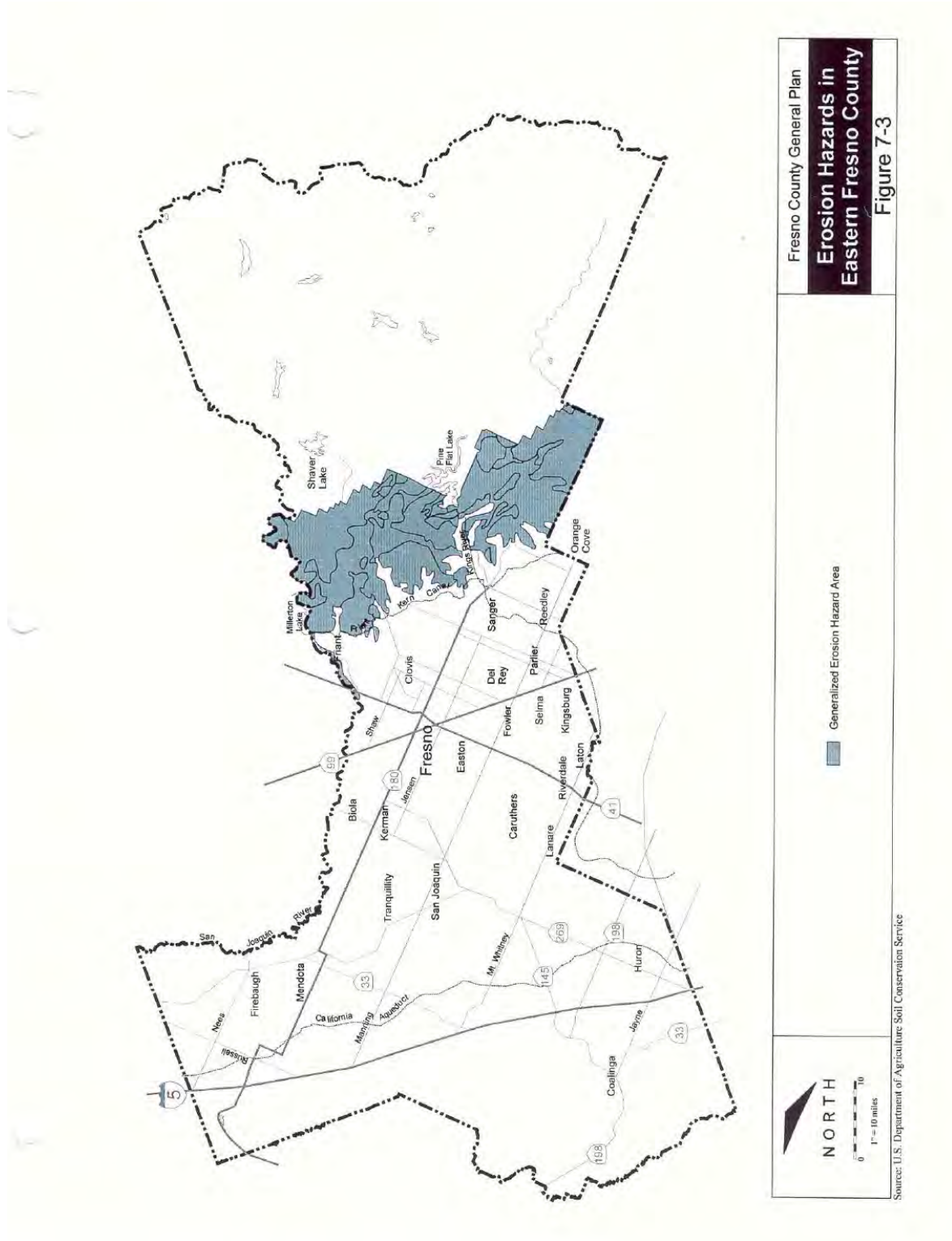
Extent

The Fresno County General Plan Background Report identifies those areas with moderately high to high erosion potential. These include areas of certain soil types in the Sierra Nevada and the foothills that generally coincide with slopes that exceed 30 percent (see Figure 4.25 and Figure 4.26). However, many of these identified areas are located within the boundaries of the Sierra National Forest, Sequoia National Forest, or Kings Canyon National Park, which limits their availability for intensive development.

Fresno County
Multi-Jurisdictional Hazard Mitigation Plan



Figure 4.26 Erosion Hazards in Eastern Fresno County

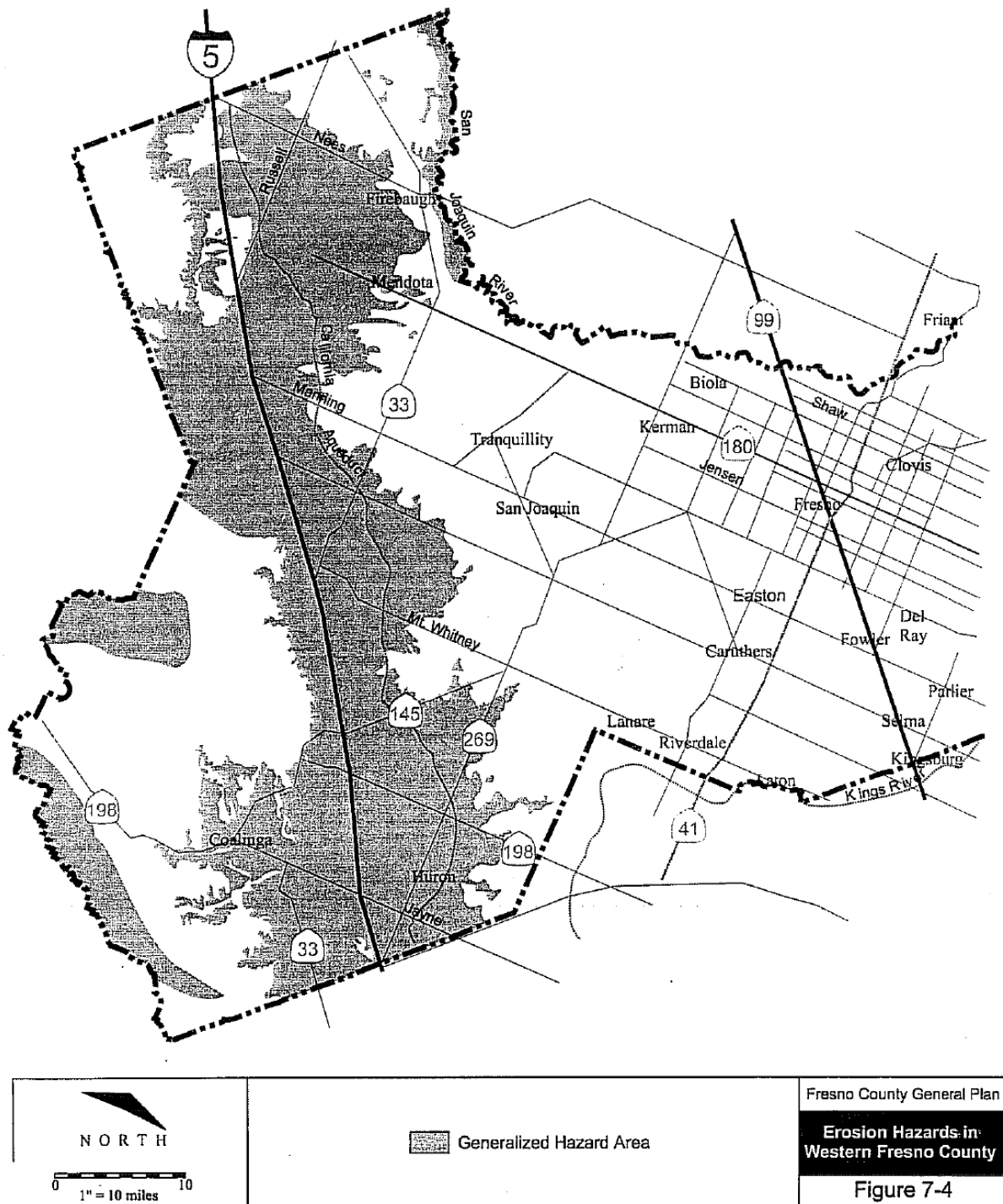


Source: Fresno County General Plan, 2000

Erosion within the valley area is generally not problematic, with the exception of areas containing Rossi soil east of the Fresno Slough from approximately Mendota to Fish Slough near Helm. Severe erosion potential has also been identified along the San Joaquin River Bluff. Also, along the main bypass floodway of the Fresno Slough, widely spaced gullies in a trellis pattern have eroded the soils where subsiding floodwaters drain back into the deeper main flood channel.

In western Fresno County, most soils associated with the Kettleman series appear to be subject to moderate to severe sheet and gully erosion potential. These include areas located primarily west of Interstate 5 in the Coast Range foothills. Also in the western portion of the County, Panoche and Panhill soils, which under natural conditions do not exhibit erosion potential, are susceptible to erosion as a result of human activity. These soils are located extensively throughout the western part of the County and are prevalent in areas on recent alluvial fans in the central part of the region (see Figure 4.27).

Figure 4.27 Erosion Hazards in Western Fresno County

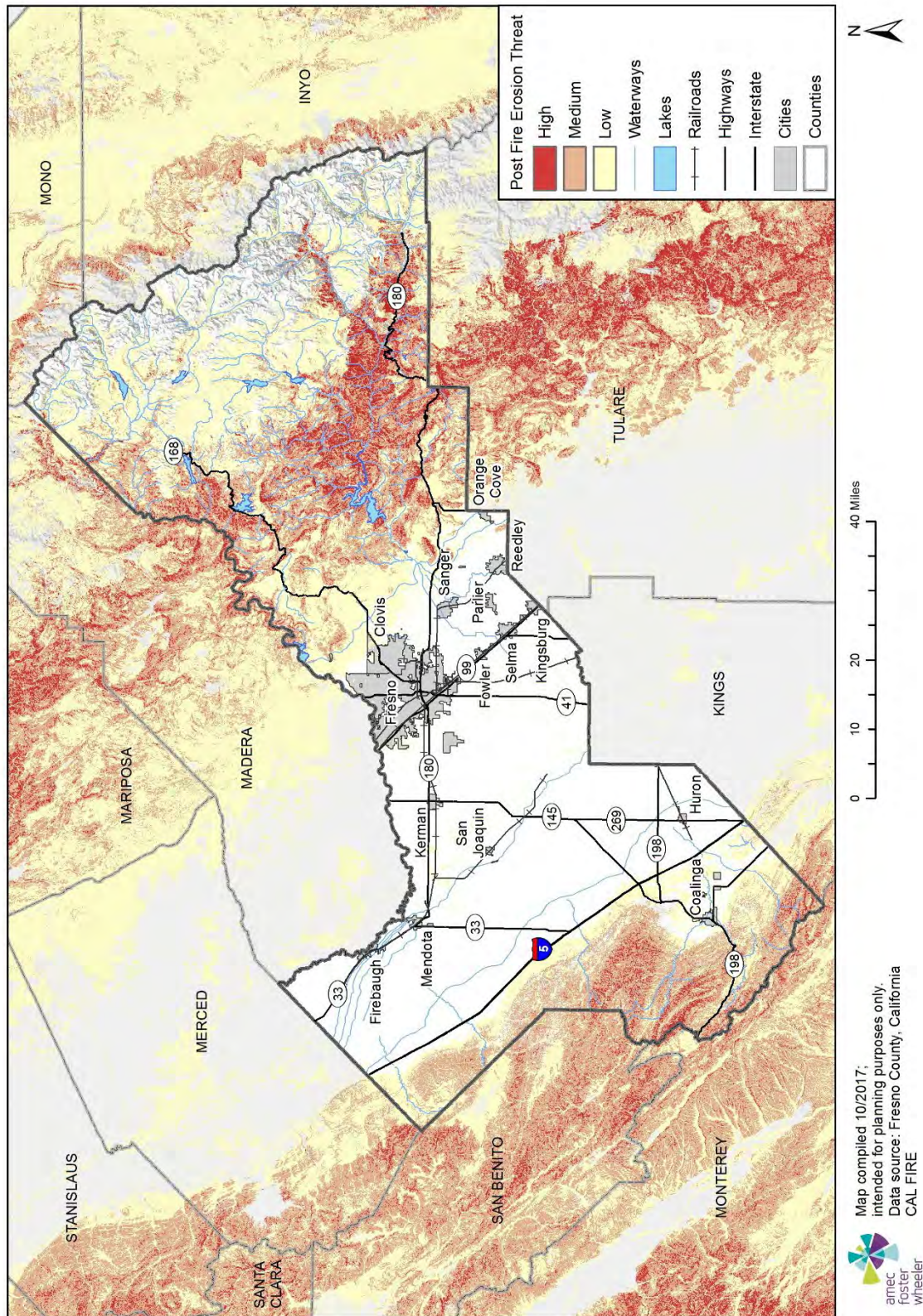


Source: U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey Western Fresno Area, California*, 1950

Source: Fresno County General Plan, 2000

One of the main concerns associated with erosion is related to wildfire; as a fire burns it destroys plant material. Plants such as shrubs, grasses, and trees provide roots that stabilize the soil. Fires destroy the soil protection, leading to increased vulnerability to erosion, in addition to increased risk of flood hazard. The amount of erosion after a burn is determined by the severity of the burn, the slope, soil type and condition of the watershed before the burn. Using information provided by Cal Fire, Figure 4.28 outlines the post fire erosion threat for Fresno County.

Figure 4.28 Fresno County Post Fire Erosion Threat



Past Occurrences

According to the HMPC and the County geologist, there have been no significant erosion events within the County.

Likelihood of Future Occurrences

Likely—Based on input from the HMPC, erosion does occur in the planning area. Given the nature of erosion problems identified within the County, erosion will continue to be an issue.

Climate Change Considerations

Global warming is expected to lead to a more vigorous hydrological cycle, including more total rainfall and more frequent high intensity rainfall events. Rainfall amounts and intensities increased on average in the United States during the 20th century, and according to climate change models they are expected to continue to increase during the 21st century. These rainfall changes, along with expected changes in temperature, solar radiation, and atmospheric CO₂ concentrations, will have significant impacts on soil erosion rates. The processes involved in the impact of climate change on soil erosion by water are complex, involving changes in rainfall amounts and intensities, number of days of precipitation, ratio of rain to snow, plant biomass production, plant residue decomposition rates, soil microbial activity, evapo-transpiration rates, and shifts in land use necessary to accommodate a new climatic regime.

4.2.11 Soil Hazards: Expansive Soils

Hazard/Problem Description

Expansive (swelling) soils or soft bedrock are those that increase in volume as they get wet and shrink as they dry. They are known as shrink-swell, bentonite, expansive, or montmorillonitic soils. Swelling soils contain high percentages of certain kinds of clay particles that are capable of absorbing large quantities of water, expanding up to 10 percent or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 20,000 pounds per square foot or greater on foundations, slabs, and other confining structures. Soils composed only of sand and gravel have no potential for volume changes. Soils are generally classified into three expansive soils classes with low, moderate, and high potential for volume changes:

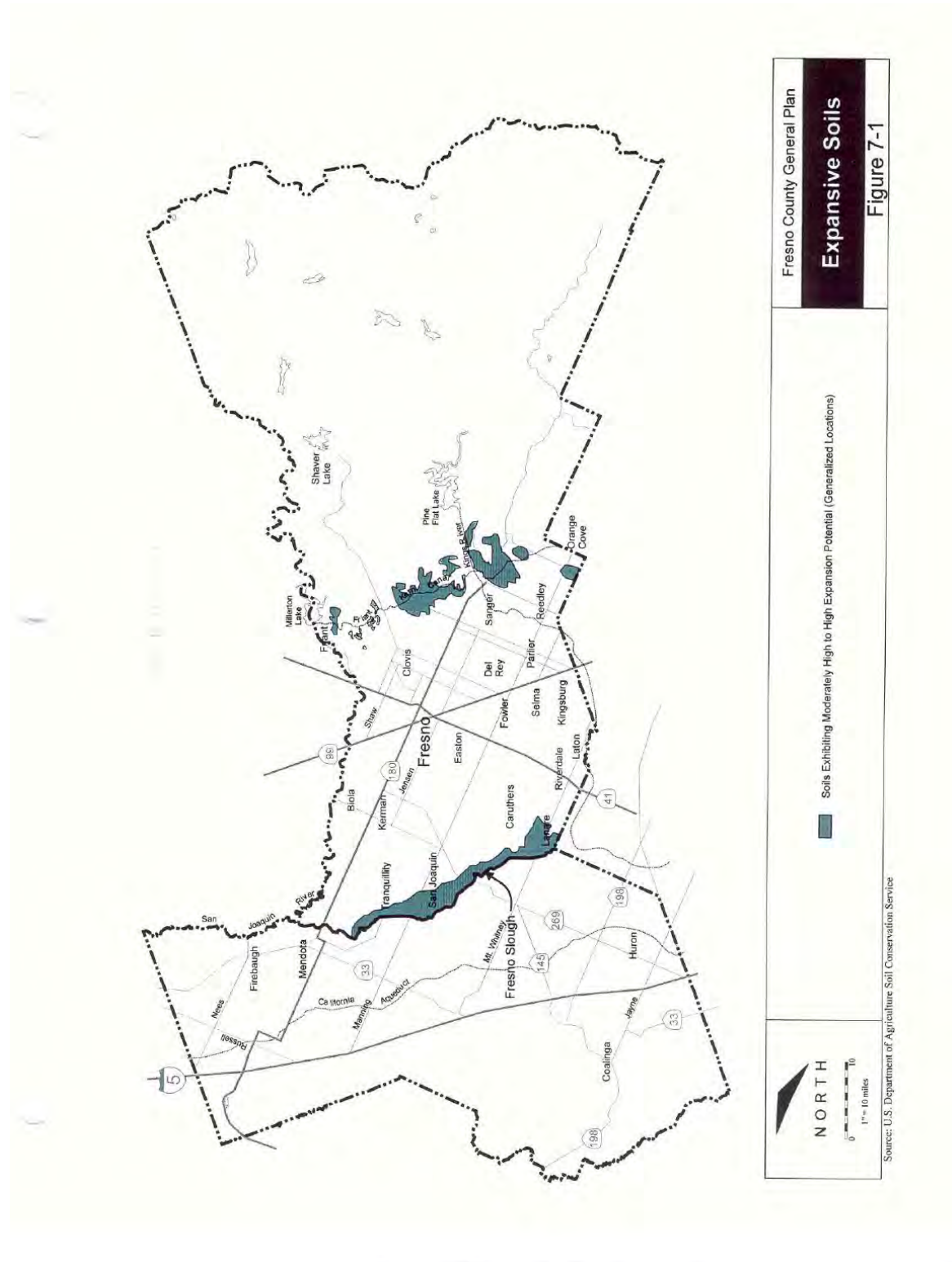
- **Low**—This soils class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential, if the clay is kaolinite. Kaolinite is a common clay mineral.
- **Moderate**—This class includes silty clay and clay textured soils, if the clay is kaolinite, and includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.
- **High**—This class includes clays and clay with mixed montmorillonite, a clay mineral which expands and contracts more than kaolinite.

Damage can include severe structural damage, cracked driveways and sidewalks, heaving of roads and highway structures, and disruption of pipelines and other utilities. Destructive forces may be upward, horizontal, or both. Building in and on swelling soils can be done successfully, although more expensively, as long as appropriate construction design and mitigation measures are followed.

Extent

According to the Fresno County General Plan Background Report, expansive soils within Fresno County generally occur in a northwest-trending belt approximately parallel to the Friant-Kern Canal foothills in Kings Canyon National Park in the Sierra Nevada, along the Fresno Slough from Madera County to Kings County, and roughly parallel to the San Luis Drain west of Tranquility and San Joaquin. Figure 4.29 from the Fresno County General Plan Background Report illustrates the areas most susceptible to expansive soils.

Figure 4.29 Expansive Soils in Fresno County



Source: Fresno County General Plan, 2000

Past Occurrences

Expansive soils are present in the County. However, due to the ability to successfully mitigate the hazard by adhering to sound design and construction practices, the HMPC was unable to find examples of historical expansive soil problems in the planning area.

Likelihood of Future Occurrences

Occasional—Based on the soil types found in Fresno County, the potential exists for expansive soils to be a future issue in the Fresno County planning area.

Climate Change Considerations

There is potential for more severe wet and dry cycles in future climate, which may have an effect on the frequency and intensity of expansive soils in Fresno County.

4.2.12 Soil Hazards: Land Subsidence

Hazard/Problem Description

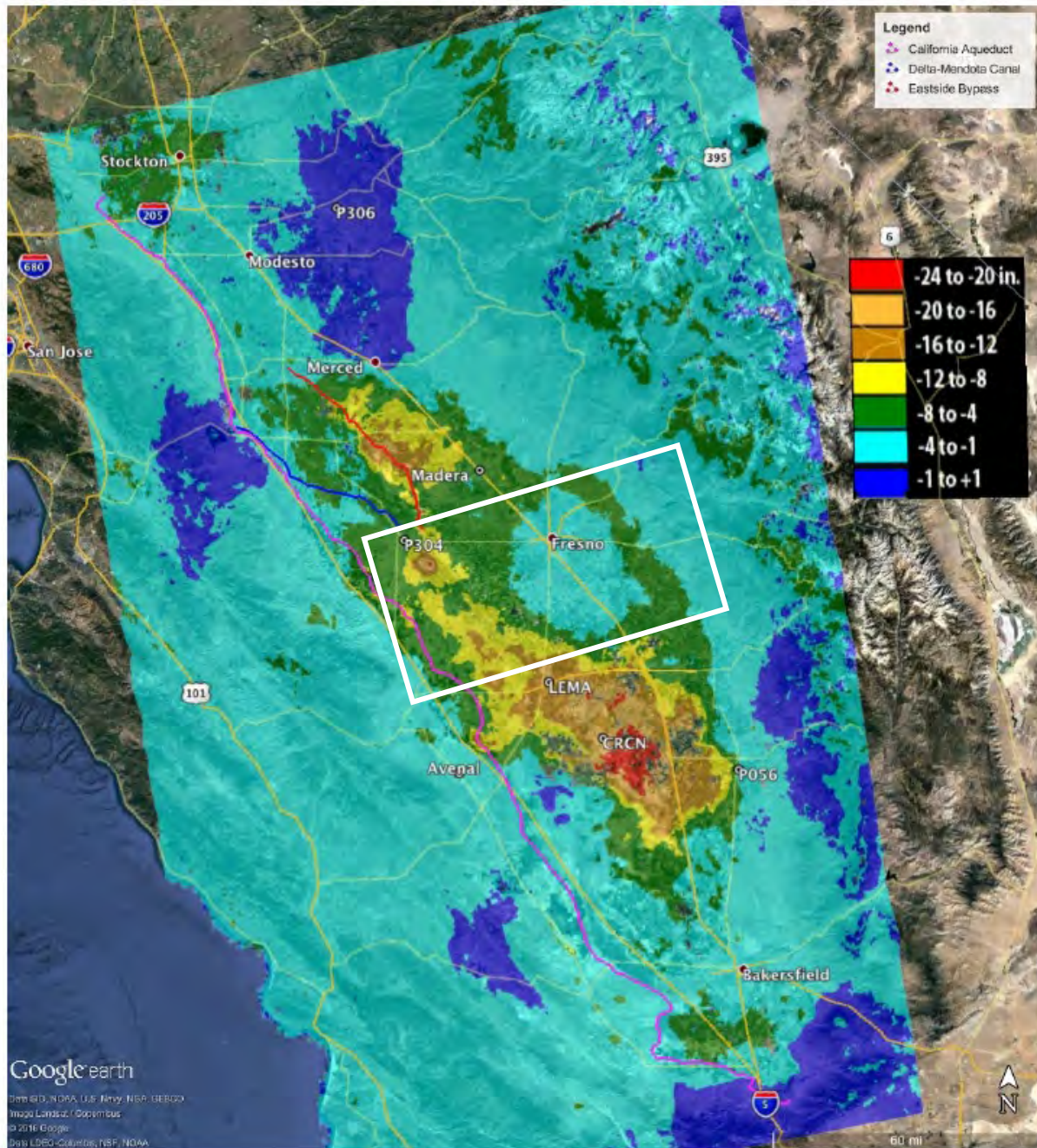
Land subsidence is defined as the vertical sinking of the land over manmade or natural underground voids. Subsidence, usually as a direct result of groundwater withdrawal or oil and gas withdrawal is common in several areas of California, including parts of the Central Valley. Weight, including surface developments such as roads, reservoirs, and buildings, and manmade vibrations from such activities as blasting and heavy truck or train traffic can accelerate the natural processes of subsidence. According to the Fresno County General Plan Background Report, some areas of the Central Valley have subsided more than 20 feet during the past 50 years.

Subsidence can result in serious structural damage to buildings, roads, irrigation ditches, canals, streams, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Improper use of land subject to subsidence can result in excessive economic losses: direct economic losses as well as indirect losses (e.g., increased taxes and decreased property values).

Extent

According to the background report, in some areas along the valley trough and in parts of western Fresno County, groundwater pumping has caused subsidence of the land surface. Historically, this has occurred in areas where the groundwater basin has been subject to overdraft and long-term recharge is inadequate to maintain the water table elevation, leaving underground voids. There are two main subsidence bowls covering hundreds of square miles that grew wider and deeper between spring 2015 and fall 2016. The geographic extent and magnitude of subsidence in the San Joaquin Valley is displayed below in Figure 4.30.

Figure 4.30 Subsidence in the San Joaquin Valley, May 7, 2015 – September 10, 2016



Source: NASA, ESA's Sentinel-1A and processed at JPL

* Approximate Fresno County planning area denoted by white square

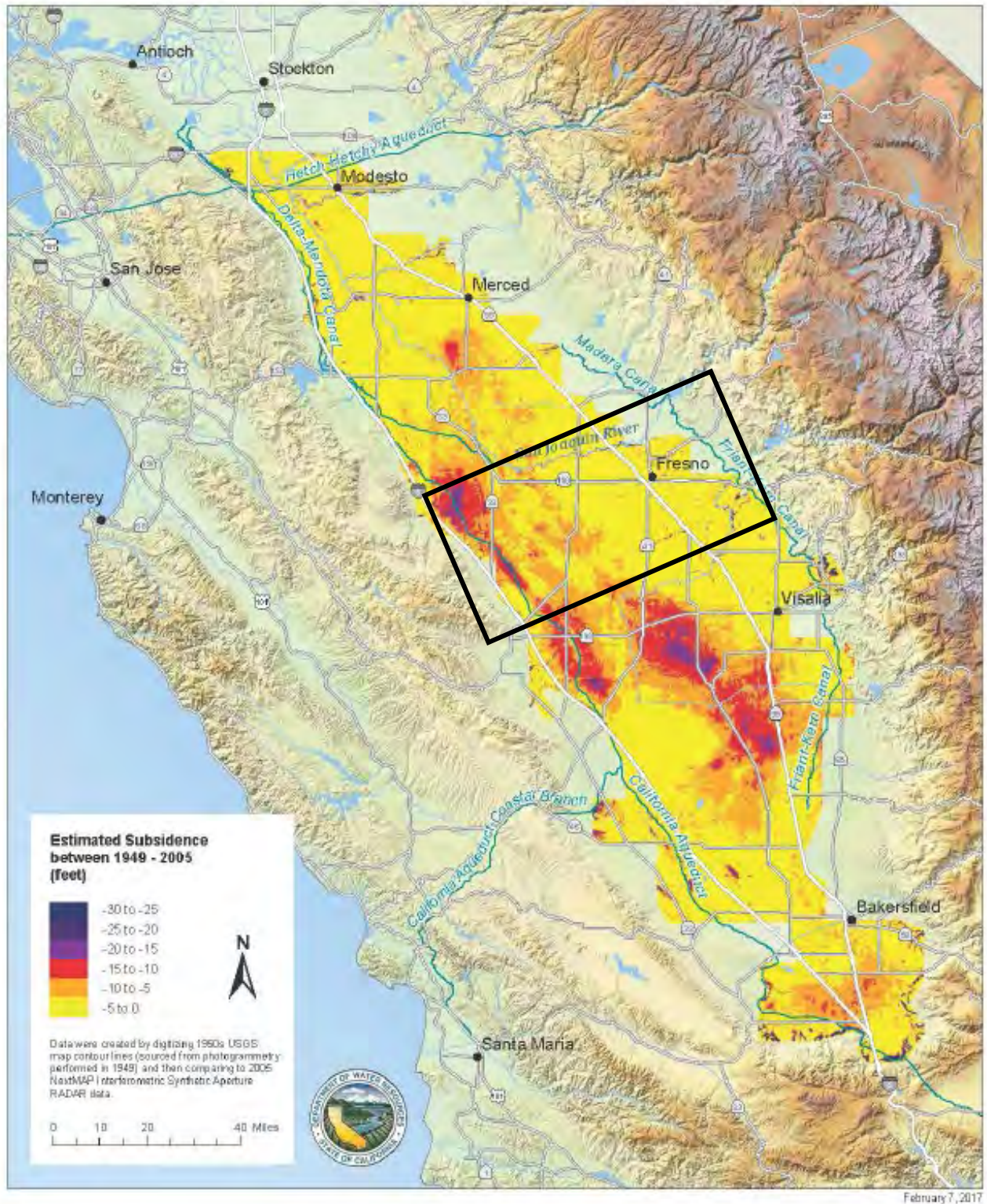
Geospatial analysis indicates that subsidence risk is concentrated in the western portion of the County. While subsidence rates fall in the -4 to -1-inch range in the east, NASA's survey technology shows subsidence reaching up to -16 inches in some pockets along the San Joaquin Valley corridor. Affected jurisdictions include Firebaugh, Mendota, Coalinga, and Huron.

Additionally, a significant area of concern is the Eastside Bypass, a system designed to carry flood flow off the San Joaquin River. Subsidence also intensified at a third area, near Tranquility, where the land surface has settled up to 20 inches in an area that extends seven miles. Specific areas where subsidence has been a problem include the Westlands Water District and the Pleasant Valley Water District. The increased subsidence rates have the potential to damage levees, bridges, and roads. Over time, subsidence can permanently reduce the underground aquifer's water storage capacity.

Past Occurrences

Subsidence caused by groundwater pumping in the Central Valley has been a problem for decades. Long-term subsidence already has destroyed thousands of public and private groundwater well casings in the San Joaquin Valley. NASA has been using radar satellite maps to document rates of subsidence in the San Joaquin Valley since 2014. The NASA analysis evaluated the Eastside Bypass system and found that the land surface had fallen between 16 inches and 20 inches since May 2015 – on top of several feet of subsidence measured between 2008 and 2012. Though recent technology and resources has brought this problem to light, the San Joaquin Valley subsidence due to groundwater extraction was observed as early as the 1920s. Extensive monitoring and research related to subsidence in the Valley was carried out in the 1950s through the 1970s because of concerns about subsidence-related damage to the state and federal water projects. Figure 4.31 below documents 50-years of estimated subsidence rates in the San Joaquin Valley. Similar to estimates in Figure 4.31, the eastern portion of the County has historically seen the most subsidence, potentially reaching up to 30-feet in the north-east.

Figure 4.31 Estimated Subsidence in the San Joaquin Valley, 1949 – 2005



Source: USGS

* Fresno County planning area denoted by black square

In 1963, DWR initiated construction of the State Water Project’s 444-mile-long California Aqueduct. Subsidence mitigation was integrated into the project design; however, subsidence has required repairs such as the raising of canal linings, bridges, and water control structures on the Aqueduct and on the Central Valley Project’s Delta-Mendota and Friant-Kern canals. In recent years, a five-mile reach of the Eastside Bypass was raised in 2000 because of subsidence, and DWR estimates that it may cost in the range of \$250 million to acquire flowage easements and levee improvements to restore the design capacity of the subsided area.

Likelihood of Future Occurrences

Occasional—Land subsidence has been a constant issue effecting Fresno County for decades. This hazard is ongoing and is certain to continue in the future. However, legislation passed in 2014 requires local governments to regulate pumping and recharge to better manage groundwater supplies. Groundwater-dependent regions are required to halt overdraft and bring basins into sustainable levels of pumping and recharge by the early 2040s. Though occurrence may be inevitable, the magnitude of subsidence rates is dependent on the mitigation actions and pumping regulations initiated by Fresno County. Excess groundwater pumping is more likely to occur during times of drought.

Climate Change Considerations

The most likely impact that climate change will have on land subsidence risk is the potential for extended and severe drought, which could likely result in more groundwater pumping and human-induced subsidence. During periods of drought, water levels may be drawn too low, which results in an irreversible compaction of aquitards. The water cannot recharge the layers, causing permanent subsidence and diminishment of groundwater storage capacity

4.2.13 Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs in the Fresno County planning area as localized thunderstorms that bring heavy rain, hail, lightning, and strong winds.

The National Oceanic and Atmospheric Administration’s National Center for Environmental Information (NCEI) has been tracking severe weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1993 to 2017 (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 6,024 severe weather events that occurred in Fresno County between January 1, 1950, and September 30, 2017. The table below summarizes these events.

Table 4.15 NCEI Hazard Event Reports for Fresno County, 1950-2017*

Type	# of Events	Property Loss (\$)	Crop Loss (\$)	Deaths	Injuries
Dense Fog*	1,135	21,350,000	0	24	72
Flash Floods	17	65,000	0	0	0
Floods	323	582,061,000	124,190,000	8	8
Funnel Clouds	36	0	0	0	0
Hail	69	1,020,000	100,500	0	4
Heavy Rain	127	2,079,000	65,690,000	0	0
High Winds**	30	2,470,000	30,000	1	0
Lightning	34	1,768,000	300,000	0	3
Severe Thunderstorms/Wind	57	3,586,500	43,035,000	2	15
Tornado**	26	5,440,050	26,000	0	3
Wildfires*	645	1,847,706,500	119,918,000	32	0
Totals	2,499	2,467,546,050	353,289,500	67	105

Source: National Center for Environmental Information Storm Events Database, www.ncdc.noaa.gov/stormevents/

*Hazards with wide extents have losses which reflect larger zones that extend beyond Fresno County

**Source is NOAA Storm Events Database GIS data

The HMPC supplemented NCEI data with data from SHELDUS (Spatial Hazard Events and Losses Database for the United States) when the plan was originally developed. SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-2005. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCEI). From 1960 to 1995, only those events that generated more than \$50,000 in damage were included in SHELDUS. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county). From 1995 to 2005, all events that were reported by the NCEI with a specific dollar amount are included in SHELDUS. SHELDUS became a fee-for service database circa 2013, thus was NCEI data was used as the primary source for the update of this plan

SHELDUS contains information on 201 severe weather events that occurred in Fresno County between 1960 and 2005. Table 4.16 summarizes these events.

Table 4.16 SHELDUS Hazard Event Reports for Fresno County, 1960-2005*

Type	# of Events	Property Loss (\$)	Crop Loss (\$)	Deaths	Injuries
Drought	1	86,207	8,620,690	.05	0
Earthquake	1	50,000	0	2	32
Flooding	13	33,296,405	189,605,958	23.38	226.14
Flooding, Severe Storm, Thunderstorm	2	66,250	13,000,000	0	0
Flooding, Wind	1	0	11,241,379	0	0
Flooding, Wind, Winter Weather	1	0	21,000,000	0	0

Type	# of Events	Property Loss (\$)	Crop Loss (\$)	Deaths	Injuries
Flooding, Winter Weather	2	96,166,667	5,000,000	0.5	0
Fog	16	1,102,500	0	6.17	98.86
Hail	17	2,437,084	86,454,282	0.78	5.17
Hail, Severe Storm/ Thunderstorm	1	50,000	0	0	0
Hail, Wind	1	5,000	0	0	0
Heat	4	1,316	7,700,000	0.18	0
Landslide	2	0	22,100,000	0	0
Lightning	8	169,404	28,676	1.06	1.33
Lightning, Wind, Winter Weather	1	20,000	0	0	0
Severe Storm, Thunderstorm	23	6,883,517	2,492,779	2.48	2.32
Severe Storm, Thunderstorm, Wind	21	1,103,636	58,892,468	0.02	20.1
Severe Storm, Thunderstorm, Winter Weather	1	5,000	0	0	0
Tornado	9	2,536,086	20,862	0.2	0
Wildfire	9	1,531,730	438	0.16	0.34
Wind	41	38,736,053	188,412	1.91	27.82
Winter Weather	26	73,000	26,311,400	0	3.86
Totals	201	184,372,355	452,767,760	32.89	328.08

Source: SHELUDUS, Hazards Research Lab, University of South Carolina, www.sheldus.org/

*Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may not be specific to Fresno County

The NCEI and SHELUDUS tables above summarize severe weather events that occurred in Fresno County. Only a few of the events actually resulted in state and federal disaster declarations. It is further interesting to note that different data sources capture different events during the same time period, and often different information specific to the same events. While the HMPC recognizes these inconsistencies, they see the value this data provides in depicting the County's "big picture" hazard environment.

As previously mentioned, all of Fresno County's state and federal disaster declarations have been a result of severe weather. For this plan, severe weather is broken down as follows:

- Extreme Temperatures (Extreme Cold/Freeze and Extreme Heat)
- Fog
- Heavy Rain/Thunderstorm/Hail/Lightning/Wind
- Winter Storm
- Tornado

Due to size of the County and changes in elevation and climate, weather conditions can vary greatly across the County. The profiles that follow provide information, where possible, from three

weather stations in different parts of the County: Huntington Lake (elevation: 7,000 feet) in east Fresno County, Fresno WSO AP (elevation: 33 feet) in central Fresno County, and Coalinga (elevation: 66 feet), in west Fresno County.

4.2.14 Severe Weather: Extreme Temperatures

Hazard/Problem Description

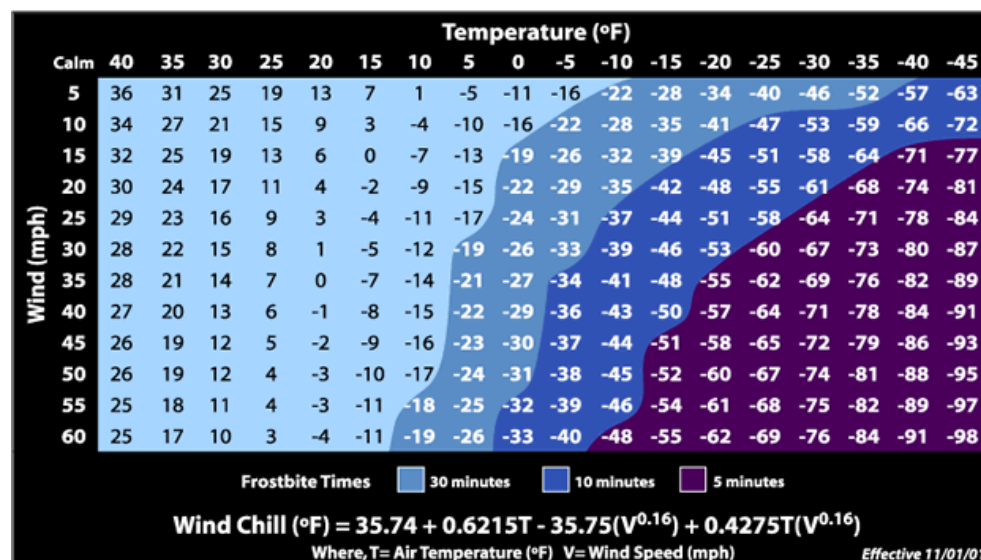
Extreme temperature events, both cold and hot, can have severe impacts on human health and mortality, natural ecosystems, and agriculture and other economic sectors.

Extreme Cold/Freeze

Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures can cause significant damage to the agricultural industry. The effects of freezing temperatures on agriculture in Fresno County are discussed further in Section 4.2.1 Agricultural Hazards.

In 2001, the National Weather Service implemented an updated Wind Chill Temperature index (see Figure 4.32). This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4.32 National Weather Service Wind Chill Chart



Source: National Weather Service Forecast Office, San Joaquin Valley/Hanford, California, www.wrh.noaa.gov/hnx/

Extreme Heat

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. According to the NWS, among natural hazards, only the cold of winter—not lightning, hurricanes, tornadoes, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died. Extreme heat can also affect the agricultural industry. Extreme heat, as it affects agriculture in Fresno County, is discussed further in the section on agricultural hazards.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise, and heat-related illness may develop. The elderly, small children, chronic invalids, those on certain medications or drugs, and people with weight and alcohol problems are particularly susceptible to heat reactions.

Extent

The NWS has in place a system to initiate alert procedures (advisories, watches, and warnings) when high temperatures are expected to have a significant impact on public safety. The expected severity of the heat determines which type of alert is issued. A common guideline for the issuance of excessive heat alerts in Fresno County is when the maximum daytime high is expected to equal or exceed 110°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days.

Fresno County begins to experience hot weather in May or June of each year, and the heat continues throughout the summer months. The Fresno County Heat Emergency Contingency Plan provides a two-phase approach to mitigate and reduce the effects of extreme heat. Phase I calls for a heat awareness campaign to be initiated at the beginning of the heat season. Phase II calls for an operational area response to a heat emergency. The County Health Officer may determine that a Heat Emergency exists based on the threat to public health and safety. This may include:

- Excessive Heat Warning or Heat Wave issued by the NWS.
- Heat-related illnesses and deaths are above average.
- Abnormal amounts of heat related deaths occur in local animal populations.
- Successive days when daytime temperature exceeds normal ranges and the nighttime heat index does not drop below 80 degrees.
- The California Independent System Operator (CALISO) issues a Stage 3 Electrical Emergency.
- High heat is accompanied by electrical blackouts or rotating power outages.

- Two or more jurisdictions within the County “declare” heat emergencies.
- The state “declares” a heat emergency.

Overall, extreme temperature impacts would likely be limited in the planning area, with 10 to 25 percent of the planning area affected. Extreme cold can occasionally cause problems with communications facilities and utility transmission lines. Danger to people is highest when they are unable to heat their homes and when water pipes freeze. Extreme cold and extreme heat can also impact livestock and even crops if the event occurs during certain times of the year.

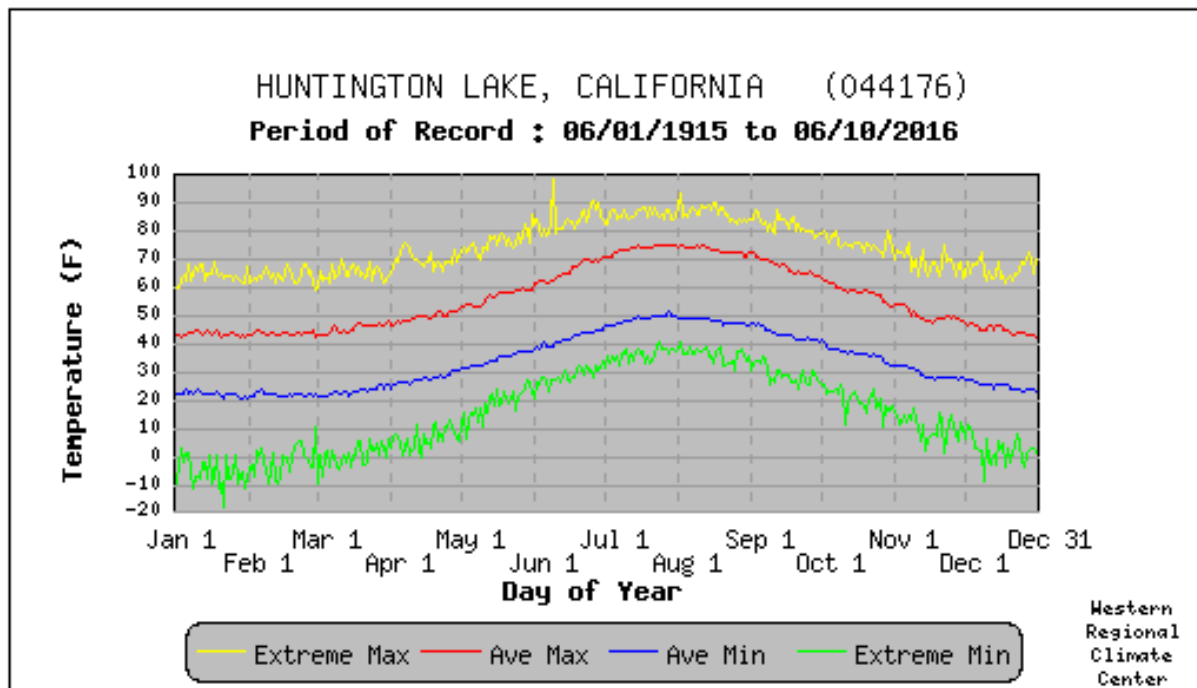
Past Occurrences

Information from the three representative weather stations introduced in Section 4.2.13 Severe Weather: General is summarized below and in Figure 4.33 through Figure 4.35

Fresno County—East (Huntington Lake Weather Station, Period of Record 1948 to 2007)

In the eastern portion of Fresno County, monthly average maximum temperatures in the warmest months (May through October) range from the mid-50s to the mid-70s. Monthly average minimum temperatures from November through April range from the low to high 20s. The highest recorded daily extreme was 88°F on September 3, 1955, August 7, 1981, and July 18, 1988. The lowest recorded daily extreme was -10°F on February 13, 1949, and January 27, 1957. In a typical year, maximum temperatures do not exceed 90°F and may be less than 32°F on 16.2 days, and minimum temperatures fall below 32°F on 169.3 days and below 0°F on .8 days.

Figure 4.33 Fresno County—East Daily Temperature Averages and Extremes

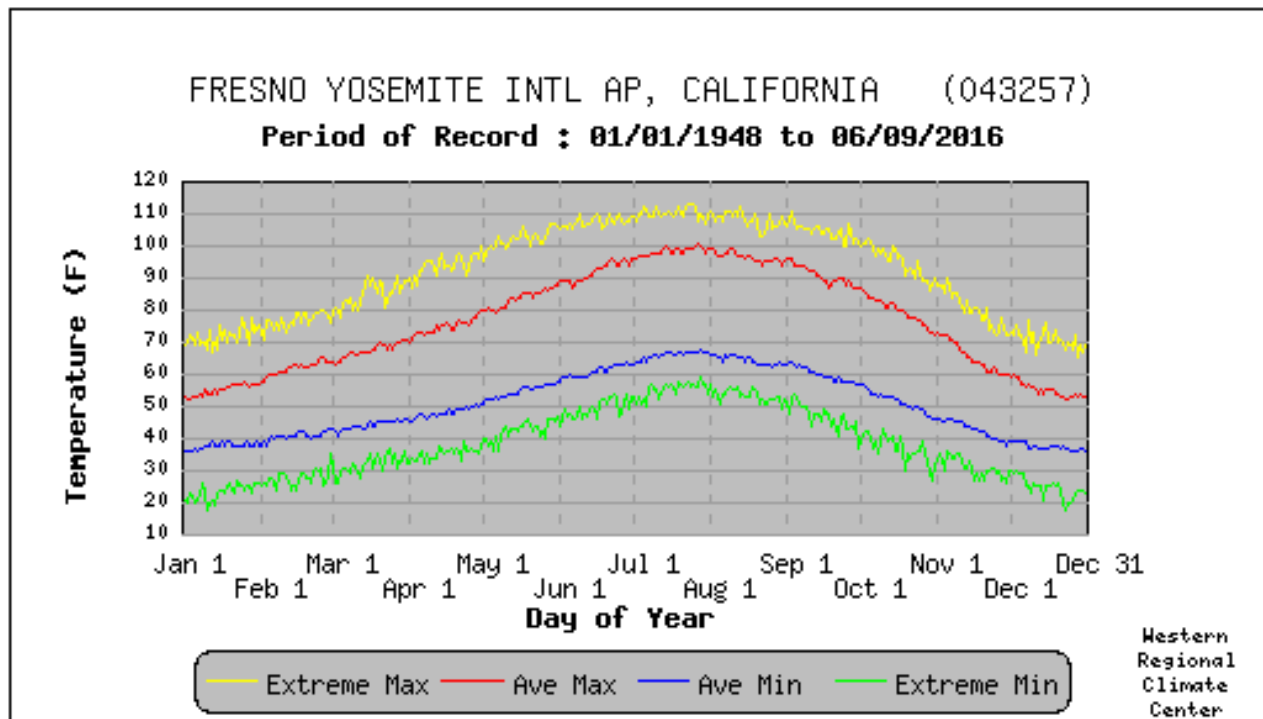


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—Central (Fresno WSO AP Weather Station, Period of Record 1948 to 2007)

In the central portion of Fresno County, monthly average maximum temperatures in the warmest months (May through October) range from the high 70s to the high 90s. Monthly average minimum temperatures from November through April range from the high 30s to the high 40s. The highest recorded daily extreme was 113°F on July 23, 2006. The lowest recorded daily extreme was 18°F on January 10, 1949, and December 23, 1990. In a typical year, maximum temperatures exceed 90°F on 106.3 days and are less than 32°F on 21.3 days, and minimum temperatures fall below 32°F on 169.4 days.

Figure 4.34 Fresno County—Central Daily Temperature Averages and Extremes

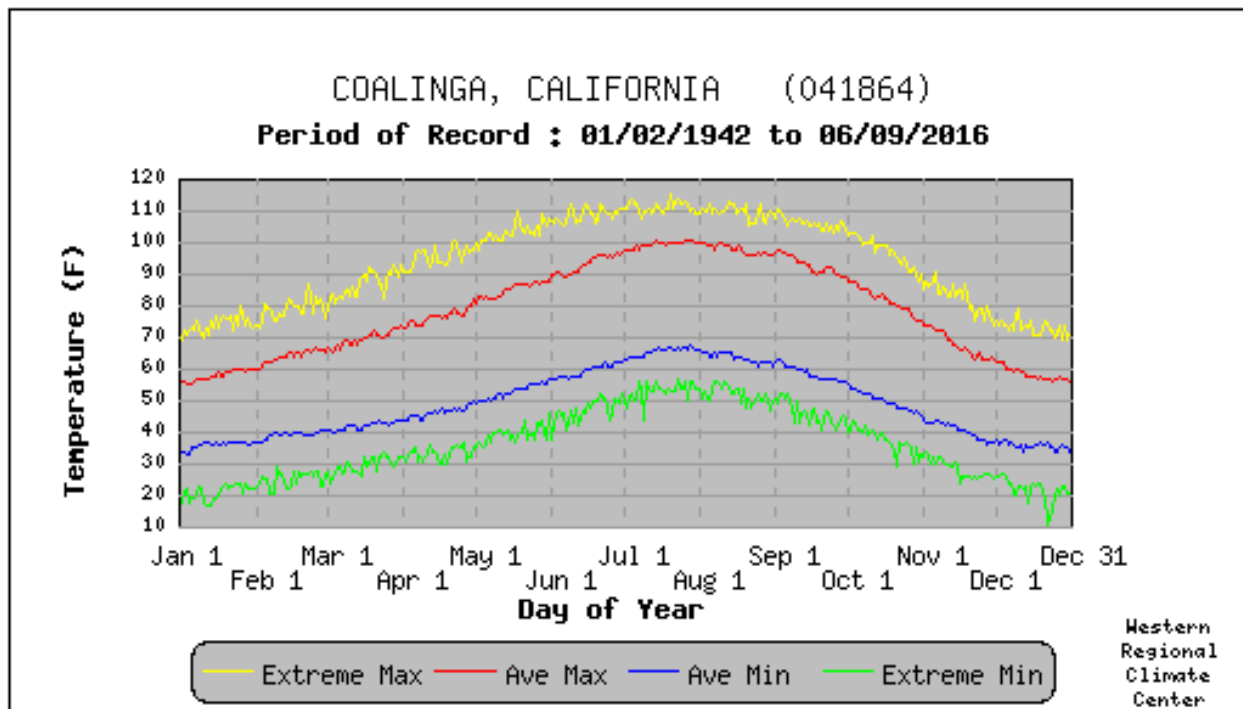


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—West (Coalinga Weather Station, Period of Record 1942 to 2007)

In the western portion of Fresno County, monthly average maximum temperatures in the warmest months (May through October) range from the low 80s to the high 90s. Monthly average minimum temperatures from November through April range from the mid-30s to the high 40s. The highest recorded daily extreme was 114°F on July 4, 1991. The lowest recorded daily extreme was 11°F on December 22, 1990. In a typical year, maximum temperatures exceed 90°F on 115.5 days and do not fall below 32°F, and minimum temperatures fall below 32°F on 32.8 days.

Figure 4.35 Fresno County—West Daily Temperature Averages and Extremes



Source: Western Regional Climate Center, www.wrcc.dri.edu/

The HMPC identified the following events related to extreme temperatures in the Fresno County planning area:

Events of Note

Extreme Cold/Freeze

- **1990**—This freeze event is on record as the most economically devastating freeze event to date due to the loss of production citrus trees, not just the loss of the fruit crop.
- **December 20-28, 1998**—Extreme low temperatures adversely affected agricultural crops in the County. Citrus crops were impacted the most, but winter vegetables were also damaged. Total crop damage was estimated at \$74 million. The loss to crops also resulted in unemployment and loss of income to small towns and industry throughout the planning area. An estimated 14,000 or more agricultural workers were out of work. Estimated economic impacts to the community were \$220 million. This freeze resulted in local, state, and federal declarations (2/9/99). The County also incurred \$223,700 in damage to government facilities and roads. Statewide, \$2.5 million was paid out in claims.
- **January 2007**—Freezing temperatures destroyed citrus crops and put a large number of people out of work. Within the agricultural citrus belts, temperatures ranged from 19-24°F during the morning. Damage to County facilities was estimated at \$15,000. Crop damage was estimated at roughly \$128 million. Residual effects from loss of sales and resulting unemployment were considered to be three times the cost of the crop damage (\$383 million). Local, state, and

federal disasters were declared. The state provided monies for mortgage and rental assistance. Federal and state donations to local food banks were increased. Unemployment insurance benefits were also increased. Central and South Valley estimated combined property damage was \$250,000, and agricultural damage was \$710 million.

Extreme Heat

- **July 16-22, 2006**—The planning area experienced six days of triple digit temperatures. The state declared a heat emergency for Fresno County. Cooling centers were opened by the state and some local jurisdictions. 24 people died between July 14 and August 1. 16,500-25,000 dairy cattle died in the Central Valley, and up to 700,000 poultry died. Milk production was down 30 percent, with dairy losses estimated to exceed \$80 million. Residual effects from loss of sales and resulting unemployment were considered to be three times the cost to the livestock industry. A local declaration was also declared to dispose of dead livestock at the County landfill. Federal/state disaster relief included \$16 million for lost milk production. Federal loans were made available to farmers.
- **July 2007**—Extreme, prolonged heat caused a mass die-off of farm animals such as dairy cattle and poultry. An estimated 50,000 turkeys, weighing up to 40 pounds each, died, which created a disposal issue. Zacky Farms was hit hardest, but other losses were incurred at various locations throughout the County. A local emergency was declared to legally dispose of these animals at the local landfill.
- **July 2008**—An extreme heat event developed on July 8 across Interior Central CA as a strong ridge of high pressure setup across the region. This weather pattern promoted progressively increasing temperatures for several days with excessive heat warning criteria met in some locations beginning the night of July 8, and continuing in most locations through July 11. Maximum temperatures on the 9th and 10th were generally between 105-112 degrees. Unusually humid conditions resulted in heat index values of 110 degrees or higher in many locations. Nighttime relief was very limited, especially in cities, where minimum heat index values failed to drop below 80 degrees. In addition, very poor air quality occurred coincident with the heat event due to wildfires across CA. The San Joaquin Valley Air Pollution Control District, in cooperation with NWS Hanford, issued several Air Quality Alerts, Health Advisories, and other air quality statements, in response to the poor air quality. NWS Hanford has a well-developed agreement to assist the Air District with air quality information dissemination.

Temperature records have been broken at several locations. The low temperature at Bakersfield on July 10th was 86 degrees. This breaks the record highest minimum temperature at Bakersfield for the date of 82 degrees, set in 2002. The low temperature at Fresno on July 10th was 82 degrees. This breaks the record for the highest minimum temperature at Fresno for the date of 80 degrees, set in 1896. The low temperature at Bakersfield on July 9th was 84 degrees. This was 7 degrees warmer than the record high minimum temperature at Bakersfield for the date of 77 degrees, set in 1975. The low temperature at Fresno on July 9th was 81 degrees.

This was 2 degrees warmer than the record high minimum temperature at Fresno for the date of 79 degrees, set in 1896.

Two fatalities occurred during this extreme heat event. Both fatalities were in Kern County near Maricopa. The victims were both farm workers working during the heat event. The first fatality occurred of a 42-year-old male vineyard worker in Kern County. He was found in his truck along a highway and vineyard. The second fatality was a man of unknown age, also working in the vineyard near Maricopa.

The combination of very hot weather of very poor air quality created a situation very dangerous for those individuals sensitive to poor conditions, such as the elderly, young, and those with chronic health problems.

Kings County Government reported extensive poultry losses on July 10, dollar estimates were unavailable. An estimated 150 tons of dead poultry came into a local rendering plant. Kings County declared a local state of emergency.

- **August 2011**—Strong high pressure developed over southeast California during late August, and led to excessive heat across Joshua Tree National Park beginning on Monday August 22nd. High temperatures across the east end of the park climbed well in excess of 100 degrees Monday, and peaked above 110 Tuesday through Saturday. The excessive heat led to the deaths of a 44-year-old Dutch man and a 38-year-old German woman on Monday afternoon. According to Lt. Tingle of the Sheriff's Indio station, the bodies were found near Black Eagle Mine road. The dead man was found on the edge of the road, about a mile and a half east of Pinto Basin Road, north of the Cottonwood Visitor's Center. The dead woman was found about one mile east of the man's body. Captain Raymond Gregory of the Sheriff's Indio station reported that the pair entered the park shortly before noon, and that they abandoned their vehicle in an area deemed impassable to passenger vehicles. Evidence indicated that they both succumbed to exposure to the elements.
- **July 2013**—A record-setting ridge of high pressure (600 dm over northern New Mexico) built in over the Great Basin and desert Southwest, beginning around June 29th, lasting through approximately July 7, when it hit another peak in temperatures. This resulted in extreme high temperatures, well above normal across the region during this period. The hottest days in July were the 1st through the 3rd, during which several record high minimums were set, as well as highs well over 100 degrees. Prolonged heat in the higher terrain was a significant impact, like in San Diego County.
- **June 2016**—Strong high pressure over the four corners region retrograded westward over southern and central California bringing a period of high temperatures over the 110-degree mark to locations in the Kern County Desert.
- **June 2017**—A strong ridge of high pressure and a dry airmass helped temperatures soar in inland areas from the 16th through the 27th. The heat was most intense in the deserts on the 20th, 24th, and 25th with Palm Springs reaching 122 degrees on all three days. Temperatures

peaked in the 100-110 degree range over the San Diego County Valleys and Inland Empire on the 20th, 24th and 25th. Flex Alerts were issued asking customers to conserve power.

Mechanical and operational issues which slowed processing at a local rendering facility, combined with seasonal high temperatures, resulted in the inability to process accumulated livestock carcasses in a timely manner. A local emergency was proclaimed to allow other methods of safe and orderly disposal of dead livestock, as determined by the Fresno County Department of Public Health and the Fresno County Agricultural Commissioner.

- **August 2017**—Upper level high pressure brought record heat to the area. A plume of subtropical moisture promoted the growth of isolated afternoon thunderstorms with large hail. A 13-year-old was hospitalized Tuesday after suffering heat stroke during tryouts for the freshman football team at Lincoln High School on August 1. Temperatures at Lincoln Airport reached 100 degrees between 4 and 7 pm PDT.
- **September 2017**—A persistent large upper ridge centered over the Great Basin provided the area with an extended period of much warmer than normal temperatures between August 26 and September 3. High temperatures ranged mainly from 106 to 112 degrees at many locations each day between August 26 and September 3 across the San Joaquin Valley, the southern Sierra foothills and the Kern County Deserts while morning lows ranged from the mid 70's to the lower 80's.

Likelihood of Future Occurrences

Highly Likely—Temperature extremes are likely to continue to occur annually in the Fresno County planning area.

Climate Change Considerations

Although heat waves will likely become more frequent, there is also the potential for continued cold outbreaks in winter, even in an overall warmer climate. This could have direct impacts on human health in terms of heat related illness. With the general trend of increased warming of average temperatures, extreme high temperatures will likely increase as well. Cascading impacts include increased stress on water quantity and quality, degraded air quality, and increased potential for more severe or catastrophic natural events such as heavy rain, droughts, and wildfire. Another cascading impact includes increased duration and intensity of wildfires with warmer temperatures.

4.2.15 Severe Weather: Fog

Hazard/Problem Description

Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. For example, rain can cool and moisten the air near the surface until fog forms. A cloud-free, humid air mass at night can lead to fog formation, where land and water surfaces that have warmed up during the summer are still evaporating water into the atmosphere. This is called

radiation fog. A warm moist air mass blowing over a cold surface also can cause fog to form, which is called advection fog.

The interior California valleys have a unique fog problem called the tule fogs. The tule fog is a radiation fog, which condenses when there is a high relative humidity, typically after a heavy rain, calm winds, and rapid cooling during the night. The longer nights during the winter months create this rapid ground cooling and results in a pronounced temperature inversion at a low altitude, creating a thick ground fog. Above the cold, foggy layer, the air is typically warm and dry. Once the fog has formed, turbulent air is necessary to break through the inversion. Daytime heating can also work to evaporate the fog in some areas. The tule fogs get their name from the tule reeds, which grew around the swamps and deltas of the great Tulare Lake that once covered the southern end of the San Joaquin Valley.

The tule fog season in Fresno County is typically in the late fall and winter (November through March) but can occur as late as May. Fog typically forms rapidly in the early morning hours. Tule fogs can last for days, sometimes weeks. Fog can have devastating effects on transportation corridors in the County. Nighttime driving in the fog is dangerous and multi-car pileups have resulted from drivers using excessive speed for the conditions and visibility.

The San Joaquin Valley is hemmed in on three sides by mountain ranges, with resulting inversion layers trapping cooler air on the valley floor. This predisposes the Fresno area to severe episodes of fog in winter months, when barometric pressures are high, humidity is increased, and ambient temperatures are low. The table below notes the average number of days with dense fog by month.

Table 4.17 Average Number of Days in Fresno with Dense Fog

Month	Number of Days
January	12
February	6
March	2
April	≤.5
May	≤.5
June	0
July	0
August	≤.5
September	≤.5
October	1
November	6
December	12
Annual	41.0

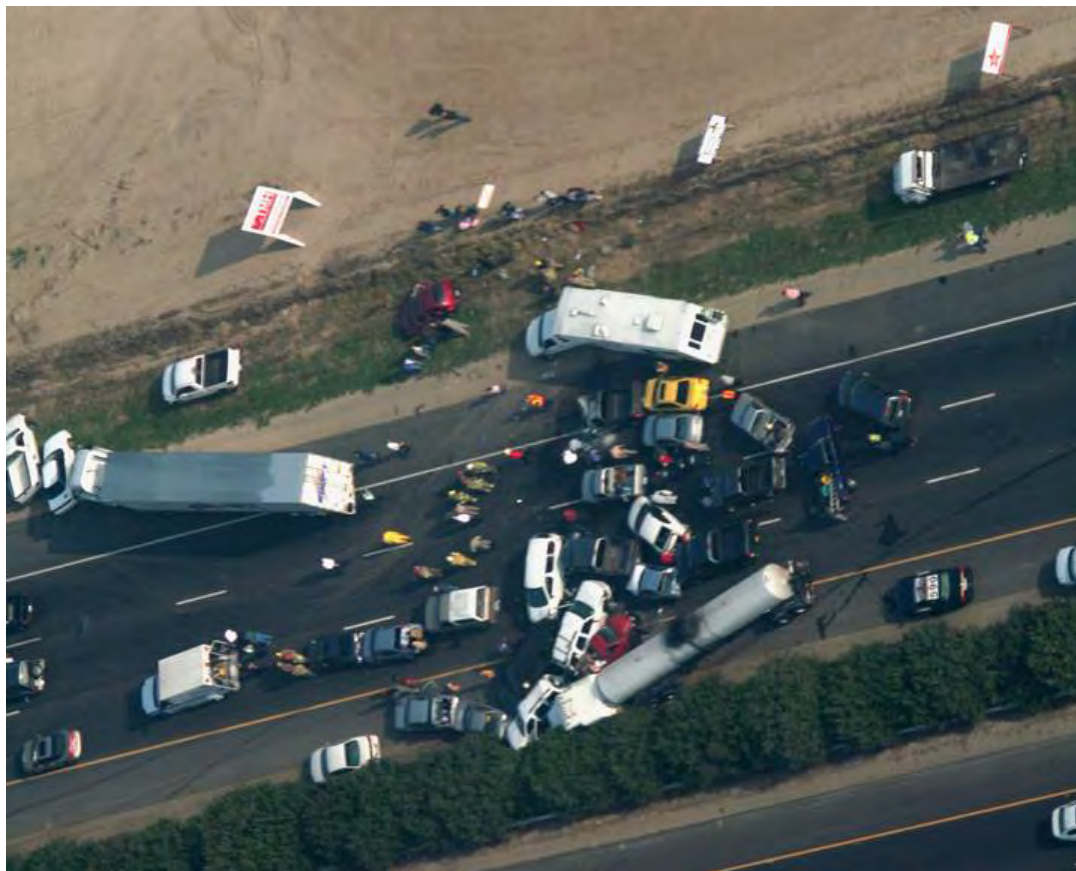
Source: Western Regional Climate Center

Fog contributes to transportation accidents and is a significant life safety hazard. These accidents can cause multiple injuries and deaths and could have serious implications for human health and the environment if a hazardous or nuclear waste shipment were involved. Other disruptions from fog include delayed emergency response vehicles and school closures.

Extent

Tule fog forms on clear nights when the ground is moist and the wind is near calm. On nights like this, the ground cools rapidly. In turn, the moist air above it cools and causes water vapor to condense. Once it has formed, the air must be heated enough to either evaporate the fog or lift it above the surface so that visibilities improve. Common areas for tule fog to form include foothills and valleys. Visibility in tule fog is usually less than an eighth of a mile (about 600 ft or 200 m), but can be much lower. Visibility can vary rapidly; in only a few feet, visibility can go from 10 feet (3.0 m) to near zero.

Figure 4.36 Traffic Accident Caused by Fog, November 2007



Source: Donovan, California Highway Patrol

Most of these notable fog-related accidents occurred on Highway 99. In addition to these events, other, less notable collisions occurred on other roads during foggy conditions. Records provided by the HMPC indicated that from January 1, 1999, through December 31, 2006, 22 collisions occurred during foggy weather on multiple roads, resulting in five injuries. The only fatal accident due to fog noted previously. It is unclear the extent that fog played in many of these accidents as there were other contributing factors, such as driver negligence.

Past Occurrences

According to the HMPC, severe fog is a recurring problem within the planning area, and most damage results from automobile accidents. Most of these incidents occurred between November and March; one was in October. Notable fog incidents reported by the HMPC include the following:

- **February 1991**—A series of accidents involving 74 vehicles occurred along a three-mile, fog-shrouded stretch of Highway 99 south of Fresno. Three people were killed and 30 were injured.
- **January 16, 1994**—Dense fog caused a 56-vehicle pileup on Highway 99 near Selma, killing two people and injuring 42 others.
- **November 1998**—Dense fog caused a chain-reaction accident involving 74 vehicles along a one-mile stretch on Highway 99 near Kingsburg. Two people were killed, 51 others injured.
- **February 2002**—Fog was a factor in a string of crashes on Highway 99 near Selma that killed two people. More than 30 others were injured in the accident, which involved 87 cars, trucks, and big rigs over a four-mile stretch.
- **November 20, 2002**—Fog was a major factor in a 50-vehicle collision on Highway 99 near Merced that resulted in 32 injuries.
- **February 7, 2006**—Fog was a factor in a 20-vehicle collision on Highway 99 near Tulare that resulted in one death and multiple injuries.
- **November 3, 2007**—Dense fog contributed to the worst traffic accident in Fresno County on Highway 99 just south of Fresno. At least two people were killed in the 108-car chain-reaction crash, which involved 18 big rigs, and 39 individuals were sent to local hospitals. Drunk driving was also cited as a contributing factor.
- **February 2008**—Two nights of dense fog resulted in a 10-15 car pileup on the morning of the 11th near Kerman west of Fresno, where there were no injuries, and newspaper accounts of only minor property damages. However, the fog was a major factor in a series of chain-reaction accidents on Highway 99 near Kingsburg during the morning of February 12th. At least four separate accidents occurred, involving at least 40 vehicles and resulting in at an estimated 10 people being injured.
- **November 2012**—Despite the lack of rainfall from the storm on November 20th-21st on the San Joaquin Valley floor, patchy dense fog developed during the morning of the 22nd. Initially the fog formed in the Los Banos area, but this patch of fog eroded from the north. Later, a larger patch of fog developed in the Reedley-Visalia area, and then spread northward and westward, lingering through much of the morning. At the same time, clouds banked up over the San Joaquin Valley. This narrow band of fog drifted over the Valley floor, causing visibilities at most airports to fluctuate from near zero to a couple of miles. Widespread dense fog continued through November 27th across most of the San Joaquin Valley. On the morning of the 27th, dense fog contributed to a chain reaction crash involving two big rigs and one vehicle. Three people were killed in this crash. The crash occurred on Highway 152 about two miles south of Chowchilla in adjacent Madera County.

- **January 2013**-January began with the central and southern San Joaquin Valley under a cold, dry airmass that moved into the region. Dense fog continued its reputation as the main winter weather hazard for the central and southern San Joaquin Valley, as a fatal collision occurred 3 miles southeast of Chowchilla in dense fog during the morning of January 4th. These conditions continued through the morning of the 5th, and then a strong upper-level low brought the first precipitation of the year that evening.
- **January 2017**-High pressure with clearing skies over the region coupled with recent heavy precipitation created ideal conditions for dense nighttime and morning radiational fog to develop. Fresno police and California Highway Patrol reported a 2-vehicle accident during dense fog causing one fatality at Jensen Avenue and Chateau Fresno Avenue in the city of Fresno in Fresno County. It also appeared alcohol was a factor.

Likelihood of Future Occurrences

Likely—Based on the NCEI and SHELDUS data, 21 major fog incidents over a 58-year period equates to a major fog event every 2.8 years and a 36.2 percent chance of a major fog event in any given year. Based on input from the HMPC, it is likely that minor fog events will continue to occur annually in the Fresno County planning area.

Climate Change Considerations

California's winter tule fog has declined dramatically over the past three decades, raising a red flag for the state's multibillion dollar agricultural industry, according to researchers at UC Berkeley. Crops such as almonds, pistachios, cherries, apricots and peaches go through a necessary winter dormant period brought on and maintained by colder temperatures. Tule fog, a thick ground fog that descends upon the state's Central Valley between late fall and early spring, helps contribute to this winter chill. "The trees need this dormant time to rest so that they can later develop buds, flowers and fruit during the growing season," said biometeorologist and study lead author Dennis Baldocchi. "An insufficient rest period impairs the ability of farmers to achieve high quality fruit yields." The findings have implications for the entire country since many of these California crops account for 95 percent of U.S. production, the authors noted. The researchers paired NASA and National Oceanic and Atmospheric Administration satellite records with data from a network of University of California weather stations, covering 32 consecutive winters. There was a great deal of variability from year to year, but on average, the researchers found a 46 percent drop in the number of fog days between the first of November and the end of February. Climate forecasts suggest that the accumulation of winter chill will continue to decrease in the Central Valley. Tule fog was also less prevalent in recent years in part due to the multi-year drought.

4.2.16 Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind

Hazard/Problem Description

Storms in the Fresno County planning area are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado.

Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is usually associated with severe storms within the Fresno County planning area. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Windstorms in Fresno County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 mph, that represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms. These winds can overturn mobile homes, tear roofs off houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire. Tornadoes (see Section 4.2.18 Tornado) and funnel clouds can also occur during these types of storms.

Downslope Winds occur when warm/dry air descends rapidly down a mountain side. These types of winds may commonly occur just west of the Sierras. These winds can blow over 40 mph, and can occur in sudden gusts that are even stronger, which can make driving hazardous. In addition, their dry conditions increase the risk of wildfires in the area.

Santa Ana Winds occur when air from a region of high pressure over the dry, desert region of the southwestern U.S. flows westward towards low pressure located off the California coast. This creates dry winds that flow east to west through the mountain passages in Southern California closer to Los Angeles and San Diego, but may occasionally influence Fresno County. These winds

are most common during the cooler months of the year, occurring from September through May. Santa Ana winds typically feel warm (or even hot) because as the cool desert air moves down the side of the mountain, it is compressed, which causes the temperature of the air to rise. These strong winds can cause major property damage. They also increase wildfire risk because of the dryness of the winds and the speed at which they can spread a flame across the landscape.

Extent

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.18 indicates the hailstone measurements utilized by the National Weather Service.

Table 4.18 Hail Measurements

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

The largest hailstones recorded in Fresno County had a diameter of 1.75 inches in 1957.

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. The LAL is reproduced in Table 4.19.

Table 4.19 Lightning Activity Level Scale *

LIGHTNING ACTIVITY LEVEL	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five-minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning.

Source: National Weather Service

Table 4.20 outlines the Beaufort scale, describing the damaging effects of wind speed.

Table 4.20 Beaufort Wind Scale

Wind Speed (mph)	Description—Visible Condition
0	Calm; smoke rises vertically
1-4	Light air; direction of wind shown by smoke but not by wind vanes
4-7	Light breeze; wind felt on face; leaves rustle; ordinary wind vane moved by wind
8-12	Gentle breeze; leaves and small twigs in constant motion; wind extends light flag
13-18	Moderate breeze; raises dust and loose paper; small branches are moved
19-24	Fresh breeze; small trees in leaf begin to sway; crested wavelets form on inland water
25-31	Strong breeze; large branches in motion; telephone wires whistle; umbrellas used with difficulty
32-38	Moderate gale whole trees in motion; inconvenience in walking against wind
39-46	Fresh gale breaks twigs off trees; generally, impedes progress
47-54	Strong gale slight structural damage occurs; chimney pots and slates removed
55-63	Whole gale trees uprooted; considerable structural damage occurs
64-72	Storm very rarely experienced; accompanied by widespread damage
73+	Hurricane devastation occurs

Source: NOAA

Fresno County is at risk to experience lightning in any of these categories.

Past Occurrences

Heavy rains and severe storms occur in the Fresno County planning area primarily during the late fall, winter, and spring, but have been documented in every month of the year. According to the Fresno County General Plan Background Report, the majority of precipitation is produced by storms during the winter months. Precipitation during the summer months is in the form of convective rain showers and is rare. Fresno County receives about 10 inches of rain per year. Snowstorms, hailstorms, and ice storms occur infrequently in the San Joaquin Valley and severe occurrences of any of these are very rare. Damaging winds often accompany winter storm systems moving through the area. Although summer winds are a frequent occurrence, with afternoon winds of 10 to 20 mph being common, it is the winds experienced during the winter storms that result in the most wind-related damage.

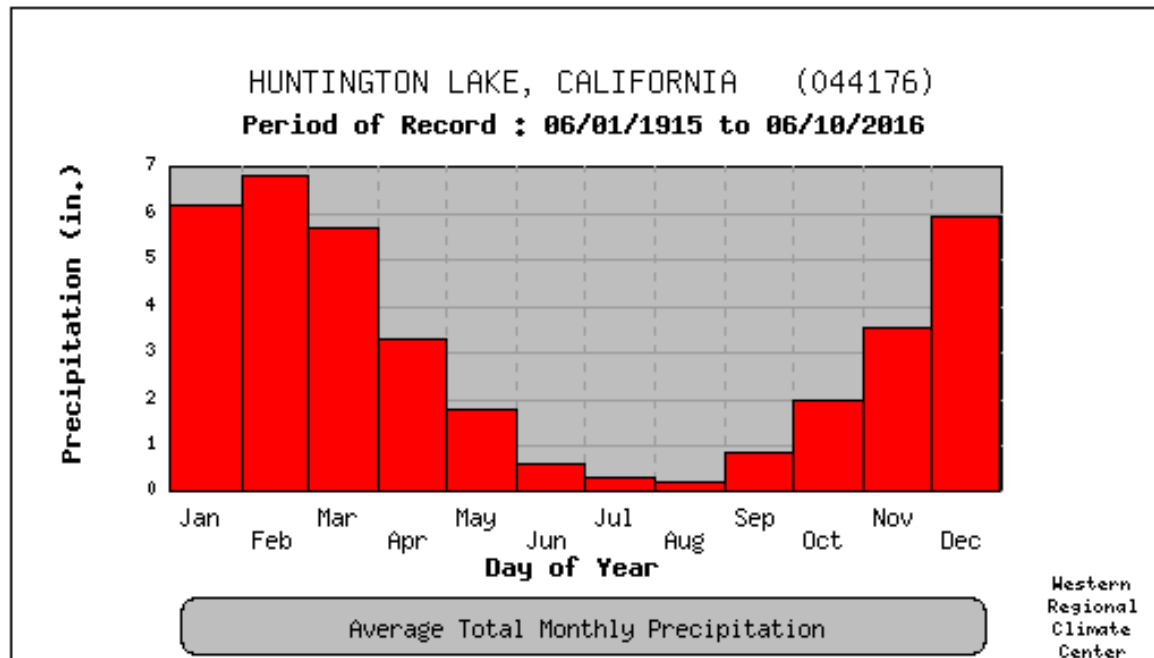
According to the HMPC, short-term, heavy storms can cause both widespread flooding as well as extensive localized drainage issues. With the increased growth of the area, the lack of adequate drainage systems has become more of an issue. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can down very mature trees.

Information from the three representative weather stations introduced in Section 4.2.13 Severe Weather: General is summarized below and in Figure 4.37 through Figure 4.42.

Fresno County—East (Huntington Lake Weather Station, Period of Record 1948 to 2017)

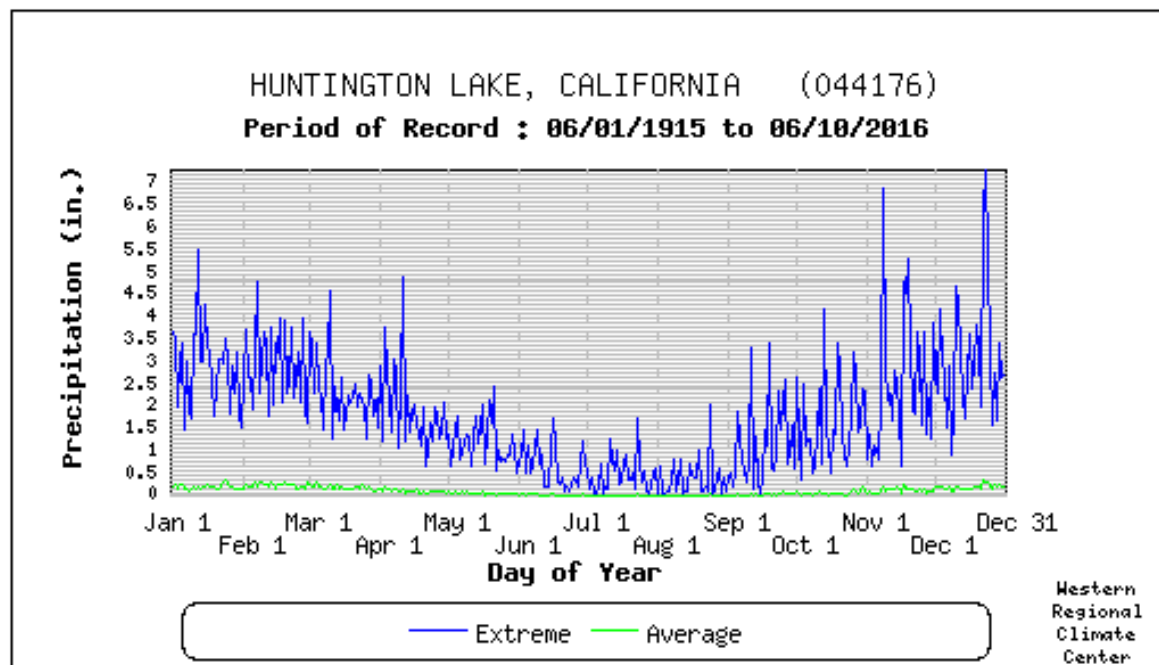
Average annual precipitation in the eastern portion of Fresno County is 41.35 inches per year. The highest recorded annual precipitation is 82.90 inches in 1982; the highest recorded precipitation for a 24-hour period is 7.28 inches on December 23, 1955. The lowest recorded annual precipitation is 19.38 inches in 1953.

Figure 4.37 Fresno County—East's Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Figure 4.38 Fresno County—East's Daily Precipitation Average and Extreme

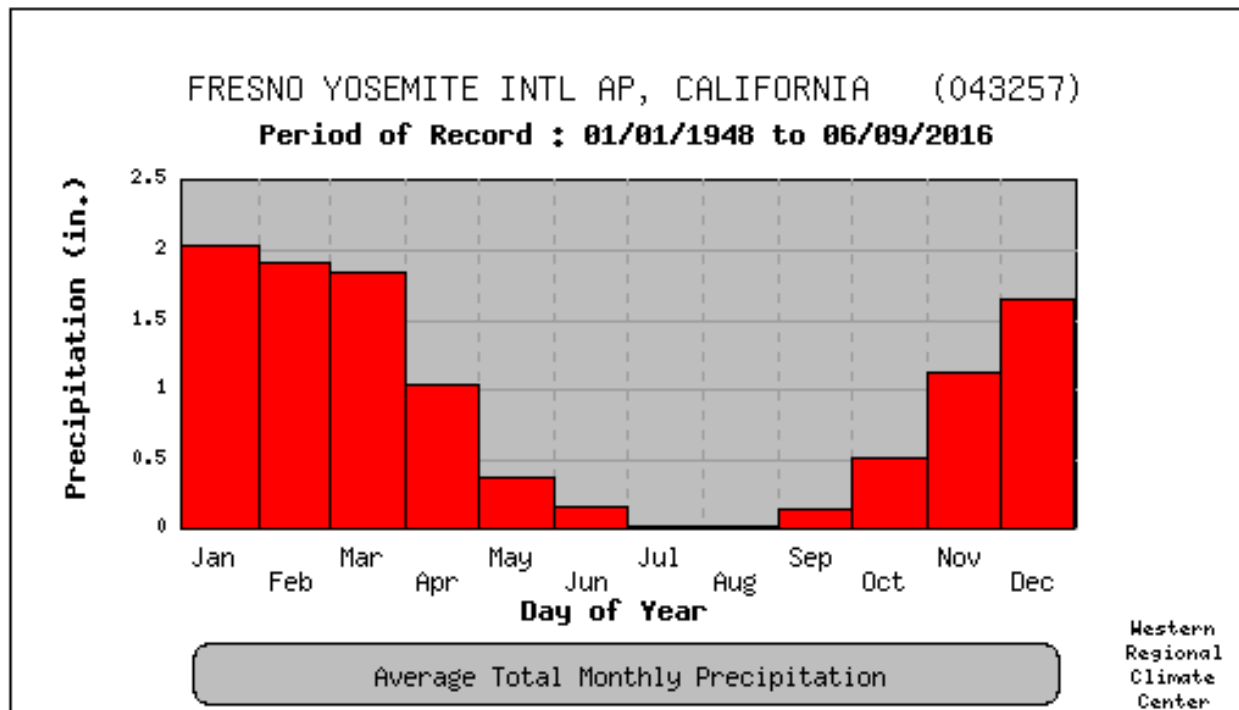


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—Central (Fresno WSO AP Weather Station, Period of Record 1948 to 2017)

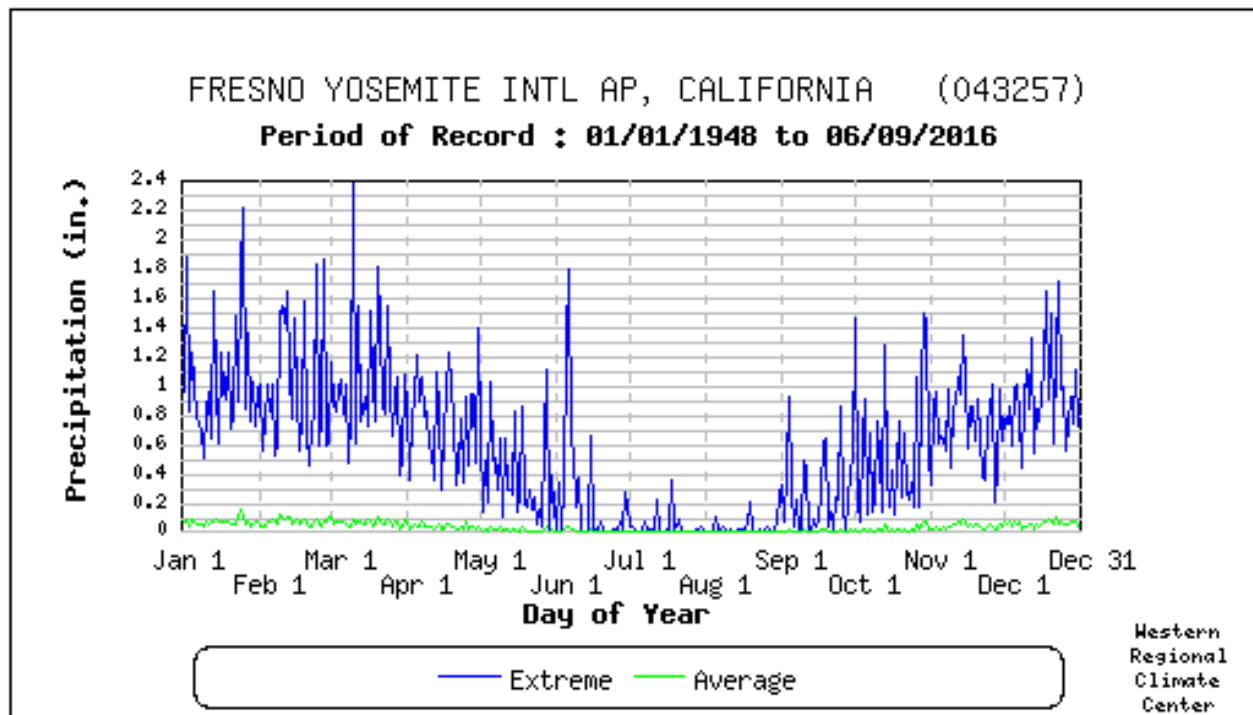
Average annual precipitation in the central portion of Fresno County is 10.90 inches per year. The highest recorded annual precipitation is 21.61 inches in 1983; the highest recorded precipitation for a 24-hour period is 2.38 inches on March 10, 1995. The lowest recorded annual precipitation is 6.07 inches in 1966.

Figure 4.39 Fresno County—Central’s Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Figure 4.40 Fresno County—Central's Daily Precipitation Average and Extreme

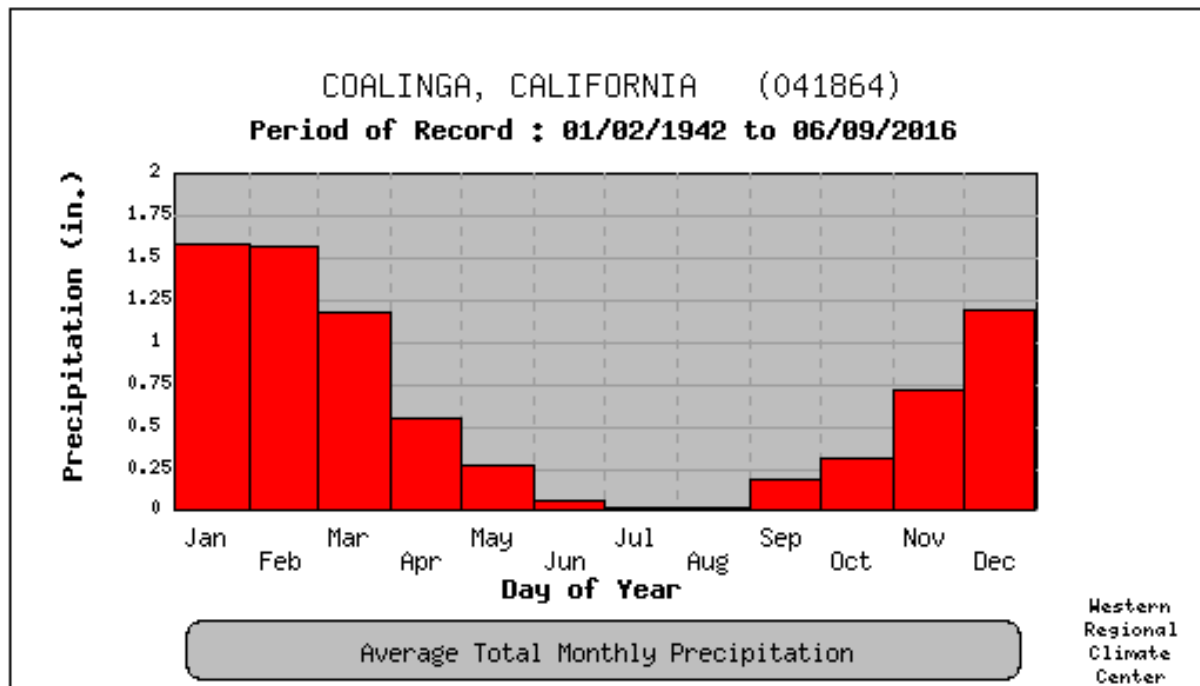


Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—West (Coalinga Weather Station, Period of Record 1942 to 2017)

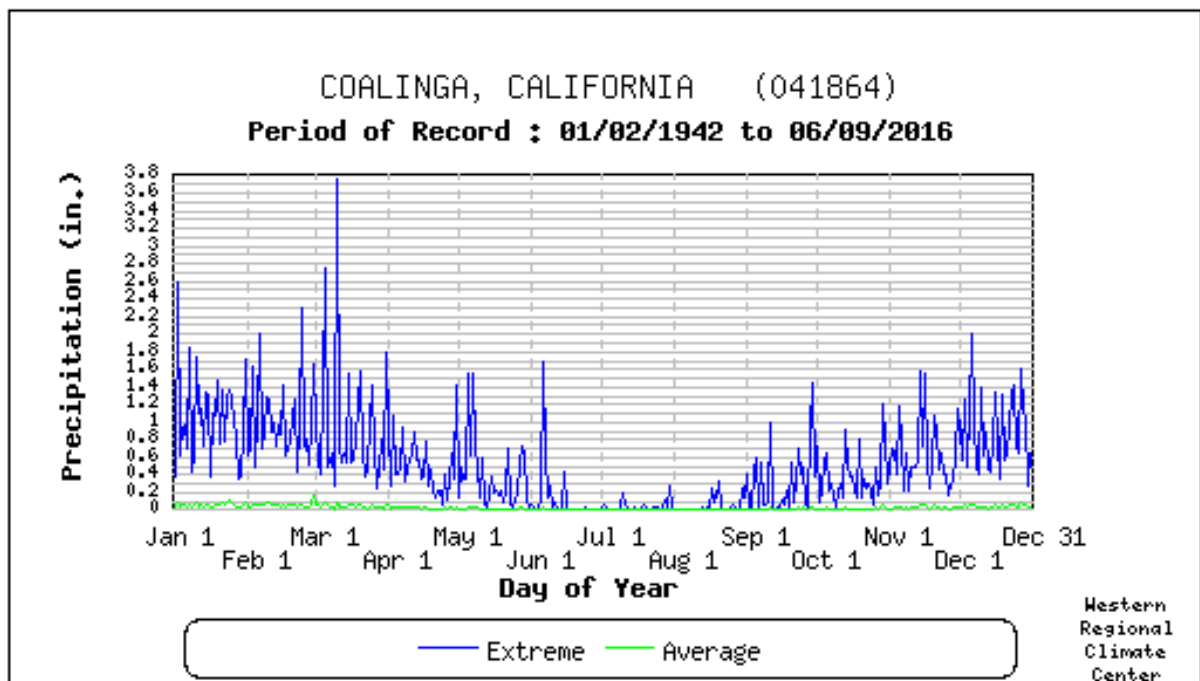
Average annual precipitation in the western portion of Fresno County is 7.69 inches per year. The highest recorded annual precipitation is 16.03 inches in 1998; the highest recorded precipitation for a 24-hour period is 3.74 inches on March 10, 1995. The lowest recorded annual precipitation is 1.98 inches in 1947.

Figure 4.41 Fresno County—West's Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Figure 4.42 Fresno County—West's Daily Precipitation Average and Extreme



Source: Western Regional Climate Center, www.wrcc.dri.edu/

High Wind Events

Also related to severe weather is the issue of dust storms caused by blowing dust during high wind events. Similar to fog conditions, blowing dust can cause extreme visibility problems resulting in traffic accidents. Given the agricultural nature of much of the planning area, recently plowed fields can create the potential for blowing dust and debris. The HMPC provided the following information on a deadly dust-related traffic accident:

- **November 29, 1991**—The day after Thanksgiving, furious winds stoked a huge dust storm on Interstate 5 in western Fresno County, reducing visibility to zero and causing multiple traffic collisions. At least 164 vehicles were involved in 33 collisions clustered along a two-mile segment of the highway. A total of 349 people were involved in the collisions; 17 were killed and 151 were injured.
- **April 14, 2009**-- Another short-lived upper-level ridge built into California on April 11th-12th, then gave way to a mostly dry system that reached California on the 13th. This cold front brought strong winds to the west side of the San Joaquin Valley on April 14th, with dust storms occurring near Coalinga and Avenal. Both dust storms produced areas of near-zero visibility. Winds gusted to 41 mph at Meadows Field Bakersfield and to 35 mph at Fresno-Yosemite International Airport. The gusts at Meadows Field were only 4 mph less than the ASOS-era record for April of 45 mph, set on April 3rd, 1999. (Because the ASOS measures winds in a different manner than older anemometers, wind records for ASOS sites only go back to the date the ASOS was commissioned).

On the 14th at 1425 PDT, the California Highway Patrol reported blowing dust at Avenal cutoff on I-5 with near-zero visibility. The CHP determined it caused a traffic collision along Interstate 5. No fatalities were reported although several people were injured. Winds continued to gust to 35 mph through the morning of April 15th, and spread across the central Valley to the cities of Merced and Atwater. The winds then abated a bit, but increased again the next day. A gust to 40 mph was measured at Fresno-Yosemite International Airport on April 16th, only 1 mph less than the ASOS-era record gust for April of 41 mph on April 14th, 2002.

The storm brought only a trace of rain to Fresno and Bakersfield. The highest reported rainfall was only 0.06 inch at Mariposa Grove in the Southern Sierra Nevada southeast of Wawona.

- **June 4, 2012**-- Wind gusted up to 40 mph on the San Joaquin Valley floor, and to around 50 mph in the Kern County mountains and deserts. The strongest gust at Fresno-Yosemite International Airport 40 mph tied the record for the strongest gust for the month of June, last set on June 10th, 2008. Blowing dust reduced visibilities to a quarter mile or less at times, and occasionally to near zero, on the Valley floor. A haboob (significant dust storm) accompanying a cold front occurred across the eastern side of the San Joaquin Valley causing near-zero visibility and reports of power outages (6000 customers without power in Fresno county) and downed trees in Fresno, Hanford, and Visalia. A 10-car pileup occurred on CA-99 near Delano (Kern County) at 1700 PDT.

The storm moved east of the central California interior on June 5th. Behind the upper-level trough, northwest winds aloft aligned with the passes and canyons of the Kern County mountain to generate strong wind gusts during the afternoon of June 5th. Winds gusted to 61 mph at the mouth of Jawbone Canyon and to 51 mph on the desert floor north of Mojave. The strongest winds occurred at Bird Springs Pass (elevation 7400 feet) about 10 miles southeast of Weldon in the Tehachapi Mountains. Here winds gusted up to 85 mph between 2 and 3 am on the 5th.

- **April 14, 2015--** An upper level trough of low pressure moved onshore on April 14th resulting in wind gusts of 45-60 MPH. An area of dust and dirt was lifted into the atmosphere, reducing visibility to near zero across Highway 180 near Fresno. The reduced visibility lead to a seven-car crash causing minor injuries and a closure of the roadway for a few hours. Blowing dust reduced visibility to nearly zero along Highway 180, near Fresno, causing two multi-car accidents.

Figure 4.43 Fresno County Wind Events Map

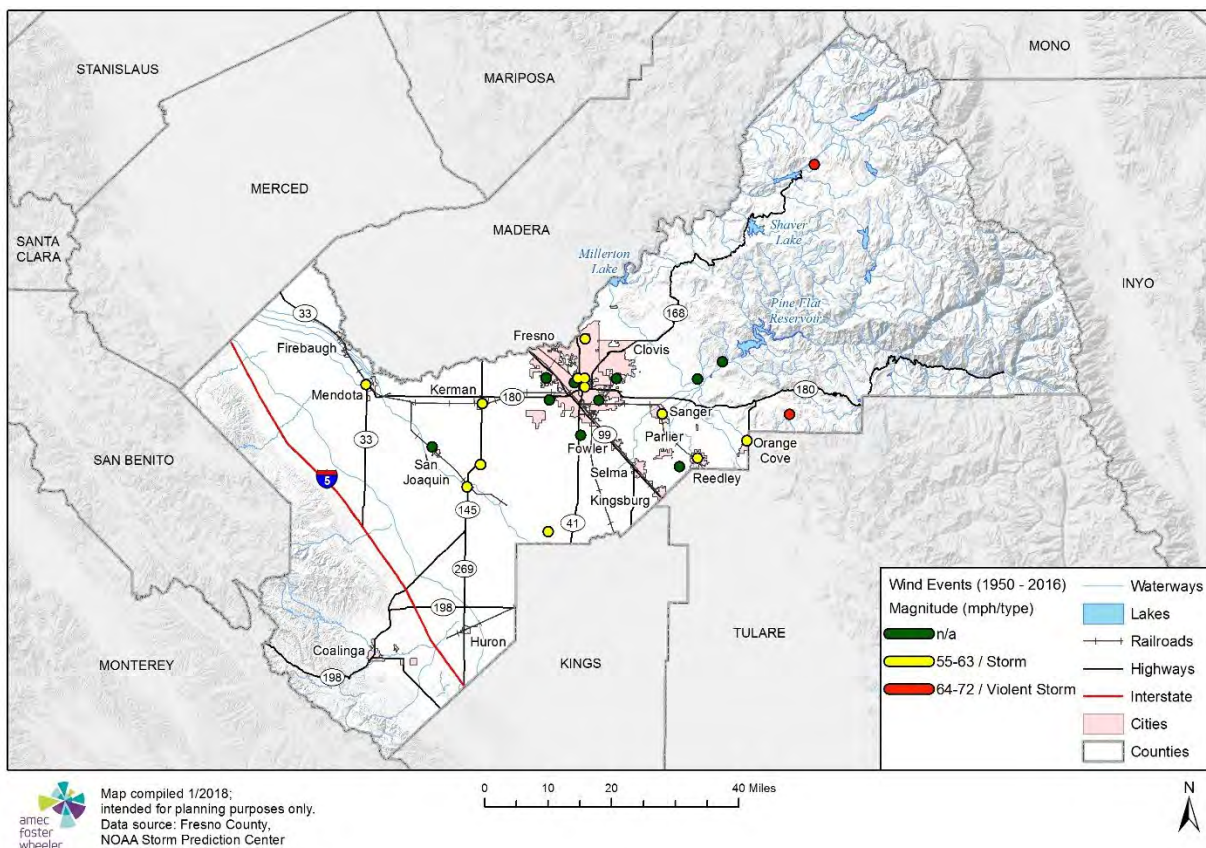


Table 4.21 Fresno County Wind Events Table

Date	Jurisdiction	Magnitude (mph)	Fatality	Injury	Property Loss	Crop Loss
1958-04-03	Fresno	0	0	0	\$0	\$0
1958-07-28	Fresno	0	0	0	\$0	\$0
1958-07-28	Unincorporated	0	0	0	\$0	\$0
1984-05-29	Fresno	0	0	0	\$0	\$0
1994-05-30	Fresno	0	1	0	\$0	\$0
1995-05-01	Unincorporated	0	0	0	\$500,000	\$0
1995-05-01	Unincorporated	0	0	0	\$500,000	\$0
1995-05-13	Unincorporated	0	0	0	\$0	\$0
1995-06-15	Unincorporated	0	0	0	\$500,000	\$0
1996-10-30	Unincorporated	0	0	0	\$10,000	\$0
1998-02-14	Fresno	57.5	0	0	\$0	\$0
1998-02-23	Fresno	0	0	0	\$100,000	\$0
2001-04-20	Fresno	57.5	0	0	\$0	\$0
2002-05-31	Unincorporated	0	0	0	\$50,000	\$0
2002-05-31	Unincorporated	0	0	0	\$50,000	\$0
2006-07-21	Unincorporated	69	0	0	\$0	\$0
2007-10-29	Fresno	57.5	0	0	\$30,000	\$0
2007-10-29	Fresno	57.5	0	0	\$50,000	\$0
2007-10-29	Fresno	57.5	0	0	\$10,000	\$0
2008-01-27	Unincorporated	64.4	0	0	\$50,000	\$0
2008-03-15	Mendota	57.5	0	0	\$10,000	\$0
2009-05-28	Fresno	57.5	0	0	\$0	\$0
2009-05-28	Reedley	57.5	0	0	\$0	\$0
2009-05-28	Sanger	57.5	0	0	\$0	\$0
2009-05-28	Unincorporated	57.5	0	0	\$60,000	\$0
2009-05-28	Unincorporated	57.5	0	0	\$0	\$0
2009-06-05	Unincorporated	59.8	0	0	\$0	\$0
2009-06-05	Unincorporated	59.8	0	0	\$0	\$0
2012-04-13	Kerman	57.5	0	0	\$50,000	\$30,000
2014-02-28	Unincorporated	64.4	0	0	\$500,000	\$0
Total			1	0	\$2,470,000	\$30,000

Likelihood of Future Occurrences

Highly Likely—Heavy rain, thunderstorms, hail, lightning, and wind are well-documented seasonal occurrences that will continue to occur annually in the Fresno County planning area.

Climate Change Considerations

Pacific Northwest National Laboratory researchers found that atmospheric rivers will reach the West Coast more frequently if greenhouse gas pollution continues to rise sharply. Currently, the West receives rain or snow from these atmospheric rivers between 25 and 40 days each year. By the end of this century, days on which the atmospheric rivers reach the coast could increase by a third this century, between 35 and 55 days a year. Meanwhile, the number of days each year on which the atmospheric rivers bring “extreme” amounts of rain and snow to the region could increase by more than a quarter.

4.2.17 Severe Weather: Winter Storm

Hazard/Problem Description

Winter snow storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of snow removal, damage repair, and business losses can have a tremendous impact on cities and towns.

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result and cause injuries and deaths.

The central and western portions of the Fresno County planning area generally do not experience snowfall on a seasonal basis; however, the higher elevations in the eastern portion of the County receive an abundance of snow, mostly between the months of November through April. Winter snow storms in this part of the County, including strong winds and blizzard conditions, can result in localized power and phone outages and closures of streets, highways, schools, business, and nonessential government operations. People can also become isolated from essential services in their homes and vehicles. Snow removal costs can impact budgets significantly. Heavy snowfall during winter can also lead to flooding or landslides during the spring if the area snowpack melts too quickly.

Extent

The extent of winter storms and cold that cause issues in Fresno County includes storms forecasted to be Winter Storm Warnings, Wind Chill Warnings or Blizzard Warnings. These storms would be confined to the Sierra Mountains within Fresno County. Heavy snows, or a combination of snow, freezing rain or extreme wind chill due to strong wind, may bring widespread or lengthy road closures and hazardous travel conditions, plus threaten temporary loss of community services such as power and water. Deep snow and additional strong wind chill or frostbite may be a threat to even the appropriately dressed individual or to even the strongest person exposed to the frigid weather for only a short period.

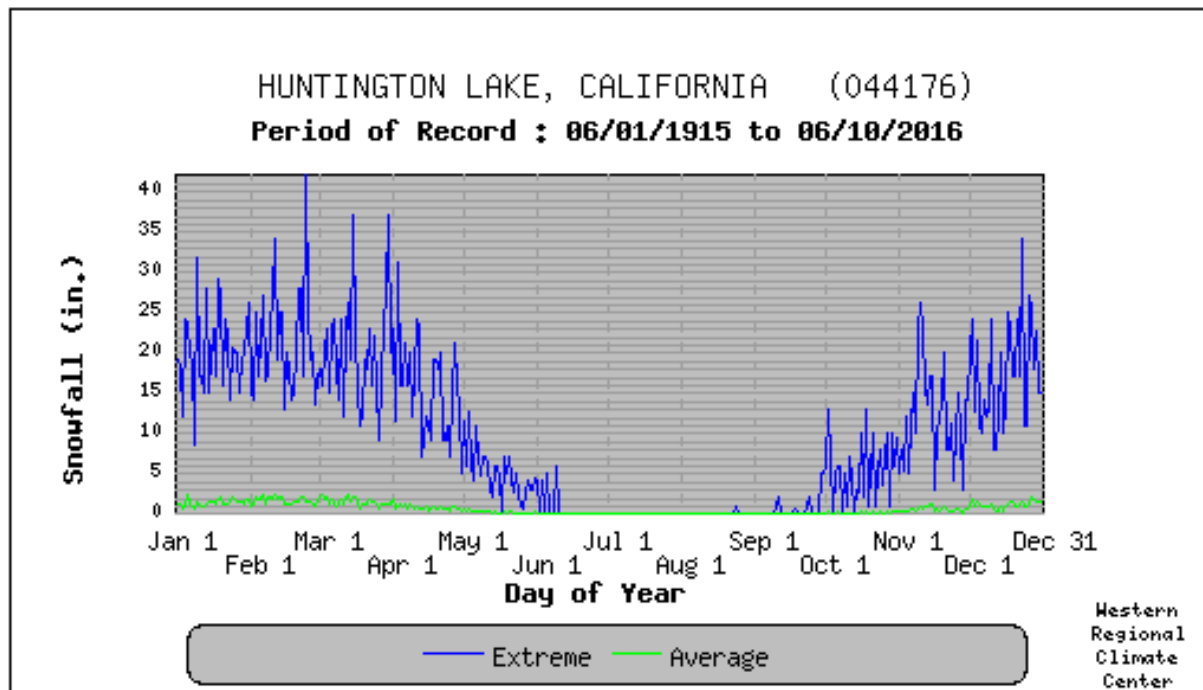
Past Occurrences

Information from the three representative weather stations introduced in Section 4.2.13 Severe Weather: General is summarized below.

Fresno County—East (Huntington Lake Weather Station, Period of Record 1948 to 2007)

Average annual total snowfall for the eastern portion of Fresno County is 183.2 inches. The snowiest months include December, January, February, and March, with 29.4, 35.2, 36.9, and 38.6 average inches of snow, respectively. April follows close behind with an average snowfall of 23.2 inches. The highest annual snowfall on record was 488 inches in 1968-69. The highest recorded monthly snowfall for the period of record was 191 inches in February 1969. The average snow depth ranges from 3 inches in November and May to 40 inches in February. Figure 4.44 illustrates the Daily Snowfall Average and Extreme for the Huntington Lake Weather Station in eastern Fresno County.

Figure 4.44 Fresno County—East's Daily Snowfall Average and Extreme



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Fresno County—Central (Fresno WSO AP Weather Station, Period of Record 1948 to 2007)

Snow in central Fresno County is quite rare. During the period of record, snow fell only four times: 0.10 inches in January 1957, 2.2 inches in January 1962, 1.2 inches in December 1968, and 0.5 inches in December 1998.

Fresno County—West (Coalinga Weather Station, Period of Record 1942 to 2007)

Snow in western Fresno County is even rarer than in central Fresno County. During the period of record, snow fell only once: five inches were recorded in January of 1957.

The Fresno County Office of Emergency Services is not aware of any incidents where snow caused enough damage to declare a countywide emergency. According to the HMPC, the following winter snow event impacted the eastern portion of the Fresno County planning area:

- **January 2005**—Heavy wet snow fell in eastern Fresno County above 4,000 feet resulting in a regionwide closure of roads and loss of power for up to three weeks in three communities. Eight injuries were reported due to vehicle accidents from poor road conditions. Property damage was estimated at \$3.5 million from trees falling on homes, cabins, and out buildings. Infrastructure damage was estimated at \$2.5 million to the power distribution grid and \$250,000 to the road system. An estimated 10-15,000 merchantable trees were damaged or

destroyed. Most roads in the area were closed for three weeks; schools were closed for two weeks.

- **March 2011-** The last major storm of the month arrived on March 24th. This storm brought gusts to 45 mph to the west side of the San Joaquin Valley, and gusts to 65 mph in the Kern County mountains and deserts. Convective activity was limited to near Merced, with several reports of road flooding due to the already saturated ground. Thunderstorms and showers moved east into the foothills of Madera and Mariposa Counties, where the heavy rains triggered rock and mud slides. Mainly light showers occurred southward. The trough moved east of the region on the 25th, with residual light showers in its wake. Additional light snow fell in the Southern Sierra Nevada measuring around 5 inches or less. Local media reported that the roof of a vacant store at Shaver Lake collapsed on March 26th due to 6 feet of snow accumulation on the roof.
- **April 2012-** An upper-level short-wave moved into California on April 10th, flattening the ridge. This set the stage for back-to-back strong storms to move through the central California interior on the 11th, 12th, and 13th. Each storm triggered severe thunderstorms over the central and southern San Joaquin Valley with hail up to 1.75 inches in diameter. Tallies of agricultural and crop loss approached 100 million dollars due to the extensive hail damage across Kings, Tulare, Fresno, and Merced counties. Funnel clouds were observed, although none touched down. The first storm brought up to a foot of snow to the Southern Sierra Nevada, and the second colder storm dropped up to 30 inches of snow at Lodgepole in Sequoia National Park.

Likelihood of Future Occurrences

Highly Likely—Snow in the eastern region of the County is a well-documented seasonal occurrence that will continue to occur annually.

Climate Change Considerations

Climate change has the potential to exacerbate the severity and intensity of winter storms, including potential heavy and intense amounts of snow. A warming climate may also result in warmer winters, the benefits of which may include lower winter heating demand, less cold stress on humans and animals, and a longer growing season. However, these benefits are expected to be offset by the negative consequences of warmer summer temperatures.

4.2.18 Severe Weather: Tornado

Hazard/Problem Description

Tornadoes are another severe weather hazard that can affect the Fresno County planning area, primarily during the rainy season. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure

differential that fuels 300-mile-wide hurricanes across a path only 300-yards wide or less. Figure 4.45 illustrates the potential impact and damage from a tornado. With additional heat in the atmosphere storms are projected to become more severe in the future, and thus lightning may become more prevalent.

Figure 4.45 Potential Impact and Damage from a Tornado

Figure 2-2 Potential impact of a tornado

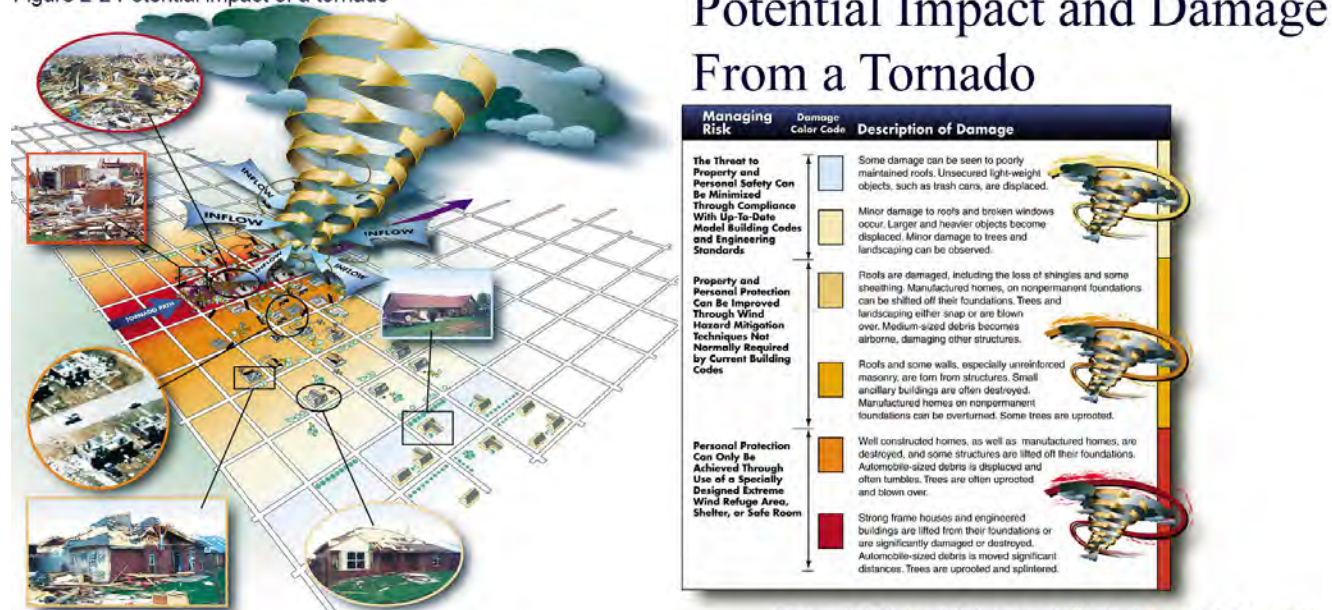


Figure 2-2 Potential damage table for impact of a tornado

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 4.22 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4.23 shows the wind speeds associated with the Enhanced Fujita Scale ratings. The Enhanced Fujita Scale's damage indicators and degrees of damage can be found online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 4.22 Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/f-scale.html

Table 4.23 Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, most injuries and deaths result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

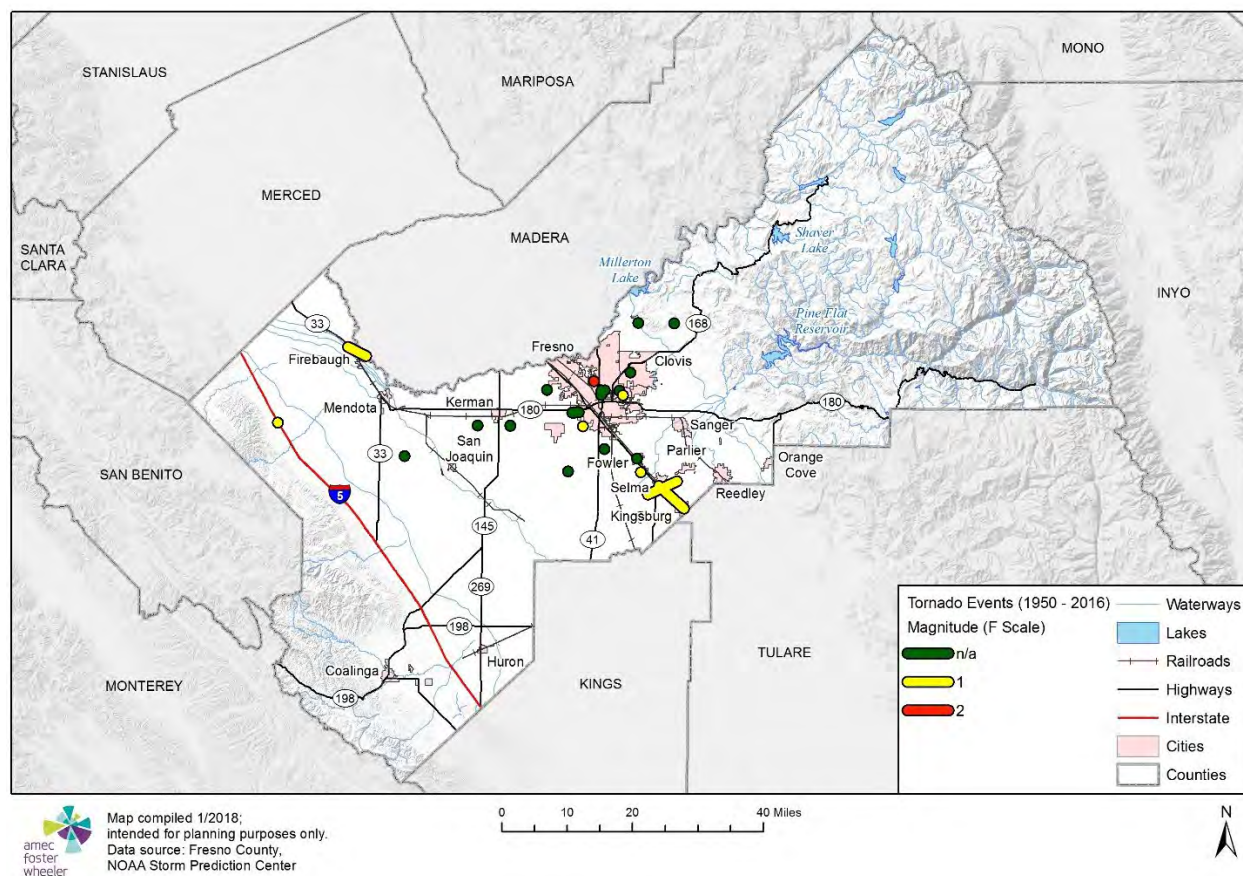
Extent

The majority of tornadoes in the past in Fresno County have been F0 and F1. Large tornadoes are possible, however. Should the County be hit by an EF-4 or EF-5 tornado, it can be extrapolated that because of its relative size and the potential size and length of a tornado's path a significant portion of the County could be impacted, resulting in property and crop damage and loss of life.

Past Occurrences

Based on data from 1950 to 1995, California ranks 32nd among the 50 states for frequency of tornadoes, 36th for injuries, and 31st for cost of damage. When compared to other states by the frequency per square mile, California ranks 44th for frequency and injuries per area and 40th for cost of damage per area. Figure 4.46 shows tornadoes that have affected the County using NOAA data from 1950 to 2016.

Figure 4.46 Fresno County Tornadoes, 1950-2016



According to the HMPC, during the rainy season, the Fresno County planning area is prone to relatively strong thunderstorms, sometimes accompanied by funnel clouds and tornadoes. While tornadoes do occur occasionally, most often they are of F0 or F1 intensity. Documented incidents of tornadoes in the Fresno County planning area from the NCEI Storm Events Database are listed in Table 4.24.

Table 4.24 Fresno County's Tornadoes, 1950-2017

Type	# of Events	Property Loss (\$)	Deaths	Injuries
Tornado: F0	18	230,000	0	0
Tornado: F1	7	5,205,050	0	3
Tornado: F2	1	5,000	0	0
Totals	26	5,440,050	0	0

Source: National Center for Environmental Information Storm Events Database

Likelihood of Future Occurrences

Occasional—Twenty-six tornadoes occurred in Fresno County over 68 years of record keeping, which equates to one tornado every 2.6 years, on average, and a 38.2 percent chance of a tornado occurring in any given year. Historical tornadic activity within the planning area indicates that the area will likely continue to experience the formation of funnel clouds and low intensity tornadoes during adverse weather conditions. The actual risk to the County is dependent on the nature and location of any given tornado.

Climate Change Considerations

There presently is not enough data or research to quantify the magnitude of change that climate change may have related to tornado frequency and intensity. NASA's Earth Observatory has conducted studies which aim to understand the interaction between climate change and tornadoes. Based on these studies meteorologists are unsure why some thunderstorms generate tornadoes and others don't, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually supercell thunderstorms that are in a wind shear environment that promotes rotation. Some studies show a potential for a decrease in wind shear in mid-latitude areas. Because of uncertainty with the influence of climate change on tornadoes, future updates to the mitigation plan should include the latest research on how the tornado hazard frequency and severity could change. The level of significance of this hazard should be revisited over time.

4.2.19 Volcano

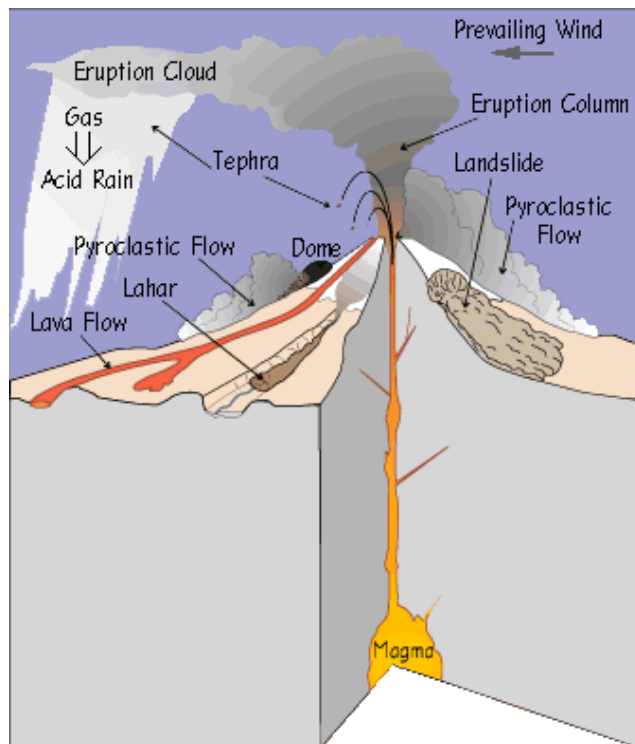
Hazard/Problem Description

Of the almost 70 active and potentially active volcanoes in the United States, more than 50 have erupted one or more times in the past 200 years. Volcano hazards are the greatest in five western states: Alaska, Hawaii, California, Oregon, and Washington. Volcanoes create a wide variety of hazards that can kill people and destroy property.

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows; although, large explosive eruptions can endanger people and property hundreds of miles away and even affect global climate. Volcanic ash can also travel and affect populations many miles away. The ash from the 1980 eruption of Mount St. Helens in Washington fell over a large area of the

western United States. Heavy ash fall can collapse buildings, and even minor ash fall can damage crops, electronics, and machinery. Some volcanic hazards, such as landslides, can occur even when a volcano is not erupting. Figure 4.47 depicts a volcano typical of those found in the western United States.

Figure 4.47 Typical Wester U.S. Volcano



Source: <http://pubs.usgs.gov/fs/fs002-97/>

The State of California Multi-Hazard Mitigation Plan identifies volcanoes as one of the hazards that can adversely impact the state. However, there have been few losses in California from volcanic eruptions. Of the approximately 20 volcanoes in the state, only a few are active and pose a threat.

Extent

The Fresno County General Plan Background Report identifies the Mono Lake-Long Valley area located adjacent to the north and east of the northernmost areas of Fresno County as the only known volcanic hazard to Fresno County. The Long Valley area is considered to be an active volcanic region of California and includes features such as the Mono-Inyo Craters, Long Valley Caldera, and numerous active and potential faults. Figure 4.48 shows volcanoes in or near California and the location of the Long Valley area relative to the Fresno County planning area.

Figure 4.48 Volcanoes In or Near California



Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. Based on information in the background report, the Fresno County planning area is susceptible to various hazards associated with its proximity to the Long Valley area as further described below.

Volcanic Flows

Two mildly explosive volcanic vents are located three to four miles from northernmost Fresno County, northwest of Duck Lake. In the event of an eruption, flows or debris from the vents would likely flow predominantly southwest approximately parallel to the North Fork of the San Joaquin River in Madera County. Lava flows, steam blasts, or base surges could occur in the northernmost tip of Fresno County. The northern portions of the Silver Divide (including Duck Lake and Fish Creek) could be subject to lava flows. However, this area of the County is mostly unpopulated and not easily developable as it is situated in the high peaks of the Sierra Nevada. Thus, potential safety hazards would be limited to backcountry visitors.

Ash

With most volcanic eruptions, a significant amount of ash is released into the atmosphere. The location and thickness of ash in any given area is generally a function of the volume erupted and wind speed and direction. Based on historical wind directions and wind speeds, most volcanic ash from a volcanic eruption of Long Valley would be deposited east of the volcano. Looking at historical data from past ash falls, the majority of ash beds from volcanic eruptions in California lie east of their source vents. Other studies of Mount Rainier and Mount St. Helens show that more than 90 percent of the ash beds deposited from volcanic eruptions during the last 10,000 years lie to the east of those volcanoes. This data suggests that most ashfall from future eruptions, including those from Long Valley, would also be deposited to the east of the source.

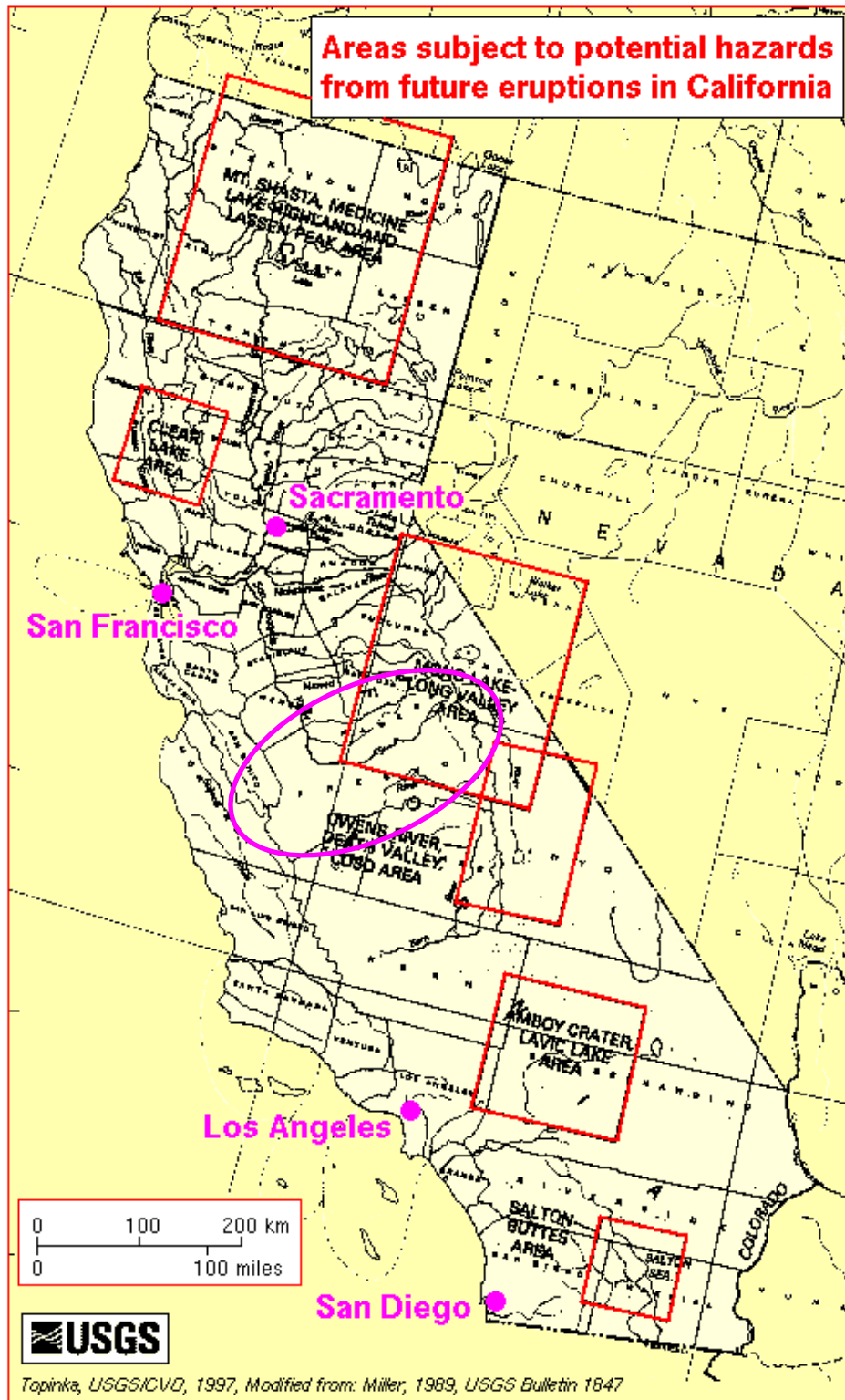
According to a worst-case scenario provided in the background report, geologists estimate that the South Fork of the San Joaquin River, Mono Creek, Margaret Lakes, Duck Lake, Fish Creek, Lake Thomas A. Edison, Bear Creek, Lake Italy, and the town of Mono Hot Springs could be subject to eight inches or more of compacted ash from an eruption at Long Valley. It only takes up to five inches of ash to stop an automobile engine. These areas, in addition to Kaiser Creek and Three Island Lake, could also be affected by hot pyroclastic flows. It is further estimated that up to two inches of ash could fall within a 50-mile radius of the eruption, potentially affecting the areas of Auberry, Prather, Meadow Lakes, Pine Ridge, Tollhouse, Dinkey Creek, Humphreys Station, Courtright Reservoir, Pine Flat Reservoir, and numerous small lakes, creeks, and streams.

Resulting Floods and Mudflows

An eruption on the western slope of Mammoth Mountain (on the rim of the Long Valley Caldera) in the winter could also cause hot mudflows to mix with melting snow and rock debris, creating the possibility of severe flood conditions in the San Joaquin River drainage system, endangering people, dams, and other property as it moves downstream.

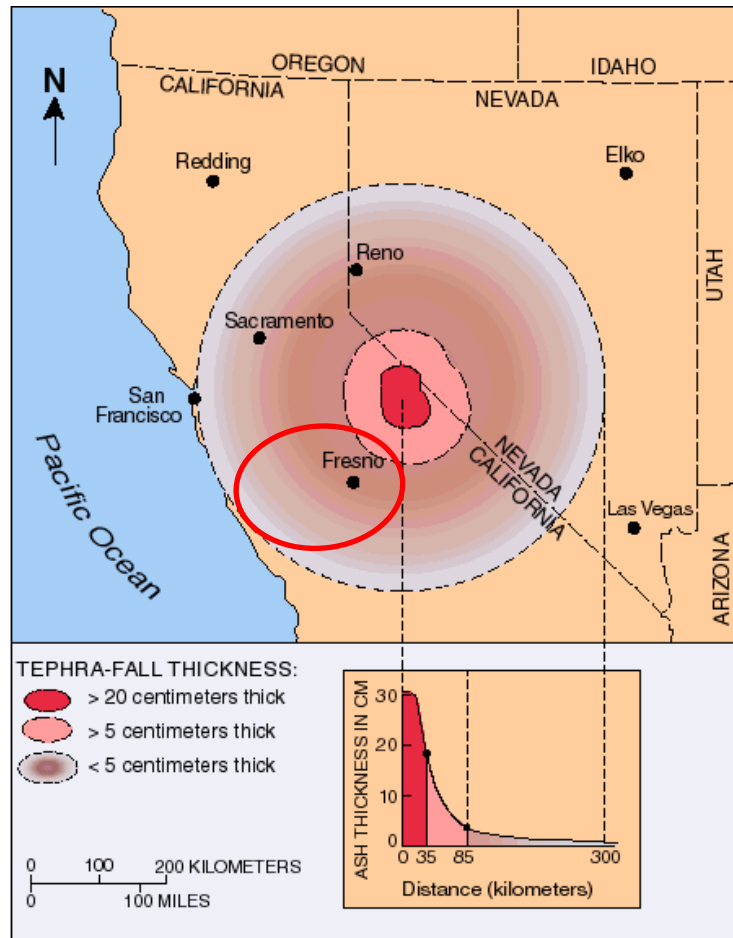
Figure 4.49 illustrates areas subject to potential volcanic hazards from future eruptions in California and supports the conclusion that the planning area is potentially at risk to volcanic activity from the Long Valley area. The ash dispersion map that follows (Figure 4.50) also illustrates the extent to which the planning area may be affected by ash fallout in the event of renewed volcanic activity in the area.

Figure 4.49 Areas Subject to Potential Volcanic Hazards from Future Eruptions in California



Source: U.S. Geological Survey, Cascades Volcano Observatory, <http://vulcan.wr.usgs.gov/Volcanoes/California/>

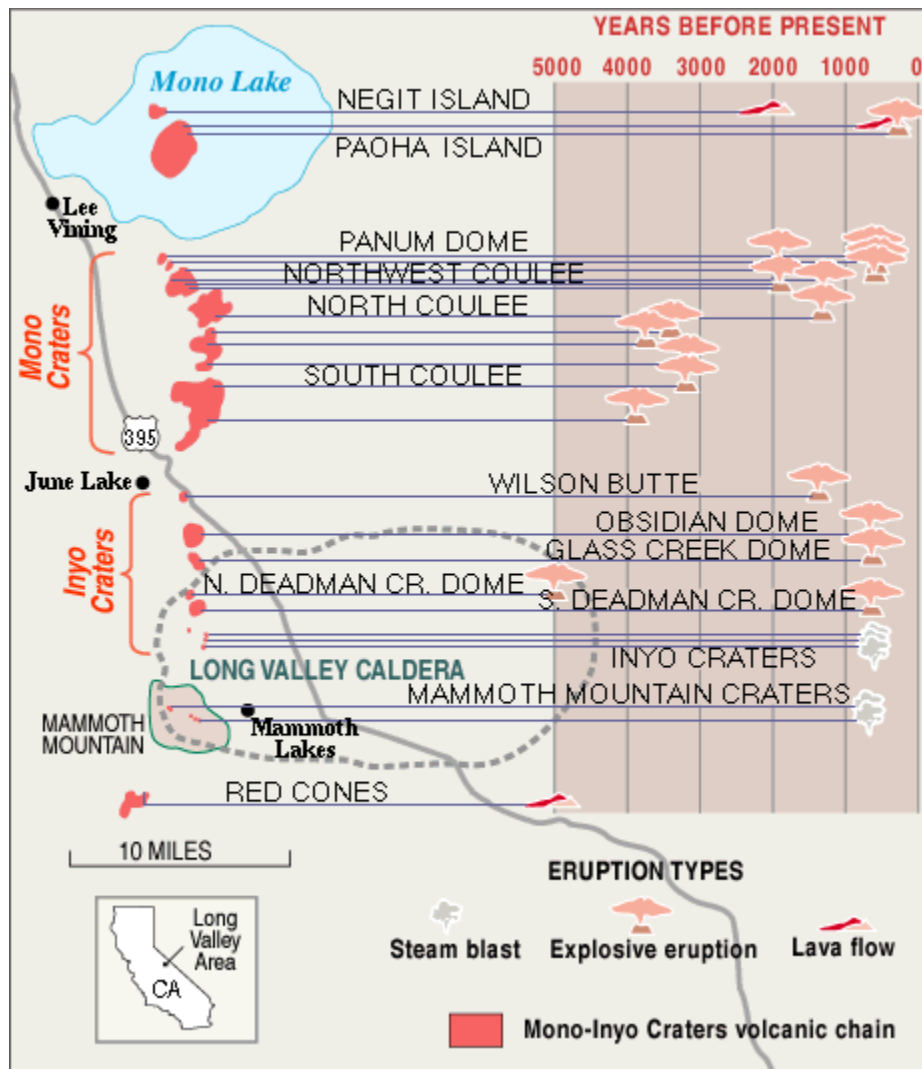
Figure 4.50 Volcanic Hazards Ash Dispersion Map for the Long Valley Caldera



Past Occurrences

During the past 1,000 years there have been at least 12 volcanic eruptions in the Long Valley area. Volcanoes in the Mono-Inyo Craters volcanic chain, which extends from just south of Mammoth Mountain to the north shore of Mono Lake, have erupted often over the past 40,000 years. Over the past 5,000 years, small to moderate eruptions have occurred at various sites along the Mono-Inyo Craters volcanic chain at intervals ranging from 250 to 700 years (see Figure 4.51).

Figure 4.51 Volcanic Activity in the Mono-Inyo Craters Volcanic Chain of the Past 5,000 Years



Source: U.S. Geological Survey, <http://pubs.usgs.gov/fs/fs073-97/eruptions.html>

In 1980, four large earthquakes (greater than magnitude 6 on the Richter Scale) and numerous relatively shallow earthquakes occurred in the area. Since then, earthquakes and associated uplift and deformation in the Mammoth Lakes Caldera have continued. Because such activities are common precursors of volcanic eruptions, the U.S. Geological Survey closely monitors the unrest in the region.

Likelihood of Future Occurrences

Unlikely—According to the U.S. Geological Survey, the pattern of volcanic activity over the past 5,000 years suggests that the next eruption in the Long Valley area will most likely happen somewhere along the Mono-Inyo volcanic chain. However, the probability of such an eruption

occurring in any given year is less than 1 percent. Most likely, the next eruption will be small and similar to previous eruptions along the Mono-Inyo volcanic chain during the past 5,000 years (see Figure 4.51 above). Based on available data and the location of the County relative to the Long Valley area, there is a remote potential for volcanic activity of sufficient magnitude to adversely impact the Fresno County planning area.

Climate Change Considerations

There presently is not enough data or research to quantify the magnitude of potential change that climate change may have on volcanic activity.

4.2.20 Wildfire

Hazard/Problem Description

Three classes of fires exist in the planning area: understory fires, crown fires, and ground fires. Naturally-induced wildfires burn at relatively low intensities, consuming grasses, woody shrubs, and dead trees. These understory fires often play an important role in plant reproduction and wildlife habitat renewal and self-extinguish by low fuel loads or precipitation. Crown fires, which consist of fires consuming whole living trees, are low probability but high consequence type events. Crown fires typically match perceptions of wildfires. In areas with high concentrations of organic materials in the soil, ground fires may burn, sometimes persisting undetected for long periods until the surface is ignited.

Wildfire is an ongoing concern for the Fresno County planning area. Historically, the fire season extends from June through October of each year during the hot, dry months. Since 2010 the fire season throughout California and Fresno County has been getting longer, typically starting in May and extending into November, but wildfires can occur any time of year. Fire conditions arise from a combination of high temperatures, intense sunlight, low rainfall and humidity, dry vegetation, and high winds. Down slope winds, such as the Santa Ana winds of southern California which can gust to 80 mph, are often associated with the most destructive wildfires. Since they usually occur in the fall and winter after the summer dry season when there is ample dry vegetation for fuel, they can cause small fires to quickly burn out of control. These Santa Ana winds have been associated with some of the state's largest fires, including in October 2003 and October 2007, when more than 800,000 and 1,000,000 acres burned, respectively (Source: <https://statesummaries.ncics.org/ca>). In December 2017 and January 2018, the Thomas Fire northwest of Los Angeles became one of the largest fires in the State's history at 291,893 acres which was also exacerbated by Santa Ana winds.

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. While wildfire risk is predominantly associated with wildland-urban interface (WUI) areas, significant wildfires can also occur in heavily populated areas and across non WUI landscapes in the forest. The wildland-urban interface is a general term that

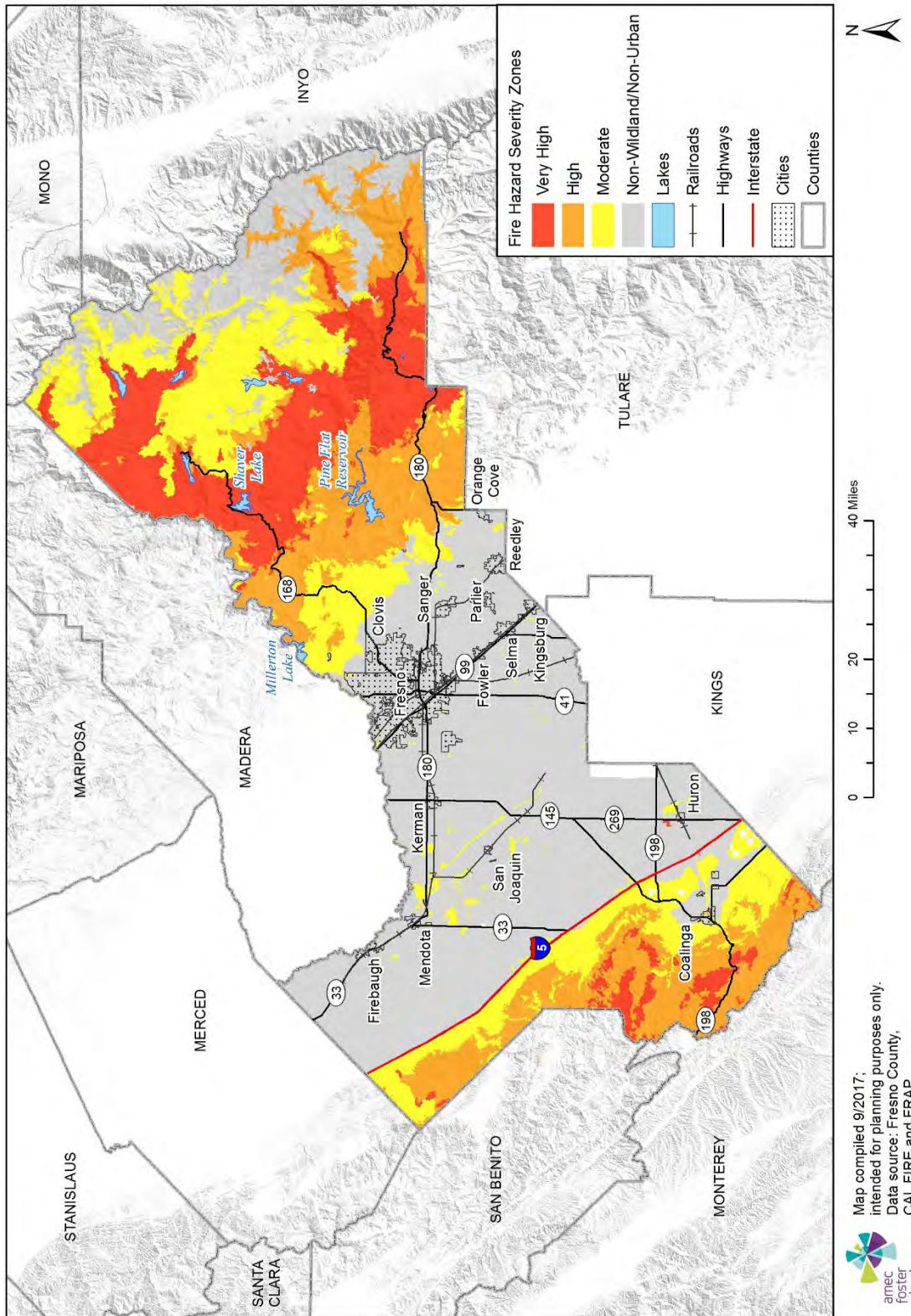
applies to development adjacent to or within large watershed landscapes that support wildfire. Wildfires affect grass, forest, and brush lands, as well as any structures located within them. Where there is human access to wildland areas, such as the Sierra Nevada and Coast Range foothills, the risk of fire increases due to a greater chance for human carelessness as 90% of wildland fires are human caused.

Within the County there are three principal areas that have large damaging fire history: West of Interstate 5, the San Joaquin River Watershed and the Kings River Watershed. Each of these areas have unique vegetation and topography types, fire weather and communities. West of Interstate 5 is best described as an area with low rainfall (average of less than 10 inches) and a vegetation type consisting of annual grass, oak woodlands and brush. This area is predominantly used as rangeland for livestock grazing, mining, oil and gas production and underground transportation.

The San Joaquin River and the Kings River Watersheds have a diverse vegetation type ranging from annual grasslands, oak woodlands, brush and timber. These vegetation types transition from the valley floor to the Sierra Nevada's. The topography ranges from rolling foothills, steep river canyons to high sierra mountains. This area has numerous communities and homes on small parcels intermixed within the larger landscape. The San Joaquin river and Kings River have numerous hydroelectric facilities and critical power infrastructure located from the foothills to the high sierra. Recreation in the Sierra and Sequoia National Forests areas along with group camps increases the population and ignition potential during fire season. The drought that started in 2012 has left an abundance of dead brush, oaks and timber in the upper elevations of these watersheds. The impacts to the vegetation will carry on for many years into the future making fire suppression more difficult and increasing the chance for large catastrophic fires across the landscape.

Figure 4.52 illustrates Fresno County's wildfire threat.

Figure 4.52 Fresno County's Wildfire Severity Zones



Potential losses from wildfire include human life, structures, critical infrastructure, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Economic losses could also result due to damages to natural resources, grazing lands, tourism and local businesses not mention the loss of revenue to businesses during a wildfire event. Smoke and air pollution from wildfires can be a severe health hazard to local communities and the greater San Joaquin Valley air basin. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season impacting communities and downstream reservoirs.

Generally, there are three major factors that sustain wildfires and predict a given area's potential to burn. These factors are fuel, topography, and weather.

- **Fuel**—Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also, to be considered as a fuel source are manmade structures, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control. Fuel types within the Fresno County planning area include annual grasses, deciduous oaks, and heavy brush in the Coast Range of western Fresno County; seasonal grasses, deciduous and evergreen oaks, brush and grass in the lower and mid-elevations of central and eastern Fresno County, and conifers in the higher elevations of eastern Fresno County.
- **Topography**—An area's terrain and slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement and types of vegetation throughout a hillside can also contribute to increased fire activity on slopes.
- **Weather**—Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will more readily ignite and burn more intensely. Thus, during periods of drought, the threat of wildfire increases. Wind is the most influential weather factor of the three and its influence can increase rates of spread regardless of temperature and relative humidity. The Fresno County planning area has a diverse normal wind pattern. The western side of the planning area is influenced more by the coastal range and weather patterns along the coast. The east side of the valley is more influenced by the normal heating and cooling of the valley floor and the influence along the river drainages, this area is also susceptible to foehn winds from the high sierra. Lightning during the summer monsoonal moisture season also ignites wildfires, often in difficult-terrain with limited access for firefighters.

Extent

In terms of geographic extent, the wildfire hazard potentially impacts the entire planning area, but the most intense fires will be in the forested areas of the county. While the wildfire threat map

(Figure 4.52) depicts potential severity across the planning area, the history of occurrence map (Figure 4.53) indicates that even moderate and low risk areas have experienced wildfires, and potentially will continue to do so. However, with regard to the severity or potential impact of the wildfire hazard two facts should be considered: first, both maps demonstrate that the areas of greatest risk correspond to the locations with the greatest number of historical events; second, the Medium, High, and Very High hazard areas correspond to heavily forested areas and urban wildland interface areas, where fuel loads for wildfire are highest, are periodically exacerbated by drought conditions, and further complicated by a widespread incidence of tree mortality adding additional fuel load risk (see Section 4.2.4 for discussion of drought and tree mortality). Finally, in order to understand the extent of wildfire severity, the variable risk (Low, Medium, High, Very High) across the planning area identified on the wildfire risk map (Figure 4.54) must be viewed in relation to the location of each jurisdiction participating in the plan. The majority of the risk is in the unincorporated areas and on the fringes of municipalities that include Coalinga, Fresno, and Firebaugh. The Sierra Resource Conservation District has considerable area at risk to wildfires. For additional information on each jurisdiction's wildfire risk, please consult the jurisdictional Annexes and the Vulnerability Section 4.3.2.

The Fire Rating System defined in Table 4.25 describes the characteristics and potential intensity of fires, including the effect on the ability to manage and suppress fires. Such characteristics should be understood in light of the wildfire risks and history of occurrence in Fresno County, as identified on Figure 4.54 through Figure 4.55, and in the narrative descriptions of wildfire history previously discussed. Fire conditions up through Class 5 are possible in Fresno County, primarily in the unincorporated areas.

Table 4.25 Fire Danger Rating System

rating	basic description	detailed description
CLASS 1: Low Danger (L) COLOR CODE: Green	fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
CLASS 2: Moderate Danger (M) COLOR CODE: Blue	fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
CLASS 3: High Danger (H) COLOR CODE: Yellow	fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
CLASS 4: Very High Danger (VH) COLOR CODE: Orange	fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.

<p>CLASS 5: Extreme (E) COLOR CODE: Red</p>	<p>fire situation is explosive and can result in extensive property damage</p>	<p>Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.</p>
---	--	---

Source: <http://www.wfas.net>

Past Occurrences

Wildfires are of significant concern throughout California. According to the California Department of Forestry and Fire Protection (CAL FIRE), vegetation fires occur within their jurisdiction on a regular basis; most are controlled and contained early with limited damage. For those ignitions that are not readily contained and become major incidents, damage can be extensive. There are many causes of wildfire, from naturally caused lightning fires to human-caused fires linked to activities such as smoking, campfires, debris burning, equipment use, and arson. Recent studies conclude that the greater the population density in an area, the greater the chance of an ignition. With population continuing to grow throughout California and the Fresno County planning area, the risk posed by wildfire also continues to grow.

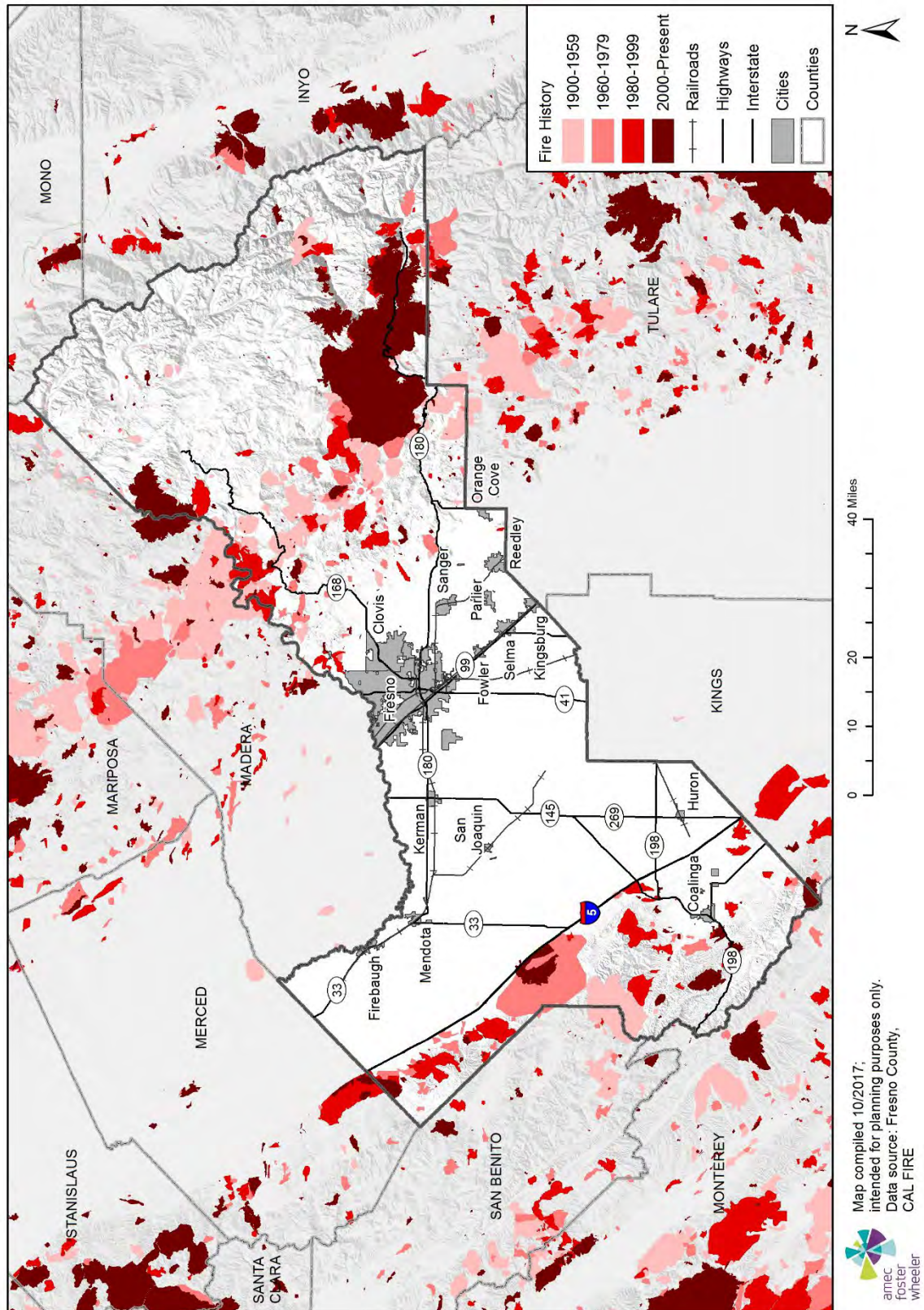
According to the 2005 Prefire Management Plan for CAL FIRE's Fresno-Kings Unit, an ignition analysis for 2004 was determined to be very similar to that of years past. The four primary ignition sources continue to be other and undetermined (535 fires), arson (311 fires), equipment use (315 fires), and debris burning (158 fires). The remaining causes, which are almost insignificant in number, are lightning, campfires, smoking, vehicles, electrical power, and playing with fire. The unit, which encompasses all of Fresno and Kings counties, experiences 120 to 200 fires a year in the state responsibility area and 1,400 to 1,600 fires in the local responsibility area is a fire history map for the Fresno-Kings Unit.

During the drafting of the 2009 Fresno County HMP, the Unit, which encompasses all of Fresno and Kings counties, experienced 120 to 200 fires a year in the state responsibility area and 1,400 to 1,600 fires in the LRA. Figure 4.53 is a fire history map for the Fresno-Kings Unit, which depicts the majority of occurrences as being located within the Very High risk area as identified on the Fresno County Fire Risk Map (Figure 4.54). Additionally, Figure 4.53 details the extent of previous fire incidents occurring between 1900 and 2017.

However, in 2017, the Fresno County Fire Protection District reports a dramatic increase in fire incidents, with 1,283 reported as of July 31, 2017. (Source: <https://www.fresnocountyfire.org/wp-content/uploads/2017/08/incident-summary.pdf>). That said, of the total number, 470 were categorized as Vegetation fires (wildfires), while the remaining fires related to vehicles (221), structures (197), refuse (331), industrial (33), improvement/controlled burns (21), and agricultural products (10). However, as has been noted previously, wildfires occur from both natural and human-made causes. Therefore, given the recent frequency increase in vegetation fires, and the

fact that other types of fires have the potential to spread into a wildfire scenario, the wildfire hazard risk seems to be growing, and the LHMP will remain vigilant in its efforts to mitigate the risks, although an increase in frequency does not necessarily translate to an increase in the extent (range) of wildfires or their severity.

Figure 4.53 Fresno County Fire History



The HMPC identified the following as notable wildfires in the Fresno County planning area:

- **1933: The Tollhouse Fire** started when a local resident was burning brush in late August. The fire got out of hand and burned across fields and grazing lands and encircled the Town of Tollhouse, a large hub for the timber industry in eastern Fresno County. It burned portions of the flume that carried logs and boards from Shaver Lake to the valley floor. The fire raced up the hill and burned into Jose Basin and over Burrough Mountain into Blue Canyon. The fire burned very hot, destroying conifers in the area, which never grew back. Tollhouse was evacuated for safety, but no losses were incurred.
- **1987:** The state declared a disaster for Fresno County and 32 other counties during the 1987 wildfires. Collectively, the fires resulted in 3 deaths, 76 injuries, and \$18 million in damage. The eastern side of Fresno County was primarily affected. Property damage was estimated at \$1 million. Damage to roads, bridges, and power distribution also occurred. Timber production in the area was also impacted.
- **August 2-21, 1989: The Powerhouse Fire** started near the Fresno and Madera county line on the Fresno side of the San Joaquin River. Arson was suspected as the cause. The fire raced up the canyon skirting Powerhouse road in Auberry, traveling mid-slope behind the settlement of Jose Basin. Fingers of the fire touched New Auberry and Auberry. It burned across the front of Bald Mountain in to Mile High and it threatened Meadow Lakes and all homes in its path. An assault by air and ground stopped the fire at Sugarloaf Road at the 3,800-foot elevation. It took a multi-agency effort to put out the fire, which burned an estimated 21,000 acres. No deaths were reported, and only minor injuries were experienced by firefighters. No homes were burned, but several out buildings were lost. Other losses included damage to power poles, fences, and automobiles. Overall, the fire was devastating to the watershed, wildlife, and residents.
- **August 24, 1994: The Big Creek Wildland Fire** occurred in eastern Fresno County in the area of Big Creek, between Shaver and Huntington Lakes, which is used extensively for recreation and has numerous summer homes. The Big Creek area is part of an extensive hydroelectric project (Southern California Edison) that produces electricity for the area. 9,000 acres of national forest land burned. Although 300-500 homes were threatened, no structures burned. Highway 168 and Huntington Lake Road were temporarily closed. The local school closed and the community of Big Creek was evacuated for 1 ½ weeks. Estimated cost of infrastructure damage included \$2 million to roads and miscellaneous improvements on national forest land and \$500,000 to power distribution. An estimated cost to recover forest land was \$2 million. Twelve firefighters were injured. Fighting the fire cost more than \$50 million. A post-fire mudslide caused an estimated \$50,000 in damage.
- **September 21, 2000: The Millwood Fire** burned 283 acres; 363 personnel responded. Highway 180 was closed until 8:00 p.m. that evening. A shelter was prepared in the City of Orange Cove, but was not used.
- **August 17, 2001: The Highway fire** located near the community of Dunlap, burned 4,152 acres and destroyed five out buildings, a cabin, two travel trailers, and a miscellaneous number of cars.

- **August 17, 2001: The Musick Fire**, located between Shaver Lake and Big Creek, burned 193 acres. No structures were damaged in this fire caused by downed power lines. The cost was estimated at \$800,000.
- **July 2013: The Aspen Fire** took place in the Kaiser Wilderness area of the Sierra National Forest, North of Huntington Lake. The fire burned over 150,000 acres with a suppression cost of \$22.8 million dollars. The fire posed imminent danger to people within the National Forest, resulting in the evacuation of multiple campsites.
- **July 30, 2015: The Rough Fire** was ignited by a lightning strike in the Sierra National Forest, North of Hume Lake, and then spread to Sequoia National Forest, Kings Canyon National Park, as well as state and private-owned lands. The fire consumed approximately 151,000 acres with significant impacts including a significant decrease in air quality, damage to one commercial building, three outbuildings, the temporary closure of 2 schools, several summer camps, and parts of the Sequoia – Kings Canyon National Forest, and the evacuation of multiple communities and campgrounds. Secondary impacts included a drastic drop in revenue from tourism and other visitors to the communities and park lands in the affected area, and a cost of \$119 million dollars to suppress the fire.
- **July 1, 2016: The Curry Fire** was a major wildland fire that burned 2,944 acres in Coalinga, CA. Though no crop, property or infrastructure damage or personal injury occurred, it did result in several road closures.
- **July 2016: The Goose Fire** began at or around the intersection of Gooseberry Lane and Morgan Canyon Road, South of the town of Prather. The fire consumed 2,241 acres, and destroyed 4 residences and 5 outbuildings. The fire posed an imminent threat to 400 homes, and residents were issued evacuation orders.
- **August 8, 2016: The Mineral Fire** was a major wildland fire which burned 7,05 acres in Coalinga, CA. Though no crop, property or infrastructure damage or personal injury occurred, it did result in several road closures.
- **July 9, 2017: The Garza Fire** was a major wildland fire igniting in Monterey County (Coalinga, CA), and spreading to Kings and Fresno Counties. Although the fire burned 48,888 acres, no personal injuries or damage to crops, buildings or infrastructure were reported. However, it did result in several road closures.
- **The Sacata Fire and Turkey Fire**, burning 2,099 and 2,530 acres respectively, both occurred in Fresno County.

Likelihood of Future Occurrences

Highly Likely—Within the Fresno-Kings Unit, fire occurrences range from 120 to 200 fires a year in the SRA and 1,400 to 1,600 fires in the LRAs. Fires will continue to occur on an annual basis in the Fresno County planning area.

Other statistical measures to be considered in assessing the extent of the wildfire hazard include data on frequency (and severity): According to the Fire and Resource Assessment Program (FRAP), having compiled and analyzed a variety of measures for fire activity, such as the influence

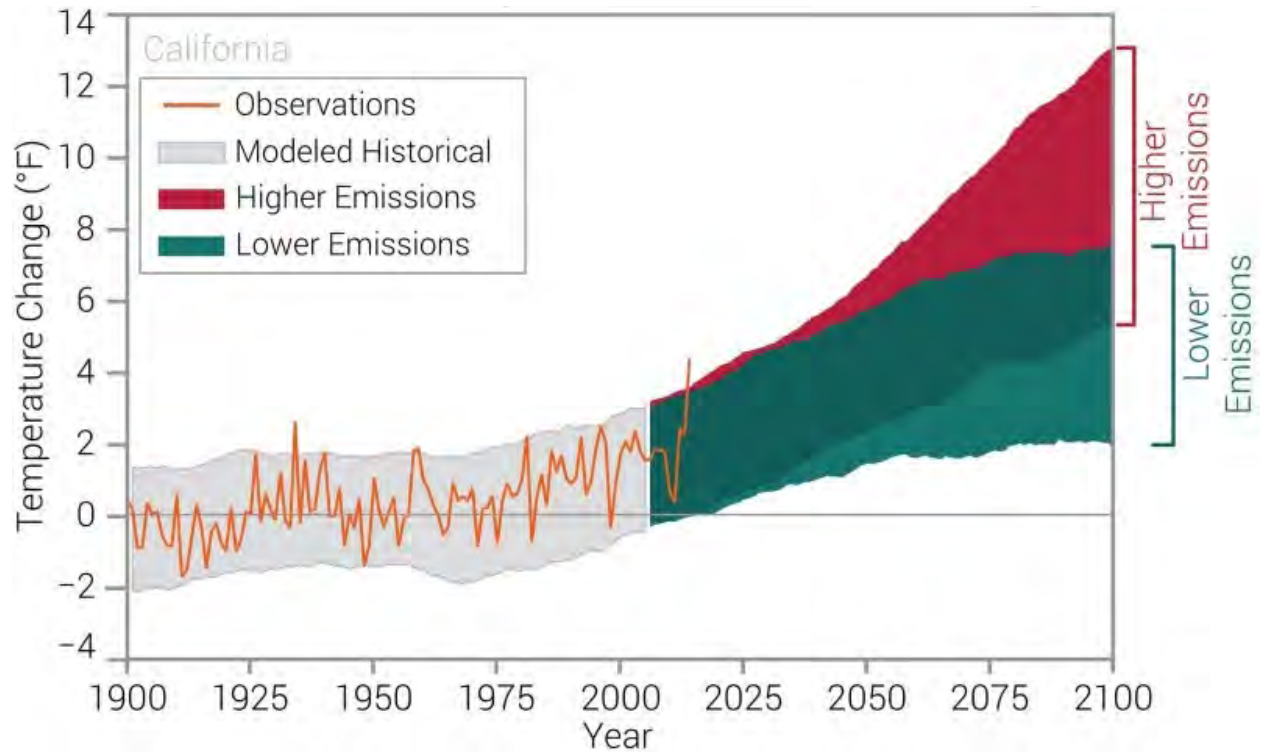
of time and fuel types, although fire activity across the state varies from year to year, the annual average since 2000 is 598,000 acres, or almost twice that of the preceding 50-year period from 1950-2000 (264,000 acres).

It should be noted that many ecosystems in the state that previously adapted to frequent low to moderate severity fires have seen shifts in reduced fire frequency (missed fire cycles), associated fuel build-up, and subsequent increases in fire severity when wildfires eventually occur. That said, other ecosystems appear to be burning too frequently – a situation facilitated by exotic invasive species that cause fundamental changes to post-fire fuel dynamics. These changes facilitate early seral phases to re-burn within a matter of only a couple years, and may reduce or eliminate native species that require time to develop to maturity and assure regeneration. And, in areas such as Fresno County, where ecosystems are commingled across various regimes, there is more uniformity of mixed-and high-severity effects that are not as clearly linked to basic ecosystem function. Therefore, in many mixed conifer systems, while the modern trend indicates an increase in fire rates, the type of fire and its typical interval are still significantly departed from the frequent low and mixed-severity fires that dominated low and mid-elevation conifer forests throughout California (Source: 2010 Assessment Chapter 2.1: Wildfire Threat to Ecosystem Health and Community Safety, p.102;(http://frap.fire.ca.gov/data/assessment2010)).

Climate Change

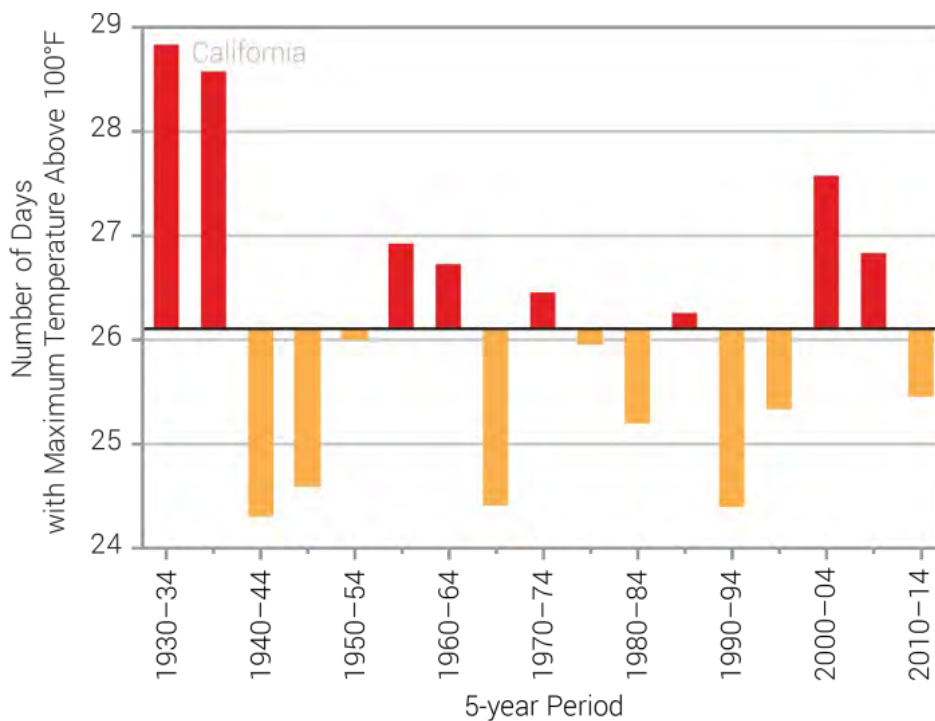
Due to higher emissions, historically unprecedented warming is projected by the end of the 21st century (See Figure 4.54 below), and in 2015 and 2016, California has experienced the highest number of days over 100 degrees since the 1930's. Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21st century. Overall, warming will lead to increased heat wave intensity but decreased cold wave intensity. Future heat waves signify a potential increase in the wildfire hazard intensity and severity in Fresno County, as well as a year-long fire season

Figure 4.54 California Observed and Projected Temperature Change



Source: <https://statesummaries.ncics.org/ca>

Figure 4.55 California Observed Number of Extremely Hot Days



Source: <https://statesummaries.ncics.org/ca>

Finally, it should be noted that Fresno County potentially has less capacity to address future wildfire risk related to climate change due to shortages in water, vital to combating wildfires. In California, rising temperatures are projected to increase the average lowest elevation at which snow falls, reducing water storage in the snowpack.

4.3 Vulnerability Assessment

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

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

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

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

With Fresno County’s hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that each hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. This section focuses on the risks to the County as a whole. Data from the individual participating jurisdictions was also evaluated and is integrated here and in the jurisdictional annexes and noted where the risk differs for a particular jurisdiction within the planning area.

This vulnerability assessment followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*, as well as Tasks 5 and 6 of the 2013 *FEMA Local Mitigation Planning Handbook*. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor’s data)
- Statewide GIS datasets compiled by the California Governor’s Office of Emergency Services to support mitigation planning

- California Department of Forestry and Fire Protection GIS datasets including tree mortality data
- FEMA's HAZUS-MH for earthquake modelling
- Written descriptions of inventory and risks provided by participating jurisdictions
- A refined flood loss estimation by jurisdiction with the use of geospatial analysis 1% and 0.2% annual chance flooding as well as the 200-year floodplain.
- Existing plans and studies
- Personal interviews with planning team members and staff from the County and participating jurisdictions

4.3.1 Fresno County Vulnerability and Assets at Risk

As a starting point for analyzing the planning area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. This section describes significant assets at risk in the planning area. Data used in this baseline assessment included:

- Total values at risk
- Critical facility inventory
- Historic, cultural, and natural resources
- Growth and development trends
- Social vulnerability

Total Values at Risk

The following data from the Fresno County Assessor's Office is based on the certified roll values for 2017. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties within the County. It is also important to note, in regard to a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table 4.26 shows the building values for the entire Fresno County planning area (e.g., the total values at risk) by jurisdiction. The values for unincorporated Fresno County are provided in Table 4.27 by property type. For more information on building exposure for each jurisdiction, see the appropriate annex.

Table 4.26 Fresno County Exposure by Jurisdiction

Jurisdiction	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Clovis	31,568	41,565	\$7,130,096,545	\$4,158,423,181	\$11,288,519,726
Coalinga	3,271	3,797	\$393,744,248	\$232,224,345	\$625,968,593
Firebaugh	1,559	2,024	\$190,892,252	\$145,901,471	\$336,793,723
Fowler	1,802	2,003	\$331,505,557	\$240,388,754	\$571,894,311
Fresno	129,037	203,846	\$24,434,591,987	\$16,375,186,070	\$40,809,778,057
Huron	805	1,085	\$83,013,224	\$50,216,784	\$133,230,008
Kerman	3,167	4,520	\$512,764,662	\$318,872,167	\$831,636,829
Kingsburg	3,626	4,003	\$636,380,099	\$425,477,080	\$1,061,857,179
Mendota	1,764	2,400	\$186,949,712	\$113,187,887	\$300,137,599
Orange Cove	1,534	1,816	\$156,857,250	\$87,111,922	\$243,969,172
Parlier	2,474	2,938	\$289,602,563	\$177,506,477	\$467,109,040
Reedley	5,678	9,894	\$865,266,269	\$550,731,018	\$1,415,997,287
San Joaquin	687	1,246	\$60,346,713	\$40,082,400	\$100,429,113
Sanger	6,343	8,354	\$817,023,618	\$491,412,710	\$1,308,436,328
Selma	5,789	7,449	\$770,773,863	\$491,867,089	\$1,262,640,952
Unincorporated	60,371	68,147	\$11,373,573,733	\$8,721,106,775	\$20,094,680,508
Total	259,475	365,087	\$48,233,382,295	\$32,619,696,128	\$80,853,078,423

Source: Amec Foster Wheeler based on information from Fresno County Assessor 2017

Table 4.27 Building Exposure for Unincorporated County, by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	7,151	7,143	\$1,244,142,066	\$1,244,142,066	\$2,488,284,132
Commercial	936	1,873	\$330,979,055	\$330,979,055	\$661,958,110
Exempt	383	763	\$0	\$0	\$0
Industrial	810	1,112	\$685,043,441	\$1,027,565,162	\$1,712,608,603
Multi-Residential	358	875	\$73,852,860	\$36,926,430	\$110,779,290
Open Space	10,498	8,263	\$3,120,718,551	\$3,120,718,551	\$6,241,437,102
Residential	40,224	48,105	\$5,916,124,497	\$2,958,062,249	\$8,874,186,746
Unknown	11	13	\$2,713,263	\$2,713,263	\$5,426,526
Total	60,371	68,147	\$11,373,573,733	\$8,721,106,775	\$20,094,680,508

Source: Amec Foster Wheeler based on information from Fresno County Assessor 2017

Critical Facility Inventory

Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those services and facilities essential during a major emergency and that, if damaged, would result in severe consequences to public health and safety or facilities that, if unusable or unreachable because of a major emergency, would seriously

and adversely affect the health, safety, and welfare of the public. Critical facilities include, but are not limited to:

- Schools and other publicly owned facilities;
- Hospitals, nursing homes, and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a major disaster;
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for response activities before, during, and after an event;
- Public and private utility facilities that are vital to maintaining or restoring normal services to damaged areas before, during, and after an event; and
- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials.

An updated inventory of critical facilities in the planning area based on data from a combination of Fresno County GIS and the Homeland Infrastructure Foundation-Level Data (HIFLD 2017) is provided in Table 4.28. A noted limitation is the lack of facilities for water and power which was not available in the County or HIFLD datasets. Critical facilities in the County are illustrated in Figure 4.56, with more detail shown in Figure 4.57, Figure 4.58, and Figure 4.59. More information on critical facilities in the participating jurisdictions can be found in the jurisdictional annexes.

Table 4.28 Fresno County Planning Area's Critical Facilities

Critical Facilities Type	Unincorporated	All Cities	County Totals
Airport	8	7	15
Behavioral Health		6	6
CalARP	87	69	156
Colleges & Universities*		24	24
Communications		4	4
County Government		4	4
Courthouse		3	3
Daycare		155	155
Department of Agriculture	1	3	4
Department of Public Health	1	4	5
Department of Public Works	11	2	13
Department of Social Services		11	11
Detention Center		4	4
District Attorney		2	2
Fire Station*	36	42	78
General Services		3	3
Health Care		18	18
Nursing Home*	3	36	39
Police*		24	24
School	127	334	461
Sheriff	2	5	7

Critical Facilities Type	Unincorporated	All Cities	County Totals
Supplemental College*		4	4
Urgent Care*		7	7
Wastewater Treatment Plant*	2		2
Total	278	771	1,049

Source: Fresno County GIS and *HIFLD 2017

Power and water utilities are not mapped

Figure 4.56 Critical Facilities in Fresno County

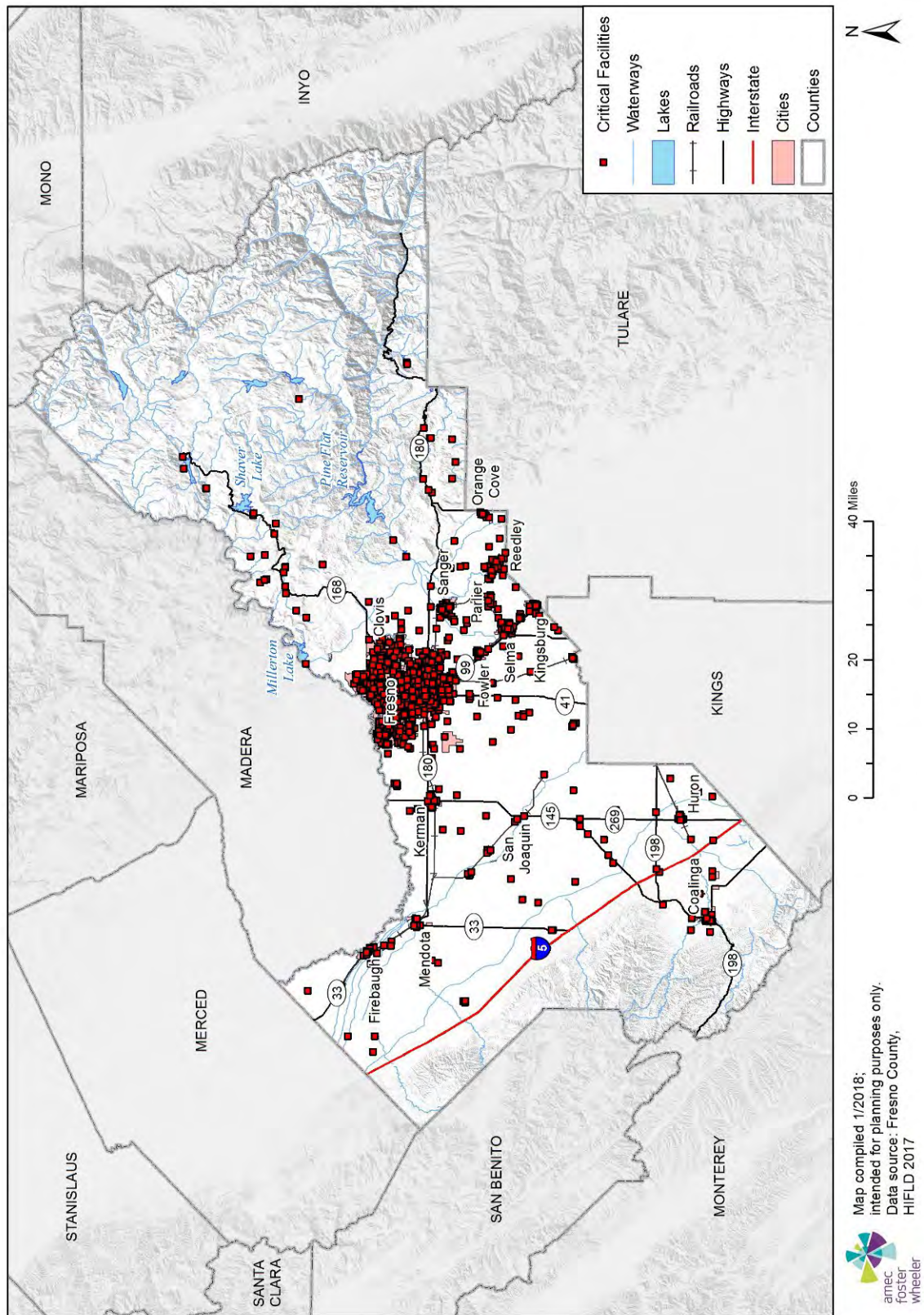


Figure 4.57 Critical Facilities in Western Fresno County

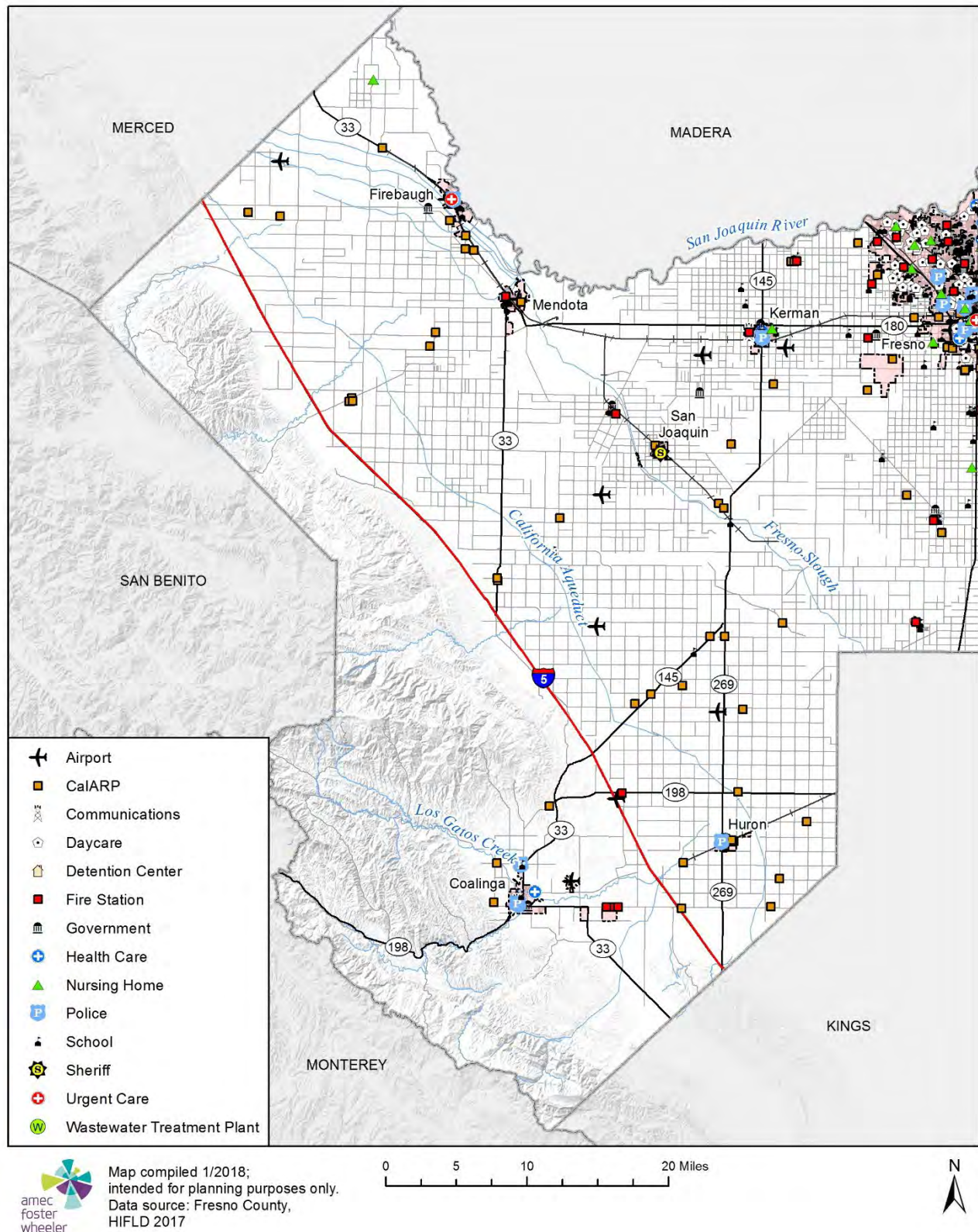


Figure 4.58 Critical Facilities in Central Fresno County

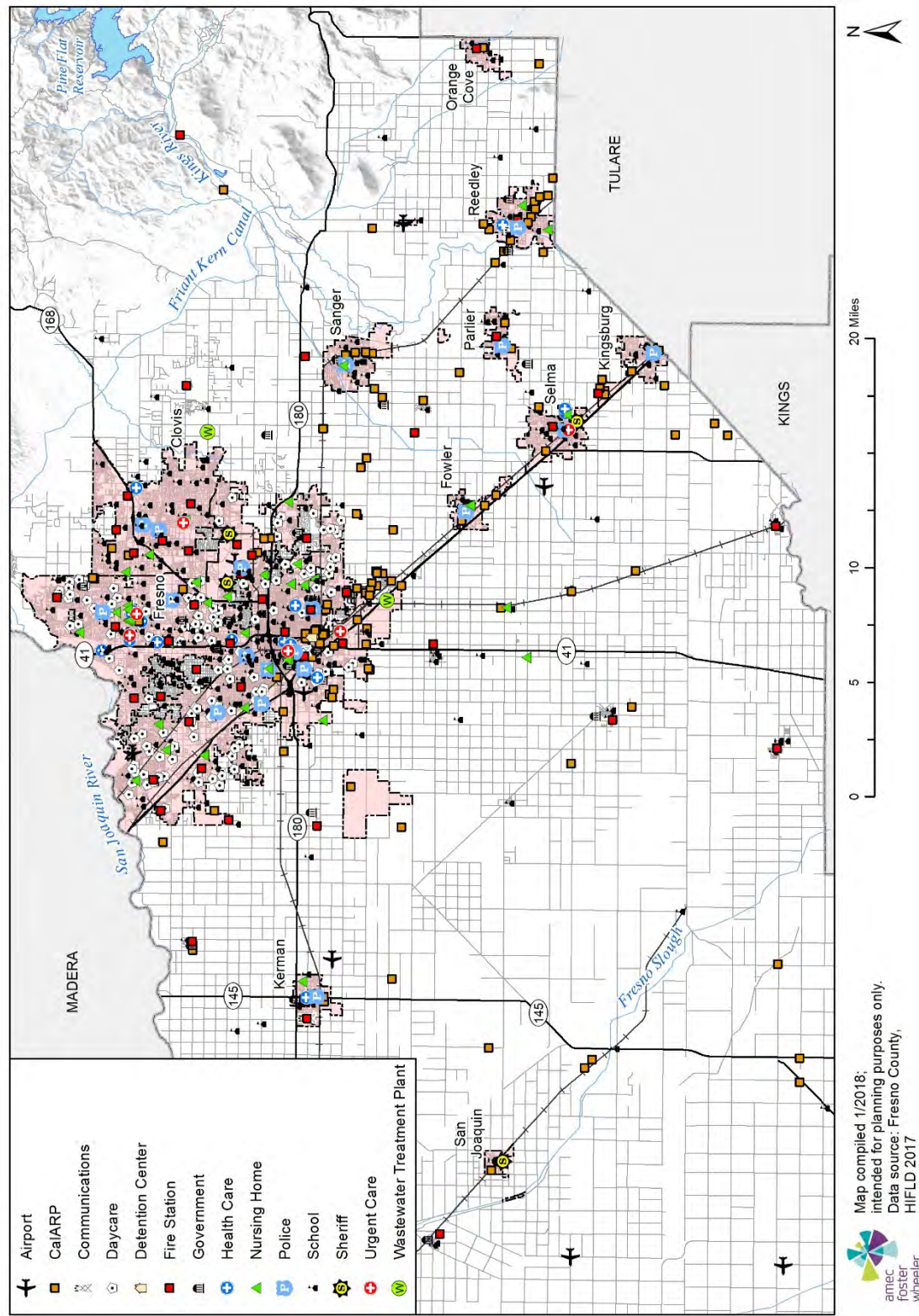
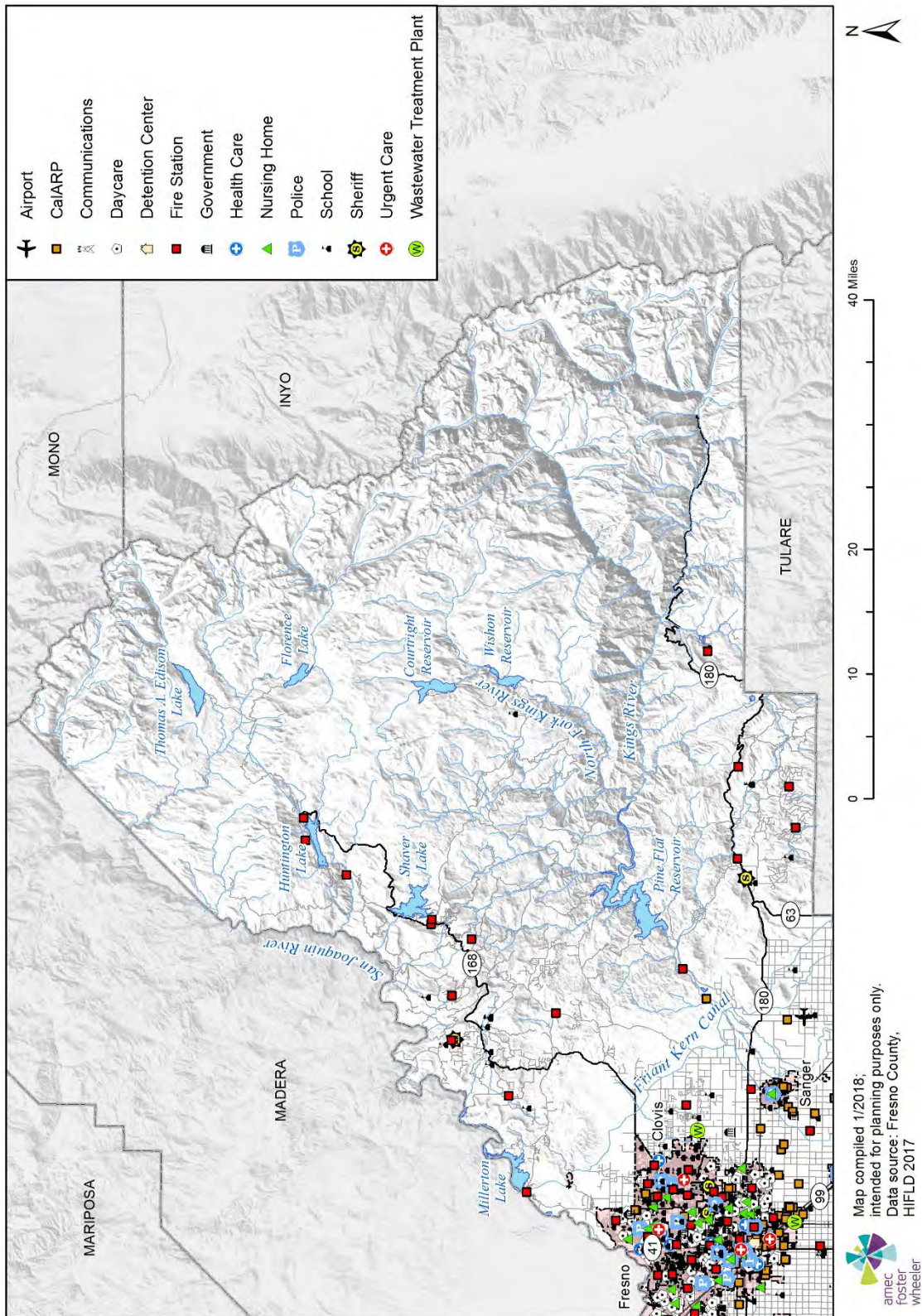


Figure 4.59 Critical Facilities in Eastern Fresno County



Historic, Cultural, and Natural Resources

Assessing the vulnerability of Fresno County to disaster also involves inventorying the historic, cultural, and natural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat help absorb and attenuate floodwaters.

Historic and Cultural Resources

Fresno County has a large stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. The OHP is responsible for the administration of federally and state mandated historic preservation programs to further the identification, evaluation, registration, and protection of California's irreplaceable archaeological, and historical resources. OHP administers the National Register of Historic Places, the California Register of Historical Resources, the California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements.

- The **National Register of Historic Places** is the Nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- The **California Register of Historical Resources** program encourages public recognition and protection of resources of architectural, historical, archeological and cultural significance; identifies historical resources for state and local planning purposes; determines eligibility for state historic preservation grant funding; and affords certain protections under the California Environmental Quality Act. The register is the authoritative guide to the state's significant historical and archeological resources.
- **California Historical Landmarks** are sites, buildings, features, or events that are of **statewide** significance and have anthropological, cultural, military, political, architectural, economic, scientific, technical, religious, experimental, or other value. Landmarks #770 and above are automatically listed in the California Register of Historical Resources.

- **California Points of Historical Interest** are sites, buildings, features, or events that are of **local (city or county)** significance and have anthropological, cultural, military, political, architectural, economic, scientific, technical, religious, experimental, or other value. Points designated after December 1997 and recommended by the State Historical Resources Commission are also listed in the California Register.

Historical resources included in the programs above are identified in Table 4.29.

Table 4.29 Fresno County's Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	Point of Interest	Date Listed	City
Arroyo De Cantua (344)		X		8/8/1939	Coalinga
Bank of Italy (N1140)	X			10/29/1982	Fresno
Birdwell Rock Petroglyph Site (N2193)	X			3/12/2003	Coalinga
Brix, H.H., Mansion (N1235, P438)	X		X	9/15/1983 (N) 10/1/1975 (P)	Fresno
Coaling Station A (P7)			X	12/16/1966	Coalinga
Coalinga Polk Street School (N1099)	X			5/6/1982	Coalinga
Dinkey Creek Bridge (N1957)	X			9/5/1996	Dinkey Creek
Einstein House (N554, P440)	X		X	1/31/1978 (N) 10/1/1975 (P)	Fresno
Fig Garden Woman's Club (P799)			X	7/18/1994	Fresno
Forestiére Underground Gardens (N524, 916)	X	X		10/28/1977 (N) 1/31/1978	Fresno
Fort Miller (584)		X		5/22/1957	Friant
Fowler's Switch (P299)			X	5/2/1973	Fowler
Fresno Bee Building (N1158)	X			11/1/1982	Fresno
Fresno Brewing Company Office and Warehouse (N1260)	X			1/5/1984	Fresno
Fresno City (488)		X		8/7/1951	Tranquillity
Fresno Memorial Auditorium (N1867)	X			5/10/1994	Fresno
Fresno Republican Printery Building (N738)	X			1/2/1979	Fresno
Fresno Sanitary Landfill (N2140)	X			8/7/2001	Fresno
Gamlin Cabin (N471)	X			3/8/1977	Wilsonia
Holy Trinity Armenian Apostolic Church (N1450)	X			7/31/1986	Fresno
Hotel Californian (N2235)	X			4/21/2004	Fresno
Kearney, M. Theo, Park and Mansion (N335, P5)	X		X	3/13/1975 (N) 8/5/1966 (P)	Fresno
Kindler, Paul, House (N1141)	X			10/29/1982	Fresno
Kingsburg Railroad Depot (P694)			X	3/30/1988	Kingsburg
Knapp Cabin (N727)	X			12/20/1978	Cedar Grove
Maulbridge Apartments (N1100)	X			5/6/1982	Fresno
Meux House (N324, P437)	X		X	1/13/1975 (N) 10/1/1975 (P)	Fresno
Milwood Townsite (P4)			X	8/5/1966	Miramonte

Name (Landmark Plaque Number)	National Register	State Landmark	Point of Interest	Date Listed	City
Old Administration Building, Fresno City College (N282)	X			5/1/1974	Fresno
Old Fresno Water Tower (N114)	X			10/14/1971	Fresno
Orange Cove Santa Fe Railway Depot (N658)	X			8/29/1978	Orange Cove
Pantages, Alexander, Theater (N559)	X			2/23/1978	Fresno
Physicians Building (N701)	X			11/20/1978	Fresno
Reedley National Bank (N1344)	X			2/28/1985	Reedley
Reedley Opera House Complex (N1276)	X			4/5/1984	Reedley
Rehorn House (N982)	X			1/8/1982	Fresno
Romain, Frank, House (N986)	X			1/11/1982	Fresno
San Joaquin Light & Power Corporation Building (N2310)	X			1/3/2006	Fresno
Santa Fe Hotel (N1673)	X			3/14/1991	Fresno
Santa Fe Passenger Depot (N443)	X			11/7/1976	Fresno
Settlement of Academy (P45)			X	9/22/1967	Toll House
Shorty Lovelace Historic District (N555)*	X			1/31/1978	Pinehurst
Site of First Junior College in California (803)		X		6/28/1965	Fresno
Site of the Fresno Free Speech Fight of the Industrial Workers of the World (873)		X		7/19/1974	Fresno
Southern Pacific Passenger Depot (N561)	X			3/21/1978	Fresno
Stoner House (N1390)	X			10/17/1985	Sanger
Sycamore Point (P226)			X	10/5/1971	Friant
Temporary Detention Camps for Japanese Americans-Fresno Assembly Center (934)		X		5/13/1980	Fresno
Temporary Detention Camps for Japanese Americans-Pinedale Assembly Center (934)		X		5/13/1980	Pinedale
Tollhouse (P145)			X	11/3/1969	Toll House
Tower Theatre (N1795)	X			9/24/1992	Fresno
Twining Laboratories (N1681)	X			3/26/1991	Fresno
Warehouse Row (N564)*	X			3/24/1978	Fresno
YWCA Building (N673, P439)	X		X	9/21/1978(N) 10/1/1975 (P)	Fresno

Source: California Department of Parks and Recreation Office of Historic Preservation, <http://ohp.parks.ca.gov/>

*Historic district

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets. Note: Since these structures are not protected, it is possible that they no longer exist.

- The **Historic American Buildings Survey (HABS)** documents America's architectural heritage. The following are the HABS structures in Fresno County:
 - Burnett Nurse's Home, 120 North Howard Street, Fresno
 - Camp Barbour Blockhouse, Millerton vicinity
 - Fort Miller Bakery, Lake Millerton, Millerton
 - Fort Miller Ford, Lake Millerton, Millerton

- Fort Miller Hospital, Lake Millerton, Millerton
- Fort Miller Mess Hall, Lake Millerton, Millerton
- Fort Miller Officer’s Quarters, Lake Millerton, Millerton
- Fort Miller, Lake Millerton, Millerton
- Ira H. Brooks House, 350 North Fulton Avenue, Fresno
- Shelter Cabin, Muir Pass, Big Pine vicinity
- The **Historic American Engineering Record** documents historic sites and structures related to engineering and industry. The following are the HAER structures in Fresno County:
 - Big Creek Hydroelectric System, Big Creek Town, Operator House Garage, Orchard Avenue south of Huntington Lake Road, Big Creek vicinity
 - Big Creek Hydroelectric System, Big Creek Town, Operator House, Orchard Avenue south of Huntington Lake Road, Big Creek vicinity
 - Big Creek Hydroelectric System, Powerhouse 3 Penstock Standpipes, Big Creek, Big Creek vicinity
 - Big Creek Hydroelectric System, Powerhouse 8, Operator Cottage, Big Creek, Big Creek vicinity
 - Hume Lake Dam, Sequoia National Forest, Hume

The Fresno County General Plan Background Report identifies the following, some of which are already mentioned above, as historic properties in Fresno County:

1.O.O.F. Hall	Beeler/Thorton Shop (denied by City)	Cardwell Home
Academy	Bekins Van & Storage	Carlson Home
Alamo/Helm House	Bernhauer House	Carmel Saddlery
Alexander Home	Berry Home	Carnegie Library
American Self Storage (denied by city)	Berven Rug Mills	Centennial Stump
Anderson Home	Besaw Home	Centerville
Arioto, Thomas; Home	Bethel Lutheran Church	Central Packaging/Supply
Armenian Presbyterian Church (demolished)	Bing Kong Tong Asso. Building	Chicago Stump
Arroyo De Cantua	Black Market (denied by city)	Chorbajian Home (demolished)
Aten Residence	Bonsel/Rush/Hunt Home (relocated)	City Fire Alarm Station
Back (Beck) Home	Booker House	City Fire Alarm Station
Baker Valley Historic District	Boole Tree	Clements Service Station
Bank of America Building	Bow On Ton Asso. Building	Clovis Carnegie Library
Bank of Italy (Fresno)	Brix Apartments (removed from city list)	Clovis Cole Home
Bank of Italy (Reedley)	Brix Home	Cobb Home
Barkdale Home	Burks, Drs.; Home	Collins Residence
Barton Opera House (non extent)	Caldwell Home	Converse Basin Grove
Basque Hotel	California Products Company	Converse Hoist Site
Bauder Home	Camp Barbour Blockhouse	Cowdrey Home
Bean Home	Campbell’s Store	Craycroft Home
		Davidson Home
		Einstein Home
		El Camino Viejo
		Elkhorn Springs

Eulless Home (denied by city)
 Evinger Home
 Ewing Home (denied by city)
 Eymann, A.C. Home
 Eymann, J.J. Home
 Farr Residence
 Fassett Home (demolished)
 Fig Garden Women's Club
 Firebaugh's Ferry
 First Church of Christian Science
 First Congressional Church
 First Fresno Store
 First Mexican Baptist Church
 First Presbyterian Church (proposed)
 First Store in Fresno
 First Store, James Pager 1872
 First United Methodist Church (proposed)
 Forestiere Underground Gardens
 Forkner Home
 Fort Miller Blockhouse
 Fort Miller Site
 Fort Washington Site
 Forthcamp Home
 Fowler's Switch
 Frank Dusy Home Site
 Frankenau Home (proposed)
 Free Speech Fight Site
 Freemont, John C.; Kearney Park
 Fresno Bee Building
 Fresno Brewery Company
 Fresno Buddhist Temple
 Fresno City College Library
 Fresno City Hall
 Fresno Copper Mine
 Fresno County Hall of Records
 Fresno County Seat
 Fresno Fire Alarm Station
 Fresno Irrigation District/Moses J. Church
 Fresno Junior College
 Fresno Memorial Auditorium
 Fresno Planning Mill
 Fresno Republican/Print Building

Fresno Temple Church of God
 Fresno Traction Company
 Fresno Trolley Cars
 Gamlin Cabin
 Gemer Home
 Gerlitz Home
 Gibbs Home
 Giffen Home (denied by city)
 Gilbert Residence (denied by city)
 Goodman Residence
 Graff Home
 Grant House
 Grant Tree/Nations Christmas Tree
 Green Bush Spring Plaque
 Gregory Home
 Griffen Home; Blackstone Ave
 Groundwater Irrigation Plaque
 Guarantee Savings Building
 Gundelfinger, Henry, Home
 Gundelfinger, Herbert, Home
 Gundelfinger, Louis, Home
 Hanger Home
 Hansen House
 Hansen, Jens; House
 Hare, Drs., Home
 Hayhurst Home
 Hays Home
 Helm Building
 Hero Home
 Hewitt Residence
 Hines Home
 Hines Home; Blackstone Ave
 Hobbs Parsons Produce Co.
 Holt Lumber Company
 Holy Trinity Armenian Apostolic Church
 Hoover Residence
 Hotel California
 Hotel Fresno
 Hotel Virginia
 Howard, Dr. Oliver, Home
 Hughes Home
 Hume Lake Dam
 Hunt/Bonsel Home (relocated)
 Huntington/Douglas Stump

Ingmire, Ovid; Home
 J.C. Penny Store
 Jamieson Home
 Japanese American Detention Site
 Jensen Home
 Johnson Home
 Johnson Home; Illinois Ave
 Johnson, N.M., Home
 Kearney Boulevard
 Kearney Mansion
 Kerman Union High School
 Kern Kay Hotel
 Kindler, Paul House
 King Solomon Lodge
 Kings River Irrigation Plaque
 Kingsburg Railroad Depot
 Knapp Cabin; Cedar Grove
 Kutner Home
 La Libertad
 Laguna de Tache Land Office (burned)
 Laton Library Building
 Legler Residence
 Leslie House
 Letcher
 Liberty Theatre/Hardys
 Long/Black Home
 Main Home
 Main Post Office
 Maracci, Joseph, Home
 Mason Building
 Masonic Hall
 Mattel Building
 Maubridge Apartments
 McAlpine Home
 McCollum Home
 McKay Home
 McIndoo/Phillips Home
 Meux Home, Museum
 Meux, John, Home (burned)
 Mill Ditch
 Miller Home
 Millerton Site
 Millwood Site
 Mink Home
 Mosgrove Home
 Mundroff Home
 National Warehouse
 Nestel Home
 Neverman Home

Newman Home
 Nye, Judge, Home
 Ohannesian Home
 Oil City
 Okamoto's Dept. Store
 Okonogi Home
 Old Administration Building
 Old Barn "M" Street
 Old Clovis Courthouse
 Old Fresno City Site
 Old Fresno Unified School Building
 Old Fresno Water Tower
 Old St. Agnes Hospital
 Orangedale Odd Fellow's Lodge 211 (proposed)
 Owen Home
 P.G.kE. Building
 Pantages, Alexander; Theater
 Parret Home
 Patterson, T.W., Building
 Pattison House
 Peden Home
 Peterson Home
 Phelan, James, Building
 Physicians Building
 Pine Flat Dann Plaque
 Pinedale Elementary Plaque
 Pollasky Railroad
 Poole's Ferry
 Porteous Home
 Posa de China Site
 Post Office Substation; Inyo
 Prescott, F.K. Home
 Post Office; Tulare
 Prescott, F.K. Home
 Pueblo de las Juntas
 Radin-Kamp Dept. Store
 Railroad Anniversary Plaque; 100 Anniversary
 Rainbow Ballroom
 Ramona Apartments (demolished)
 Reedley National Bank
 Reedley Opera House
 Rehorn Residence
 Reyburn Home
 Rheingans Home
 Riverview Ranch House
 Robinson Home
 Roessler Home

Roessler Winery
 Romain Home
 Rowell Building
 Rowell Home
 Rustigan Building
 Rutherford Home (not extant)
 Saddler Office Supply
 San Joaquin Grocers
 Wholesale
 San Joaquin Valley Coal Mine
 San Joaquin Valley Railroad
 Sanger Depot Museum
 Sanger Lodge #316 (proposed)
 Sanger Womens Club
 Santa Fe Depot, Fresno
 Santa Fe Depot; Orange Cove
 Santa Fe Motel
 Saroyan Home; El Monte Way
 Saroyan Home; Griffith Way
 Schmidt Home
 Schutz Residence (non extant)
 Scottish Rite Temple
 Scottsburg Site
 Security Bank Building
 Selma Flouring Mill
 Selma, Townsite
 Sharer Home
 Shipp Home
 Shorty Lovelace Hist. District
 Shuttera Home
 Solorio Residence
 Southern Pacific Depot
 Spencer Home
 Squaw Leap Archeological Dit.
 St. Alphonsus Catholic Church
 St. Ansgar's Lutheran Church
 St. Genevieve's Catholic
 St. John's Cathedral
 St. John's Hall School
 St. John's Rectory
 St. Paul's Armenian Church
 Staley House
 Station "A" Postal Service
 Steinwand Home
 Stone Home

Stoner House
 Sun Maid Raisin Growers (demolished)
 Sun Stereo Warehouse
 Swedish Methodist Church
 Swift Home
 Sycamore Bend
 Teilrnan Home
 Temple Beth Israel
 Theatre 3
 Thomas, Montgomery; Home
 Thompson Residence
 Tinkler Mission Chapel
 Tollhouse Grade
 Towne Apartments
 Tranquillity Site
 Traveler's Hotel
 Turner Building
 Turpin Home
 Twin Sisters/McVey House
 Twining Laboratories
 Van Ness Gate
 Van Volkenburgh Home
 Vartanian Home
 Vincent Home
 Vincent Home; San Pablo Ave
 Warehouse Row
 Warehouse Row Packing
 Warehouse Row Storehouse
 Warrior's/Pantages Theater
 Water Works Assoc.
 Webb House
 Weems House
 Welsh Home
 Wilson Theater Building
 Wishon Home
 Wishon, A.G.; Home
 Wishon, A.G.; Home, Fulton St
 Woolfolk Home
 YWCA Residence Hall
 Yost & Webb Mortuary
 Yost Sr Webb
 Mortuary/Martin
 Young Home
 Zacky Farm Grain Elevator

A 1988 publication from the state’s Office of Historical Preservation identified 16 “ethnic historic sites” in Fresno County. *Five Views: An Ethnic Historic Site Survey for California* was originally conceived to broaden the spectrum of ethnic community participation in historic preservation activities and to provide better information on ethnic history and associated sites. The 16 sites are as follows:

- Burr Ranch/Smith Brothers Ranch (Black American)
- Fowler City Park (Black American)
- Gabriel Moore Ranch (Black American)
- Young’s Place (Black American)
- First Mexican Baptist Church (Mexican American)
- Fresno Buddhist Church (Japanese American)
- Fresno Nihonmachi (Japanese American)
- H. Sumida Company (Japanese American)
- Iseki Labor Camp (Japanese American)
- Kamikawa Brothers (Japanese American)
- Nihin Byoin-Hashiba Sanitarium (Japanese American)
- Okonogi Hospital Site (Japanese American)
- Reedley Kyogi-Kai Hall (Japanese American)
- Bowles (Japanese American)
- Selma Japanese Mission Church (Japanese American)
- KGST (Mexican American)

The Fresno County General Plan Background Report also identifies 13 museums in Fresno County, most of which are located in the City of Fresno. They are all privately owned and operated nonprofit organizations.

- African-American Museum, Fresno (city)
- Centro Bellas Artes, Fresno (city)
- Clovis-Big Creek Historical Museum, Clovis
- Discovery Center, Fresno (city)
- Forestiere Underground Gardens, Fresno (city)
- Fresno Art Museum, Fresno (city)
- Fresno Metropolitan Museum, Fresno (city)
- German Museum, Fresno (city)
- Kearney Mansion Museum, Fresno (city)
- Meux Home Museum, Fresno (city)
- R.C. Baker Memorial Museum, Coalinga
- Reedley Museum, Reedley
- Sanger Depot Museum, Sanger

It should be noted that these lists may not be complete, as they may not include those properties currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Natural Resources

Natural resources are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as stores and reduces the force of floodwaters.

Central Coast Range Region

Only a small portion of the far western edge of Fresno County lies in the central Coast Range region. This area supports a mosaic of summer dry grassland, blue oak and blue oak-foothill pine woodland, and chaparral habitat types. Western Fresno County transitions from the grasslands and agriculture of the Central Valley to the inner coast region. Mostly intermittent streams flow from the inner Coast Range to the valley floor. Some can support riparian habitat that provides additional value to both resident and migratory wildlife.

San Joaquin Valley Floor Region

More than 50 percent of Fresno County lies in the southern San Joaquin Valley subregion of the Central Valley. This southern subregion is generally hotter and drier than the subregion to the north and supports some desert elements. The valley floor region has undergone extensive conversion of native habitats that existed before European settlement of the state. Presently, this region supports extensive amounts of agriculture and urban development around the Fresno, Clovis, and Sanger areas.

In the few remaining areas not converted to urban or agriculture use, unique biological features persist. Mixed in with areas of grassland habitat are freshwater and alkaline vernal pools that support unique native flora and fauna. A few small isolated areas of sodic vernal pools occur in the northwestern part of the County, primarily at the Kerman reserve. Concentrations of freshwater vernal pools occur in a belt along the northeast edge of the valley floor region north of the Kings River. In the highly modified Central Valley, vernal pool areas are often grazed but remain a unique biological relic of native California species in the natural landscape.

The rivers and streams that flow from the mountains in the east historically meandered through broad floodplain. Because of urbanization and agriculture, these broad floodplains have been

restricted to narrower belts along the rivers and streams or otherwise modified for flood control. In the upper San Joaquin River, the floodplains are naturally constrained by high bluffs bordering the river. Within this modified landscape, the remaining riparian habitat provides corridors and linkages to and from the biotic regions of the County and is of great value to resident and migratory wildlife. The San Joaquin and Kings river systems and the Fresno Slough are the major waterways in the County.

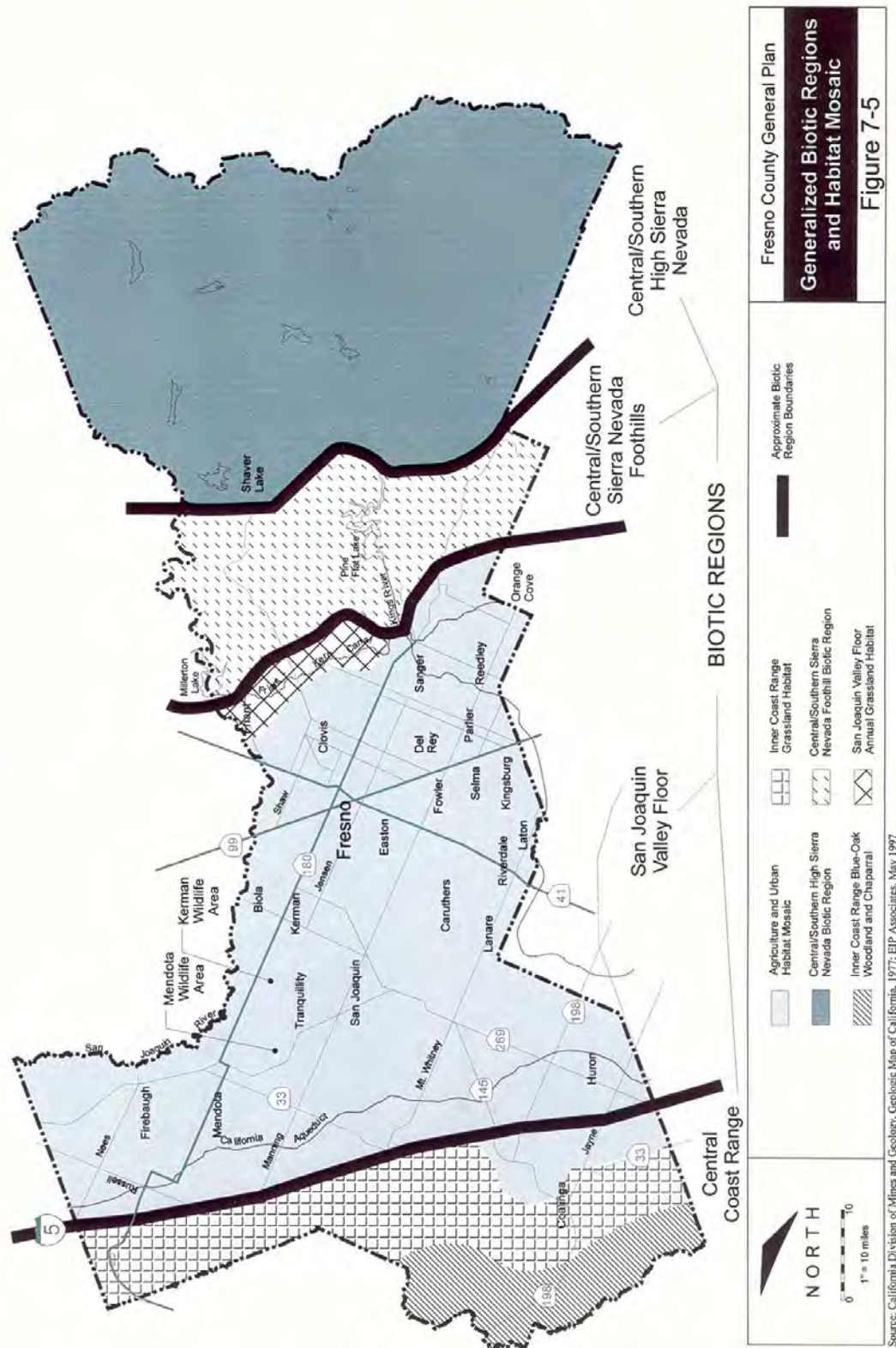
Central Southern Sierra Nevada Foothills

Fresno County includes a portion of the central and southern subregions of the Sierra Nevada Mountains that can be further divided into a central/southern Sierra Nevada foothill and central/southern high Sierra Nevada district. The foothill district is best differentiated from the high Sierra and the San Joaquin Valley areas by habitat types that change with topography. The foothills that are the transition from the valley floor to the high Sierra can be characterized by blue oak and blue oak-foothill pine woodlands and chaparral habitats dotted with areas of serpentine soils. Density and canopy coverage of tree species is highly variable depending on natural conditions such as soils, topography, slope and aspect, and human influences from grazing, hardwood harvesting, and other land clearing activities. Moderate gradient perennial and intermittent streams and rivers support a varied amount of riparian habitat that provide valuable habitat for wildlife.

Central/Southern High Sierra Nevada

The transition from the foothills to the high Sierra Nevada can be characterized by the addition of ponderosa pine at the low elevations into the dominant plant species composition (from around 2,000 feet). The foothills to high Sierra biotic regions make a transition through a mixed hardwood conifer habitat to those habitats dominated by conifers, such as ponderosa pine, white fir, and giant sequoia. In the higher elevations, Jeffrey pine, lodgepole pine, and treeless alpine communities dominate. Rivers and streams are at a higher gradient than their foothill or valley floor reaches and support a montane riparian habitat that, like the others, provides valuable habitat for resident and migratory wildlife. The majority of the high Sierra region in Fresno County is included in the Sequoia and Sierra National Forests and Kings Canyon National Park and managed by their respective federal agencies for recreational, timber, tourism, and wilderness values.

Figure 4.60 Fresno County's Generalized Biotic Regions and Habitat Mosaic



Source: Fresno County General Plan, 2000

Each region hosts specific habitats that together support a wide variety of vegetation and wildlife (see Table 4.30), and each region has different susceptibilities to hazards such as wildfire, flood, and drought. Fresno County recognizes the importance of protecting, preserving, conserving, and restoring this biodiversity.

Table 4.30 Fresno County Habitat Types by Biotic Region

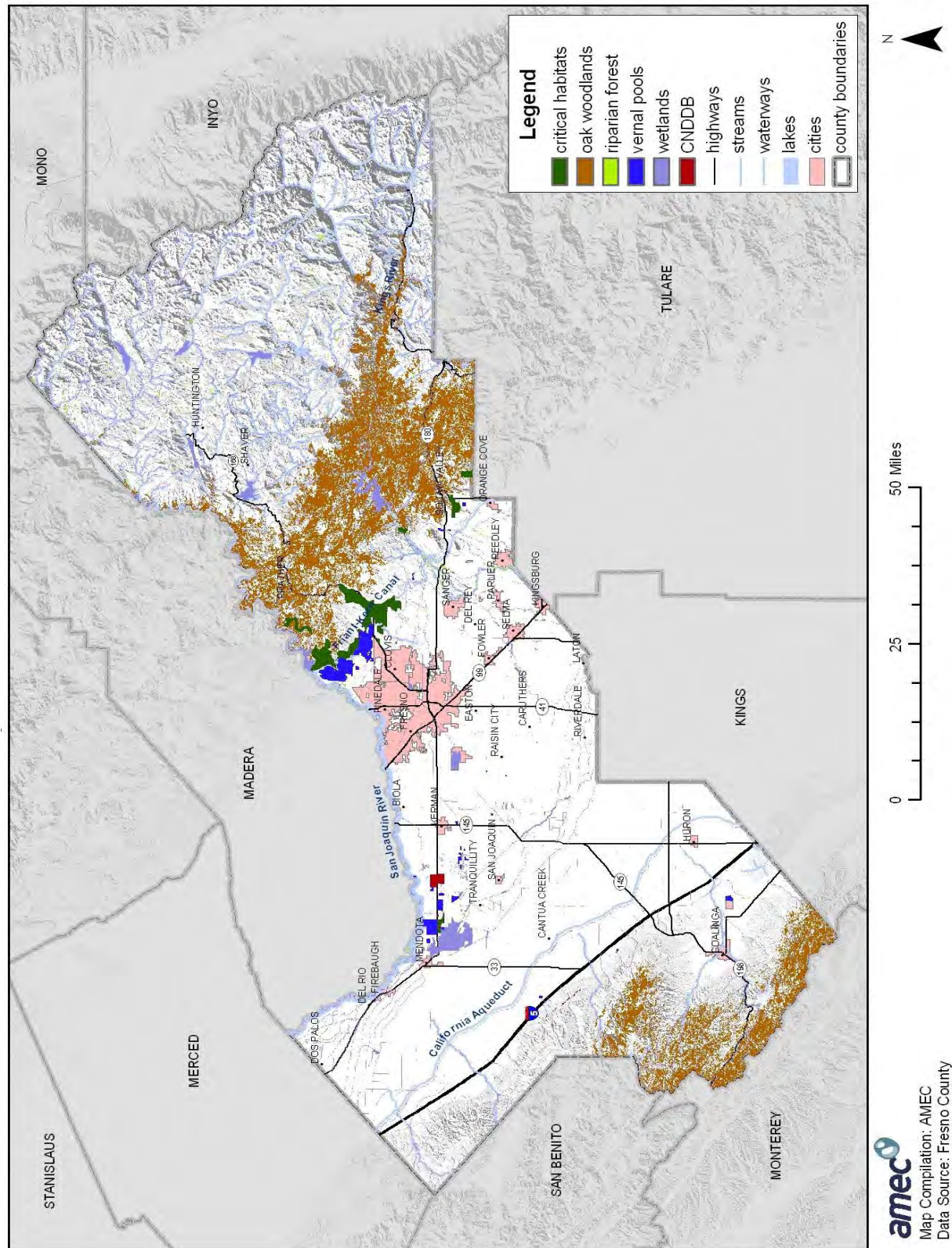
Central Coast Range	San Joaquin Valley Floor	Central/Southern Sierra Nevada Foothills	Central/Southern High Sierra Nevada
<ul style="list-style-type: none"> • Annual/Ruderal Grassland • Valley Oak Woodland • Pasture • Cropland • Valley-Foothill Riparian/Riverine • Fresh Emergent Wetland • Larustrine • Blue Oak Woodland • Blue Oak-Foothill Pine Woodland • Mixed Chaparral • Chamise-Redshank Chaparral 	<ul style="list-style-type: none"> • Annual/Ruderal Grassland • Vernal Pool • Alkali Scrub • Pasture • Cropland • Orchard-Vineyard • Urban • Valley-Foothill Riparian • Fresh Emergent Wetland • Lacustrine 	<ul style="list-style-type: none"> • Annual/Ruderal Grassland • Pasture • Cropland • Orchard-Vineyard • Urban • Valley-Foothill Riparian • Fresh Emergent Wetland • Larustrine • Blue Oak Woodland • Blue Oak Foothill Fine Woodland • Mixed Chaparral • Chamise-Redshank Chaparral 	<ul style="list-style-type: none"> • Montane Chaparral • Montane Hardwood-Conifer • Montane Riparian • Sierran Mixed Conifer • Ponderosa Pine • Jeffrey Pine • White Fir • Red Fir • Lodgepole Pine • Subalpine Conifer • Alpine Dwarf Scrub • Wet Meadow • Bitterbrush • Juniper

Source: Fresno County General Plan, 2000

Approximately one third of the County lies within land under federal jurisdiction. The USDA Forest Service and National Parks Service manage these lands for recreation, biology, wilderness, tourism, timber, and mining under federal guidelines, policies, and laws. The biotic regions that are outside of federal ownership and, therefore, most subject to development are the Central Coast Range, San Joaquin Valley Floor, and the lower Sierra Nevada foothills.

For purposes of this plan, natural resources include special-status species, sensitive habitats, wetlands, and other natural resources identified by the HMPC. Figure 4.61 further illustrates Fresno County's environmental features.

Figure 4.61 Fresno County's Environmental Features



Special-Status Species

To further understand natural resources that may be particularly 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.

Information from the U.S. Fish and Wildlife Service and the California Natural Diversity Data Base, a program that inventories the status and locations of rare plants and animals in California, was combined to create an inventory of special-status species in Fresno County. The full inventory, along with information about habitat requirements and distribution where available from the Fresno County General Plan Background Report, is available in Appendix B: Special-Status Species in Fresno County. Table 4.31 lists national and state endangered, threatened, rare, and candidate species in Fresno County by species type.

Table 4.31 Endangered, Threatened, Rare, and Candidate Species in Fresno County

Common Name	Scientific Name	Federal Status	California Status
Amphibians			
California red-legged frog	<i>Rana aurora draytonii</i>	Threatened	None
California tiger salamander*	<i>Ambystoma californiense</i>	Threatened	None
Sierra Madre (=mountain) yellow-legged frog	<i>Rana muscosa</i>	Endangered	None
Sierra Nevada yellow-legged frog	<i>Rana sierrae</i>	Candidate	None
Yosemite toad	<i>Bufo canorus</i>	Candidate	None
Birds			
Bald eagle	<i>Haliaeetus leucocephalus</i>	Delisted	Endangered
Bank swallow	<i>Riparia</i>	None	Threatened
California condor	<i>Gymnogyps californianus</i>	Endangered	Endangered
Great gray owl	<i>Strix nebulosa</i>	None	Endangered
Swainson's hawk	<i>Buteo swainsoni</i>	None	Threatened
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	Candidate	Endangered
Willow flycatcher	<i>Empidonax traillii</i>	None	Endangered
Fish			
Central Valley steelhead	<i>Oncorhynchus mykiss</i>	Threatened	None
Lahontan cutthroat trout	<i>Oncorhynchus (=Salmo) clarkii henshawi</i>	Threatened	None
Paiute cutthroat trout	<i>Oncorhynchus (=Salmo) clarkii seleniris</i>	Threatened	None
Invertebrates			
Valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	Threatened	None
Vernal pool fairy shrimp*	<i>Branchinecta lynchi</i>	Threatened	None

Common Name	Scientific Name	Federal Status	California Status
Vernal pool tadpole shrimp*	<i>Lepidurus packardii</i>	Endangered	None
Mammals			
California wolverine	<i>Gulo</i>	None	Threatened
Fresno kangaroo rat*	<i>Dipodomys nitratoideis exilis</i>	Endangered	Endangered
Giant kangaroo rat	<i>Dipodomys ingens</i>	Endangered	Endangered
Nelson's antelope squirrel	<i>Ammospermophilus nelsoni</i>	None	Threatened
Pacific fisher	<i>Martes pennanti (pacifica) DPS</i>	Candidate	None
San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	Endangered	Threatened
Sierra Nevada (=California) bighorn sheep	<i>Ovis canadensis sierrae (=californiana)</i>	Endangered	Endangered
Sierra Nevada red fox	<i>Vulpes necator</i>	None	Threatened
Tipton kangaroo rat	<i>Dipodomys nitratoideis</i>	Endangered	Endangered
Plants			
Boggs Lake hedge-hyssop	<i>Gratiola heterosepala</i>	None	Endangered
California jewel-flower	<i>Caulanthus californicus</i>	Endangered	Endangered
Congdon's lewisia	<i>Lewisia congdonii</i>	None	Rare
Greene's tuctoria	<i>Tuctoria greenei</i>	Endangered	Rare
Hairy Orcutt grass*	<i>Orcuttia pilosa</i>	Endangered	Endangered
Hartweg's golden sunburst	<i>Pseudobahia bahiifolia</i>	Endangered	Endangered
Hoover's eriastrum	<i>Eriastrum hooveri</i>	Delisted	None
Keck's checkerbloom (=checker-mallow)*	<i>Sidalcea keckii</i>	Endangered	None
Mariposa pussypaws	<i>Calyptidium pulchellum</i>	Threatened	None
Palmate-bracted bird's-beak	<i>Cordylanthus palmatus</i>	Endangered	Endangered
San Benito evening-primrose	<i>Camissonia benitensis</i>	Threatened	None
San Joaquin adobe sunburst	<i>Pseudobahia peirsonii</i>	Threatened	Endangered
San Joaquin Valley Orcutt grass*	<i>Orcuttia inaequalis</i>	Threatened	Endangered
San Joaquin woollythreads	<i>Monolopia congdonii (=Lembertia congdonii)</i>	Endangered	None
Slender moonwort	<i>Botrychium lineare</i>	Candidate	None
Succulent (=fleshy) owl's-clover	<i>Castilleja campestris ssp. succulenta</i>	Threatened	Endangered
Tompkins' sedge	<i>Carex tompkinsii</i>	None	Rare
Tree-anemone	<i>Carpenteria californica</i>	None	Threatened
Reptiles			
Blunt-nosed leopard lizard	<i>Gambelia (=Crotaphytus) sila</i>	Endangered	Endangered
Giant garter snake	<i>Thamnophis gigas</i>	Threatened	Threatened

Sources: U.S. Fish and Wildlife Service Sacramento Office, www.fws.gov/sacramento/; California Natural Diversity Data Base, www.dfg.ca.gov/biogeodata/cnddb/

*According to the U.S. Fish and Wildlife Service, critical habitat is designated for this species

Sensitive Habitats

The California Department of Fish and Game Natural Diversity Data Base identifies 12 sensitive habitat types in Fresno County:

- Big tree forest
- Coastal and valley freshwater marsh
- Great Valley mesquite scrub

- Great valley mixed riparian forest
- Monvero residual dunes
- Northern basalt flow vernal pool
- Northern claypan vernal pool
- Northern hardpan vernal pool
- Northern vernal pool
- Sycamore alluvial woodland
- Valley needlegrass grassland
- Valley sink scrub

Wetlands

Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. Wetland habitats vary from rivers to seasonal ponding of alkaline flats and include swamps, bogs, marshes, vernal pools, and riparian woodlands. Wetlands are considered to be waters of the United States and are subject to the jurisdiction of the U.S. Army Corps of Engineers as well as the California Department of Fish and Game (CDF&G). Where the waters provide habitat for federally endangered species, the U.S. Fish and Wildlife Service may also have authority.

Wetlands are a valuable natural resource for communities due to their benefits to water quality, wildlife protection, recreation, and education and play an important role in hazard mitigation. Wetlands provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation are vital and reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water.

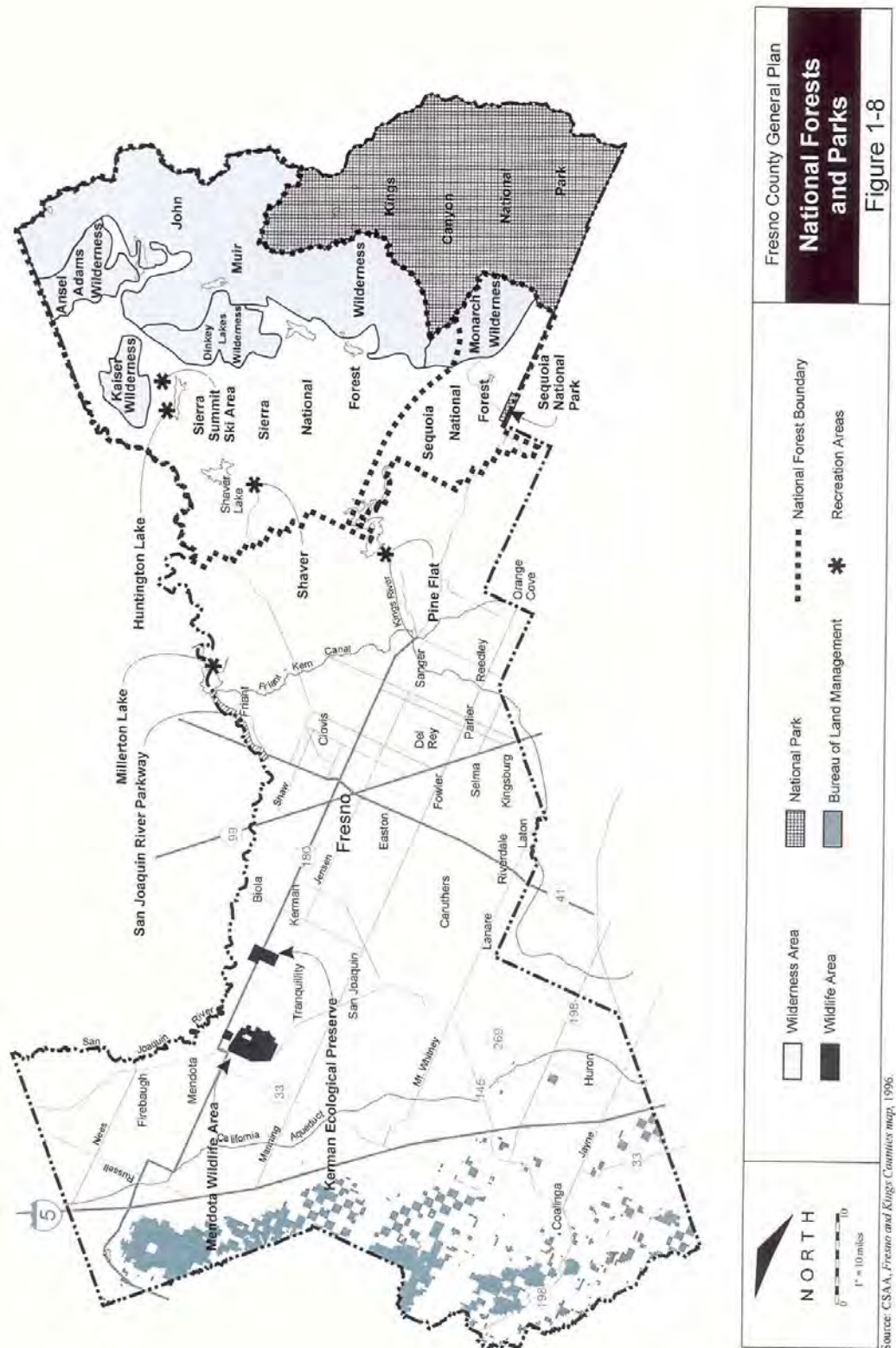
Notable categories of wetlands found in Fresno County include wet meadows in the mountainous region, vernal pools in the foothills, marshes in the valley trough, and reclaimed agricultural lands in western Fresno County. The CDF&G manages several of the major identified wetlands in Fresno County, including the Mendota Wildlife Management Area, Kerman Ecological Reserve, Alkali Sink Ecological Reserve, and smaller wetlands management units along the San Joaquin River. While these lands are currently being adequately protected, environmental concern is primarily focused on wetlands that are not yet identified and protection of remaining vernal pools. Several vernal pool complexes are located near Friant between Friant Road and the Friant-Kern Canal and in the area south of Academy and east of Red Mountain. A large concentration of very high quality vernal pools is found in these areas, and they are considered to be some of the best examples of vernal pools in the state. The County's vernal pools are threatened by urban development and conversion to intensive agriculture.

Other Natural Resources

While some of these resources are not owned or managed by the County, they are important assets for the County (see Figure 4.62).

- **Sierra National Forest**—Managed by the USDA Forest Service, makes up much of the eastern portion of the County north of the Kings River
- **Sequoia National Forest**—Managed by the USDA Forest Service, makes up a small portion of the County south of the Kings River
- **Kings Canyon National Park**—Managed by the National Park Service, encompasses a portion of southeastern Fresno County
- **John Muir, Ansel Adams, Monarch, Kaiser, and Dinkey Lake Wilderness Areas**—Managed by the Bureau of Land Management, located in the eastern portion of the County
- **Mendota Wildlife Area**—Operated by the California Department of Fish and Game, located three miles south of Mendota
- **Kerman Ecological Preserve**—Operated by the California Department of Fish and Game
- **Alkali Sink Ecological Reserve**—Operated by the California Department of Fish and Game
- **Allen Ranch**—640 acres operated by the California Department of Fish and Game
- **Millerton Lake State Recreational Area**—Administered by the California Department of Parks and Recreation

Figure 4.62 National Forests and Parks in Fresno County



Source: Fresno County General Plan, 2000

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability. Information from the Fresno County General Plan Housing Element, the draft 2007 Fresno County Regional Housing Needs Allocation Plan, and the California Department of Finance form the basis of this discussion.

More specific information on growth and development for each participating jurisdiction can be found in the jurisdictional annexes.

Current Status and Past Development

The 2016 estimated population of Fresno County was 979,915. This was an increase of 5.09 percent from the 2010 census population of 932,450. In terms of population, Fresno County is the 10th largest county in California (and the 53rd largest in the United States). Table 4.32 through Table 4.35 illustrate past growth in Fresno County in terms of population, housing units, and density.

Table 4.32 Fresno County's Population Growth 1960-2016

	1960's	1970	1980	1990	2000	2010	2016*
Total	365,945	413,329	514,621	667,490	799,407	932,450	979,915
Change	--	47,384	101,292	152,869	131,917	133,043	47,465
Percent Change (%)	--	12.95	24.51	29.71	19.76	16.64	5.09

Sources: Social Science Data Analysis Network, www.censusscope.org/; California Department of Finance, www.dof.ca.gov/Research/

*Estimate

Table 4.33 Population Growth for Jurisdictions in Fresno County, 2010-2016

Jurisdiction	2010	2016*	% Change	# Change	% of County	% of Total Growth
Clovis	93,631	106,583	13.83%	12,952	10.88%	27.29%
Coalinga	13,380	16,598	24.05%	3,218	1.69%	6.78%
Firebaugh	7,549	8,311	10.09%	762	0.85%	1.61%
Fowler	5,682	6,348	11.72%	666	0.65%	1.40%
Fresno	494,665	522,053	5.54%	27,388	53.28%	57.70%
Huron	6,754	6,941	2.77%	187	0.71%	0.39%
Kerman	13,544	14,594	7.75%	1,050	1.49%	2.21%
Kingsburg	11,382	11,807	3.73%	425	1.20%	0.90%
Mendota	11,014	11,418	3.67%	404	1.17%	0.85%
Orange Cove	9,078	9,586	5.60%	508	0.98%	1.07%
Parlier	14,494	15,179	4.73%	685	1.55%	1.44%
Reedley	24,194	25,582	5.74%	1,388	2.61%	2.92%
San Joaquin	4,001	4,024	0.57%	23	0.41%	0.05%
Sanger	24,270	25,007	3.04%	737	2.55%	1.55%
Selma	23,219	24,597	5.93%	1,378	2.51%	2.90%
All Cities	758,867	808,628	6.56%	49,761	82.52%	105%
Unincorporated	173,583	171,287	-1.32%	-2,296	17.48%	-4.84%
County Totals	932,450	979,915	5.09%	47,465	100%	100%

Source: US Census Bureau. <http://factfinder.census.gov/> *Estimate based on 2010 Census

Table 4.34 Growth in Housing Units for Jurisdictions in Fresno County, 2010-2016

Jurisdiction	2010	2016	% Change	# Change	% of County	% of Total Growth
Clovis	35,306	36,704	4%	1,398	11%	17%
Coalinga	4,344	4,453	3%	109	1%	1%
Firebaugh	2,096	2,189	4%	93	1%	1%
Fowler	1,842	1,803	-2%	-39	1%	0%
Fresno	171,288	175,978	3%	4,690	54%	56%
Huron	1,602	1,815	13%	213	1%	3%
Kerman	3,908	4,025	3%	117	1%	1%
Kingsburg	4,069	3,938	-3%	-131	1%	-2%
Mendota	2,556	2,872	12%	316	1%	4%
Orange Cove	2,231	2,407	8%	176	1%	2%
Parlier	3,494	3,845	10%	351	1%	4%
Reedley	6,867	7,484	9%	617	2%	7%
San Joaquin	934	1085	16%	151	0%	2%
Sanger	7,104	7,079	0%	-25	2%	0%
Selma	6,813	7,014	3%	201	2%	2%
All Cities	254,454	262,691	3%	8,237	81%	99%
Unincorporated	61,077	61,166	0.1%	89	19%	1%
County Totals	315,531	323,857	3%	8,326	100%	100%

Source: US Census Bureau. <http://factfinder.census.gov/> *Estimate based on 2010 Census

Table 4.35 Population and Housing Unit Density for Jurisdictions in Fresno County, 2010-2016

Jurisdiction	Area in Square Miles	2010 Population Density	2010 Housing Unit Density	2016 Population Density*	2016 Housing Unit Density*
Clovis	17.12	5,469	2,062	6,226	2,144
Coalinga	5.96	2,245	729	2,785	747
Firebaugh	2.91	2,594	720	2,856	752
Fowler	2.03	2,799	907	3,127	888
Fresno	104.8	4,720	1,634	4,981	1,679
Huron	1.34	5,040	1,196	5,180	1,354
Kerman	2.16	6,270	1,809	6,756	1,863
Kingsburg	2.34	4,864	1,739	5,046	1,683
Mendota	1.87	5,890	1,367	6,106	1,536
Orange Cove	1.54	5,895	1,449	6,225	1,563
Parlier	1.62	8,947	2,157	9,370	2,373
Reedley	4.49	5,388	1,529	5,698	1,667
San Joaquin	0.99	4,041	943	4,065	1,096
Sanger	4.75	5,109	1,496	5,265	1,490
Selma	4.34	5,350	1,570	5,668	1,616
All Cities	158.26	4,795	1,608	5,109	1,660
Unincorporated	5,859.16	30	10	29	10
County Totals	6,017.42	155	52	163	54

Source: US Census Bureau. <http://factfinder.census.gov/> *Estimate based on 2010 Census

Current Status and Past Development Summary

- 171,287 individuals, 17.48 percent of Fresno County's residents live in the unincorporated portion of the County.
- 808,628 individuals, 82.52 percent, of Fresno County's residents live within the County's incorporated areas.
- Population growth between 2010 and 2016 was greatest in the incorporated areas of Coalinga (24.05%), Clovis (13.83%), Fowler (11.72%) and Firebaugh (10.09%).
- Numerically, the greatest population growth occurred in the Cities of Fresno (27,388) and Clovis (12,952). The combined population of the contiguous cities is 628,636, 64.15 percent of the County's total population.
- Population between 2010 and 2016 decreased by 1.32% (2,296 individuals) in the unincorporated county. Among the incorporated areas, growth was slowest in the City of San Joaquin (0.57%), Huron (2.77%), Sanger (3.04%), and Mendota (3.67%).
- Population growth in the City of Fresno was 57.7 percent of the County's total population growth. The City's housing unit growth was 56.3 percent of the County's total housing unit growth.

- Fresno County's population growth outstripped the increase in housing units by 2.5 percent, suggesting an increasing unmet housing need, larger household sizes (with potential overcrowding), or both.
- With 9,370 people per square mile, Parlier has the highest population density in the County, followed by Kerman (6,756), and Clovis (6,225). Clovis and Kerman displaced Orange Cove since the 2012 update of this plan.
- With 2,373 housing units per square mile, Parlier has the highest housing unit density in the County, followed by Clovis (2,143) and Kerman (1,863).

Future Development

As indicated in the previous section, Fresno County has been steadily growing over the last four decades, and this growth is projected to continue through the middle of the century. Table 4.36 shows the population projections for the County as a whole through 2050.

Table 4.36 Population Projections for Fresno County, 2000-2050

	2000	2010	2020	2030	2040	2050
Population	804,508	983,478	1,201,792	1,429,228	1,670,542	1,928,411
Percent Change (%)		22.25	22.20	18.92	16.88	15.44

Source: California Department of Finance, www.dof.ca.gov/Research/

Table 4.37 shows the population projections for each jurisdiction and the unincorporated area through 2050.

Table 4.37 Detailed Population Projections for Fresno County, 2015-2050

Jurisdiction	2015	2020	2025	2030	2035	2040	2045	2050
Clovis	114,770	123,780	132,830	141,110	149,150	156,860	164,130	171,740
Coalinga	16,530	17,350	18,170	18,920	19,650	20,350	21,010	21,700
Firebaugh	7,780	8,600	9,430	10,180	10,920	11,620	12,280	12,980
Fowler	6,580	7,240	7,890	8,490	9,070	9,630	10,160	10,710
Fresno	574,590	627,190	679,970	728,280	775,190	820,140	862,570	906,950
Huron	6,820	6,990	7,160	7,310	7,460	7,610	7,740	7,890
Kerman	14,880	15,900	16,930	17,860	18,770	19,650	20,470	21,330
Kingsburg	12,750	13,670	14,590	15,440	16,260	17,050	17,790	18,570
Mendota	11,210	12,030	12,850	13,610	14,340	15,040	15,700	16,390
Orange Cove	9,360	9,540	9,710	9,880	10,030	10,190	10,330	10,480
Parlier	15,100	16,100	17,110	18,040	18,940	19,800	20,610	21,460
Reedley	25,570	26,700	27,830	28,870	29,880	30,850	31,760	32,720
Sanger	26,310	27,990	29,680	31,230	32,730	34,170	35,520	36,940
San Joaquin	4,040	4,310	4,580	4,830	5,070	5,310	5,520	5,750
Selma	26,680	28,280	29,870	31,330	32,750	34,110	35,400	36,740
Subtotal Cities	872,970	945,670	1,018,600	1,085,380	1,150,210	1,212,380	1,270,990	1,332,350
Unincorporated	99,330	101,770	104,220	106,460	108,630	110,720	112,680	114,740
Total County	972,300	1,047,440	1,122,820	1,191,840	1,258,840	1,323,100	1,383,670	1,447,090

Future Development Summary

- According to the projections in Table 4.37, all areas of the County will continue to grow, but the percentage of growth will decrease over time, through 2050.
- The Fresno County General Plan assumes that 92.6 percent of the population growth experienced in Fresno County through the year 2020 will be directed to incorporated cities and 7.4 percent will be absorbed in the unincorporated area.
- In evaluating the residential growth potential based on development on vacant sites in the unincorporated areas, Fresno County recognizes the governmental, environmental, and economic influences that may impact the provision of new housing or maintenance of existing housing.
- The Land Resources Inventory verifies that there is no shortage of potentially developable land in Fresno County. Consistent with the County's urban development policy, intensive housing development will be directed to residentially zoned urban areas and established communities where infrastructure and services are available. This policy reflects the commitment to conserve natural and managed resources and to minimize the loss of valuable agriculture land and open space.

Social Vulnerability

Certain demographic and housing characteristics may amplify or reduce overall vulnerability to hazards. These characteristics, such as age, race/ethnicity, income levels, gender, building quality, and public infrastructure, all contribute to social vulnerability.

A Social Vulnerability Index compiled by the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina measures the social vulnerability of U.S. counties to environmental hazards for the purpose of examining the differences in social vulnerability among counties. Based on national data sources, primarily the 2000 census, it synthesizes 42 socioeconomic and built environment variables that research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards (i.e., social vulnerability). Eleven composite factors were identified that differentiate counties according to their relative level of social vulnerability: personal wealth, age, density of the built environment, single-sector economic dependence, housing stock and tenancy, race (African American and Asian), ethnicity (Hispanic and Native American), occupation, and infrastructure dependence. Fresno County ranks in the top 20 percent in the nation and in the state on the vulnerability index, which indicates highest social vulnerability.

Fresno County is the 8th most socially vulnerable County (out of 58 counties) in California. To better understand the characteristics behind this ranking, the HMPC researched information from the 2000 census on four factors of social vulnerability: gender, age, language spoken in home, and wealth/poverty. These factors were analyzed for Fresno County as a whole and individually for each of the incorporated and unincorporated communities. One characteristic of social

vulnerability is differential access to resources and greater susceptibility to hazards. All factors considered here are related to this characteristic. Table 4.38 displays these variables and compares them to the same variables for California and the United States. These factors of social vulnerability hold many implications for disaster response and recovery and are important considerations when identifying and prioritizing mitigation actions and overall goals and objectives of the plan.

Gender

Women may have a more difficult time recovering from disaster than men because of sector-specific employment, lower wages, and family care responsibilities. The percentage of men and women in the County is approximately equal: Fresno County is 50.1 percent female. This is generally true for the incorporated and unincorporated areas; however, Coalinga has a higher proportion of men to women, with 56.3 percent men, as well as Firebaugh (52.5%), and Fowler (51.1%). Some jurisdictions have higher proportions of women, including Huron (52.3%) and Sanger (52.2%).

Age

Age can affect the ability of individuals to move out of harm's way and take care of themselves. The HMPC analyzed two variables for age, percentage of population age 65 and over and percentage under age 18.

According to the Fresno County General Plan, the percentage of children in Fresno County decreased from 30.2 percent in 2010 to 29.3 percent in 2014. Fresno County as a whole has higher percentage of children than the state average, 29.3 percent and 24.2 percent respectively. Some cities have between 35 and 45 percent of their population under the age of 18 (San Joaquin, Orange Cove, Huron, Parlier). Fresno County's children population grew at an average annual rate of 0.3 percent while the statewide population of children declined at an average annual rate of -0.3 percent. The incorporated areas of the county, especially Coalinga, Fowler, and Kerman, the population of children grew rapidly over the period. The unincorporated county had a slight increase in the population of children between 2010 and 2014, an average annual growth rate of 0.4 percent. Although the low proportion of elderly residents in many areas lowers vulnerability; some of these areas have a high percentage of children, which heightens vulnerability

Fresno County has a slightly smaller percentage of seniors (10.6 percent) than California (12.1 percent). Fresno County's senior population grew at an average annual rate of 2.9 percent, compared to 3.3 percent for California. Unincorporated Fresno County has a higher percentage of seniors (14.9 percent) than the whole of Fresno County (10.6 percent), and higher than any of the individual incorporated cities. Huron experienced the highest average annual growth in the senior population, at a rate of 27.3 percent. The incorporated cities of Kerman, Reedley, and San Joaquin were the only cities to experience a negative average annual growth rate among the senior population. The percent of the population age 65 and over is particularly high in Kingsburg (10.4%), and Reedley (13.2%).

Language Spoken at Home

Language barriers can affect communication of warning information and access to post-disaster funding. In California, 39.5 percent of the population speaks a language other than English in the home. This is much higher than for the United States as a whole, which is 17.9 percent. Fresno County has a slightly higher percentage than the state: 40.8 percent. In more than half of Fresno County's cities and census-designated places, more than half of the populations speak languages other than English at home. In a number of communities, this percentage exceeds 75 percent: San Joaquin (89.8 percent), Huron (86.9 percent), Cantua Creek (83.3 percent), Parlier (82.9 percent), Mendota (82 percent), Calwa (81.8 percent), Orange Cove (77.9 percent), Firebaugh (77.1 percent), and Biola (76.8 percent). While this does not mean these populations do not speak English (20.7 percent of the County's population speaks English less than "very well"), these figures are indicative of cultural differences that may affect receipt of and response to disaster information.

Wealth and Poverty

Wealth and poverty are also indicators of social vulnerability. Low income and impoverished populations have fewer resources available for recovery and are more likely to live in structures of greater physical vulnerability. Wealthier communities often have greater capabilities to mitigate hazards and greater access to funds for recovery.

To compare wealth and poverty, the HMPC analyzed the percentage of individuals below the poverty level and the median home value in each city and census-designated place in Fresno County. Fresno County overall has a higher percentage of people living below the poverty level, 22.9 percent, than California (14.2 percent) or the nation (12.4 percent). Poverty is highest in the unincorporated areas of Orange Cove (44.5 percent) and Mendota (41.9 percent). The median value of single-family, owner-occupied homes in Fresno County in 2000 was \$104,900 compared to \$211,500 in California. Home values are lowest (below \$80,000) in Cantua Creek, Lanare, Biola, Del Rey, Calwa, Tranquillity, Huron, and Laton.

Table 4.38 Measures of Fresno County's Social Vulnerability

	Total Population	Total Housing Units	% Females	% Under Age 18	% Age 65 and Over	% Speak Language Other than English in Home**	% Individuals Below Poverty Level**	Median Value (\$), Single-Family Owner-Occupied Homes**
United States	308,745,538	133,351,840	50.9	24.0	13	17.9	15.5	178,600
California	37,253,956	13,845,790	50.3	28.1	12.5	39.5	16.3	385,500
Fresno County	930,450	321,955	49.9	28.2	6.1	40.8	26.8	194,600
Clovis	95,630	36,270	51.6	25.4	5.7	17.1	13.8	247,700
Coalinga*	13,380	4,472	43.7	33.0	5.9	42.2	23.2	154,600
Firebaugh	7,550	2,248	47.5	32.3	9.0	77.1	33.5	121,600
Fowler	5,570	154,600	48.9	29.6	9.0	53.7	25.3	204,500
Fresno	494,670	174,593	50.8	37.9	2.4	39.5	29.8	177,500
Huron	6,750	1,861	52.3	36.0	9.4	86.9	35.8	122,900
Kerman	13,540	3,975	50.5	26.4	10.4	62.4	25.6	174,300
Kingsburg	11,380	3,900	51.5	33.5	4.2	23.7	17.9	223,000
Mendota	11,010	2,951	47.	38.1	6.1	82	46.5	108,100
Orange Cove	9,080	2,460	51.6	35.4	5.7	77.9	53.0	116,300
Parlier	14,490	3,844	49.2	30.1	13.2	82.9	42.3	113,300
Reedley	24,190	7,240	49.7	30.8	9.2	58.8	26.7	164,200
San Joaquin	4,000	1,044	52.2	42.5	5.6	89.8	54.2	103,100
Sanger	24,270	7,350	50.7	29.9	9.4	65	23.0	161,800
Selma	23,220	6,984	49.8	28.2	6.1	55.6	24.3	164,100

Source: U.S. Census Bureau, 2010, American Community Survey 2015 estimates, www.census.gov

*Population count revised

**Based on sample data

4.3.2 Vulnerability of Fresno County to Specific Hazards

The Disaster Mitigation Act regulations require the HMPC to evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the County's vulnerability to each of the hazards. Where specific hazards vary across the County vulnerability is broken out by jurisdiction where feasible; additional information can be found in the jurisdictional annexes. The hazards evaluated further as part of this vulnerability assessment include, in alphabetical order:

- Agricultural Hazards
- Avalanche
- Dam Failure
- Drought
 - Tree Mortality
- Earthquake
- Flood
 - Levee Failure
- Human Health Hazards
 - Epidemic/Pandemic
 - West Nile Virus
- Landslide
- Soil Hazards
 - Erosion
 - Expansive Soil
 - Land Subsidence
- Severe Weather
 - Extreme Temperatures
 - Extreme Cold/Freeze
 - Extreme Heat
 - Fog
 - Heavy Rain/Thunderstorm/Hail/Lightning
 - Windstorm
 - Snowstorm
 - Tornado
- Volcano
- Wildfire

A summary of the vulnerability of the County to each identified hazard is provided in each of the hazard-specific sections that follow. Vulnerability generally reflects the hazard significance rating which is also summarized in Section 4.1.1 Table 4.1. Vulnerability/Significance is measured in is a summary of the potential impact based on past occurrences, spatial extent, likelihood of future occurrences and impacts (damage and casualty potential). It is categorized into the following classifications:

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. The potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.

Vulnerability to Avalanches (Low)

People

Although future avalanches are likely to occur, the spatial extent is limited and the magnitude is low. Therefore, avalanches are a low significance hazard in the County. No known critical facilities or cultural resources were located in avalanche paths at the time this plan was written. It is public safety that is most threatened by this hazard. Outdoor recreationalists who travel into backcountry areas are most at risk. Additionally, while road closures help to mitigate impacts to travelers in avalanche-prone areas, snowplow drivers can still be exposed while clearing roads of snow or avalanche debris.

Property

In general, structures located below an area at high risk to avalanches are likely to be exposed to the impacts of an avalanche, but no instances of this were known based on available data.

Critical Facilities

There are not any known critical facility likely to be exposed to the impacts of an avalanche.

Natural Environment

Avalanches can erode topsoil, cover the environment with debris, and damage surrounding vegetation. For the most part the environment is resilient and would be able to rebound from whatever damages occurred, though this process could take years.

Future Development

Avalanche vulnerability could increase somewhat with future development and population growth as there will be a higher number of people driving on roadways and taking part in backcountry recreation. It is unlikely that risk to structures will increase as long as future development is planned outside of mapped or suspected avalanche hazard zones.

Vulnerability to Agricultural Hazards (High)

Given the importance of agriculture to Fresno County, agricultural hazards continue to be an ongoing concern. The primary causes of agricultural losses are severe weather events, such as drought and freeze and, to a limited extent, insect infestations and livestock disease. According to the HMPC, agricultural losses occur on an annual basis throughout the County and are usually associated with these severe weather events.

People

The largest impact to people from a widespread crop loss is pressure on the food supply. Some animal diseases can be transmitted to people which could pose a public health concern.

Property

The greatest impact to property from an agricultural hazard is crop damage and loss. Loss of livestock and poultry can also be significant. The economic value of total damaged or lost crops could range in the hundreds of millions of dollars.

Natural Environment

Critical Facilities

Agricultural hazards would most likely not have an impact on critical facilities. Mass mortality of animals could stress local rendering plants.

Future Development

Vulnerability to Dam Failure (High)

A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the dam itself and associated revenues that accompany those functions.

People

Persons located underneath or downstream of a dam are at risk of a dam failure, though the level of risk can be tempered by topography, amount of water in the reservoir and time of day of the breach. Injuries and fatalities can occur from debris, bodily injury and drowning. Once the dam has breached, standing water presents all the same hazards to people as floodwater from other

sources. People in the inundation area may need to be evacuated, cared for, and possibly permanently relocated. Specific population impacts are noted in the following section.

Property

In general, communities located below a dam and along a waterway are potentially exposed to the impacts of a dam failure. Specific inundation maps and risk information are included in the dam-specific emergency action plans. Due to the sensitive nature of this information, it is not included in this plan. Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are produced for all high hazard dams and are contained in the Emergency Action Plan (EAP) required for each dam. However, the information contained in those plans is considered sensitive and is not widely distributed. For reference, high hazard dams threaten lives and property, significant hazard dams threaten property only.

The potential impacts from a dam failure in the County and its municipalities are largely dependent on the specific dam or area in question. Generally, any buildings or other infrastructure located in a dam inundation area is vulnerable to the impacts from rising waters.

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding causing overtopping of the structure. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam.

According to the Fresno County Operational Area Dam Failure Evacuation Plan, of the 23 dams with a potential to impact the planning area four of them pose the greatest threat should a failure occur: Big Dry, Fancher Creek, Friant, and Pine Flat. According to the plan, a catastrophic failure of any of these dams could have a significant impact on Fresno County. Some jurisdictions are more at risk to dam failure than others. The City of Clovis and the City of Fresno are the most vulnerable, with three and five high hazard dams respectively. Centerville, Firebaugh, Friant, and Sanger also have a high hazard dam located within their boundaries. The failure of any of these dams would cause downstream flooding and would likely result in loss of life and property. The potential magnitude of a dam failure depends on the time of year and the base flow of the river when the failure occurs. During the winter months, when the river flows are higher, the impact to the area would be much greater and evacuation times much less.

Table 4.39 Major Dams with Potential to Impact the Fresno County Planning Area

Dam	Stream	Capacity (Acre-Feet)	Population Threatened
Balch Afterbay	North Fork Kings River	318	20
Balch Diversion	North Fork Kings River	1,295	20
Balsam Meadow	West Fork Balsam Creek	2,040	319
Big Creek No. 4	Big Creek	100	244
Big Creek No. 6	San Joaquin River	993	104

Dam	Stream	Capacity (Acre-Feet)	Population Threatened
Big Creek No. 7	San Joaquin River	35,000	713
Big Dry 1017	Big Dry Creek/ Dog Creek	30,200	266,502
Courtright	Helms Creek	123,300	20
Crane Valley	North Fork Willow Creek	45,410	142
Fancher Creek	Fancher Creek & Hog Creek	9,600	134,775
Florence Lake	South Fork San Joaquin River	64,406	822
Friant	San Joaquin River	520,500	75,184
Giffen Reservoir	Tributary Holland Creek	900	98
Hume Lake	Ten Mile Creek	1,410	57
Huntington Lake	Big Creek	88,834	1,018
Little Panoche	Little Panoche Creek	5,580	459
Mammoth Pool	San Joaquin River	123,000	817
Pine Flat	Kings River	1,000,000	143,678
Redbank	Redbank Creek	1,100	947
Sequoia Lake	Mill Flat Creek	1,370	27
Shaver Lake	Stevenson Creek	135,283	863
Vermilion Valley	Mono Creek	125,000	822
Wishon	North Fork Kings River	118,000	20

Source: Fresno County Operational Area Dam Failure Evacuation Plan, 2003

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Based on the risk assessment, it is apparent that a major dam failure could have a devastating impact on the planning area. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies.

Natural Environment

Dam failure effects on the environment would be similar to those caused by flooding from other causes. Water could erode stream channels and topsoil and cover the environment with debris. For the most part the environment is resilient and would be able to rebound from whatever damages occurred, though this process could take years.

Critical Facilities

A total dam failure can cause catastrophic impacts to areas downstream of the water body, including critical infrastructure. Any critical asset located under the dam in an inundation area would be susceptible to the impacts of a dam failure. Of particular risk would be roads and bridges that could be vulnerable to washouts, further complicating response and recovery by cutting off impacted areas. Risk to specific facilities is considered sensitive information but is detailed in the Fresno County Operational Area Dam Failure Evacuation Plan.

Future Development

Areas slated for future development should take into consideration potential impacts from dam failure risk upstream. In the case of a dam failure, inundation would likely follow some existing FEMA mapped floodplains, which contains development restrictions for areas in the 1% annual chance floodplain, but it could exceed those floodplains and affect areas that are not regulated for flood hazards. Also of note is that development below a low hazard dam could increase its hazard rating, though there are not any low hazard dams in the County.

Vulnerability to Drought (High)

People

The historical and potential impacts of drought on populations include agricultural sector job loss, secondary economic losses to local businesses and public recreational resources, increased cost to local and state government for large-scale water acquisition and delivery, and water rationing and water wells running dry for individuals and families. As drought is often accompanied by prolonged periods of extreme heat, negative health impacts such as dehydration can also occur, where children and elderly are most susceptible. Air quality often declines in times of drought which can affect those with respiratory ailments.

In particular, Fresno County's tree mortality risk and fallen tree occurrences has resulted in the closure of numerous roads most notably in parks, forest land, and outdoor recreation areas: In 2016, 20 to 30 campgrounds were closed as well as Kings Canyon National Park due to tree mortality risks to public safety. The risk is especially high between May and October, due to a dramatic influx of campers and other outdoor enthusiasts.

Property

The historical and potential impacts of drought on property include crop loss, injury and death of livestock and pets, and damage to infrastructure, homes and other buildings resulting from the secondary drought impact of land subsidence. As a related drought impact, tree mortality has resulted in potentially vulnerable critical infrastructure property as these trees become more susceptible to falling with time. Table 4.40 through Table 4.43 show the results of analysis for tree mortality related to property exposure. As depicted in Table 4.40, in both the incorporated and unincorporated parts of the county, there are 4,819 structures, valued at close to \$657 million, with \$337 million in contents located within the Tier I tree mortality hazard area. Most of the exposed buildings (90%) are residential and located in the unincorporated area, with total exposure (improved value and contents) for residentially zoned parcels equal to over \$957 million. Tier II tree mortality only effects the unincorporated parts of Fresno County, with \$8,688 buildings and \$1.1billion in exposure.

Table 4.40 Tier I Tree Mortality Hazard by Property Type

Jurisdiction	Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Coalinga	Commercial	4	2	\$177,515	\$177,515	\$355,030
	Exempt	1	1	\$0	\$0	\$0
	Multi-Residential	1	1	\$122,400	\$61,200	\$183,600
	Residential	5	6	\$479,443	\$239,722	\$719,165
	Total	11	10	\$779,358	\$478,437	\$1,257,795
Unincorporated	Agricultural	34	43	\$2,642,571	\$2,642,571	\$5,285,142
	Commercial	67	124	\$12,989,552	\$12,989,552	\$25,979,104
	Exempt	28	71	\$0	\$0	\$0
	Multi-Residential	1	2	\$121,255	\$60,628	\$181,883
	Open Space	17	18	\$2,064,361	\$2,064,361	\$4,128,722
	Residential	3,365	4,551	\$638,314,167	\$319,157,084	\$957,471,251
	Total	3,512	4,809	\$656,131,906	\$336,914,195	\$993,046,101
Grand Total		3,523	4,819	656,911,264	337,392,632	994,303,896

Table 4.41 Tier I Tree Mortality Hazard Summary

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Coalinga	11	10	\$779,358	\$478,437	\$1,257,795
Unincorporated	3,512	4,809	\$656,131,906	\$336,914,195	\$993,046,101
Total	3,523	4,819	\$656,911,264	\$337,392,632	\$994,303,896

Table 4.42 Tier II Tree Mortality Hazard by Property Type

Jurisdiction	Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Unincorporated	Agricultural	172	219	\$21,474,268	\$21,474,268	\$42,948,536
	Commercial	147	297	\$59,402,148	\$59,402,148	\$118,804,296
	Exempt	55	166	\$0	\$0	\$0
	Industrial	10	16	\$1,772,934	\$2,659,401	\$4,432,335
	Multi-Residential	2	3	\$159,849	\$886,467	\$1,046,316
	Open Space	215	237	\$24,307,614	\$159,849	\$24,467,463
	Residential	5,923	7,750	\$943,017,235	\$12,153,807	\$955,171,042
	Total	6,524	8,688	\$1,050,134,048	\$96,735,940	\$1,146,869,988

Table 4.43 Tier II Tree Mortality Hazard Summary

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Unincorporated	6,524	8,688	\$1,050,134,048	\$96,735,940	\$1,146,869,988
Total	6,524	8,688	\$1,050,134,048	\$96,735,940	\$1,146,869,988

In addition to tree mortality hazards, several examples of agricultural impacts shape drought vulnerability and potential losses. When it comes to farm-gate values, Fresno County used to lead the nation in farm-gate crop values, but this has not been the case since 2012; reductions in the water supply being the primary factor.

The value of the nearly 400 different crops produced in Fresno County has continued to fall since it peaked at just over \$7 billion in 2014. The 2016 figure of \$6.18 billion provided by the County Agricultural Commissioner was not only lower than the previous year's figure by over 7.2 percent, it is off more than 12.5 percent from its 2014 record.

In raw numbers, Fresno County farmers and ranchers received \$885 million fewer dollars in 2016 than they did in 2014. These producers also had 10 percent fewer acres of land in 2016 for the production of food and fiber compared to 2012. In 2016, the county had nearly 973,000 acres of irrigated farmland, a reduction of 12 percent over the same period.

Overall, water availability and prices, along with general commodity prices, account for the slump in the county's overall farm value. At no time since at least 1997 has the farm gate value fallen as steep in Fresno County as it has since 2014. Additionally, for West side growers, this included a third straight year of no surface water allocation. Moreover, for those jurisdictions where allocations were available, during the most recent drought some municipalities in Fresno County had to pay more for their surface water allocations. This impacted the smaller water districts and cities of Huron, Coalinga and Orange Cove that mostly rely on surface water. Officials also noted that a number of wells went dry, and drilling deeper was expensive and cost prohibitive. Together, such constraints on surface water allocations and groundwater supplies greatly impacts agricultural commodity growth, health, farm values and drought recovery efforts throughout the planning area.

Natural Environment

The historical and potential impacts of drought on the natural environment are widespread throughout public and private lands within the County, including tree mortality, impacts to all flora and fauna, and destabilization (erosion, subsidence) of land along streams and rivers, and within watersheds.

One of the core issue shaping the impact of drought in Fresno County and throughout California is water supply and demand. Several factors play into the issue including groundwater basins, surface water run-off, public and agricultural demand, and surface water storage water sheds. As such, an analysis was conducted through the 2010 Forest and Rangeland Assessment to identify threats and assets in order to select Priority Landscapes (PL) where water supply would benefit

from forest management designed to protect or enhance water resources, the key effort which, in part, both defines and mitigates the severity of drought risk and vulnerabilities.

With regard to overall threat and asset findings shaping the potential severity of drought for Fresno County, the analysis determined that the Sierra bioregion (where Fresno County contains portions of the southern Sierra) has the greatest concentration of high priority landscape. The watersheds in this region contribute greatly to the state's water supply. They are under threat from climate change, wildfire and development. In addition, groundwater basins in the San Joaquin Valley and Sacramento Valley bioregions are an abundant resource that is heavily threatened by over pumping.

Given that the extent of the drought hazard is, in part, determined by the extent of ground and surface water over-pumping in Fresno County, it should also be pointed out that such over-pumping is part of a broader context of water supply and demand trends with related impacts to agriculture: (and the secondary hazard impacts from land subsidence resulting from groundwater withdrawal).

See also the discussion and maps showing Fresno County Wildfire Priority Landscapes based on threats to water supply and water quality in the wildfire vulnerability section. Trends in landscape characteristics indicate high threats to water quality and supply in the eastern portion of the County, in the Sierra Nevada region.

Critical Facilities

Drought impacts to critical facilities include water shortfalls for facility operations and critical functions, and potential structural destabilization and damage resulting from land subsidence. As a related drought impact, tree mortality has resulted in potentially vulnerable critical infrastructure as these trees become more susceptible to falling with time. The unincorporated county is the only area with critical facilities at risk to tree mortality. Table 4.44 below summarizes the types of facilities at-risk while Table 4.45 provides more details. In addition to the schools and fire stations in Tier I, there is one public works facility and two buildings of the Sheriff's Office located in the Tier II hazard areas.

Table 4.44 Critical Facilities within the Tree Mortality Tier I Summary

Jurisdiction	Facility Type	Counts
Unincorporated	Fire Station	8
	School	7
Total		15

Table 4.45 Critical Facilities within the Tree Mortality Tier I in the Unincorporated County

Jurisdiction	Facility Type	Name
Unincorporated	Fire Station	Bald Mountain Volunteer Fire Department
	Fire Station	Big Creek Volunteer Fire Department
	Fire Station	Fresno County Fire Protection District - Shaver Lake
	Fire Station	Hume Lake Volunteer Fire and Rescue Company
	Fire Station	Huntington Lake Volunteer Fire Department
	Fire Station	Huntington Lake Volunteer Fire Department Station 2
	Fire Station	Pine Ridge Volunteer Fire Department
	Fire Station	Shaver Lake Volunteer Fire Department
	School	Big Creek Elementary
	School	Hammer Mountain School
	School	Hume Lake Charter
	School	Pine Ridge Elementary
	School	Pole Corral Elementary School

Table 4.46 Critical Facilities within the Tree Mortality Tier II Summary

Jurisdiction	Facility Type	Counts
Unincorporated	School	19
	Fire Station	13
	Department of Public Works	1
	Sheriff	2
Total		35

Future Development

Because future development encompasses all forms of property, buildings, infrastructure, critical facilities and all related populations and their functions, drought impacts to future development align with the historical and potential impacts to populations, property, natural environment, and critical facilities discussed (above).

Vulnerability to Earthquake (Medium)

People and Property

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

The California Geological Survey and U.S. Geological Survey have done considerable work using GIS to identify populations in high seismic hazard zones in every California County.

Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicentral location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Fault rupture itself contributes very little to damage unless the structure or system element crosses the active fault. In general, newer construction is more earthquake resistant than older construction because of improved building codes and their enforcement. Manufactured housing is very susceptible to damage because rarely are their foundation systems braced for earthquake motions. Locally generated earthquake motions, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry, as was seen in the Oroville, Coalinga, Santa Cruz, and Paso Robles earthquakes.

Common impacts from earthquakes include damage to infrastructure and buildings (e.g., crumbling of unreinforced masonry, failure of architectural facades, rupturing of underground utilities, and road closures). Earthquakes also frequently trigger secondary hazards, such as dam failures, landslides and rock falls, explosions, and fires that can become disasters themselves.

Estimating Potential Losses

Earthquake losses will vary across the Fresno County planning area depending on the source and magnitude of the event. The Coalinga earthquake provides a good estimate of loss to the planning area based on a realistic earthquake scenario. To further evaluate potential losses associated with earthquake activity in the planning area, a HAZUS-MH probabilistic earthquake scenario was run with the latest version of HAZUS-MH.

The methodology used probabilistic seismic hazard contour maps developed by the U.S. Geological Survey (USGS) for the 2014 update of the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively. The 2,500-year return period analyzes ground shaking estimates from the various seismic sources in the area with a 2 percent probability of being exceeded in 50 years. The International Building Code uses this level of ground shaking for building design in seismic areas and is more of a worst-case scenario.

The results of the scenario are captured in Table 4.47. Key losses included the following:

- Total economic loss estimated for the earthquake was \$7.3 billion, which includes building losses and lifeline losses based on the HAZUS-MH inventory.
- Building-related losses, including direct building losses and business interruption losses, totaled \$6.7 billion.
- 49,107 buildings (18% of total) were at least moderately damaged. 2,858 buildings were completely destroyed.
- Over 57 percent of the building- and income-related losses were residential structures.
- 15 percent of the estimated losses were related to business interruptions.
- The mid-day earthquake caused the most casualties: 2,205.
- 62,906 households experienced a loss of potable water the first day after the earthquake.

Table 4.47 HAZUS-MH Earthquake Loss Estimation: 2,500-Year Scenario Results

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 93,173 Moderate: 37,607 Extensive: 8,642 Complete: 2,858
Building and Income Related Losses	\$6.74 billion 57 percent of damage related to residential structures 15 percent of loss due to business interruption
Total Economic Losses (Includes building, income and lifeline losses)	\$7.3 billion
Casualties (Based on 2 a.m. time of occurrence)	Without requiring hospitalization: 1,212 Requiring hospitalization: 216 Life threatening: 19 Fatalities: 36
Casualties (Based on 2 p.m. time of occurrence)	Without requiring hospitalization: 2,205 Requiring hospitalization: 521 Life threatening: 77 Fatalities: 144
Casualties (Based on 5 p.m. time of occurrence)	Without requiring hospitalization: 1,498 Requiring hospitalization: 351 Life threatening: 80 Fatalities: 91
Damage to Transportation Systems	0 highway bridges, complete damage 61 highway bridges, moderate damage 2 airport facilities, moderate damage 2 bus facility, moderate damage
Damage to Essential Facilities	0 schools, 0 police stations, 0 fire station at least moderately damaged
Damage to Utility Systems	4 wastewater systems, moderate damage 1 oil system, moderate damage 10 electrical power systems, moderate damage 36 communication systems, moderate damage Potable water breaks: 1,863 Waste water breaks: 1,335 Natural gas breaks: 383
Households without Power/Water Service (Based on 289,391 total households)	Power loss, Day 1: 21,540 Power loss, Day 3: 13,819 Power loss, Day 7: 6,195 Power loss, Day 30: 1,375

Type of Impact	Impacts to County
	Power loss, Day 90: 30 Water loss, Day 1: 62,906 Water loss, Day 3: 60,182 Water loss, Day 7: 54,726 Water loss, Day 30: 24,665 Water loss, Day 90: 0
Displaced Households	3,985
Shelter Requirements	3,828
Debris Generation	1.41 million tons

Source: HAZUS-MH

A map showing the peak ground accelerations by census tract is shown in Figure 4.10, with warm color tones indicate damaging levels of shaking. The western portion of the County would experience the greatest shaking levels and damage due to its proximity to the San Andreas fault and other faults.

Natural Environment

An earthquake could cause cascading effects, including dam failure or rockslide that would impact the natural environment in different ways, depending on the scope of the cascading hazard. Other types of ground deformation could result as well.

Critical Facilities

An earthquake could have major impacts on critical infrastructure. HAZUS estimates impacts to critical facilities including hospitals, schools, Emergency Operations Centers (EOCs), police stations and fire stations. The following table shows the estimates for 2500-year scenario.

Table 4.48 Expected Damage to Critical Facilities

Classification	Total	Number of Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on Day 1
Hospitals	13	0	0	13
Schools	367	0	0	222
EOCs	2	0	0	2
Police Stations	28	0	0	23
Fire Stations	29	0	0	22
Total	439	0	0	282

Source: HAZUS-MH

In addition to the exposure analysis generated through Hazus, information provided by the California Geological Survey, and USGS was utilized to generate estimates of critical facilities within the 55% g or greater ground shaking potential area.

Table 4.49 Critical Facilities in Earthquake Hazard Areas

Jurisdiction	Facility Type	County
Coalinga	Airport	1

Jurisdiction	Facility Type	County
	Colleges & Universities	2
	Communications	1
	Department of Public Works	1
	Fire Station	3
	Health Care	1
	Police	3
	School	10
	Total	22
Firebaugh	Airport	1
	CalARP	2
	Fire Station	1
	Police	1
	School	9
	Urgent Care	1
	Total	15
Huron	CalARP	7
	Fire Station	1
	Police	1
	School	3
	Total	12
Mendota	Airport	1
	CalARP	1
	Fire Station	1
	School	7
	Total	10
San Joaquin	CalARP	1
	School	2
	Sheriff	1
	Total	4
Unincorporated County	Airport	5
	CalARP	35
	Department of Agriculture	1
	Department of Public Works	2
	Fire Station	5
	Nursing Home	1
	School	17
	Total	66
	Grand Total	129

Source: California Geological Survey, USGS

Future Development

Future development in the county is not anticipated to significantly affect vulnerability to earthquakes, but will result in a slight increase in exposure of the population and building stock

Vulnerability to Flood/Levee Failure (High)

People

The total number of residential properties in each floodplain was multiplied by the average household size of 3.17 persons for the County (2010 census), and that total was multiplied by the County Occupancy Factor (95%) to estimate resident population. Based on this analysis, which accounts for residents only and not workers, there are 6,662 residents living in the 100-year flood zone throughout Fresno County. Of all study areas, the unincorporated county has the most residents living in the 1% annual chance flood area, followed by the City of Firebaugh. Table 4.50 below details population estimates by jurisdiction, followed by similar tables for the 200-year and 500-year floodplains.

Table 4.50 Population Living in 1% Annual Chance Flood Hazard Zone

Jurisdiction	Population
Clovis	409
Coalinga	330
Firebaugh	1,385
Fowler	152
Fresno	342
Huron	3
Kerman	-
Kingsburg	-
Mendota	165
Orange Cove	583
Parlier	101
Reedley	-
San Joaquin	-
Sanger	346
Selma	51
Unincorporated	2,796
Total	6,662

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA, US Census Bureau

The same analysis was conducted for the 500-year floodplain, indicating that there are 143,481 residents living in the 500-year flood zone throughout Fresno County. The majority of people living in this floodplain are residents of the City of Fresno, with 107,400 people representing 75% of the total. This population distribution is shown in Table 4.51.

Table 4.51 Population Living in 0.2% Annual Chance Flood Hazard Zone

Jurisdiction	Population
Clovis	18,741
Coalinga	1,797

Firebaugh	2,143
Fowler	51
Fresno	107,400
Huron	1,880
Kerman	-
Kingsburg	-
Mendota	38
Orange Cove	127
Parlier	-
Reedley	428
San Joaquin	-
Sanger	155
Selma	-
Unincorporated	10,721
Total	143,481

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA, US Census Bureau

Population estimates were also generated for the 200-year floodplain using data provided by the USACE Comprehensive Study and the CA DWR. This flood hazard area does not cover as many jurisdictions as the 1% or 0.2% annual chance flood zones, with 3,294 residents at-risk. Table 4.52 shows the communities and number of residents effected, with a large concentration located in the City of Firebaugh.

Table 4.52 Population Living in 200-Year Flood Hazard Zone

Jurisdiction	Population
Clovis	-
Coalinga	-
Firebaugh	2,729
Fowler	-
Fresno	57
Huron	-
Kerman	-
Kingsburg	-
Mendota	222
Orange Cove	-
Parlier	-
Reedley	-
San Joaquin	-
Sanger	-
Selma	-
Unincorporated	285
Total	3,294

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; USACE Comprehensive Study

Property

Flooding is a natural occurrence in the Central Valley because it is a natural drainage basin for thousands of watershed acres of Sierra Nevada and Coast Range foothills and mountains. Historically, the Fresno County planning area has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. But, occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

Flooding has occurred in the past: within the 100-year floodplain and in other localized areas. Recent draft digital flood insurance rate maps (DFIRMs) dated January 2016 placed additional areas within the 100-year or greater floodplain. This is primarily due to the inability of the old and inadequate levees to be certified in accordance with current FEMA standards. As such, these levees no longer provide protection from the 100-year flood. It should be noted, however, that all levees, whether certified or not, provide some level of protection to the planning area and remain a critical factor in floodplain management for the communities.

The continued need to rely on these flood control structures is an ongoing concern. The history of the area, beginning with hydraulic gold mining techniques and through the continuing conversion of agricultural lands to commercial and residential uses, makes it impossible to reverse the planning area's dependence on structural flood control protection. Levee maintenance is a continuous effort due to erosion and scour brought on by the channelization itself.

Additional improvements to strengthen the levees and make them less susceptible to seepage induced failures are a priority of local and state agencies. Once these improvements are made, certification may be possible. Nevertheless, while these improvements may mitigate the impacts of flooding due to levee failure, the levees will remain subject to overtopping by flood events larger than their design capacity.

The likelihood of flooding increases with the heavy rains that occur annually between November and May. In addition to damage to area infrastructure, other problems associated with flooding include erosion, sedimentation, degradation of water quality, loss of environmental resources, and certain health hazards.

Methodology

A flood vulnerability assessment was performed for Fresno County using GIS. The county's parcel layer and associated assessor's building improvement valuation data were provided by the county and were used as the basis for the inventory. Fresno County's effective DFIRM was used as the hazard layer. DFIRM is FEMA's flood risk data that depicts the 1% annual chance (100-year) and the 0.2% annual chance (500-year) flood events. Fresno County's effective FEMA DFIRM, dated January 20, 2016, was determined to be the best available floodplain data. Table 4.53 summarizes the flood zones included on these maps.

Table 4.53 Fresno County's Flood Zones

Flood Zone	Definition
Special Flood Hazard Areas (SFHA) Subject to Inundation by 100-Year Flood	
Zone A	No base flood elevations determined
Zone AE	Base flood elevations determined
Zone AH	Flood depths of 1-3 feet (usually areas of ponding); base flood elevations determined
Zone AO	Flood depths of 1-3 feet (usually sheet flow on sloping terrain); average depths determined; for areas of alluvial fan flooding, velocities also determined
Zone AR	SFHA formerly protected from the 1 percent annual chance flood by a flood control system that was subsequently decertified; zone AR indicates that the former flood control system is being restored to provide protection from the 1 percent annual chance or greater flood
Zone A99	Area to be protected from 1 percent annual chance flood by a federal flood protection system under construction; no base flood elevations determined
Other Flood Areas	
Zone X (with color coding)	Areas of 0.2 percent annual chance flood (i.e., 500-year flood); areas of 1 percent annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1 percent annual chance flood
Other Areas	
Zone X (with no shading)	Areas determined to be outside the 0.2 percent annual chance floodplain
Zone D	Areas in which flood hazards are undetermined, but possible

Source: 2016 Draft Digital Flood Insurance Rate Maps, Fresno County

GIS was used to intersect the parcel boundaries with a master address point layer to obtain number of buildings per parcel. The parcel layer was then converted into a centroid, or point, representing the center of each parcel polygon.

Only parcels with improvement values greater than zero and address points were used in the analysis, this method assumes that improved parcels have a structure of some type. The DFIRM flood zones were overlaid in GIS on the address points and parcel centroid data to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event. These overlays can be seen graphically in the regional maps in Figure 4.63, Figure 4.64, and Figure 4.65, and in more detail in the jurisdictional annexes.

Figure 4.63 Eastern Fresno County Flood Hazards

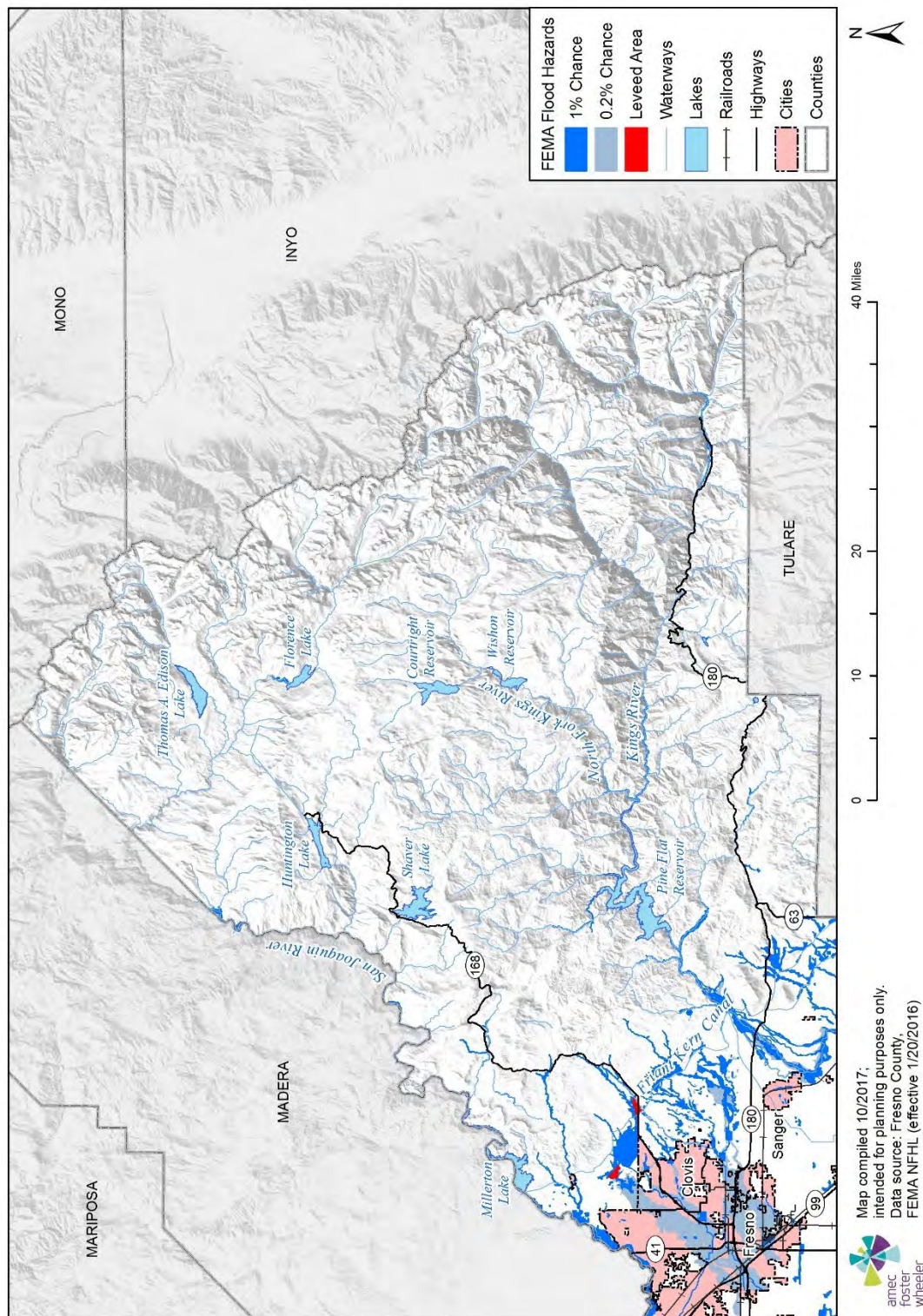


Figure 4.64 Central Fresno County Flood Hazards

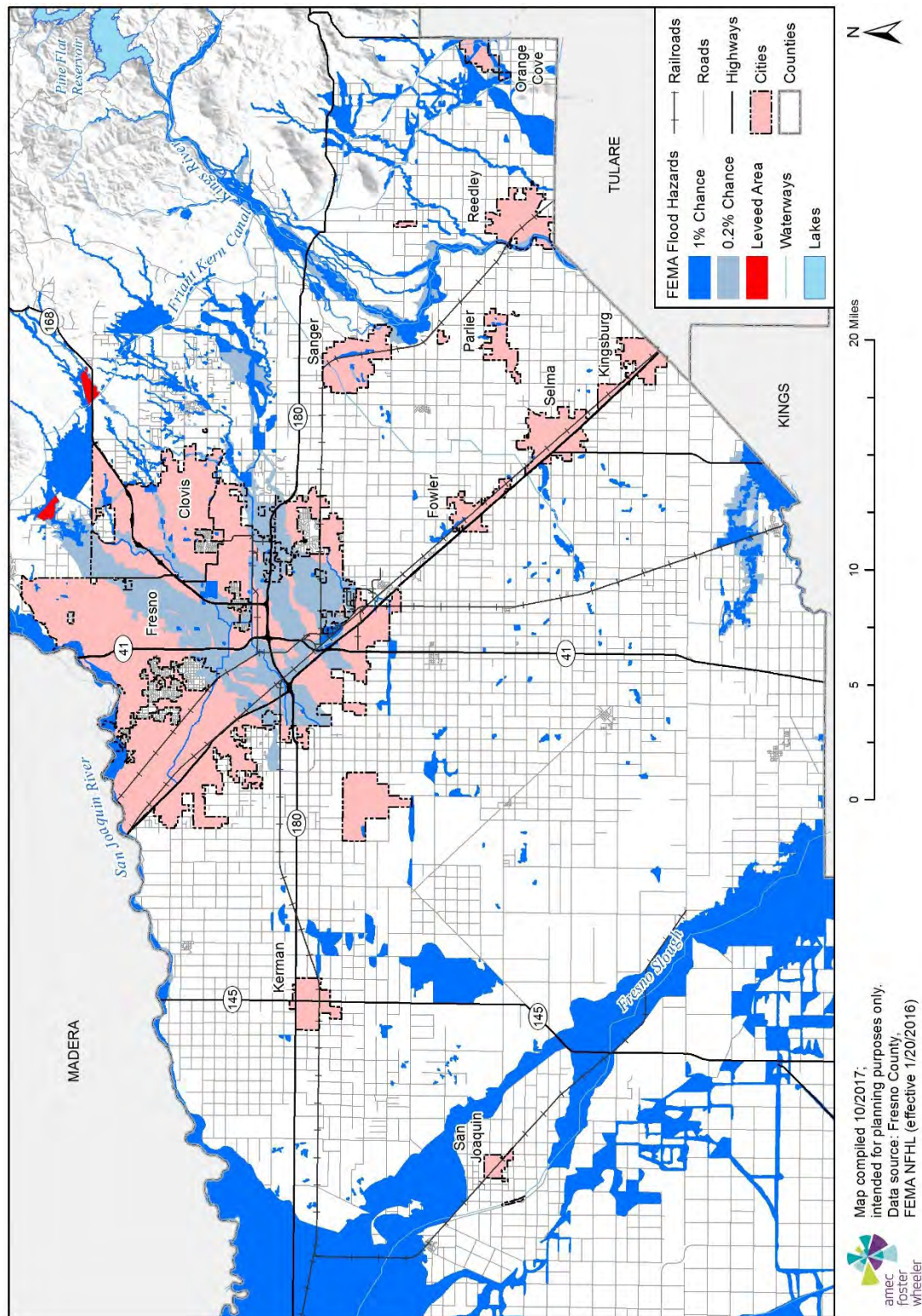


Figure 4.65 Western Fresno County Flood Hazards

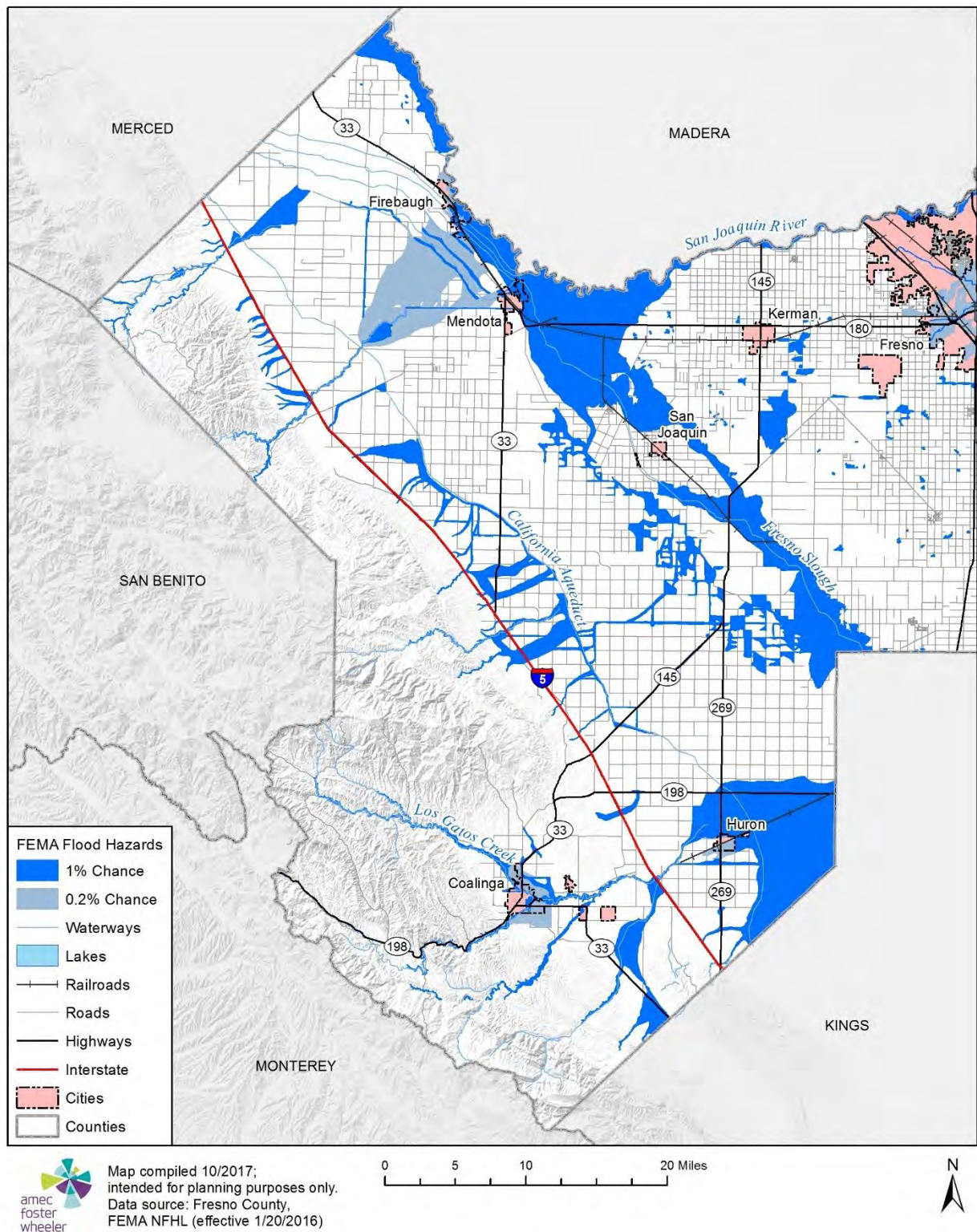
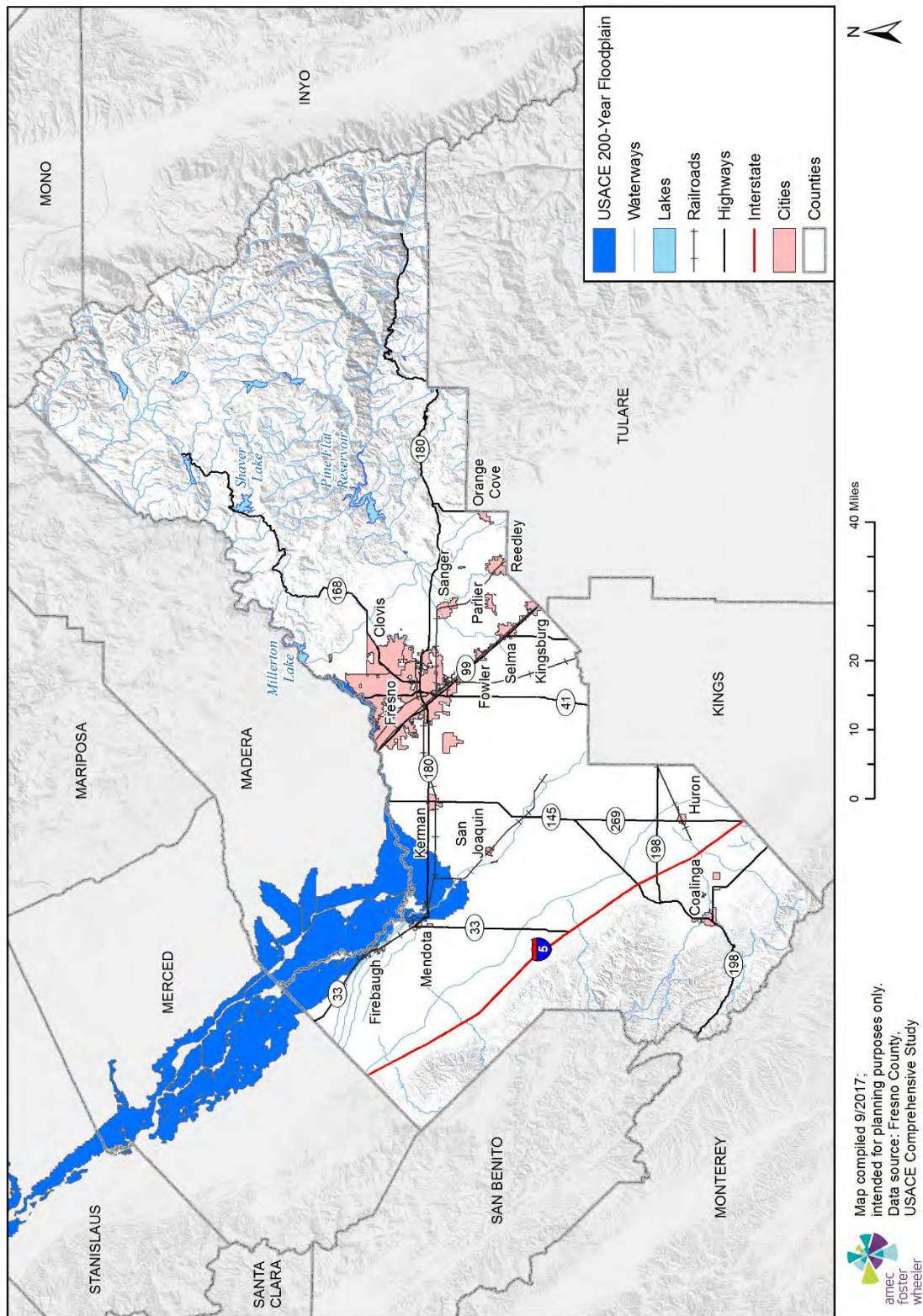


Figure 4.66 Fresno County USACE Comprehensive Study 200-Year Floodplain



Building improvement values and counts for those points were then extracted from the parcel/assessor's data and summed for the unincorporated county and jurisdictions. Results of the overlay analysis area shown in Table 4.54 for the 1% annual chance flood and Table 4.55 for 0.2% annual chance flood. The jurisdictional annexes provide more detailed information based on property type. Property type refers to the land use of the parcel and includes agricultural, commercial, exempt, industrial, multi-residential, open space and residential. Building loss is the number of impacted structures divided by the total number of structures in the jurisdiction.

A loss estimate analysis was also performed based on depth damage functions developed by the Corp of Engineers and applied in FEMA's BCA software. The loss curves depict the expected flood losses associated with the depth of flooding at a structure. Contents values were estimated as a percentage of building value based on their occupancy type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for agricultural, commercial, exempt, and open space structures, 50% for multi-residential and residential structures and 150% for industrial structures. Building and contents values were totaled to obtain total exposure.

There are different curves for structure and content losses. For the purposes of this planning level analysis, an average flood depth of 2 feet is assumed. A depth damage ratio of 25% was used for structural loss, based on the FEMA damage curves for a 2-foot flood. The results are shown in the loss estimate columns in Table 4.54 for the 1% annual chance flood, Table 4.55 for the 0.2% annual chance flood and Table 4.56 for areas protected by levee.

It is important to note that there could be more than one structure or building on an improved parcel (i.e., condo complex occupies one parcel but might have several structures). Parcel and structure count were separated in the analysis to help better identify this issue. The end result is an inventory of the number and types of parcels and buildings subject to the hazards. Results are presented by unincorporated county and incorporated jurisdictions. Detailed tables show counts of parcels by jurisdictions and land use type (agricultural, commercial, exempt, industrial, multi-residential, open space and residential) within each flood zone. This flood loss analysis does not account for business disruption, emergency services, environmental damages, or displacement costs, thus actual losses could exceed the estimate shown.

Table 4.54 Count and Improved Value of Parcels in 1% Annual Chance Floodplain by Jurisdiction

Jurisdiction	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Clovis	170	232	\$46,561,472	\$30,660,891	\$77,222,363	\$19,305,591
Coalinga	109	221	\$10,100,954	\$5,627,905	\$15,728,859	\$3,932,215
Firebaugh	464	542	\$54,041,713	\$41,117,441	\$95,159,154	\$23,789,789
Fowler	53	57	\$6,251,558	\$4,204,757	\$10,456,315	\$2,614,079
Fresno	231	556	\$62,764,109	\$65,204,716	\$127,968,825	\$31,992,206
Huron	1	0	\$4,125,000	\$2,062,500	\$6,187,500	\$1,546,875
Kerman	-	-	-	-	-	-
Kingsburg	-	-	-	-	-	-
Mendota	54	46	\$10,235,064	\$5,257,341	\$15,492,405	\$3,873,101
Orange Cove	251	313	\$22,644,434	\$13,891,997	\$36,536,431	\$9,134,108
Parlier	43	53	\$2,846,336	\$2,038,897	\$4,885,233	\$1,221,308
Reedley	3	3	\$0	\$0	\$0	\$0
San Joaquin	-	-	-	-	-	-
Sanger	134	351	\$21,812,438	\$19,633,372	\$41,445,810	\$10,361,453
Selma	16	18	\$1,953,999	\$977,000	\$2,930,999	\$732,750
Unincorporated	2,364	2,303	\$665,119,669	\$588,852,859	\$1,253,972,528	\$313,493,132
Total	3,893	4,695	\$908,456,746	\$779,529,675	\$1,687,986,421	\$421,996,605

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

Table 4.55 Count and Improved Value of Parcels in 0.2% Annual Chance Floodplain by Jurisdiction

Jurisdiction	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Clovis	6,129	9,544	\$1,468,015,418	\$850,310,253	\$2,318,325,671	\$579,581,418
Coalinga	583	666	\$100,974,088	\$98,146,277	\$199,120,365	\$49,780,091
Firebaugh	749	877	\$78,569,006	\$75,471,573	\$154,040,579	\$38,510,145
Fowler	16	5	\$1,449,011	\$1,449,011	\$2,898,022	\$724,506
Fresno	37,849	64,728	\$5,358,755,572	\$5,114,818,267	\$10,473,573,839	\$2,618,393,460
Huron	674	858	\$61,211,332	\$56,966,997	\$118,178,329	\$29,544,582
Kerman	-	-	-	-	-	-
Kingsburg	-	-	-	-	-	-
Mendota	13	24	\$1,704,421	\$1,704,421	\$3,408,842	\$852,211
Orange Cove	43	51	\$10,402,925	\$8,631,773	\$19,034,698	\$4,758,674
Parlier	-	-	-	-	-	-
Reedley	137	186	\$29,706,099	\$29,706,099	\$59,412,198	\$14,853,050
San Joaquin	-	-	-	-	-	-
Sanger	49	50	\$7,767,763	\$7,767,763	\$15,535,526	\$3,883,882
Selma	-	-	-	-	-	-

Jurisdiction	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Unincorporated	3,921	4,553	\$566,971,666	\$594,425,493	\$1,161,397,159	\$290,349,290
Total	50,163	81,542	\$7,685,527,301	\$6,839,397,924	\$14,524,925,225	\$3,631,231,306

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

Looking at the flood risk for the entire Fresno County planning area, in general, Clovis, Firebaugh, Coalinga, Fresno, and Reedley are predominantly inundated by the 500-year flood. Orange Cove, San Joaquin, and Sanger are predominantly inundated by the 100-year flood. Fowler, Huron, Mendota, Parlier, and Selma are just barely affected by the floodplain. Kerman and Kingsburg are not in floodplains. This analysis does not take localized flooding into account

Table 4.56 Fresno County Flood Loss Estimates—Fresno County Planning Area

Flood Hazard	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
1% Annual Chance	3,893	4,695	\$908,456,746	\$779,529,675	\$1,687,986,421	\$421,996,605
0.2% Annual Chance	50,163	81,542	\$7,685,527,301	\$6,839,397,924	\$14,524,925,225	\$3,631,231,306
Leveed Area	54	61	\$8,644,969	\$4,781,060	\$13,426,029	\$3,356,507
Total	54,110	86,298	\$8,602,629,016	\$7,623,708,659	\$16,226,337,675	\$4,056,584,419

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

*Includes 500-year and 100-year flood data

According to this information, the Fresno County planning area has 3,893 parcels valued at roughly \$908.4 million in the 100-year floodplain. An additional 50,163 parcels valued at roughly \$7.7 billion fall within the 500-year floodplain, plus the 54 parcels (\$8.6million value) in the leveed areas. As a result, total structural exposure is approximately \$8.6 billion. When factoring the content values within these areas in addition to the structures and contents in leveed areas the total combined value of exposure is \$16.2 billion. The end of this section provides more discussion on vulnerability in leveed areas.

In addition to the analysis of the 100- and 500-year floodplains, Table 4.57 describes the property located in the 200-year floodplain. There are significantly fewer parcels and buildings located in this area, and only three related jurisdictions. The majority of parcels in the 200-year flood hazard layer are located in the City of Firebaugh, with 1,362 buildings representing over half of all at-risk structures. In total, there is \$446 million in combined structural and content value in this floodplain throughout the Fresno County planning area.

Table 4.57 Count and Improved Value of Parcels in 200-Year Floodplain by Jurisdiction

Jurisdiction	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Clovis	-	-	-	-	-	-
Coalinga	-	-	-	-	-	-

Jurisdiction	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Firebaugh	985	1,362	\$97,678,429	\$57,792,254	\$155,470,683	\$38,867,671
Fowler	-	-	-	-	-	-
Fresno	27	163	\$16,486,935	\$10,435,182	\$26,922,117	\$6,730,529
Huron	-	-	-	-	-	-
Kerman	-	-	-	-	-	-
Kingsburg	-	-	-	-	-	-
Mendota	78	76	\$8,931,543	\$9,493,886	\$18,425,429	\$4,606,357
Orange Cove	-	-	-	-	-	-
Parlier	-	-	-	-	-	-
Reedley	-	-	-	-	-	-
San Joaquin	-	-	-	-	-	-
Sanger	-	-	-	-	-	-
Selma	-	-	-	-	-	-
Unincorporated	558	564	\$124,258,595	\$121,876,254	\$246,134,849	\$61,533,712
Total	1,648	2,165	\$247,355,502	\$199,597,576	\$446,953,078	\$111,738,269

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; USACE Comprehensive Study

Table 4.58, Table 4.59, and Table 4.60 below provides a detailed analysis that shows the count and improved value of parcels that fall in a floodplain by property type for the 100- and 500-year annual chance flood zones. Additionally, these tables include information on loss estimates by flood based on guidance from FEMA. Based on this guidance, contents value is estimated at 50 percent of the improved value. Estimated losses assume that a flood is unlikely to cause total destruction. Losses are related to a variety of factors, including flood depth, flood velocity, building type, and construction. Using FEMA's recommendations, average damage is estimated to be 20 percent of the total building value. Refer to the annexes for these results specific to each jurisdiction.

While there are several limitations to this model, it does allow for potential loss estimation. It should be noted that the model may have included structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, it is important to remember that the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Table 4.58 Count and Improved Value of Parcels in 1% Annual Chance Floodplain by Property Type—Unincorporated Fresno County

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	448	381	\$77,195,934	\$77,195,934	\$154,391,868	\$38,597,967
Commercial	23	60	\$8,486,419	\$8,486,419	\$16,972,838	\$4,243,210
Exempt	20	30	\$0	\$0	\$0	\$0
Industrial	37	43	\$22,608,533	\$33,912,800	\$56,521,333	\$14,130,333

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Multi-Residential	1	1	\$35,404	\$17,702	\$53,106	\$13,277
Open Space	953	519	\$380,879,678	\$380,879,678	\$761,759,356	\$190,439,839
Residential	881	1,267	\$175,106,750	\$87,553,375	\$262,660,125	\$65,665,031
Unknown	1	2	\$806,951	\$806,951	\$1,613,902	\$403,476
Total	2,364	2,303	\$665,119,669	\$588,852,859	\$1,253,972,528	\$313,493,132

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

*Includes Zones A, AE, AH, and AO

**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table 4.59 Count and Improved Value of Parcels in 0.2% Annual Chance Floodplain by Property Type—Unincorporated Fresno County

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	167	123	\$23,370,188	\$23,370,188	\$46,740,376	\$11,685,094
Commercial	34	47	\$11,634,321	\$11,634,321	\$23,268,642	\$5,817,161
Exempt	18	20	\$0	\$0	\$0	\$0
Industrial	170	224	\$71,751,039	\$107,626,559	\$179,377,598	\$44,844,399
Multi-Residential	102	206	\$16,843,386	\$8,421,693	\$25,265,079	\$6,316,270
Open Space	150	104	\$32,509,380	\$32,509,380	\$65,018,760	\$16,254,690
Residential	3,280	3,829	\$410,863,352	\$410,863,352	\$821,726,704	\$205,431,676
Total	3,921	4,553	\$566,971,666	\$594,425,493	\$1,161,397,159	\$290,349,290

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

*Includes Zones A, AE, AH, and AO

**Includes Shaded Zone X (500-year) and all 100-year flood zones

Table 4.60 Count and Improved Value of Parcels in 200-Year Floodplain by Property Type—Unincorporated Fresno County

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	122	126	\$13,927,928	\$13,927,928	\$27,855,856	\$6,963,964
Commercial	6	13	\$968,584	\$968,584	\$1,937,168	\$484,292
Exempt	8	19	\$0	\$0	\$0	\$0
Industrial	3	6	\$3,525,545	\$5,288,318	\$8,813,863	\$2,203,466
Open Space	329	226	\$97,546,311	\$97,546,311	\$195,092,622	\$48,773,156
Residential	90	174	\$8,290,227	\$4,145,114	\$12,435,341	\$3,108,835
Total	558	564	\$124,258,595	\$121,876,254	\$246,134,849	\$61,533,712

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; USACE Comprehensive Study

Insurance Coverage, Claims Paid, and Repetitive Losses

Unincorporated Fresno County joined the National Flood Insurance Program (NFIP) on December 12, 1982, and the Community Rating System (CRS) on October 1, 1991. According to the CRS listing of eligible communities dated October 1, 2007, the County is currently a Class 7, which is lower than the 2007 rating (8). Lower ratings are preferable and a Class 7 provides a 15 percent discount on flood insurance for those located within the special flood hazard area (SFHA) and a 5 percent discount for those located in non-SFHA areas.

In the unincorporated County, there are 840 policies in force, of which there are 746 single family units, 11 2-4 family, 4 all other residential, and 79 nonresidential. 423 policies were located in an A zone (80 in zone A01-30 & AE, 193 in zone A, 119 in AO, 31 AH). The remaining policies are split between standard B, C, & X zone (146) and preferred B, C, & X Zone (271). 462 policies are pre-FIRM, leaving 378 as post-FIRM structures. There are two repetitive loss buildings in the unincorporated County. On repetitive loss structure is located in A zone, with three total payments equaling \$19,385. The other repetitive loss building is located in zone B, C, and X, with two payments totaling \$36,570. There are 35 paid losses in the unincorporated county, equal to \$529,973. Of these losses, 17 were parcels in A zones and 18 parcels were in the B, C, and X zones. Of the 35 claims, 28 claims were associated with pre-FIRM structures and 7 with post-FIRM structures. According to the FEMA Community Information System accessed 9/17/2018 there are no Severe Repetitive Loss properties located in the unincorporated county.

NFIP data indicates that there are 1,709 insurance policies in Fresno County representing \$435.053 million of insurance coverage in force. There have been 151 paid losses, totaling \$1.55 million. Table 4.61 provides more details on NFIP participation for each individual jurisdiction.

Table 4.61 Fresno County NFIP Information

Jurisdiction	Policies	Insurance in Force	No. of Paid Losses	Total Losses Paid
Clovis	103	\$31,999,500	14	\$134,920
Coalinga	60	\$12,902,300		
Firebaugh	159	\$31,729,100		
Fowler	22	\$5,787,700	1	\$3,197.94
Fresno Unincorporated	840	\$208,980,000	39	\$537,282.62
Fresno City	323	\$93,791,300	81	\$765,183.27
Huron	9	\$4,320,000		
Kerman	No SFHA/Not Participating/Not Required			
Kingsburg	10	\$3,220,000		
Mendota	17	\$4,630,900	3	\$2,572.00
Orange Cove	96	\$23,078,500	6	\$78,052
Parlier	8	\$1,337,000		
Reedley	8	\$2,345,000		

Jurisdiction	Policies	Insurance in Force	No. of Paid Losses	Total Losses Paid
San Joaquin			3	\$10,720.38
Sanger	54	\$10,931,700	4	\$16,288.44
Selma	Not Participating - Sanctioned			
Total	1709	\$435,053,000	151	\$1,548,217

Source: FEMA National Flood Insurance Program Community Information System

Historic, Cultural, and Natural Resources at Risk

The Fresno County planning area has significant historic, cultural, and natural resources located throughout the County as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

Overall Community Impact

Floods and their impacts will vary by location and severity and will likely only affect certain areas of the County at any one time. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to certain areas of the County. However, many of the floods in the County are minor, localized flood events that are more of a nuisance than a disaster. Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;
- Health hazards associated with mold and mildew;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) upon the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Natural Environment

Natural resources are generally resistant to flooding except where natural landscapes and soil compositions have been altered for human development or after periods of previous disasters such as drought and fire. Wetlands, for example, exist because of natural flooding incidents. Areas that are no longer wetlands may suffer from oversaturation of water, as will areas that are particularly impacted by drought. Areas recently suffering from wildfire damage may erode because of flooding, which can permanently alter an ecological system.

Critical Facilities

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. An analysis was performed using GIS software to determine critical facilities in Fresno County's floodplain. The DFIRM flood layer previously discussed was used to identify the 100- and 500-year floodplains. For more information on the spatial distribution and location of critical facilities, see the Critical Facility overview. The impact to the community could be great if these critical facilities were damaged or destroyed during a flood event. Similar data is available for the other participating jurisdictions in the jurisdictional annexes.

As described earlier, critical facilities are located throughout Fresno County. Critical facilities in the floodplain are summarized in Table 4.62 and Table 4.63 for the 100 and 500-year flood zones. In total, there are 34 facilities in the 100-year flood zone, 209 facilities in the 500-year flood zone, and 9 critical facilities in the 200-year floodplain. Information regarding critical facilities in the floodplain for each jurisdiction is outlined in the jurisdictional annexes.

Table 4.62 Critical Facilities in the 100-Year Floodplain

Jurisdiction	Facility Type	Building Count
Coalinga	Colleges & Universities	1
	Department of Public Works	1
	Total	2
Firebaugh	CalARP	1
	School	7
	Total	8
Fresno	CalARP	1
	Total	1
Mendota	Fire Station	1
	Total	1
Orange Cove	Fire Station	1
	Total	1
Parlier	CalARP	1
	School	1
	Total	2
Sanger	CalARP	2
	School	1
	Total	7
Unincorporated	Airport	1
	CalARP	9
	Fire Station	1
	School	1
	Total	12
	Grand Total	34

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

Table 4.63 Critical Facilities in the 500-Year Floodplain

Jurisdiction	Facility Type	Building Count
Clovis	Colleges & Universities	1
	Nursing Home	1
	School	6
	Total	8
Coaling	Health Care	1
	Total	1
Firebaugh	Airport	1
	CalARP	1
	School	1
	Urgent Care	1
	Total	4
Fresno	Airport	1
	Behavioral Health	1
	CalARP	12
	Colleges & Universities	5
	Communications	1
	County Government	2
	Daycare	52
	Department of Agriculture	2
	Department of Public Health	2
	Department of Social Services	6
	District Attorney	1
	Fire Station	7
	General Services	3
	Health Care	1
	Nursing Home	12
	Police	5
	School	68
	Urgent Care	2
	Total	183
Huron	CalARP	4
	School	2
	Total	6
Unincorporated	CalARP	4
	Fire Station	1
	School	2
	Total	7
	Grand Total	209

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; National Flood Hazard Layer Effective date 01/20/2016, FEMA

Table 4.64 Critical Facilities in the 200-Year Floodplain

Jurisdiction	Facility Type	Building Count
Firebaugh	Fire Station	1
	Police	1
	School	3
	Urgent Care	1
	Total	6
Mendota	Airport	1
	CalARP	1
	Total	2
Unincorporated	Nursing Home	1
	Total	1
	Grand Total	9

Source: 2017 Certified Roll Values, Fresno County Assessor's Office; USACE Comprehensive Study

Future Development

Flooding and floodplain management are significant issues for Fresno County. The potential or likelihood of a flood event in the city increases with the annual onset of heavy rains in April combined with snowmelt runoff from May through June. Much of the historical growth in the Problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards. Future annexations of unincorporated areas could significantly add to the number of flood-prone structures in Fresno County.

For NFIP participating communities, floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains.

The development trend in the Fresno County planning area is steady, significant growth. Much of this growth is occurring in the urban areas, which causes a significant increase in peak flow and stormwater runoff.

Census projections from the California Department of Finance expect the County's population to grow to 1,201,792 by 2020. This is an increase of 271,342 people from the 2010 census estimate of 930,450. Such growth will consume previously undeveloped acres, and the impacts may overwhelm existing drainage and flood control facilities.

The potential for flooding may increase as stormwater is channelized due to land development. Such changes can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on buildout land use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality

regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the floodplain.

Local floodplain management ordinances require that new construction be built with the lowest floor elevated a minimum of one foot above the base flood (100-year) elevation. New development that adheres to the elevation requirements in addition to other requirements for maintaining elevation certificates and implementing stormwater program elements and erosion or sediment controls for all new development in the floodplain should help protect development from 100-year floods.

The amount of growth in the County and nearby communities can also strain the limits of the entire water management system, which includes water supply in addition to water control. When flood control structures are overwhelmed, the result is not only severe flooding. Significant losses to the water supply system may also occur.

Vulnerability to Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to levee failures is generally confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions.

Vulnerability to Human Health: Epidemic/Pandemic (Medium)

Based on historical occurrences, the risk to the Fresno County planning area is occasional, but the vulnerability is medium. According to the Centers for Disease Control and Prevention, the risk from avian influenza is generally low to most people, because the viruses do not usually affect humans. However, H5N1 and H7N9 are some of the few avian influenza viruses to have crossed the species barrier to infect humans, and infection commonly results in severe disease. Most human cases of H5N1 and H7N9 influenza have resulted from contact with infected poultry, and the spread of these viruses from person to person has been limited. Nonetheless, because all influenza viruses have the ability to change, scientists are concerned that the H5N1 and H7N9 viruses, or another influenza virus, could one day be able to infect humans and spread easily from one person to another. If this were to happen, a pandemic could begin and everyone would be at risk. Other communicable diseases of this nature could result in a similar type of epidemic/pandemic and become a significant concern for the Fresno County planning area.

People

Disease spread and mortality is affected by a variety of factors, including virulence, ease of spread, aggressiveness of the virus and its symptoms, resistance to known antibiotics and environmental factors. While every pathogen is different, diseases normally have the highest mortality rate among the very young, the elderly or those with compromised immune systems. As an example, the unusually deadly 1918 H1N1 influenza pandemic had a mortality rate of 20%. If an influenza

pandemic does occur, it is likely that many age groups would be seriously affected. The greatest risks of hospitalization and death—as seen during the last two pandemics in 1957 and 1968 as well as during annual outbreaks of influenza—will be to infants, the elderly, and those with underlying health conditions. However, in the 1918 pandemic, most deaths occurred in young adults. Few people, if any, would have immunity to a new virus.

Property

For the most part, property itself wouldn't be impacted by a human disease epidemic or pandemic. As concerns about contamination increase, property may be quarantined or destroyed as a precaution against spreading illness.

Natural Environment

A widespread pandemic would not have an impact on the natural environment unless the disease was transmissible between humans and animals.

Critical Facilities

Agricultural hazards would most likely not have an impact on critical facilities.

Future Development

Future development would not be impacted by a pandemic.

Vulnerability to Human Health: West Nile Virus (Low)

While the likelihood of occurrence of West Nile virus in the Fresno County planning area is likely, the County's vulnerability is low, based on the percentage of total population that actually comes down with the disease. Since the discovery of West Nile virus in California in 2003, Fresno County has had 255 confirmed human cases.

Although the potential for exposure does exist in Fresno County, the vulnerability should be considered in terms of adverse effects due to exposure. The County already has an active vector control program in place for mosquitoes, and protective measures to prevent exposure are relatively simple and cost-effective. Given the nature of protective measures, such as wearing long-sleeved clothing and using bug spray, the responsibility for protection can and should be an individual responsibility. Fresno County's current public education program should give the community the knowledge as well as access to resources to effectively counter the risk and impact from the virus.

People

Approximately twenty percent of people exposed to West Nile Virus through a mosquito bite develop symptoms related to the virus; it is not transmissible from one person to another. Preventive steps can be taken to reduce exposure to mosquitos carrying the virus; these include

insect repellent, covering exposed skin with clothing and avoiding the outdoors during twilight periods of dawn and dusk, or in the evening when the mosquitos are most active.

Property

Property would not be affected by West Nile Virus.

Natural Environment

While birds are the species primarily affected by West Nile Virus, bats, horses, cats, dogs, chipmunks, skunks, squirrels, domestic rabbits and alligators can all be infected with the virus.

Critical Facilities

Should a widespread outbreak of West Nile Virus occur, medical facilities could be stressed.

Future Development

Future development would not be impacted by West Nile Virus.

Vulnerability to Landslide (Low)

People

People are susceptible if they are caught in a landslide or rockfall; falling debris can cause injury or death. There is also a danger to drivers operating vehicles, as rocks and debris can strike vehicles passing through the hazard area or cause dangerous shifts in roadways.

Property

Landslide risk is minimal in the highly developed valley area of the County due to the relatively flat topography, and most structures concentrated in the central and eastern portion of the County are not at risk to landslides. However, the Fresno County General Plan identifies State Route 168 in eastern Fresno County and State Route 198 in western Fresno County as areas that could be affected by landslides caused by earthquakes or heavy rains. Current data is limited and future studies should evaluate the geologic conditions throughout the planning area.

Natural Environment

Landslides and rockfalls have minimal impacts to the natural environment; these impacts would be confined to a small area. There is a slight chance that a rockfall or landslide in the drainages above the City could cause blockage and water backup from temporary landslide dams.

Critical Facilities

There is not enough available data to determine whether or not there are any critical facilities located in landslide susceptible areas

Future Development

The severity of landslide problems is directly related to the extent of human activity in hazard areas. Human activities such as property development and road construction can also exacerbate the occurrence of landslides. Future development should be done carefully to prevent landslide damage to property or people. Adverse effects can be mitigated by early recognition and avoiding incompatible land uses in these areas or by corrective engineering. Improving mapping and information on landslide hazards and incorporating this information into the development review process could prevent siting of structures and infrastructure in identified hazard areas.

Vulnerability to Severe Weather: Extreme Temperatures (Extreme Cold/Freeze and Extreme Heat) (Low)

People

Traditionally, the very young and very old are considered at higher risk to the effects of extreme temperatures, but any populations outdoors in the weather are exposed, including otherwise young and healthy adults and homeless populations. While everyone is vulnerable to extreme temperature incidents, some populations are more vulnerable than others. Extreme temperatures pose the greatest danger to outdoor laborers, such as highway crews, police and fire personnel, and construction. The elderly, children, people in poor physical health, and the homeless are also vulnerable to exposure. Arguably, the young-and-otherwise-healthy demographic may experience a higher vulnerability of exposure, due to the increased likelihood that they will be out in the extreme temperatures, whether due to commuting for work or school, conducting property maintenance such as snow removal or lawn care, or for recreational reasons.

It is difficult to isolate the County's specific vulnerability to this hazard, as the impacts from extreme temperatures can be spread across an entire state or region. In general, all the population of the County can be considered at-risk to this hazard.

Property

Recent research indicates that the impact of extreme temperatures, particularly on populations, has been historically under-represented. The risks of extreme temperatures are often profiled as part of larger hazards, such as severe winter storms or drought. However, as temperature variances may occur outside of larger hazards or outside of the expected seasons but still incur large costs, it is important to examine them as stand-alone hazards. Extreme heat may overload demands for electricity to run air conditioners in homes and businesses during prolonged periods of exposure and presents health concerns to individuals outside in the temperatures. Extreme heat may also be a secondary effect of droughts, or may cause temporary drought-like conditions. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist. Extreme heat can cause infrastructure damage to roads. Extreme cold impacts structures when pipes or water mains freeze and burst, causing damage.

Extreme cold may also lead to higher electricity and natural gas demands to maintain appropriate indoor heating levels combined with damages caused to the delivery infrastructure such as frozen lines and pipes. Cold may impact transportation as well. Exposed populations may be at risk while waiting for public transportation, particularly when combined with wind-chill, and some vehicles may not start which impacts the commute of the workforce and, in worst case scenarios, the movement of emergency services personnel.

Natural Environment

Extreme heat may cause temporary drought-like conditions. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist. Extreme cold has the same impacts on exposed wildlife as it does on exposed people.

Changing heating and cooling patterns globally can have destructive secondary impacts, intensifying a variety of weather-related disasters that directly impact jurisdictions.

Critical Facilities

Extreme temperatures can impact pipe (extreme cold) and road infrastructure (extreme heat), but direct impacts to critical infrastructure is expected to be minimal. Critical infrastructure that relies on public utility systems that could be overloaded may see impacts during extreme temperature events.

Future Development

Since structures are not usually directly impacted by severe temperature fluctuations, continued development is less impacted by this hazard than others in the plan. However, pre-emptive cautions such as construction of green buildings that require less energy to heat and cool, use of good insulation on pipes and electric wirings, and smart construction of walkways, parking structures, and pedestrian zones that minimize exposures to severe temperatures may help increase the overall durability of the buildings and the community to the variations. Continued development also implies continued population growth, which raises the number of individuals potentially exposed to variations. Public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme heat and cold.

Vulnerability to Severe Weather: Fog (Medium)

Fog issues are well documented in the Fresno County planning area. In recent years, there have been several large-scale accidents during periods of heavy fog. However, it should be noted that while fog is present, usually driver error is a significant contributory factor to these accidents. Fog is driven by weather patterns in the Central Valley that will continue to occur annually. As such,

until people can learn to take appropriate precautions during fog events, fog-related accidents will also continue to occur.

People

Reduced visibility is the greatest risk to people when heavy fog is prevalent. Particularly when fog is dense, it can be hazardous to drivers, mariners and aviators and contributes to numerous accidents each year. To reduce injury and harm, people should avoid driving when dense fog is prevalent, if possible. If driving is pertinent, emergency services advise driving with lights on low beam, watching for CHP pace vehicles to guide through fog, avoiding stopping on highways, and avoiding crossing traffic lanes.

Property

Based on historic information, the primary effect of fog has not resulted in significant damages to property, or the losses are typically covered by insurance.

Natural Environment

As referred to in the Climate Change Considerations section of the Fog hazard profile, California's winter tule fog has declined dramatically over the past three decades, raising a red flag for the state's multibillion dollar agricultural industry. Crops such as almonds, pistachios, cherries, apricots and peaches go through a necessary winter dormant period brought on and maintained by colder temperatures. Tule fog, a thick ground fog that descends upon the state's Central Valley between late fall and early spring, helps contribute to this winter chill.

Critical Facilities

Fog can have devastating effects on transportation corridors in the County. Multi-car pileups have resulted from drivers using excessive speed for the conditions and visibility.

These accidents can cause multiple injuries and deaths and could have serious implications for human health and the environment if a hazardous or nuclear waste shipment were involved. Other disruptions from fog include delayed emergency response vehicles and school closures.

Future Development

Population and commercial growth in the County will increase the potential for complications with traffic accidents and commerce interruptions associated with dense fog.

Vulnerability to Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning/Wind (Low)

People

Exposure is the greatest danger to people from severe thunderstorms. People can be hit by lightning, pelted by hail, and caught in rising waters. Serious injury and loss of human life is rarely associated with hailstorms.

While national data shows that lightning causes more injuries and deaths than any other natural hazard except extreme heat, there doesn't seem to be any trend in the data to indicate that one segment of the population is at a disproportionately high risk of being directly affected. Anyone who is outside during a thunderstorm is at risk of being struck by lightning. Aspects of the population who rely on constant, uninterrupted electrical supplies may have a greater, indirect vulnerability to lightning. As a group, the elderly or disabled, especially those with home health care services relying on rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged. If they do not have a back-up power source, rural residents and agricultural operations reliant on electricity for heating, cooling, and water supplies are also especially vulnerable to power outages. Thunderstorms have the potential energy and strong winds to topple dead trees and injure people.

Property

Based on historic information, the primary effect of these storms has not resulted in significant injury or damages to people and property, or the losses are typically covered by insurance. It is the secondary hazards caused by weather, such as floods, that have had the greatest impact on the County.

Natural Environment

Severe thunderstorms are a natural environmental process. Environmental impacts include the sparking of potentially destructive wildfires by lightning and localized flattening of plants by hail. As a natural process, the impacts of most severe thunderstorms by themselves are part of the overall natural cycle and do not cause long-term consequential damage.

Critical Facilities

Because of the unpredictability of severe thunderstorm strength and path, most critical infrastructure that is above ground is equally exposed to the storm's impacts. Due to the random nature of these hazards, a more specific risk assessment was not conducted for this plan.

Future Development

New critical facilities, such as communication towers should be built to withstand heavy rain, monsoon, and hail damage. Future development projects should consider severe weather hazards

at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Stormwater master planning and site review should be considered for all new development. Thus, development trends in the County are not expected to increase overall vulnerability to the hazard, but population growth will increase potential exposure to hazards such as lightning.

Vulnerability to Severe Weather: Winter Storm (Medium)

People

While virtually all aspects of the population are vulnerable to severe winter weather, there are segments of the population that are more vulnerable to the potential indirect impacts of a severe winter storm than others, particularly the loss of electrical power. If they do not have a back-up power source, rural residents reliant on electricity for heating and water supplies are also especially vulnerable to power outages. As a group, the elderly or disabled, especially those with home health care services that rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged.

Public education efforts may help minimize the risks to future populations by increasing knowledge of appropriate mitigation behaviors, clothing, sheltering capacities, and decision making regarding snow totals, icy roads, driving conditions, and outdoor activities (all of which are contributors to decreased public safety during severe winter storms.) New establishments or increased populations who are particularly vulnerable to severe winter storms (such as those with health concerns or those who live in communities that may be isolated for extended periods of time due to the hazard) should be encouraged to maintain at least a 72-hour self-sufficiency as recommended by FEMA. Encouraging contingency planning for businesses may help alleviate future economic losses caused by such hazards while simultaneously limiting the population exposed to the hazards during commuting or commerce-driven activities.

Property

While virtually all aspects of the population are vulnerable to severe winter weather, there are segments of the population that are more vulnerable to the potential indirect impacts of a severe winter storm than others, particularly the loss of electrical power. If they do not have a back-up power source, rural residents reliant on electricity for heating and water supplies are also especially vulnerable to power outages. As a group, the elderly or disabled, especially those with home health care services that rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged.

Public education efforts may help minimize the risks to future populations by increasing knowledge of appropriate mitigation behaviors, clothing, sheltering capacities, and decision making regarding snow totals, icy roads, driving conditions, and outdoor activities (all of which are contributors to decreased public safety during severe winter storms.) New establishments or

increased populations who are particularly vulnerable to severe winter storms (such as those with health concerns or those who live in communities that may be isolated for extended periods of time due to the hazard) should be encouraged to maintain at least a 72-hour self-sufficiency as recommended by FEMA. Encouraging contingency planning for businesses may help alleviate future economic losses caused by such hazards while simultaneously limiting the population exposed to the hazards during commuting or commerce-driven activities.

Natural Environment

Natural resources may be damaged by the severe winter weather, including broken trees and death of wildlife. Unseasonable storms may damage or kill plant and wildlife, which may impact natural food chains until the next growing season. Most of these impacts would be short-term.

Critical Facilities

Because of the unpredictability of severe winter storm strength and path, most critical infrastructure that is above ground is equally exposed to the storm's impacts. Roads are especially susceptible to the effects of a winter storm. A more specific risk assessment was not conducted for this plan.

Future Development

Future residential or commercial buildings in locations that receive large amounts of snow each year should be built to be able to withstand snow loads from severe winter storms. Jurisdictions within Sierra National Forest like Lakeshore, Big Creek, Cedar Grover and Rock Haven may benefit from taking these precautions. Population growth in these areas and growth in visitors will increase problems with road, business, and school closures, and increase the need for snow removal and emergency services related to severe winter weather events. Development in the County will increase the number of vehicles and persons vulnerable to this hazard.

Vulnerability to Severe Weather: Tornadoes

People

Populations are the most vulnerable to tornados. The availability of sheltered locations such as basements, buildings constructed using tornado-resistant materials and methods, and public storm shelters, all reduce the exposure of the population. However, there are also segments of the population that are especially exposed to the indirect impacts of tornadoes, particularly the loss of electrical power. These populations include the elderly or disabled, especially those with medical needs and treatments dependent on electricity. Nursing homes, Community Based Residential Facilities, and other special needs housing facilities are also vulnerable if electrical outages are prolonged, since backup power generally operates only minimal functions for a short period of time.

Property

General damages are both direct (what the tornado physically destroys) and indirect, which focuses on additional costs, damages and losses attributed to secondary hazards spawned by the tornado, or due to the damages caused by the tornado. Depending on the size of the tornado and its path, a tornado is capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize the resistance of the structures to damage.

Secondary impacts of tornado damage often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These indirect impacts of a tornado put tremendous strain on a community. In the immediate aftermath, the focus is on emergency services.

Natural Environment

Tornadoes can cause massive damage to the natural environment, uprooting trees and other debris. This is part of a natural process, however, and the environment will return to its original state in time.

Critical Facilities

Public gathering places including (but not limited to) schools, community centers, shelters, nursing homes and churches, may have increased impacts at certain times of day if struck by a tornado. Due to the random nature of these hazards, a more specific risk assessment was not conducted for this plan.

Future Development

As the County continues to add population, the number of people and housing developments exposed to the hazard increases. Proper education on building techniques and the use of sturdy building materials, basements, attached foundations, and other structural techniques may minimize the property vulnerabilities. Public shelters at parks and open spaces may help reduce the impacts of tornadoes on the recreational populations exposed to storms.

Vulnerability to Soil Hazards: Erosion (Low)

People

Erosion generally only damage structures, with no direct impacts on people.

Property

While impacts are slow to accumulate, costly damages to residences, facilities, roads, and other infrastructure could occur. Erosion occurs over a long period of time, though weather and other climatic factors can catalyze the magnitude of impact. Properties near construction sites are the

most vulnerable to erosion, followed by structures on/near steep slopes, disturbed pits/quarries, and runoff channels.

Natural Environment

There are generally no significant impacts to the natural environment associated with erosion.

Critical Facilities

Roads, pipelines and facilities can be impacted but significant impacts are not anticipated.

Future Development

Erosion controls such as silt fences, netting, and vegetative coverage can be utilized to minimize soil erosion around at-risk properties. During construction, erosion risk can be reduced through the use of paved roads and runoff control features, while vegetation removal should be minimized and drainage ditches constructed only where necessary.

Vulnerability to Soil Hazards: Expansive Soils (Low)

People

No direct impacts on people are anticipated. Should an impact occur, it is anticipated to be localized.

Property

While impacts are slow to accumulate, costly damages property could occur. The majority of the hazard's significance is drawn from the exposure of existing development to this hazard. Older construction may not be resistant to the swelling soil conditions and, therefore, may experience expensive and potentially extensive damages. This includes heaving sidewalks, structural damage to walls and basements, the need to replace windows and doors, or dangers and damages caused by ruptured pipelines. Newer construction may have included mitigation techniques to avoid most damage from the hazard, but the dangers continue if mitigation actions are not supported by homeowners. For example, the maintenance of grading away from foundations and the use of appropriate landscaping near structures must be continued to prevent an overabundance of water in vulnerable soils near structures. While continued public education efforts may help increase compliance for landscaping and interior finishing mitigation actions, physical reconstruction of foundations is probably not feasible in all but the most heavily impacted of existing development. Therefore, damages may be expected into the future for existing structures.

Critical Facilities

Roads, pipelines and facilities can be impacted but significant impacts are not anticipated.

Natural Environment

No significant impacts are anticipated.

Future Development

The recognition of expansive soils typically allows it to be mitigated in future development.

Vulnerability to Soil Hazards: Land Subsidence (Medium)

People

Typically, this hazard results in property damage, not risk to human life.

Property

Subsidence may result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate natural processes of subsidence, or incur subsidence over manmade voids. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. Available data prevented further estimation of loss potential.

Critical Facilities

Linear infrastructure (roads, buried pipelines) tends to have the most risk to land subsidence. Infrastructure at risk includes levees (which can lower their ability to contain flood flows), the California Aqueduct, and Interstate 5. Other buried infrastructure on the west side of the Valley could be at risk as well.

Natural Environment

Typically, there is little impacts to the natural environment from this hazard.

Future Development

The areas with the highest susceptibility to subsidence include the western edge of the Central Valley, where development trends have been slower than the more urbanized areas of the County. As such, vulnerability to this hazard is not anticipated to increase with new development, provided that land use planning and engineering practices are followed. Increased efforts to monitor and manage groundwater pumping, increased accuracy of mapping, and emphasis on appropriate grading and ground compaction during development will help alleviate vulnerability for future development in unknown areas of risk

Vulnerability to Volcanoes (Low)

The Mono Lake-Long Valley area located adjacent to the north and east of the northernmost areas of Fresno County is the only known volcanic hazard to Fresno County. Because of the limited

area affected and remote potential of an eruption, the significance is rated low. A more likely scenario would involve ash from a regional event.

People

While a remote possibility for Fresno, volcanoes could have significant impacts on people. These include ash accumulation on the ground and in the air, that can affect the ability to breathe. More significant, though remote, could be the need to evacuate the area entirely, and a temporary or permanent relocation of large segments of the population.

Property

Volcanoes can cause two major types of impacts to the built environment. One type of impact has to do with the accumulation of ash and eruption debris on infrastructure, which needs to be removed. The other type of impact is direct impacts from lava flows and lahars, which can destroy buildings and infrastructure in their path. Due to the remote possibility of occurrence damage is not anticipated to be significant in the near future.

Natural Environment

Volcanoes can have significant impacts on the natural environment. The direct impacts of volcanoes can also destroy the landscape around the eruption – flattening trees, starting fires, moving debris and contaminating water sources. Volcanic eruptions can even affect the global climate. According to research conducted by NASA, after Mount Pinatubo in the Philippines erupted in 1991, strong winds spread the aerosol particles from the plume around the globe. The result was a measurable cooling of the Earth's surface for a period of almost two years.

Critical Facilities

Due to the low probability of this hazard, a more specific assessment of critical infrastructure risk was not conducted for this plan.

Future Development

The Mono Lake-Long Valley area located adjacent to the north and east of the northernmost areas of Fresno County is the only known volcanic hazard to Fresno County. Development in close proximity to the Valley is more at risk to volcanic flow hazards, however, the destructive impacts of a volcanic eruption cannot be easily mitigated by building codes or smart construction.

Vulnerability to Wildfire (High)

Fresno County planning area's wildfire risk and vulnerability is of significant concern, with some areas of the planning area being at greater risk than others as described further in this section. High fuel loads in the planning area, along with geographical and topographical features create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of

drought, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. Even the relatively flat and more urbanized area of central Fresno is not immune from fire. During the fire season, the dry vegetation and hot and sometimes windy weather combined with a denser population results in an increase in the number of ignitions.

Fresno County's wildfire vulnerability is the result of increased development encroaching into forested and annual grassland areas, typically referred to as the wildland-urban interface. As development continues throughout the planning area, especially in the interface, the risk and vulnerability to wildfires will likely increase. Two fire safe councils have been created to address this increased wildfire threat in the wildland-urban interface: Highway 168 and Oak to Timberline fire safe councils.

People

The historical and potential impacts of wildfire on populations include threat of injury or death, possible agricultural sector job loss, secondary economic losses to businesses located in the wildland-urban interface and within or near wildland resources like parks and national forests, and loss of public access to recreational resources. Fire suppression may also require increased cost to local and state government for water acquisition and delivery, especially during periods of drought when water resources are scarce.

The data and mapping demonstrates variations in vulnerability (population, population growth and density) across jurisdictions, and enables the analysis to identify the location of each jurisdiction relative to its risk zone on the wildfire risk map. Other at-risk populations include the location of the County's wildland recreational areas where persons might be located during a wildfire event, such as state and national parks and forests.

Wildfire risk is of greatest concern to populations residing in the moderate, high, and very high wildfire threat zones. GIS was used to estimate populations within the hazard zones, based on the residential parcels with improvements in the wildfire threat zones. Results are shown by jurisdiction in the table below.

Table 4.65 Populations at Risk to Wildfire: Fresno County Planning Area

Jurisdiction	Very High	High	Moderate	Nonwildland/ Nonurban	Urban Unzoned	Total
Clovis	0	0	0	17,968	77,713	95,680
Coalinga	0	751	1,756	431	6,464	9,402
Firebaugh	0	0	666	593	3,075	4,333
Fowler	0	0	0	1,407	3,775	5,183
Fresno	0	0	2,450	30,242	345,365	378,057
Huron	0	0	0	0	2,197	2,197
Kerman	0	0	0	2,295	7,180	9,475
Kingsburg	0	0	0	593	10,154	10,746

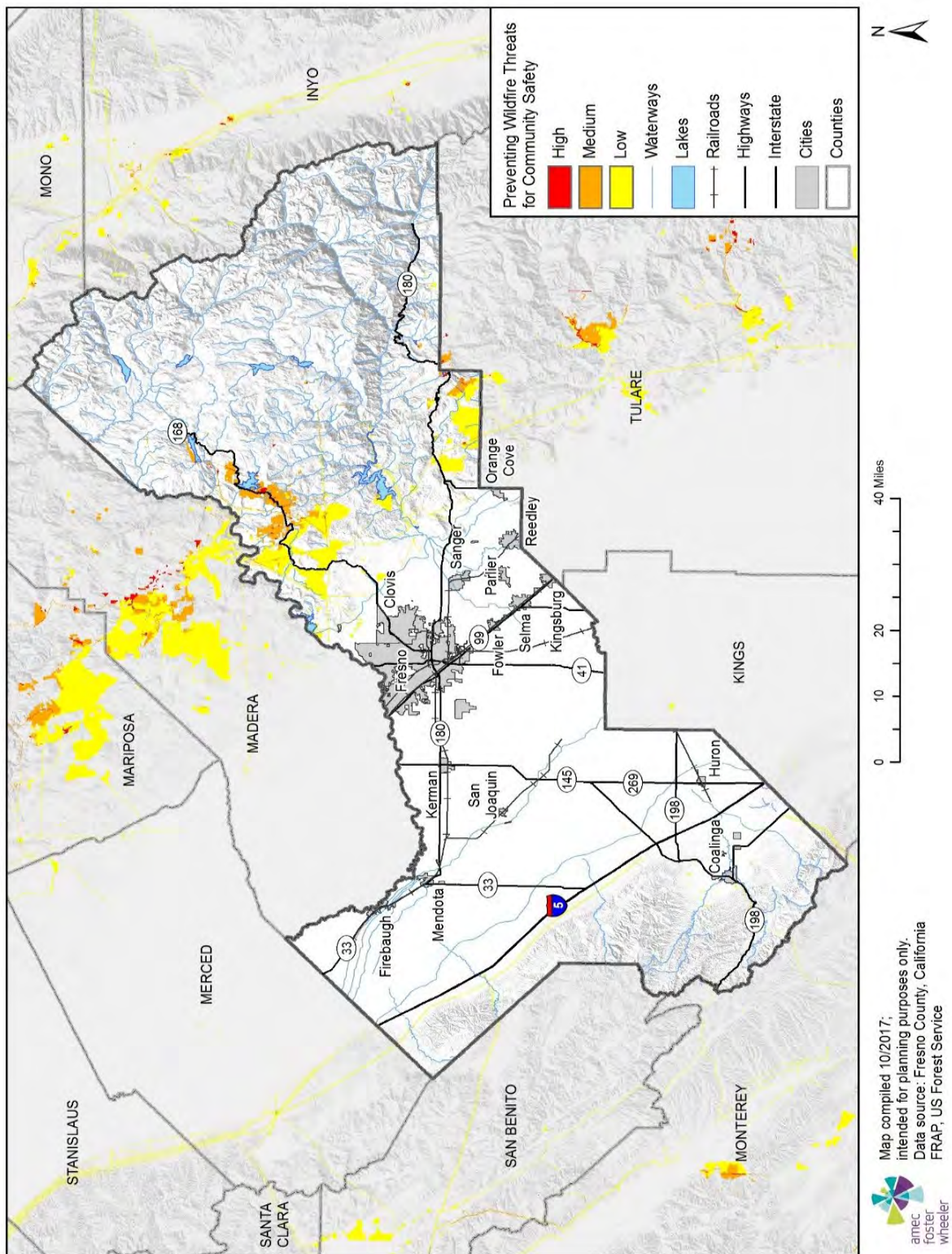
Jurisdiction	Very High	High	Moderate	Nonwildland/ Nonurban	Urban Unzoned	Total
Mendota	0	0	0	894	4,232	5,126
Orange Cove	0	0	0	155	4,394	4,549
Parlier	0	0	0	1,167	6,258	7,424
Reedley	0	0	0	1,480	15,096	16,576
San Joaquin	0	0	0	0	1,975	1,975
Sanger	0	0	0	3,119	15,701	18,820
Selma	0	0	0	973	15,860	16,833
All Cities	0	751	4,872	61,317	519,436	586,377
Unincorporated	10,981	12,325	8,033	19,502	77,804	128,645
County Totals	10,981	13,076	12,905	80,819	597,241	715,022

Sources: Amec Foster Wheeler analysis of California Department of Forestry and Fire Protection and Fresno County data

In another assessment of community vulnerability, the 2010 FRAP assessment utilized the Priority Landscape unit of analysis and defined it as the convergence of areas with high wildfire threat and human infrastructure assets. The analytical framework follows the same pattern of aligning threats with key assets to define the priority landscape. In this case, the threat is specific to the nature of fire that can cause significant losses to human infrastructure, personal property and pose a risk to public safety. These risk areas are shown on the map below. GIS Analysis of population within this area yielded the following estimates, all of which are in unincorporated areas.

- Population in High: 3,072
- Population in Medium: 8,125
- Population in Low: 11,041

Figure 4.67 Fresno County Preventing Wildfire Threats for Community Safety



Property

The historical and potential impacts of wildfire on property include crop loss, injury and death of livestock and pets, and damage to infrastructure, homes and other buildings located throughout the wildfire risk area, with greatest potential impact on property, buildings and infrastructure located within high and very high hazard zones including the urban-wildland interface, and buildings and infrastructure located within forested lands, including (but not limited to) national forests and parks.

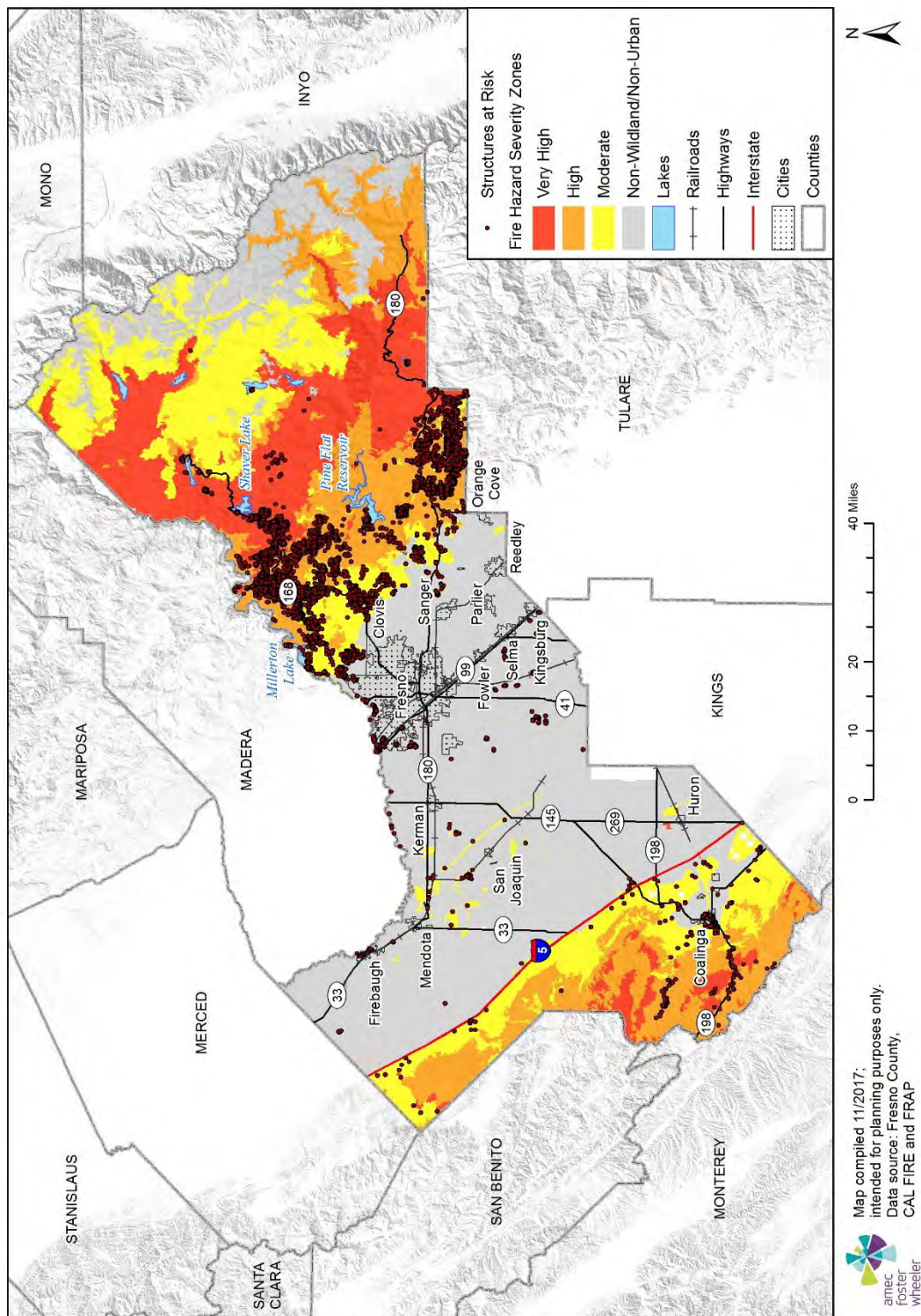
Methodology

Using CAL FIRE's Fire Hazard Severity Zones (FHSZ), an assessment of wildfire risk in the Fresno County planning area. GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the wildfire layer. For the purposes of this analysis, the wildfire hazard zone that intersected the centroid was assigned as the hazard zone for the entire parcel. For purposes of this analysis, it was assumed that every parcel with an improved value greater than zero was developed in some way. Only improved parcels and the value of their improvements were analyzed. The wildfire data was acquired from the CAL FIRE Fire and Resource Assessment Program; the layer used was the Fire Hazard Severity Zones, Very High zones in LRA (Source: http://frap.fire.ca.gov/projects/wui/525_CA_wui_analysis.pdf and <http://frap.fire.ca.gov/projects/hazard/fhz.html>). The County's parcel layer was used as the basis for the inventory of developed parcels.

The results are summarized in the tables and maps that follow. The Community Wildfire Threat used in this analysis was derived from a new and unique spatial dataset, Fire Hazard Severity Zones (FHSZ). This dataset was explicitly built for adopting new ignition-resistant building code standards and adopted by the California Building Commission in 2007. It is constructed to describe the nature and probability of fire exposure to structures, including those lands that are highly urbanized, but in close proximity to open wildlands (WUI). Details of the FHSZ mapping project are available on the FRAP website (<http://frap.fire.ca.gov/projects/hazard/fhz.html>).

As the following illustrates, there is a significant fire hazard in the eastern and far western portions of the County. The majority of the structures in the WUI are in the Sierra foothills region.

Figure 4.68 Structures at Risk to Wildfire



Once the number of parcels and their values were determined, contents values were estimated (based on 50 percent of the assessed value) to determine total values at risk by hazard zone. Overlaying the fire hazard severity zone map with the County parcel layer, it is evident that the Fresno County planning area has significant assets at risk to wildfire as detailed in Table 4.66 through Table 4.68.

Table 4.66 Values at Risk from Wildfire Summary by Severity

Fire Severity Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Very High	3,659	4,999	\$724,565,578	\$386,663,834	\$1,111,229,412
High	4,830	6,042	\$552,079,230	\$322,941,866	\$875,021,096
Moderate	5,096	5,730	\$1,189,769,652	\$787,321,643	\$1,977,091,295
Total	13,585	16,771	\$2,466,414,460	\$1,496,927,342	\$3,963,341,802

Sources: 2017 Certified Roll Values, Fresno County Assessor's Office; California Department of Forestry and Fire Protection

Table 4.67 Values at Risk from Wildfire by Property Type—Unincorporated County

Fire Severity Type	Property Type	Parcels	Building Count	Improved Value (\$)	Contents Value (\$)	Total Value (\$)
Moderate	Agricultural	353	324	\$177,961,972	\$177,961,972	\$355,923,944
	Commercial	64	106	\$21,887,626	\$21,887,626	\$43,775,252
	Exempt	29	80	\$0	\$0	\$0
	Industrial	13	23	\$1,516,713	\$2,275,070	\$3,791,783
	Multi-Residential	1	2	\$40,189	\$20,095	\$60,284
	Open Space	509	319	\$147,552,400	\$147,552,400	\$295,104,800
	Residential	2,533	3,128	\$538,399,955	\$269,199,978	\$807,599,933
	Total	3,502	3,982	\$887,358,855	\$618,897,140	\$1,506,255,995
High	Agricultural	236	298	\$27,321,155	\$27,321,155	\$54,642,310
	Commercial	85	325	\$28,173,191	\$28,173,191	\$56,346,382
	Exempt	29	55	\$0	\$0	\$0
	Industrial	9	15	\$1,703,010	\$2,554,515	\$4,257,525
	Multi-Residential	3	2	\$345,207	\$172,604	\$517,811
	Open Space	341	355	\$33,417,902	\$33,417,902	\$66,835,804
	Residential	3,885	4,624	\$430,444,222	\$215,222,111	\$645,666,333
	Total	4,588	5,674	\$521,404,687	\$306,861,478	\$828,266,165
Very High	Agricultural	54	65	\$3,803,132	\$3,803,132	\$7,606,264
	Commercial	74	133	\$41,254,672	\$41,254,672	\$82,509,344
	Exempt	28	95	\$0	\$0	\$0
	Multi-Residential	1	2	\$121,255	\$60,628	\$181,883
	Open Space	39	34	\$3,704,286	\$3,704,286	\$7,408,572
	Residential	3,463	4,670	\$675,682,233	\$337,841,117	\$1,013,523,350
	Total	3,659	4,999	\$724,565,578	\$386,663,834	\$1,111,229,412

Sources: 2017 Certified Roll Values, Fresno County Assessor's Office; California Department of Forestry and Fire Protection

Table 4.68 Values at Risk from Wildfire—Fresno County Incorporated Cities

Fire Severity	Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Moderate	Agriculture	3	17	\$289,793	\$289,793	\$579,586
	Commercial	17	111	\$26,502,121	\$26,502,121	\$53,004,242
	Exempt	18	18	0	0	0
	Industrial	20	20	\$3,886,103	\$5,829,155	\$9,715,258
	Multi-Residential	16	37	\$15,868,751	\$7,934,376	\$23,803,127
	Residential	1,521	1,561	\$255,989,940	\$127,994,970	\$383,984,910
	Total	1,595	1,764	\$302,536,708	168,550,414	\$471,087,122
High	Agricultural	1	1	\$66,463	\$66,463	\$132,926
	Commercial	4	118	\$1,419,770	\$1,419,770	\$2,839,540
	Multi-Residential	3	5	\$151,816	\$75,908	\$227,724
	Residential	234	244	\$29,036,494	\$14,518,247	\$43,554,741
	Total	242	368	\$30,674,543	\$16,080,388	\$46,754,931
Grand Total		1,837	2,132	\$333,211,251	\$184,630,802	\$517,842,053

Sources: 2017 Certified Roll Values, Fresno County Assessor's Office; California Department of Forestry and Fire Protection

Natural Environment: Wildfire Potential Impact to Ecosystems

Natural resources are important to include in benefit-cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting watersheds will help maintain the quantity and quality of water, timber production and promote carbon sequestration.

Given the previous discussion on wildfire frequency and severity, research conducted as part of the 2010 FRAP Assessment brings to light the factors that shape the potential impact of wildfire events, namely the vulnerability characteristics of ecosystems, populations, buildings and infrastructure that lie within wildfire risk areas within the planning area and beyond. As such, the 2010 Assessment analyzed a variety of factors according to a set of criteria in order to identify what it terms, Priority Landscapes and Priority Communities most vulnerable to wildfire.

With regard to ecosystems, Figure 4.69 shows the analytical framework for identifying the Priority Landscape to assess the risk and feed the mitigation strategy for dealing with preventing damage to ecosystems as a result of wildfire.

Figure 4.69 Defining Wildfire Priority Landscapes



In analyzing the threats, the Assessment defined a particular small area as a Stand-Level threat and is derived from FRAP's fire threat data compiled in 2004. It is based on fuel conditions, observed fire frequency and expected fire weather conditions.

The Landscape-Level wildfire threat attempts to capture the threat of damage to ecosystems at the landscape scale. This is derived by calculating the percentage of each vegetation type in each unique tree seed zone that is "unhealthy", based on being in a condition class that indicates significant deviation from historical fire regimes—specifically the proportion of a given ecosystem that is in either condition class two or three. This approach recognizes that stand-level threats have elevated importance if cumulatively they have potential to damage broader landscape-level ecosystems. A detailed discussion of the metrics can be found on the FRAP website (http://frap.fire.ca.gov/assessment2003/Chapter3_Quality/wildfire.html).

Overall, results of the Assessment indicate that Priority Landscape identifies priority areas within ecosystems that have high levels of threat from future fires, and should be viewed as a basic assessment of need for strategies and adoption of tools to protect these key areas in the future. It is constructed by combining stand- and landscape-level threats to create a composite threat map, and classifying the final product into low, medium, and high priority landscapes. The following maps depict the Assessment findings, showing Fresno County Wildfire Priority Landscapes based on threats to water supply and water quality. Trends in landscape characteristics indicate high threats to water quality and supply in the eastern portion of the County, in the Sierra Nevada region.

Figure 4.70 Fresno Wildfire Priority Landscape- Water Supply

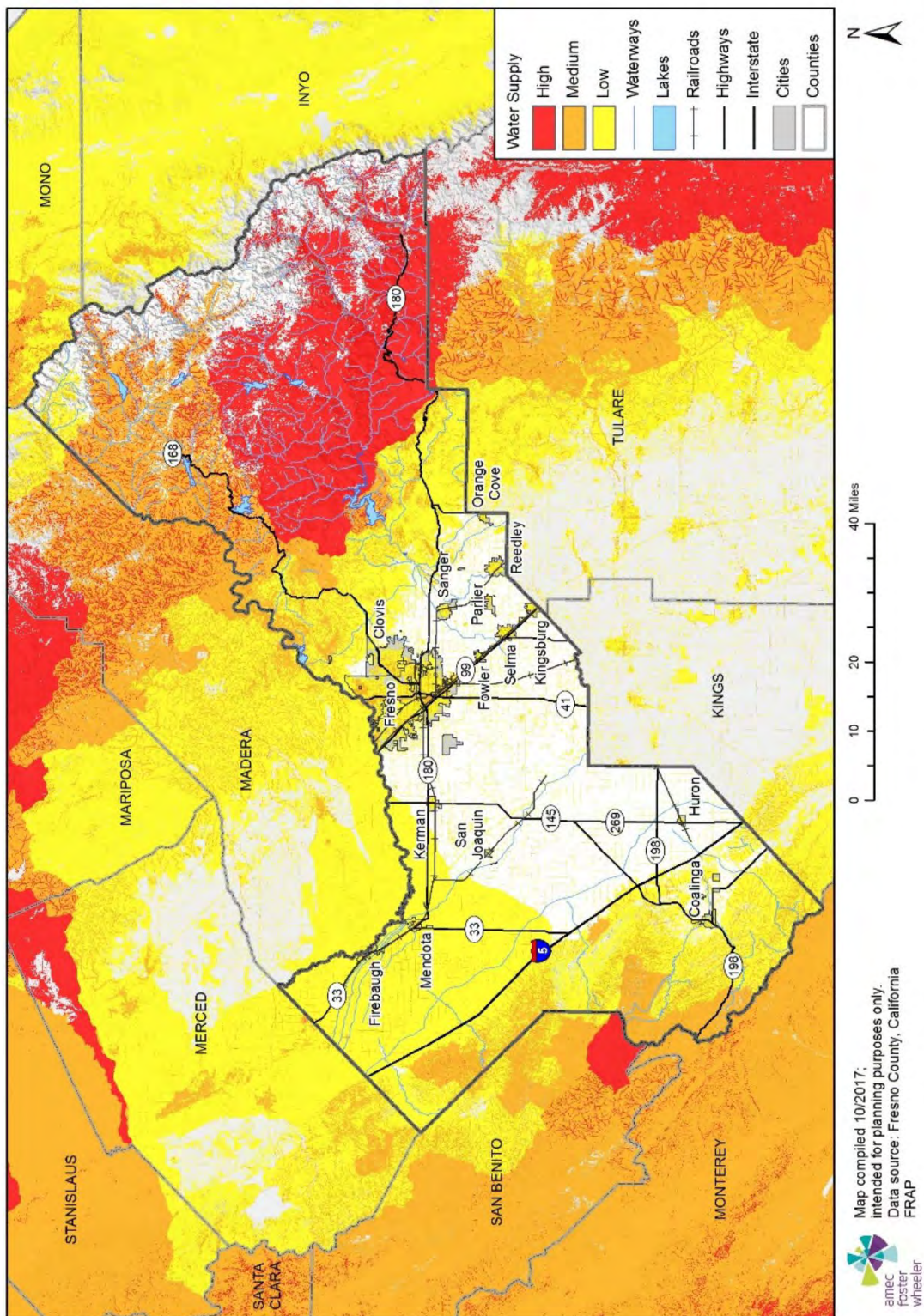


Figure 4.71 Fresno Wildfire Priority Landscape- Water Quality

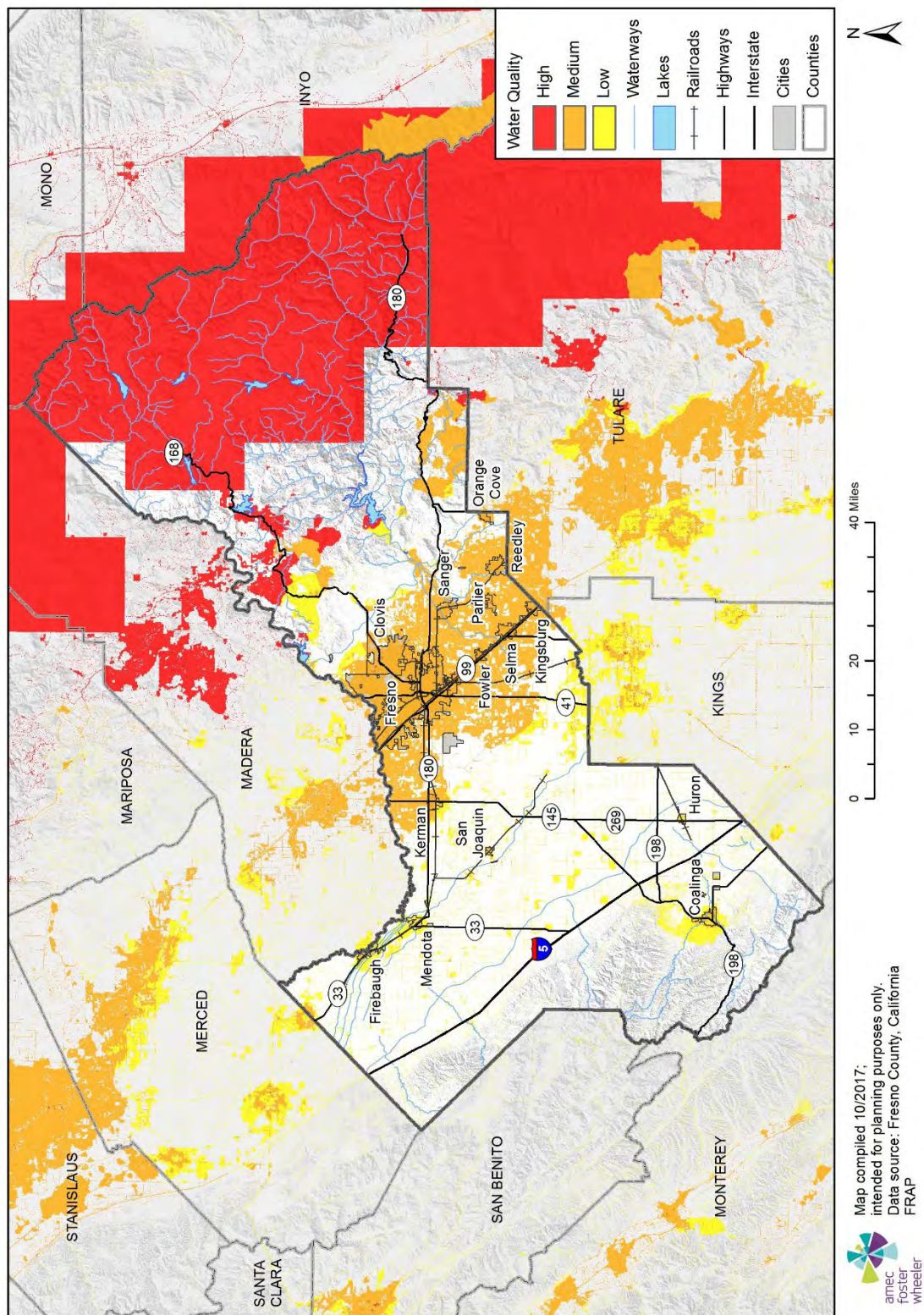
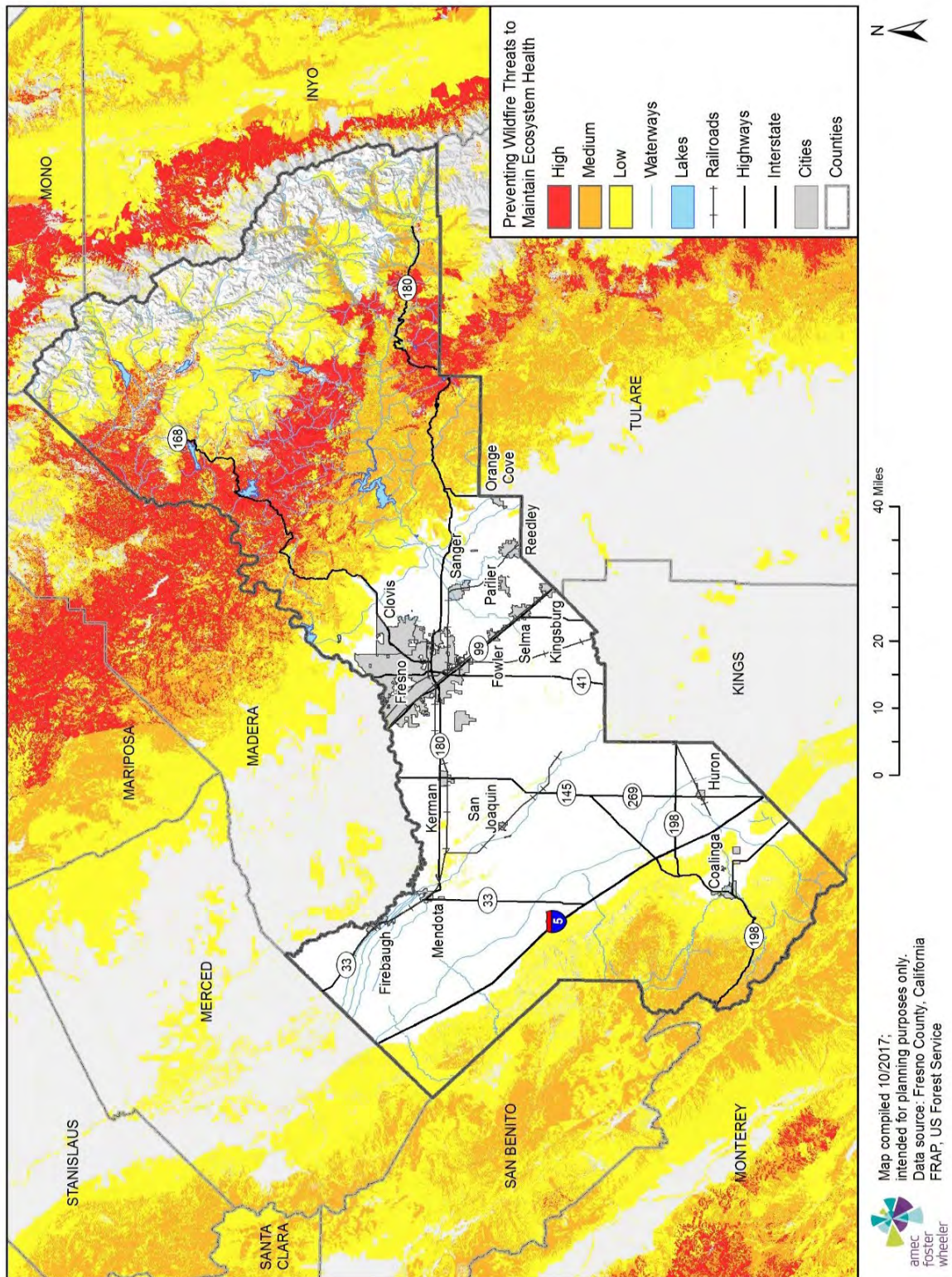


Figure 4.72 Fresno County Preventing Wildfire Threats to Maintain Ecosystem Health



The Fresno County planning area has substantial cultural and natural resources located throughout the County as previously described. Wildfires also cause watershed and ecosystem losses. These losses include impacts to water supplies and water quality as well as air quality. Another loss is to the aesthetic value of the area. Major fires that result in visible damage detract from that value. Other natural resources at risk from wildfire include wildland recreation areas, wildlife and habitat areas, rangeland, and timber resources. The loss to these natural resources would be significant.

The historical and potential impacts of wildfire on the natural environment are widespread throughout public and private lands within the County, exacerbated by drought and tree mortality, with impacts to all flora and fauna, and the destabilization (erosion, subsidence) of land dependent on healthy plants and trees for stability.

The data and mapping captures the full range of vulnerable species, habitat types, biotic regions, parks and forests, and other environmental features within Fresno County. Also provided is each jurisdiction's location within these natural areas, and the location of both jurisdictions and natural areas/species relative the wildfire risk zones on the wildfire risk map. It should be noted that those species and natural zones most greatly affected by drought appear to be most vulnerable to wildfire - The history of drought and (pine) tree mortality locations (section 4.2.4, p. 25, 26) in the County highly correlates with the Very High hazard zone on the Wildfire Severity Map (Figure 4.52) (Source: http://frap.fire.ca.gov/projects/projects_drought).

Critical Facilities

Wildfire impacts to critical facilities include structural damage or destruction, risk to persons located within facilities, and interruption of facility operations and critical functions.

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described in Section 4.3.1. An analysis was performed using GIS software to determine where critical facilities are located within the wildfire threat zones. Table 4.69 lists the critical facilities in the different wildfire hazard zones for the entire Fresno County planning area.

Table 4.69 Critical Facilities at Risk to Wildfire by Hazard Class: Fresno County Planning Area

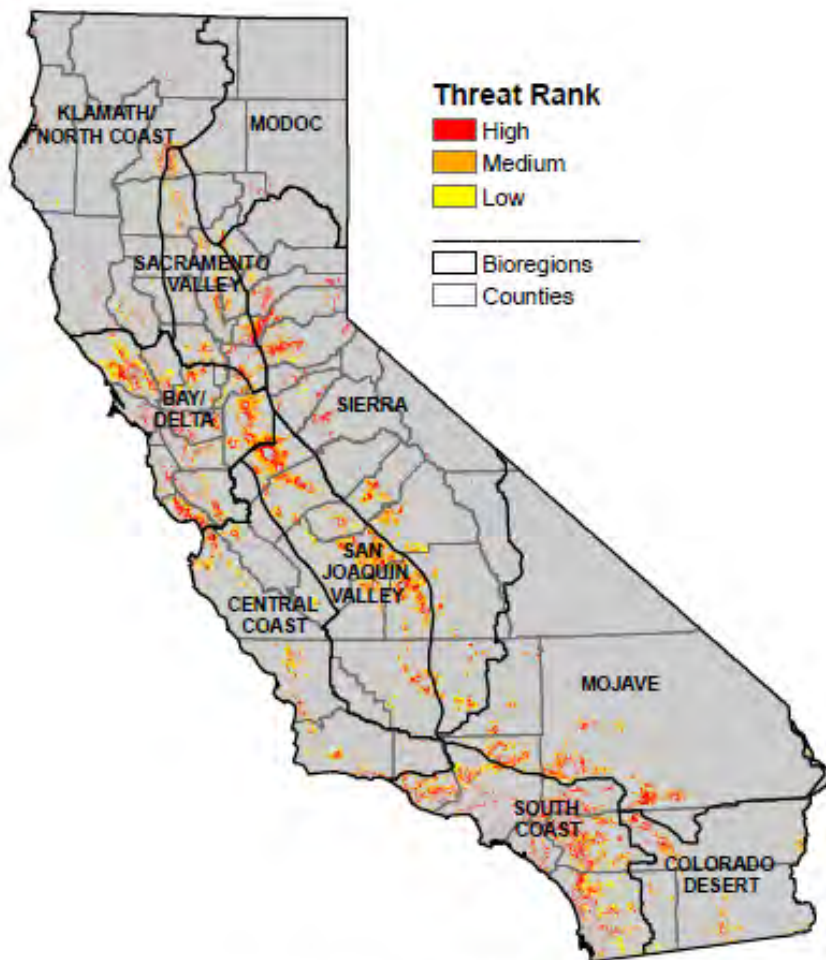
Fire Severity	Jurisdiction	Facility Type	Counts
Very High	Unincorporated	Fire Station	8
		School	7
		Total	15
High	Unincorporated	Fire Station	7
		School	15
		Sheriff	1
		Total	23
Moderate	Coalinga	Department of Public Works	1
		Fire Station	2
		Total	3
	Firebaugh	Airport	1
		Total	1
	Fresno	Daycare	1
		Total	1
	Unincorporated	CalARP	3
		Department of Public Works	1
		Fire Station	3
		School	2
		Sheriff	1
		Total	10
		Grand Total	15

Sources: Fresno County GIS, California Department of Forestry and Fire Protection, Amec Foster Wheeler analysis 2018

Future Development

Given that large, destructive fires continue to plague California communities (and Fresno County), recent research points out that such impacts are related to growth/land-use development and federal, state and local policy makers continue to expand the demarcations of the Wildland Urban Interface (WUI). Because future development encompasses all forms of property, buildings, infrastructure, critical facilities and all related populations and their functions, drought impacts to future development align with the historical and potential impacts to populations, property, natural environment, and critical facilities discussed (above). Population growth and development in Fresno County is on the rise. Additional growth and development within the WUI interface will continue to increase the risk and vulnerability of the planning area to damaging wildfires.

Figure 4.73 Localized Development Threat



**Figure 1.1.3.
Localized development threat.**

Data Sources: U.S. Census Bureau (2000); ICLUS, U.S. Environmental Protection Agency (2009); Commission on Local Governance for the 21st Century (2000)

Source: http://frap.fire.ca.gov/data/assessment2010/pdfs/1.1population_growth.pdf

In general, continuing past trends, much development in Fresno County is projected on land currently used for agriculture. Figure 4.73 (above) shows high risk of development across large extents of the San Joaquin Valley.

Overall Community Impact

The overall impact to the community from a severe wildfire includes:

- Injury and loss of life;
- Commercial and residential structural damage;
- Decreased water quality in area watersheds;
- Increase in post-fire hazards such as flooding, sedimentation, and mudslides;
- Damage to natural resource habitats and other resources, such as timber and rangeland;
- Loss of water, power, roads, phones, and transportation, which could impact, strand, and/or impair mobility for emergency responders and/or area residents;
- Economic losses (jobs, sales, tax revenue) associated with loss of commercial structures;
- Negative impact on commercial and residential property values;
- Loss of churches, which could severely impact the social fabric of the community;
- Loss of schools, which could severely impact the entire school system and disrupt families and teachers, as temporary facilities and relocations would likely be needed; and
- Impact on the overall mental health of the community.

4.4 Human-Caused Hazards

This risk assessment differs from the risk assessment for natural hazards in that it does not include an assessment of potential losses from human-caused hazards. Such an assessment is very difficult, primarily because of how unpredictable and complex such events are. Human-caused hazard events are often measured in terms such as human lives and economic disruption as well as the value of the facilities actually impacted. The value of impacted facilities is often negligible as compared to the emotional value and the economic impact of affected local, regional, national, and world markets. The unpredictability of human-caused hazard events creates a level of complexity in modeling potential losses which is often covered in other planning mechanisms and is well beyond the scope of this DMA planning effort.

The risk assessment process for human-caused hazards identifies the areas most susceptible to potential hazard events by evaluating which populations and facilities are most vulnerable to human-caused hazards. It is presented in two sections: Hazard Identification and Profiles: Human Caused-Hazards and Asset Inventory and Vulnerability Assessment.

4.4.1 Hazard Identification and Profiles: Human-Caused Hazards

Natural hazards, while essentially uncontrollable events, do follow the fundamental laws of earth science and physics. Therefore, the types, frequencies, and locations of many natural hazards can be identified and often predicted with a certain level of confidence. For example, within floodplains, it can be stated that in any given year there is a 1 percent chance of a flood event at a given discharge and flood depth that will be equaled or exceeded. These predictions are based on

historical flood records combined with hydrologic and hydraulic modeling. In many cases, warning systems are in place to notify the public of a pending natural event. The same is not usually true for human-caused hazards.

With human-caused hazards, the recurrence interval cannot be predicted and human behaviors, such as incompetence, carelessness or malice cannot be forecast with any level of accuracy. While some warning systems have been established to notify at risk populations of impending threats from human-caused hazards, these types of hazards usually do not follow a predictable pattern. The potential exists for most types of human-caused hazards to occur anywhere at any time. Due to their unpredictability, human-caused hazards can pose great danger to public health and safety. Education, warning, and response capability are particularly important in preparing for human-caused incidents.

Human-caused hazards are hazards that directly result from human activity. These hazards can be accidental or intentional. FEMA guidance generally separates human-caused hazards into two broad categories: technological hazards (accidental) and terrorism hazards (intentional). The HMPC chose to only address technological hazards associated with a hazardous materials release in this plan.

Hazardous Materials Incidents

Hazardous Material Incidents usually result from accidents or system failures. These hazards are largely unforeseen and therefore are difficult to predict with any level of accuracy. Hazards of concern in Fresno County include fixed facility incidents and transportation incidents (these are discussed further below); in other words, facilities and operations that produce, transport, store, and/or use hazardous materials.

Hazardous materials are substances that are flammable or combustible, explosive, toxic, noxious, corrosive, reactive, an oxidizer, an irritant, carcinogenic, or radioactive. These materials can harm people through skin contact, inhalation, ingestion, or pharmaceutical action. Hazardous materials have the potential to be released into the environment during use, processing, storage, and transport or when improperly disposed. A release of a hazardous material can pose a risk to life safety, public health, and property and can result in the evacuation of a few people, a portion of a facility, or an entire area. Other concerns include impacts to air quality, water quality, and other short- and long-term impacts to the natural environment. As a result of these risks, the use, storage, transport, and disposal of hazardous materials is highly regulated at the federal, state, and local levels.

Hazardous materials are everywhere, and spills or releases occur in this nation on a daily basis. According to FEMA, the impact to life and property from any given release depends on a number of factors:

- **Application Mode** describes the human act(s) or unintended event(s) necessary to cause the hazard to occur.

- **Duration** is the length of time the hazard is present on the target.
- The **dynamic/static characteristic** of a hazard describes its tendency, or that of its effects, to either expand, contract, or remain confined in time, magnitude, and space.
- **Mitigating conditions** are characteristics of the target and its physical environment that can reduce the effects of a hazard.
- **Exacerbating conditions** are characteristics that can enhance or magnify the effects of a hazard

Additional factors contribute to the impact of hazardous materials releases from a fixed facility or transportation incident: Cal A

- Solid, liquid, and/or gaseous hazardous materials can be released from fixed or mobile containers either accidentally or on purpose (see Table 4.70).
- The resulting release can last for hours or for days.
- The substances released may be corrosive or otherwise damaging over time, and they may cause an explosion and/or fire.
- Contamination may be carried out of the incident area by people, vehicles, water, and/or wind.
- Weather conditions will directly affect how the hazard develops.
- The micrometeorological effects of buildings and terrain can alter travel and duration of agents.
- Shielding in the form of sheltering in place can protect people and property from harmful effects.
- Noncompliance with fire and building codes as well as failure to maintain existing fire protection and containment features can substantially increase the damage from a hazardous materials release.

Table 4.70 Potential Human-Caused Actions Resulting in Technological Hazard Events

Industrial (Fixed Facility)	Industrial (Transportation Accidents)	Supervisory Control and Data Acquisition
Failure to adhere to procedures	Tanker truck spills	Failure of automated systems
Leaks	Truck accidents	Sabotage/intrusion
Failure of equipment	Railway accidents	
Failure of safety systems		

Source: Integrating Manmade Hazards into Mitigation Planning, FEMA 386-7, 2003; HMPC

Fixed Facility Incidents

Industrial accidents occur due to inadequate human oversight or the failure of systems used to move or store materials, such as pipes and storage tanks. Numerous facilities in the Fresno County region have been identified as sites that store hazardous materials as part of their daily operations. The threat that these sites pose to the region depends on the type of material present and the proximity of these facilities to populations and whether or not these materials are transported.

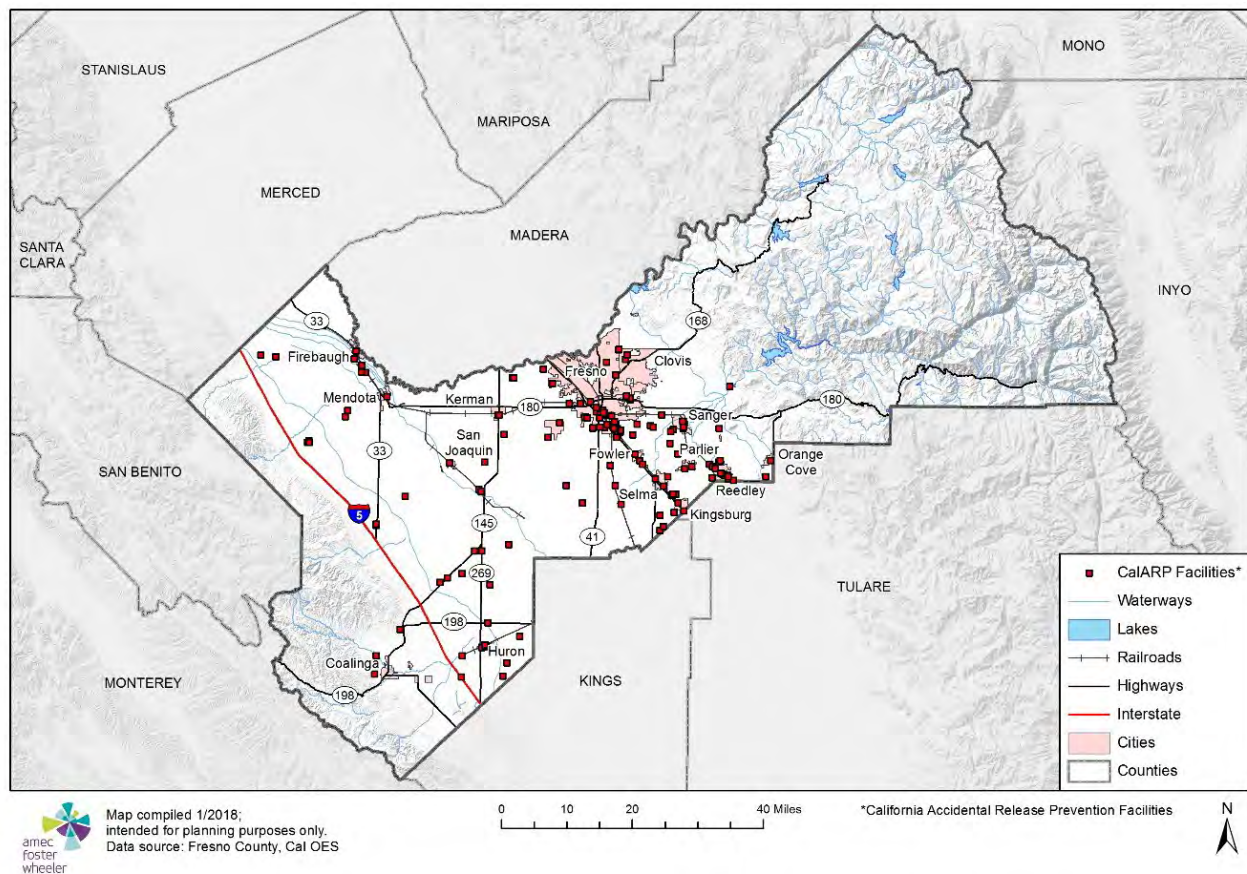
In order to identify those facilities with the greatest potential for a hazardous materials release that could adversely impact communities within the Fresno County planning area, the HMPC took an initial inventory of potential sites by utilizing data from the California Accidental Release Prevention Program (CalARP). The program was implemented on January 1, 1997 and replaced the California Risk Management and Prevention Program (RMPP). The purpose of the CalARP program are to prevent accidental releases of substances that can cause serious harm to the public and the environment, to minimize the damage if releases do occur, and to satisfy community right-to-know laws. This is accomplished by requiring businesses that handle more than a threshold quantity of a regulated substance listed in the regulations to develop a Risk Management Plan (RMP). An RMP is a detailed engineering analysis of the potential accident factors present at a business and the mitigation measures that can be implemented to reduce this accident potential. The RMP contains:

- Safety information
- A hazard review
- Operating procedures
- Training requirements
- Maintenance requirements
- Compliance audits
- Incident investigation procedures

The CalARP program is implemented at the local government level by [Unified Program Agencies \(UPAs\)](#). Of benefit to the HMPC's efforts to address hazardous materials incidents is the fact that the CalARP program is designed so that UPA's work directly with regulated facilities.

Figure 4.74 (below) identifies the all CalARP regulated facilities within the planning area, as well as the location and density of such facilities in relation to jurisdictions (at risk population centers), and critical infrastructure such as railways and major transportation routes. The mapped sites below represent those most critical (CalARP) sites as determined by the HMPC for the purposes of the plan update.

Figure 4.74 Fresno County CalARP Facilities



- In addition to the Cal ARP sites mapped (above), the following sites are identified in the Fresno County 2040 General Plan (2017 public review draft):
- As of February 1, 2016, there are 70 active Leaking Underground Storage Tanks (LUST) sites and 28 Superfund sites, including five National Priorities List (NPL) listed sites, in Fresno County.
- There are 1,678 small quantity hazardous waste generators and 150 large quantity hazardous waste generators in Fresno County.
- There are three hazardous waste disposal facilities in Fresno County: A collection facility and a recycling facility, both operated by Safety Kleen Corporation, and a Regional Permanent Household Hazardous Waste Facility operated by Fresno County to accommodate the disposal of hazardous household waste. The Safety Kleen recycling facility handles immersion cleaners and mineral spirits.
- Agriculture operations in proximity to urbanized areas, particularly near residential uses, present some risks associated with agricultural chemicals (pesticides and fertilizers). As more residential development is built close to existing agricultural uses, risks associated with

agricultural chemicals may increase (Source: Fresno County 2040 General Plan, (2017 Public Review Draft, p. 8.67).

The following table (Source: CalARP) identifies the number of hazardous materials facilities within each jurisdiction and in unincorporated Fresno County. It is useful as a cross-reference to illustrate how the risk varies by jurisdiction.

Table 4.71 Hazmat Facilities by Jurisdiction

Jurisdiction	Counts
Clovis	2
Firebaugh	2
Fowler	3
Fresno	28
Huron	7
Kerman	2
Kingsburg	5
Mendota	1
Orange Cove	1
Parlier	2
Reedley	8
San Joaquin	1
Sanger	5
Selma	2
Unincorporated	87
Total	156

Source: CalARP

Transportation Incidents (e.g., Rail, Highway)

Transportation incidents can occur during the transportation of hazardous materials to and from storage facilities. The most likely routes for the transportation of hazardous materials are major roadways and railroads. Two major north-south roadways are located in Fresno County. Highway 99 runs through the central part of the County and provides a north-south corridor through several counties. Most of the County's industrial and residential activity is positioned along Highway 99. In western Fresno County, Interstate 5 traverses the County at the base of the Coast Range foothills. State Routes 33, 41, 43, 63, 145, 168, 180, 198, and 269 provide local service to urban and rural areas in the County. A network of County roads connects the various communities to these major arteries. Major rail lines include Union Pacific, Burlington Northern and Santa Fe Company, Port Railroads, Inc., and San Joaquin Valley Railroad. The major transportation corridors and rail lines are listed in Table 4.72 and illustrated in Figure 4.75 and Figure 4.76.

The United States Department of Transportation (USDOT) has established nine hazardous materials classifications: explosive, compressed gases, flammable/combustible liquids, flammable

solids, oxidizers, poisons, corrosive, radioactive, and miscellaneous. Transporters of such materials must adhere to routing requirements that are enforced by the California Highway Patrol. Transportation must take the most direct route, utilizing State or interstate highways whenever possible, and only roadways with sufficient width and load bearing capacity. All nine classes of hazardous materials, including hazardous waste, may be transported on Interstate 5. Materials that are poisonous by inhalation, explosives or high level radioactive may be transported on certain State Routes, including SR 33, 41, 63, 99, 180, and 198, but are subject to restrictions (Source: Fresno County 2040 General Plan, (2017 Public Review Draft)).

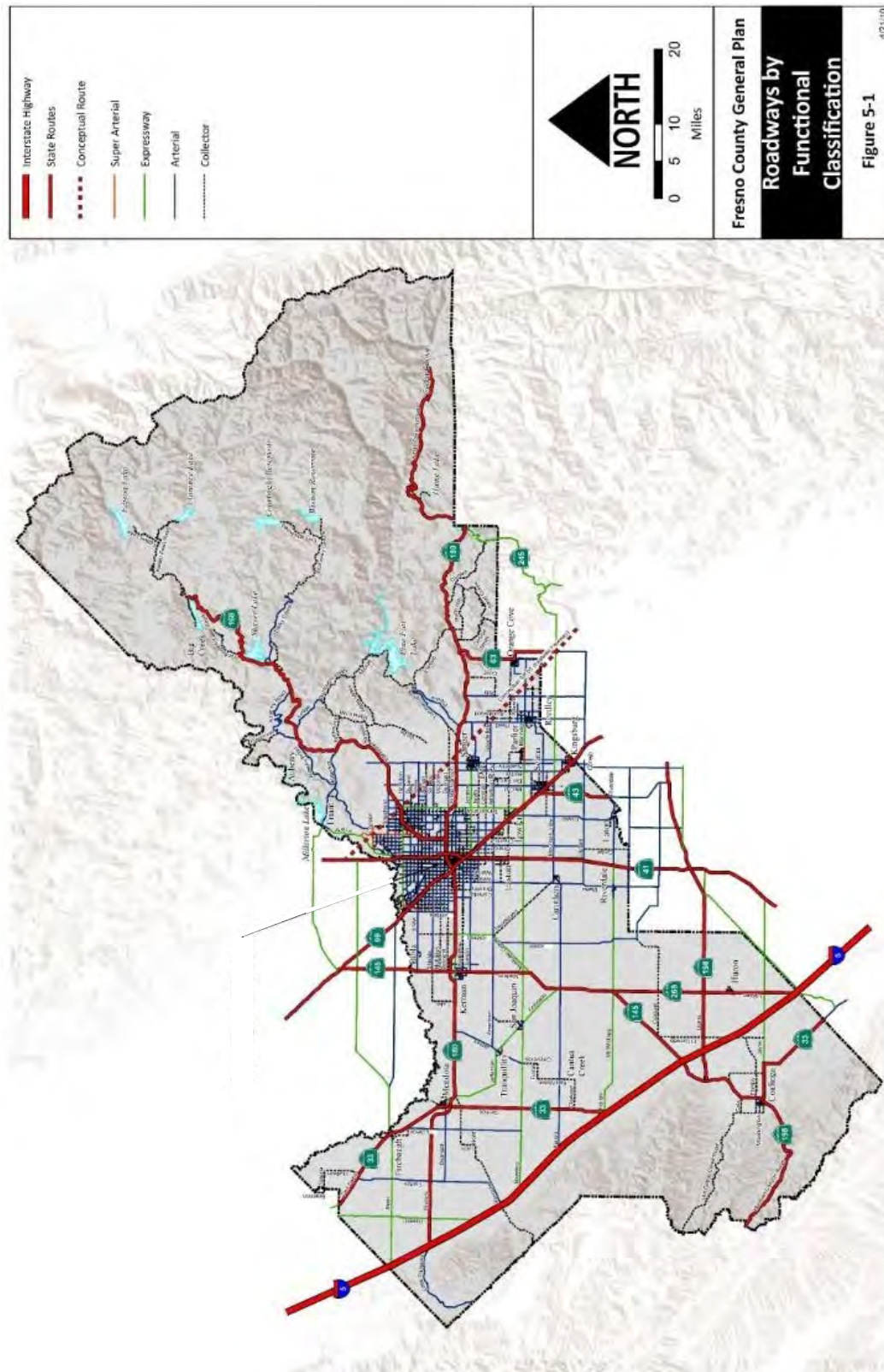
Table 4.72 Major Fresno County Transportation Corridors

Major Roadways	Rail Lines/Operators
Highway 99 *	Union Pacific Railways
Interstate 5*	Burlington Northern and Santa Fe Company
State Route 33	Port Railroads Inc.
State Route 41	San Joaquin Valley Railroad
State Route 43	
State Route 63	
State Route 145	
State Route 168	
State Route 180	
State Route 198	
State Route 269	
Golden State Boulevard*	
Manning Avenue	
Jensen Avenue*	

Source: Fresno County General Plan

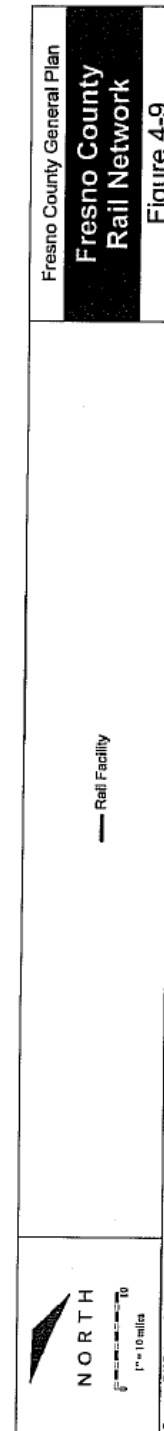
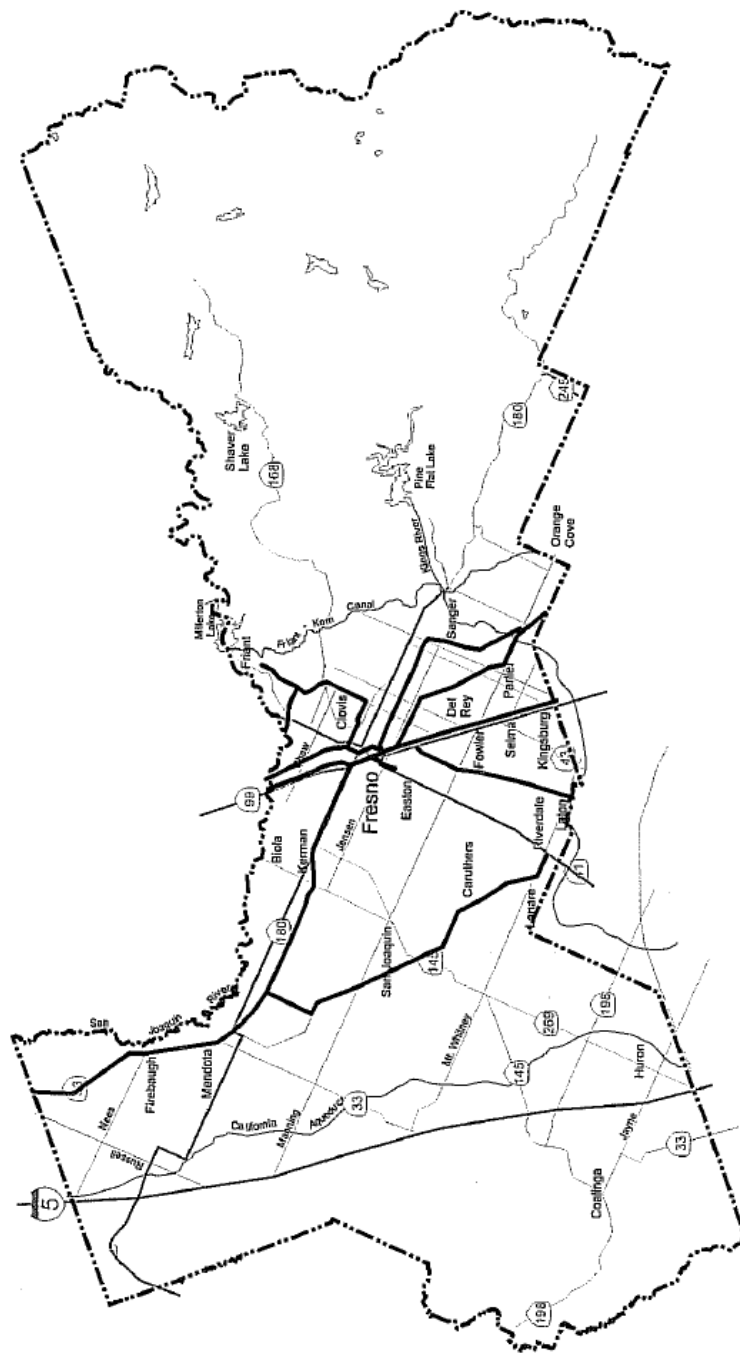
*Indicates corridor experiences truck traffic in excess of 2,000 vehicles per day

Figure 4.75 Fresno County's Transportation System



Source: Fresno County General Plan, 2017

Figure 4.76 Fresno County's Rail Network



Source: Fresno County General Plan, 2000

Of the County's transportation corridors, Interstate 5, Highway 99, and State Route 41 are the most significant because they provide direct links between the County transportation system, the surrounding regions, and beyond. The other corridors identified in Table 4.72 connect cities and communities in Fresno County with each other.

According to the Fresno County General Plan Background Report, truck transportation, followed by rail, air, and pipeline, provides the majority of goods movement in Fresno County, including the transportation of hazardous materials. Fresno County has considerable long-distance trucking activity due to the presence of Interstate 5 and Highway 99. According to the background report, Highway 99 carries the greatest volume of truck traffic in Fresno County (between 7,800 and 22,100 vehicles per day); Interstate 5 also experiences large volumes of truck traffic (between 5,500 and 6,500 vehicles per day). Other routes with significant truck traffic (i.e., more than 2,000 vehicles per day) include Golden State Boulevard and Jensen Avenue.

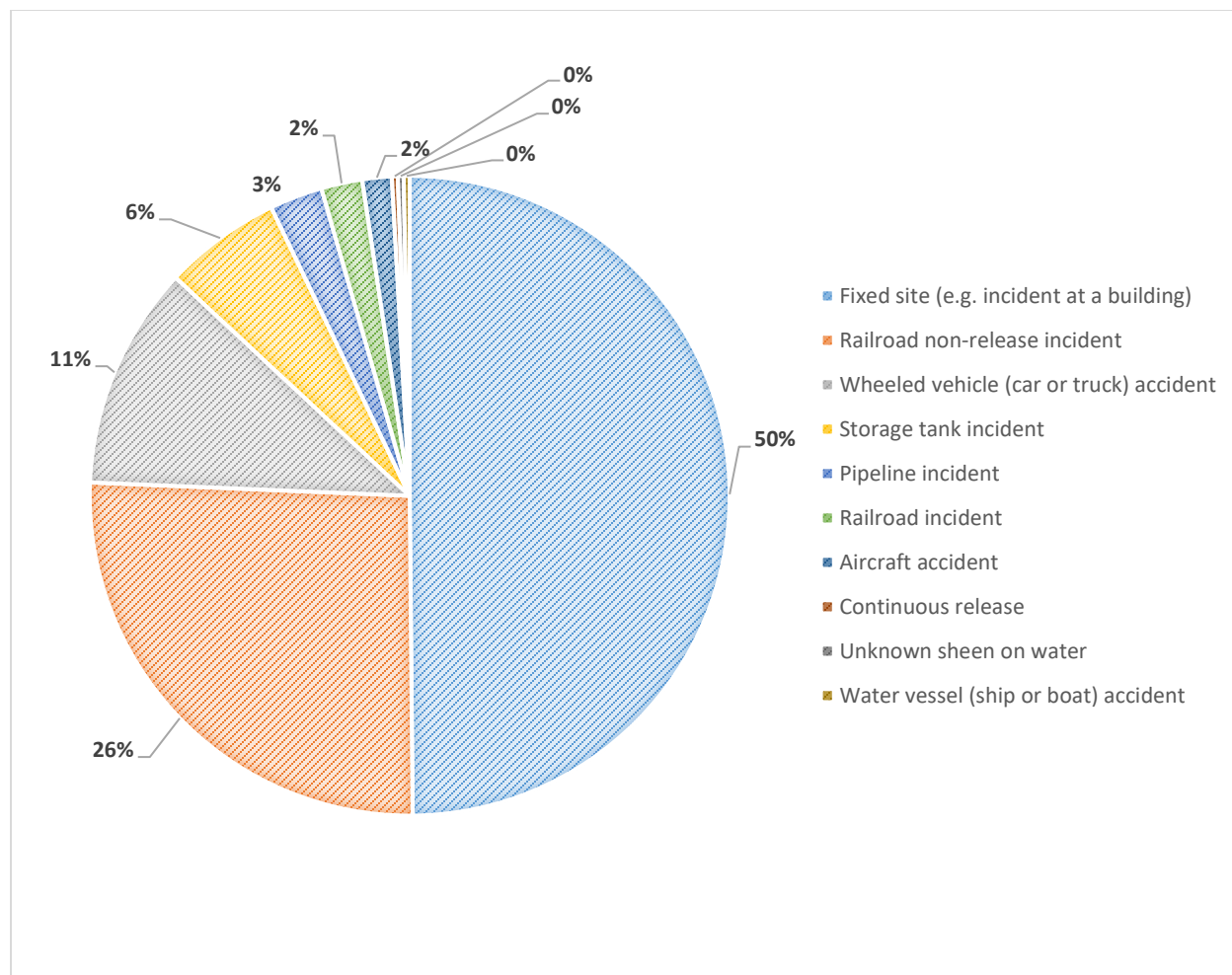
There are two mainline rail lines that run north-south through Fresno County. The first, owned by the Burlington Northern and Santa Fe Company, connects the County to Sacramento and the San Francisco Bay Area to the north and Bakersfield to the south. The second, owned by Union Pacific Railways, parallels the Highway 99 corridor and connects the County to Sacramento and the Bay Area to the north and Bakersfield to the south. Both lines service the City of Fresno. Other lines provide rail service primarily to communities within the County and to adjacent counties. According to the HMPC, approximately 40 trains travel through the City of Fresno each day, and sometimes the trains carry hazardous materials very close to schools and residential areas.

Past Occurrences

Hazardous materials incidents in Fresno County are frequent events. Statistics from the National Response Center, which serves as the sole national point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment anywhere in the United States and its territories, indicate that between 2009 and the end of 2016, 337 incidents were reported in Fresno County. Of these, 64 included fatalities, 61 included injuries, 38 included hospitalizations. The incidents required 1,874 people to be evacuated, and caused \$353,888 in property damage.

Figure 4.77 shows the breakdown of the types of incidents that occurred in Fresno County in this time period. Of the incidents, 50 percent were fixed, 26 percent were railroad non-release, 11 percent were mobile (transportation on land), 3 percent were pipeline and 2 percent were railroad.

Figure 4.77 Reports of Hazardous Materials Incidents in Fresno County, 2009-2016



Source: National Response Center, www.nrc.uscg.mil/

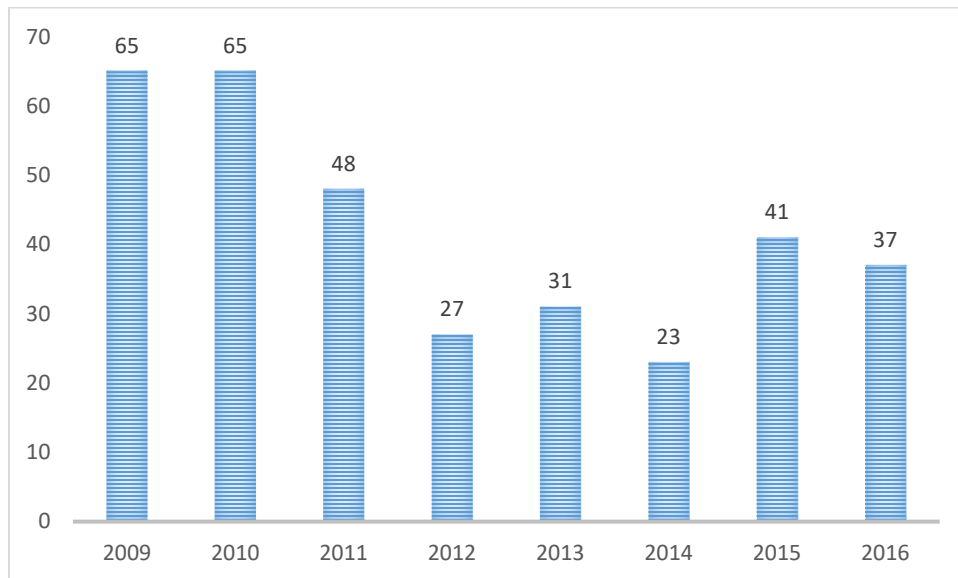
Table 4.73 NRC-Reported Hazardous Materials Incidents in Fresno County, 2009-2016

Incident Type	Number of Incidents
Fixed site (e.g. incident at a building)	168
Railroad non-release incident	87
Wheeled vehicle (car or truck) accident	38
Storage tank incident	20
Pipeline incident	9
Railroad incident	7
Aircraft accident	5
Continuous release	1
Unknown sheen on water	1
Water vessel (ship or boat) accident	1
Drilling platform incident	0
Unknown	0
Left Blank	0

Source: National Response Center, www.nrc.uscg.mil/

Trend data between 2009 and 2016 shows a high of 65 incidents reported to the NRC per year (2009, 2010), and a low of 23 incidents per year (2014). The data shows a gradual decline in number of incidents per year.

Figure 4.78 Reports of Hazardous Materials Incidents in Fresno County, 2009-2016



Source: National Response Center, www.nrc.uscg.mil/

NRC data shows that a majority of incidents occurred in Fresno, with 197 reported; the following table shows total number of incidents reported to the NRC for Fresno County by jurisdiction.

Table 4.74 NRC-Reported Hazardous Materials Incidents by Jurisdiction 2009-2016

Cities	Incidents
Fresno*	197
Sanger*	19
Auberry	11
Old Fig Garden	11
Clovis*	10
Big Creek	7
Fowler*	7
Selma*	7
Reedley*	6
Coalinga*	5
Firebaugh*	5
Not Identified	5
Helm	4
Kingsburg*	4
Conejo	3
Del Rey	3
Laton	3
Shaver Lake	3
Cantua Creek	2
Huron*	2
Kerman*	2
Lemoore	2
Squaw Valley	2
Tranquility	2
Canejo	1
Caruthers	1
Corcoran	1
Five Points	1
Hammond	1
Mendota*	1
NAS Lemoore	1
North Fork	1
Pickley	1
Pitdria	1
Riverdale	1
Sigarden	1
Sunmaid	1

Cities	Incidents
Traver	1
Trigo	1

Note: Municipalities are noted with an *

Source: National Response Center, www.nrc.uscg.mil/

The County's emergency response team receives numerous calls each year related to hazardous materials releases. Since 2004, the team has received over 1,000 reports. The majority of incidents in Fresno County were fuel spills and characterized as relatively minor. As such, it is just a response/cleanup issue that generally does not pose a significant impact to the community. However, other incidents can and have occurred in the County. The HMPC provided details about some of the hazardous materials incidents that have occurred in Fresno County (see Table 4.75 and Table 4.74.

Table 4.75 Hazardous Materials Fixed Facility Incidents in Fresno County

Date	Location	Incident Type	Damage/Exposures
7/7/2004	Sun West Fruit Company, 755 E. Manning Avenue, Parlier	Anhydrous ammonia (approximately 50 pounds) leaked	86 people were employees, 28 were taken to the hospital

Source: Fresno County HMPC

Table 4.76 Hazardous Materials Transportation Incidents in Fresno County

Date	Location	Incident Type	Damage/Exposures
6/5/2000	Interstate 5 in Fresno County	Pressurized anhydrous ammonia released (truck was hauling 19,500 pounds) in accident	Employees of nearby business affected, one person hospitalized, Interstate 5 was closed for 29 hours
4/28/2006	Southbound Freeway 41 at Highway 99	Automotive fluid released (20 gallons) onto the roadway and into a culvert as a result of an overturned big rig	Spill contained and cleaned up
1/22/2007	Northbound Highway 99 North of Ashlan Avenue	Sodium hydroxide (up to 5 gallons) Methanol, Alkanolamine, and Tolad resulting from a motor vehicle accident	Spill contained and cleaned up, northbound Highway 99 was closed for 9 ½ hours
6/19/2007	Blackstone and McKinley Avenue	Suspected propane resulting from train derailment	Due to potential danger, Fresno City College campus was closed for the evening; no actual release occurred
6/28/2007	Southbound State Route 41 below the Jensen Avenue overpass	Diazinon 50W (insecticide, 10 gallons) occurring when products shifted in a truck and containers fell onto the freeway and were struck by an oncoming truck	Two people exposed and decontaminated; Spill contained and cleaned up
11/3/2007	Highway 99 and Clovis Avenue	Small amount of diesel fuel spilled due to numerous car accidents	Spill contained and cleaned up

Source: Fresno County HMPC

4.4.2 Asset Inventory and Vulnerability Assessment

The probability and potential losses of human-caused technological hazards are difficult to quantify due to the “human” element. These hazards can occur at any time and virtually any place with little or no warning. However, they can often be inventoried because they typically occur in conjunction with a particular facility/business that produces, transports, stores, or uses substances that present a specific hazard to the local community or environment, or the hazard is present due to the shipment of potentially harmful substances from outside the region across various transportation arteries that bisect Fresno County communities.

The facilities and transportation corridors identified in Table 4.72 and Figure 4.75 and Figure 4.76 are those that the HMPC has identified as potential sites for hazardous materials releases that may adversely affect the Fresno County planning area.

Asset Inventory

Section 4.3 Vulnerability Assessment and the jurisdictional annexes identify the total assets at risk in the Fresno County planning area to both natural and human-caused hazards. Also included in those sections are inventories of critical facilities. These critical facilities, as previously defined, are considered vital to the daily continuity of life, unobstructed flow of commerce, and the continued health and welfare of the planning area as a whole.

Vulnerability Assessment

As previously stated, it is often quite difficult to quantify the potential losses from human-caused hazards. While the facilities themselves have a tangible dollar value, loss from a human-caused hazard often inflicts an even greater toll on a community, both economically and emotionally. The impact to identified assets will vary from event to event and depend on the type, location, and nature of a specific technological hazard event.

Given the difficulty in quantifying the losses associated with technological hazards, this section focuses on analyzing key assets and populations relative to the hazardous materials sites identified previously.

Fixed Facility Incidents

As discussed above, there are over 157 fixed facilities (CalARP sites) identified in the Fresno County planning area with the potential to cause a hazardous materials release of sufficient type and magnitude to adversely impact surrounding areas. These sites are regulated and most have emergency action plans in place. The impact to surrounding areas would depend on the nature and quantity of any release as well as the time of the event and prevailing weather conditions.

Critical Facilities at Risk

The following table is derived from a GIS analysis on the CalARP data, and focuses on the number and types of critical facilities within each jurisdiction that are located within a half-mile of a hazardous materials facility. The analysis indicates the City of Fresno having the highest number of critical facilities within a half-mile of CalARP designated facilities.

Table 4.77 Critical Facilities Within a ½ Mile Buffer from Hazmat Facilities

Jurisdiction	Facility Type	Counts
Clovis	Fire Station	1
	School	2
	Total	3
Firebaugh	Fire Station	1
	Police	1
	School	4
	Urgent Care	1
	Total	7
Fowler	Fire Station	1
	Police	1
	School	1
	Total	3
Fresno	Colleges & Universities	1
	Communications	1
	County Government	4
	Courthouse	1
	Daycare	11
	Department of Public Health	2
	Department of Social Services	4
	Detention Center	4
	District Attorney	2
	Fire Station	4
	Health Care	3
	Nursing Home	4
	Police	1
	School	17
	Sheriff	1
	Supplemental College	1
	Urgent Care	1
	Total	62
Huron	Fire Station	1
	Police	1
	School	3

Jurisdiction	Facility Type	Counts
	Total	5
Kerman	Police	1
	Total	1
Kingsburg	Fire Station	1
	Police	1
	School	2
	Total	4
Mendota	Airport	1
	Total	1
Orange Cove	Fire Station	1
	School	2
	Total	3
Parlier	Police	1
	School	1
	Total	2
Reedley	Colleges & Universities	1
	Communications	1
	Fire Station	1
	Police	1
	School	8
	Total	12
San Joaquin	School	2
	Total	2
Sanger	Behavioral Health	1
	Department of Agriculture	1
	Fire Station	1
	Nursing Home	1
	Police	1
	School	9
	Total	14
Selma	Fire Station	1
	Nursing Home	1
	Police	1
	Sheriff	1
	Urgent Care	1
	Total	5
Unincorporated	Department of Public Works	3
	Fire Station	3
	Nursing Home	1
	School	11
	Total	18

Jurisdiction	Facility Type	Counts
	Grand Total	142

Source: Amec Foster Wheeler Analysis of County, CalARP, and Federal Data

4.5 Fresno County's Mitigation Capabilities

Thus far, the planning process has identified the hazards posing a threat to Fresno County and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County's "net vulnerability" to disasters and more accurately focuses the goals, objectives, and proposed actions of this plan.

As such, this section presents Fresno County's mitigation capabilities: programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. It also identifies select state and federal departments/agencies that can supplement the County's mitigation capabilities. This assessment is divided into three sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities. Information about capabilities specific to the other participating jurisdictions can be found in the jurisdictional annexes.

The HMPC used a two-step approach to originally conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken, if deemed appropriate. Second, the HMPC reviewed existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses. During the 2017-2018 update this section was reviewed by County and Amec Foster Wheeler consultant team staff to update information where applicable. This included revising sections to align with changes that will be reflected in the updated General Plan.

This update process afforded the County and its participating jurisdictions the opportunity to review their previous capabilities and note the ways in which these capabilities have improved or expanded since the adoption of the previous plan. Additionally, in summarizing their current capabilities and identifying gaps, plan participants also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. Chapter 5 Mitigation Strategy includes mitigation actions aimed at improving community capability to reduce hazard risk and vulnerability.

4.5.1 Fresno County's Regulatory Mitigation Capabilities

Table 4.78 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Fresno County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.78 Fresno County's Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General plan	Yes	Adopted October 2000; in process of update 2017-2018
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	No	
Floodplain ordinance	Yes	
Other special purpose ordinance (e.g., stormwater, steep slope, wildfire)	Yes	See ordinance discussion that follows
Building code	Yes	2016 California Building Code
Fire department ISO rating	No	
Erosion or sediment control program	Yes	Via grading permits
Stormwater management program	No	See Fresno Metropolitan Flood Control District/Drainage of Land Ordinance
Capital improvements plan	Yes	
Economic development plan	Yes	Policies in County's documents
Local emergency operations plan	Yes	Fresno County Operational Area Master Emergency Services Plan
Other special plans	Yes	
Flood insurance study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016, via floodplain administrator
Elevation certificates	Yes	

As indicated in the table above, Fresno County has several plans and programs that guide the County's development in hazard-prone areas. Starting with the Fresno County General Plan, which is the most comprehensive of the County's plans when it comes to mitigation, some of these are described in more detail below.

Fresno County General Plan

The Fresno County General Plan consists of multiple documents: the countywide General Plan Background Report, the countywide General Plan Policy Document, and over 40 regional, community, and specific plans. This discussion is derived primarily from the Fresno County General Plan Policy Document, from which the text that follows is largely extracted.

The Fresno County General Plan is a comprehensive, long-term framework for the protection of the county's agricultural, natural, and cultural resources and for development in the county. Designed to meet state general plan requirements, it outlines policies, standards, and programs and sets out plan proposals to guide day-to-day decisions concerning Fresno County's future. It is a legal document that serves as the County's "blue print" or "constitution" for land use and development.

The General Plan Policy Document is organized into the following seven elements, which generally correspond with the content requirements specified in State Planning Law:

- Economic Development
- Land Use
- Transportation and Circulation
- Public Facilities and Services
- Open Space and Conservation
- Health and Safety
- Housing

Each of these elements includes goal statements relating to different aspects of the issues addressed in the element. Under each goal statement, the plan sets out policies that amplify the goal statement. Implementation programs are listed in a separate Administration and Implementation Section and describe briefly the action proposed by the program, the County agencies or departments with primary responsibility for carrying out the program, and the time frame for accomplishing the program.

The County is conducting a comprehensive review of its current General Plan. Based on the review, County staff has proposed revisions to the Plan's goals, policies, and programs. These revisions will be subject to review and deliberation by the Planning Commission and Board of Supervisors prior to adoption, which is expected to occur by the end of 2018.

Following is an element-by-element summary of the General Plan goals and policies that are most relevant to the Hazard Mitigation Plan Update. The summary tracks the organization of each element, with topically-focused goals followed by related policies. Note that the summaries reflect to policies as proposed by the County as a result of its ongoing review, including deletions and revisions.

Health and Safety Element

Planning for growth and development requires the consideration of a wide range of public safety issues. Many of the health and safety risks associated with development, including risks to buildings and infrastructure, can be avoided through siting decisions made at the planning stages of development, while others may be lessened through the use of mitigation measures in the planning and land use review process. This element outlines Fresno County's strategy for ensuring the maintenance of a healthy and safe physical environment. Applicable goals and policies are presented below.

Emergency Management and Response

Policies in this section seek to create an effective emergency response and management system by ensuring that vital public infrastructure is designed to remain operational during and after a major disaster event, by siting critical emergency response facilities as far from potential disaster impact

areas as is practical, and through continuing public education and outreach on emergency preparedness and disaster response programs.

Goal HS-A:	To protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters.
Policy HS-A.2	In coordination with cities, special districts, and other State and Federal agencies, the County shall maintain the Fresno County Multi-Jurisdictional Hazard Mitigation Plan to identify and mitigate, to the extent feasible, natural and human-made hazards within the county.
Policy HS-A.3:	The County shall, within its authority and to the best of its ability, ensure that emergency dispatch centers, emergency operations centers, communications systems, vital utilities, and other essential public facilities necessary for the continuity of government are designed in a manner that will allow them to remain operational during and following an earthquake or other disaster.
Policy HS-A.4:	The County shall ensure that the siting of critical emergency response facilities such as hospitals, fire stations, sheriff's offices and substations, dispatch centers, emergency operations centers, and other emergency service facilities and utilities are sited and designed to minimize their exposure and susceptibility to flooding, seismic and geological effects, fire, avalanche, and explosions as required by state regulations.
Policy HS-A.5	The County shall maintain coordination with other local, State, and Federal agencies to provide coordinated disaster response.
Policy HS-A.6:	The County shall continue to conduct programs to inform the general public of emergency preparedness and disaster response procedures.
Policy HS-A.7	The County shall review the design of all buildings and structures to ensure they are designed and constructed to State and local regulations and standards as part of the building permit plan check process.

Fire Hazards

Policies in this section are designed to ensure that new development is constructed to minimize potential fire hazards, minimize the risk of fire in already developed areas, and to provide public education concerning fire prevention.

Goal HS-B:	To minimize the risk of loss of life, injury, and damage to property and natural resources resulting from fire hazards.
Policy HS-B.1:	The County shall review project proposals to identify potential fire hazards and to evaluate the effectiveness of preventive measures to reduce the risk to life and property.
Policy HS-B.2:	The County shall ensure that development in high fire hazard areas is designed and constructed in a manner that minimizes the risk from fire hazards and meets all applicable state and County fire standards. Special consideration shall be given to the use of fire-resistant construction in the underside of eaves, balconies, unenclosed roofs and floors, and other similar horizontal surfaces in areas of steep slopes.
Policy HS-B.3:	The County shall require that development in high fire hazard areas have fire-resistant vegetation, cleared fire breaks separating communities or clusters of structures from native vegetation, or a long-term comprehensive vegetation and fuel management program. Fire hazard reduction measures shall be incorporated into the design of development projects in fire hazard areas.
Policy HS-B.4:	The County shall require that foothill and mountain subdivisions of more than four parcels provide for safe and ready access for fire and other emergency equipment, for routes of escape that will safely handle evacuations, and for roads and streets designed to be compatible with topography while meeting fire safety needs.
Policy HS-B.5:	The County shall require development to have adequate access for fire and emergency vehicles and equipment. All major subdivisions shall have a minimum of two points of ingress and egress.
Policy HS-B.6:	The County shall work with local fire protection agencies, the California Department of Forestry and Fire Protection, and the U.S. Forest Service to promote the maintenance of existing fuel

Goal HS-B:	To minimize the risk of loss of life, injury, and damage to property and natural resources resulting from fire hazards.
	breaks and emergency access routes for effective fire suppression and in managing wildland fire hazards.
Policy HS-B.7:	The County shall require that community fire breaks be coordinated with overall fire break plans developed by the foothill and mountain fire agencies. Firebreak easements in subdivisions of more than four parcels or in built-up areas shall include access for firefighting personnel and motorized equipment. Easements shall be dedicated for this purpose.
Policy HS-B.8:	The County shall refer development proposals in the unincorporated County to the appropriate local fire agencies for review of compliance with fire safety standards. If dual responsibility exists, both agencies shall review and comment relative to their area of responsibility. If standards are different or conflicting, the more stringent standards shall apply.
Policy HS-B.9:	The County shall require that provisions for establishing year-round fire protection in foothill and mountain areas are developed where concentrations of population are such that structural fire protection is needed.
Policy HS-B.10:	The County shall ensure that existing and new buildings of public assembly incorporate adequate fire protection measures to reduce potential loss of life and property in accordance with state and local codes and ordinances.
Policy HS-B.11:	The County shall require new development to have water systems that meet County fire flow requirements. Where minimum fire flow is not available to meet County standards, alternate fire protection measures, including sprinkler systems, shall be identified and may be incorporated into development if approved by the appropriate fire protection agency.
Policy HS-B.12:	The County shall promote installation and maintenance of smoke detectors in existing residences and commercial facilities that were constructed prior to the requirement for their installation.
Policy HS-B.13:	The County shall work with local fire agencies to develop high-visibility fire prevention programs, including education programs and voluntary home inspections.

Flood Hazards

Policies in this section are designed to minimize flood hazards by restricting development in flood-prone areas, requiring development that does occur in floodplains to be designed to avoid flood damage, and through public education about flood hazards.

Goal HS-C:	To minimize the risk of loss of life, injury, and damage resulting from flood hazards.
Policy HS-C.1	The County shall coordinate with the cities in Fresno County to develop and maintain a countywide flood emergency plan that is consistent with the Fresno County General Plan and city general plans.
Policy HS-C.2	The County shall prohibit new development in existing undeveloped areas (i.e., areas devoted to agriculture or open space that are not designated for development) protected by a State flood control project without appropriately considering significant known flooding risks and taking reasonable and feasible action to mitigate the potential property damage to the new development resulting from a flood.
Policy HS-C.3	<p>The County shall not enter into a development agreement, approve any building permit or entitlement, or approve a tentative or parcel map unless it finds one of the following:</p> <ul style="list-style-type: none"> a. The flood control facilities provides 200-year level of protection in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan; b. Conditions imposed on the development will protect the property at a 200-year level of protection in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan; or c. The local flood management agency has made “adequate progress” on the construction of a flood protection system which will result in protection equal or greater than the 200-year flood event in urban and non-urban areas consistent with the current Central Valley Flood Protection Plan.
Policy HS-C.4	The County shall require new flood control projects or developments within areas subject to 100- and 200-year frequency floods are designed and constructed in a manner that will not cause

Goal HS-C:	To minimize the risk of loss of life, injury, and damage resulting from flood hazards.
	floodwaters to be diverted onto adjacent property or increase flood hazards to property located elsewhere.
Policy HS-C.5	The County shall encourage all agencies that operate public facilities, such as wastewater treatment plants, gas, electrical, and water systems, located within areas subject to 100- and 200-year frequency floods to locate and construct facilities to minimize or eliminate potential flood damage.
Policy HS-C.6	The County shall encourage expansion of stormwater and flood protection infrastructure capacity in order to accommodate changes in precipitation and extreme weather events.
Policy HS-C.7	The County shall support State and local flood management agencies to provide relocation assistance or other cost-effective strategies for reducing flood risk to existing economically-disadvantaged communities located in non-urbanized areas.
Policy HS-C.8	The County shall work with local, regional, State, and Federal agencies to maintain an adequate information base, prepare risk assessments, and identify strategies to mitigate flooding impacts.
Policy HS-C.9:	The County shall encourage the Fresno Metropolitan Flood Control District to control stormwater flows originating in the streams of the Fresno County Stream Group and the stormwater resulting from urban development by means of construction of dams or joint-use flood control and recharge facilities at appropriate locations.
Policy HS-C.10:	The County shall require that the design and location of dams and levees be in accordance with applicable design standards and specifications and accepted design and construction practices.
Policy HS-C.11:	The County shall promote a floodplain management approach in flood hazard areas that are presently undeveloped by giving priority to regulation of land uses over development of structural controls as a method of reducing flood damage.
Policy HS-C.12:	The County shall encourage the performance of appropriate investigations to determine the 200-year water surface elevations for the San Joaquin River, taking into account recent storm events and existing channel conditions, to identify the potential extent and risk of flooding. New development, including public infrastructure projects, shall not be allowed along the river until the risk of flooding at the site has been determined and appropriate flood risk reduction measures identified.
Policy HS-C.13:	Where existing development is located in a flood hazard area, the County shall require that construction of flood control facilities proceed only after a complete review of the environmental effects and a project cost benefit analysis.
Policy HS-C.14:	The County shall promote flood control measures that maintain natural conditions within the 200-year floodplain of rivers and streams and, to the extent possible, combine flood control, recreation, water quality, and open space functions. Existing irrigation canals shall be used to the extent possible to remove excess stormwater. Retention-recharge basins should be located to best utilize natural drainage patterns.
Policy HS-C.15:	The County shall continue to participate in the Federal Flood Insurance Program by ensuring compliance with applicable requirements.
Policy HS-C.16:	The County shall continue to implement and enforce its Floodplain Management Ordinance. During the building permit review process, the County shall ensure project compliance with applicable Federal Emergency Management Agency (FEMA) standards pertaining to residential and non-residential development in the floodplain, floodway, or floodway fringe.
Policy HS-C.17:	The County shall prohibit the construction of essential facilities (e.g., hospitals, police and fire facilities) in the 100- and 200-year floodplains, unless it can be demonstrated that the facility can be safely operated and accessed during flood events.
Policy HS-C.18:	The County shall require that all placements of structures and/or flood proofing be done in a manner that will not cause floodwaters to be diverted onto adjacent property, increase flood hazards to other property, or otherwise adversely affect other property.
Policy HS-C.19:	The County shall encourage open space uses in all flood hazard areas. Land Conservation contracts and open space and scenic easements should be made available to property owners.
Policy HS-C.20:	The County shall consider dam failure inundation maps of all reservoirs in making land use and related decisions.
Policy HS-C.21:	The County shall continue public awareness programs to inform the general public and potentially affected property owners of flood hazards and potential dam failure inundation.

Seismic and Geological Hazards

Policies in this section seek to ensure that new buildings and facilities are designed to withstand seismic and geologic hazards.

Goal HS-D:	To minimize the loss of life, injury, and property damage due to seismic and geologic hazards.
Policy HS-D.1:	The County shall continue to support scientific geologic investigations that refine, enlarge, and improve the body of knowledge on active fault zones, unstable areas, severe groundshaking, avalanche potential, and other hazardous geologic conditions in Fresno County.
Policy HS-D.2:	The County shall ensure that the General Plan and/or County Ordinance Code is revised, as necessary, to incorporate geologic hazard areas formally designated by the state geologist (e.g., earthquake fault zones and seismic hazard zones). Development in such areas, including public infrastructure projects, shall not be allowed until compliance with the investigation and mitigation requirements established by the state geologist can be demonstrated.
Policy HS-D.3:	The County shall require that a soils engineering and geologic-seismic analysis be prepared by a California-registered engineer or engineering geologist prior to permitting development, including public infrastructure projects, in areas prone to geologic or seismic hazards (i.e., fault rupture, ground shaking, lateral spreading, lurchcracking, fault creep, liquefaction, subsidence, settlement, landslides, mudslides, unstable slopes, or avalanche).
Policy HS-D.4:	The County shall require all proposed structures, additions to structures, utilities, or public facilities situated within areas subject to geologic-seismic hazards as identified in the soils engineering and geologic-seismic analysis to be sited, designed, and constructed in accordance with applicable provisions of the Uniform Building Code (Title 24 of the California Code of Regulations) and other relevant professional standards to minimize or prevent damage or loss and to minimize the risk to public safety.
Policy HS-D.5:	Pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code, Chapter 7.5), the County shall not permit any structure for human occupancy to be placed within designated earthquake fault zones unless the specific provisions of the act and Title 14 of the California Code of Regulations have been satisfied.
Policy HS-D.6:	The County shall ensure compliance with state seismic and building standards in the evaluation, design, and siting of critical facilities, including police and fire stations, school facilities, hospitals, hazardous material manufacture and storage facilities, bridges, large public assembly halls, and other structures subject to special seismic safety design requirements.
Policy HS-D.7:	The County shall require a soils report by a California-registered engineer or engineering geologist for any proposed development, including public infrastructure projects, that requires a County permit and is located in an area containing soils with high “expansive” or “shrink-swell” properties. Development in such areas shall be prohibited unless suitable design and construction measures are incorporated to reduce the potential risks associated with these conditions.
Policy HS-D.8:	The County shall seek to minimize soil erosion by maintaining compatible land uses, suitable building designs, and appropriate construction techniques. Contour grading, where feasible, and revegetation shall be required to mitigate the appearance of engineered slopes and to control erosion.
Policy HS-D.9:	The County shall require the preparation of drainage plans for development or public infrastructure projects in hillside areas to direct runoff and drainage away from unstable slopes.
Policy HS-D.10:	The County shall not approve a County permit for new development, including public infrastructure projects where slopes are over 30 percent unless it can be demonstrated by a California-registered civil engineer or engineering geologist that hazards to public safety will be reduced to acceptable levels.
Policy HS-D.11:	In known or potential landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including concentration of water through drainage, irrigation, or septic systems, undercutting the bases of slopes, removal of vegetative cover, and steepening of slopes.
Policy HS-D.12:	The County shall not approve a County permit for new development, including public infrastructure projects, in known or potential avalanche hazard areas unless it can be demonstrated by a California-registered engineer or engineering geologist that the structures will be safe under anticipated snow loads and avalanche conditions.

Goal HS-D:	To minimize the loss of life, injury, and property damage due to seismic and geologic hazards.
Policy HS-D.13:	Whenever zoning is employed to restrict the use of land subject to severe geologic hazards (e.g., landslides), the County shall designate parcels so restricted for open space uses.

Hazardous Materials

Policies in this section are designed to ensure that development projects minimize public risks associated with both intended and unintended exposure to hazardous materials and wastes.

Goal HS-F:	To minimize the risk of loss of life, injury, serious illness, and damage to property resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous wastes.
Policy HS-F.1:	The County shall require that facilities that handle hazardous materials or hazardous wastes be designed, constructed, and operated in accordance with applicable hazardous materials and waste management laws and regulations.
Policy HS-F.2:	The County shall require that applications for discretionary development projects that will use hazardous materials or generate hazardous waste in large quantities include detailed information concerning hazardous waste reduction, recycling, and storage.

Agriculture and Land Use Element

Applicable goals and policies from the Agriculture and Land Use Element are presented below.

Resource Lands

This section addresses land that will remain primarily open in character. The goals, policies, and implementation programs for these topics reflect a basic commitment to preserve the existing open rural character of the County and its natural and managed resources. While necessarily protective and restrictive, the policies also recognize the need to maintain economic productivity and allow for urban growth. The intent of the policies is not to preclude intensive development but to direct it to minimize loss of valuable open space.

Agriculture

Policies in this section seek to sustain agriculture by protecting agricultural activities from incompatible land uses, promoting agricultural land preservation programs, developing programs to preserve or maintain soil conditions or improve soil productivity, facilitating agricultural production by supplying adequate land for support services, and controlling expansion of nonagricultural development onto productive agricultural lands.

Goal LU-A:	To promote the long-term conservation of productive and potentially- productive agricultural lands and to accommodate agricultural-support services and agriculturally-related activities that support the viability of agriculture and further the County's economic development goals.
Policy LU-A.13:	The County shall protect agricultural operations from conflicts with nonagricultural uses by requiring buffers between proposed non-agricultural uses and adjacent agricultural operations.
Policy LU-A.14:	The County shall ensure that the review of discretionary permits includes an assessment of the conversion of productive agricultural land and that mitigation be required where appropriate.

Goal LU-A:	To promote the long-term conservation of productive and potentially- productive agricultural lands and to accommodate agricultural-support services and agriculturally-related activities that support the viability of agriculture and further the County's economic development goals.
Policy LU-A.20:	The County shall adopt and support policies and programs that seek to protect and enhance surface water and groundwater resources critical to agriculture.

Westside Rangelands

Policies in this section seek to preserve rangelands by maintaining their open space character, minimizing grading and erosion, maintaining grazing and agricultural operations, accommodating mineral resource recovery, and protecting biological resources from development.

Goal LU-B:	To preserve the unique character of the Westside Rangelands, which includes distinctive geologic and topographic landforms, watersheds, important agricultural activities, and significant biological resources, while accommodating agriculture, grazing, recreation, resource recovery, and other limited uses that recognize the sensitive character of the area.
Policy LU-B.12:	The County shall require a preliminary soils report for discretionary development projects when the project site is subject to moderate or high risk landslide potential and has slopes in excess of 15 percent. If the preliminary soil report indicates soil conditions could be unstable, a detailed geologic report by a registered geologist and registered civil engineer, or a registered engineering geologist, shall be required indicating the suitability of any proposed or additional development.

River Influence Areas

Policies in this section seek to preserve and enhance the County's river influence areas by avoiding adverse impacts from development and encouraging environmentally friendly recreational and agricultural activities.

Goal LU-C:	To preserve and enhance the value of the river environment as a multiple use, open space resource; maintain the environmental and aesthetic qualities of the area; protect the quality and quantity of the surface and groundwater resources; provide for long term preservation of productive agricultural land; conserve and enhance natural wildlife habitat; and maintain the flood-carrying capacity of the channel at a level equal to the 1 percent flood event (100-year flood).
Policy LU-C.7:	Fresno County shall take into consideration the presence of the regulatory floodway or other designated floodway, the FEMA-designated 100-year floodplain, estimated 250-year floodplain, the Standard Project Flood, and the Fresno Metropolitan Flood Control District (FMFCD) Riverine Floodplain Policy in determining the location of future development within the San Joaquin River Parkway area. Any development sited in a designated 100-year floodplain shall comply with regulatory requirements at a minimum and with the FMFCD Riverine Floodplain Policy criteria, or requirements of other agencies having jurisdiction, where applicable.

Rural Development

This section guides development in areas designated Rural Residential, Rural Settlement Area, and Planned Rural Community. The policies provide for the continued development of areas within these designations in a manner that minimizes environmental impacts and public infrastructure investments, but generally limits expansion of these designations.

Nonagricultural Rural Development

Policies in this section provide for appropriate development in rural areas by directing development away from productive and potentially productive agricultural areas, limiting expansion of existing designated rural residential areas, and minimizing the environmental and service impacts of continued development within areas already designated for rural development.

Goal LU-E:	To provide for the continued development of areas already designated for nonagricultural rural-residential development in a manner that minimizes environmental impacts and public infrastructure and service costs while restricting designation of new areas for such development.
Policy LU-E.6:	The County shall allow planned residential developments in areas that are currently designated for rural residential development subject to the following conditions: f. The size and configuration of the buildable portion of the lot shall be based on sufficient geological and hydrological investigations.
Policy LU-E.8	The County shall not allow further parcelization of uncommitted rural residential areas lying northeast of the Enterprise Canal due to potential groundwater supply problems. These areas shall be zoned to a limited agricultural zone district. However, rezoning and development for rural residential use may be permitted subject to established criteria.
Policy LU-E.10	The County shall require new subdivisions within areas designated rural residential be designed to use individual on-site sewer and water systems. All proposals shall be reviewed by the County to determine the appropriate minimum lot size based on local hydrogeological conditions.
Policy LU-E.11	The County shall require subdividers of rural residential lots to install, provide, or participate in an effective means for utilization of available surface water entitlements for the area included in the subdivision.
Policy LU-E.12	The County shall ensure through discretionary permit approvals and other development regulations that development within areas designated rural residential does not encroach upon natural water channels or restrict natural water channels in such a way as to increase potential flooding damage. Land divisions shall not render inoperative any existing canal.
Policy LU-E.22	The County shall allow development within the designated Quail Lakes Planned Rural Community to proceed in accordance with the Specific Plan adopted at the time the designation was granted by the County. The County may grant amendments to the Specific Plan provided the overall density of development is not increased and the plan continues to demonstrate the following: a. The development will have no significant adverse impacts on groundwater. c. Impacts on Fresno County for the provision of services including, but not limited to, police, fire protection, schools, and other essential public services are adequately mitigated. f. Provide for monitoring of mitigation measures established by the required environmental impact report.

Public Facilities and Services Element

Applicable goals and policies from the Public Facilities and Services Element are presented below.

Water Supply and Delivery

Policies in this section seek to ensure an adequate water supply for both domestic and agricultural users by providing necessary facility improvements, ensuring water availability, and utilizing water conservation measures.

Goal PF-C:	To ensure the availability of an adequate and safe water supply for domestic and agricultural consumption.
Policy PF-C.1:	The County shall engage in and support the efforts of others within Fresno County to retain existing water supplies and develop new water supplies.
Policy PF-C.2:	The County shall actively engage in efforts and support the efforts of others to import flood, surplus, and other available waters for use in Fresno County.
Policy PF-C.3:	To reduce demand on the County's groundwater resources, the County shall encourage the use of surface water to the maximum extent feasible.
Policy PF-C.4:	The County shall support efforts to expand groundwater and/or surface water storage that benefits Fresno County.
Policy PF-C.5:	The County shall support water banking when the program has local sponsorship and involvement and provides new benefits to the County.
Policy PF-C.6:	The County shall recommend to all cities and urban areas within the County that they adopt the most cost-effective urban best management practices published and updated by the California Urban Water Agencies, California Department of Water Resources, or other appropriate agencies as a means of meeting some of the future water supply needs.
Policy PF-C.7:	The County shall require preparation of water master plans for areas undergoing urban growth.
Policy PF-C.8:	The County shall work with local irrigation districts to preserve local water rights and supply.
Policy PF-C.10:	The County shall actively participate in the development and implementation of Sustainable Groundwater Management Plans to ensure an on-going water supply to help sustain agriculture and accommodate future growth.
Policy PF-C.11:	The County shall approve new development only if an adequate sustainable water supply to serve such development is demonstrated.
Policy PF-C.12:	In those areas identified as having severe groundwater level declines or limited groundwater availability, the County shall limit development to uses that do not have high water usage or that can be served by a surface water supply.
Policy PF-C.13:	The County shall require that water supplies serving new development meet U.S. Environmental Protection Agency and California Department of Public Health and other water quality standards.
Policy PF-C.15:	If the cumulative effects of more intensive land use proposals are detrimental to the water supplies of surrounding areas, the County shall require approval of the project to be dependent upon adequate mitigation. The County shall require that costs of mitigating such adverse impacts to water supplies be borne proportionately by all parties to the proposal.
Policy PF-C.16:	The County shall, prior to consideration of any discretionary project related to land use, undertake a water supply evaluation.
Policy PF-C.17:	In the case of lands entitled to surface water, the County shall approve only land use-related projects that provide for or participate in effective use of the surface water entitlement.
Policy PF-C.21:	The County shall promote the use of surface water for agricultural use to reduce groundwater table reductions.
Policy PF-C.22:	The County supports short-term water transfers as a means for local water agencies to maintain flexibility in meeting water supply requirements. The County shall support long-term transfer, assignment, or sale of water and/or water entitlements to users outside of the county only under circumstances identified in the General Plan.
Policy PF-C.23:	The County shall regulate the transfer of groundwater for use outside of Fresno County. The regulation shall extend to the substitution of groundwater for transferred surface water.
Policy PF-C.24:	The County shall encourage the transfer of unused or surplus agricultural water to urban uses within Fresno County.
Policy PF-C.25:	The County shall require that all new development within the county use water conservation technologies, methods, and practices as established by the County.
Policy PF-C.26:	The County shall encourage the use of reclaimed water where economically, environmentally, and technically feasible.
Policy PF-C.27:	The County shall maintain and recommend to all cities and community water system providers that they also adopt, the most cost-effective urban best water conservation management practices circulated and updated by the California Urban Water Agencies, California Department of Water Resources, or other similar authoritative agencies and organizations.

Goal PF-C:	To ensure the availability of an adequate and safe water supply for domestic and agricultural consumption.
Policy PF-C.28	The County shall participate in integrated Regional Water Management Planning efforts with other local and regional water stakeholders to plan for the efficient use, enhancement, and management of surface and groundwater supplies.
Policy PF-C.29:	The County shall encourage agricultural water conservation where economically, environmentally, and technically feasible.
Policy PF-C.30:	The County shall, in order to reduce excessive water usage, require tiered water pricing within County service areas and County waterworks districts.
Policy PF-C.31:	The County shall not approve land use-related projects that incorporate a manmade lake or pond that will be sustained by the use of groundwater.

Storm Drainage and Flood Control

Policies in this section seek to ensure safe, efficient, and environmentally sound means to drain, divert and retain stormwater and provide flood control by providing necessary facility improvements, ensuring adequate funding, providing a means to detain/retain runoff, and ensuring the facilities meet state environmental regulations. This includes retention strategies that could lessen the county's vulnerability to drought and wildfire.

Goal PF-E:	To provide efficient, cost-effective, and environmentally sound storm drainage and flood control facilities that protect both life and property and to divert and retain stormwater runoff for groundwater replenishment.
Policy PF-E.1:	The County shall coordinate with the agencies responsible for flood control or storm drainage to assure that construction and acquisition of flood control and drainage facilities are adequate for future urban growth authorized by the County General Plan and city general plans.
Policy PF-E.2:	The County shall encourage the agencies responsible for flood control of storm drainage to coordinate the multiple use of flood control and drainage facilities with other public agencies.
Policy PF-E.3:	The County shall encourage the Fresno Metropolitan Flood Control District to spread the cost of construction and acquisition of flood control and drainage facilities in the most equitable manner consistent with the growth and needs of this area.
Policy PF-E.4:	The County shall encourage the local agencies responsible for flood control or storm drainage to require that storm drainage systems be developed and expanded to meet the needs of existing and planned development.
Policy PF-E.5:	The County shall only approve land use-related projects that will not render inoperative any existing canal, encroach upon natural channels, and/or restrict natural channels in such a way as to increase potential flooding damage.
Policy PF-E.6:	The County shall require that drainage facilities be installed concurrently with and as a condition of development activity to ensure the protection of the new improvements as well as existing development that might exist within the watershed.
Policy PF-E.7:	The County shall require new development to pay its fair share of the costs of Fresno County storm drainage and flood control improvements within unincorporated areas.
Policy PF-E.8:	The County shall encourage the local agencies responsible for flood control or storm drainage to precisely locate drainage facilities well in advance of anticipated construction, thereby facilitating timely installation and encouraging multiple construction projects to be combined, reducing the incidence of disruption of existing facilities.
Policy PF-E.9:	The County shall require new development to provide protection from the 100-year flood as a minimum.
Policy PF-E.10:	In growth areas within the jurisdiction of a local agency responsible for flood control or storm drainage, the County shall encourage that agency to design drainage facilities as if the entire areas of service were developed to the pattern reflected in the adopted general plans to assure that the facilities will be adequate as the land use intensifies.

Goal PF-E:	To provide efficient, cost-effective, and environmentally sound storm drainage and flood control facilities that protect both life and property and to divert and retain stormwater runoff for groundwater replenishment.
Policy PF-E.11:	The County shall encourage project designs that minimize drainage concentrations and maintain, to the extent feasible, natural site drainage patterns.
Policy PF-E.12:	The County shall coordinate with the local agencies responsible for flood control or storm drainage to ensure that future drainage system discharges comply with applicable State and Federal pollutant discharge requirements.
Policy PF-E.13:	The County shall encourage the use of natural stormwater drainage systems to preserve and enhance natural drainage features.
Policy PF-E.14:	The County shall encourage the use of retention-recharge basins for the conservation of water and the recharging of the groundwater supply.
Policy PF-E.15:	The County should require that retention-recharge basins be suitably landscaped to complement adjacent areas and should, wherever possible, be made available to the community to augment open space and recreation needs.
Policy PF-E.16:	The County shall minimize sedimentation and erosion through control of grading, cutting of trees, removal of vegetation, placement of roads and bridges, and use of off-road vehicles. The County shall discourage grading activities during the rainy season, unless adequately mitigated, to avoid sedimentation of creeks and damage to riparian habitat.
Policy PF-E.17:	The County shall encourage the local agencies responsible for flood control or storm drainage retention-recharge basins located in soil strata strongly conducive to groundwater recharge to develop and operate those basins in such a way as to facilitate year-round groundwater recharge.
Policy PF-E.18:	The County shall encourage the local agencies responsible for flood control or storm drainage to plan retention-recharge basins on the principle that the minimum number will be the most economical to acquire, develop, operate, and maintain.
Policy PF-E.19:	In areas where urbanization or drainage conditions preclude the acquisition and use of retention-recharge basins, the County shall encourage the local agencies responsible for flood control or stormwater drainage to discharge storm or drainage water into major canals and other natural water courses subject to established conditions.
Policy PF-E.20:	The County shall require new development of facilities near rivers, creeks, reservoirs, or substantial aquifer recharge areas to mitigate any potential impacts of release of pollutants in floodwaters, flowing rivers, streams, creeks, or reservoir waters.
Policy PF-E.21:	The County shall require the use of feasible and practical best management practices (BMPs) to protect streams from the adverse effects of construction activities, and shall encourage the urban storm drainage systems and agricultural activities to use BMPs.
Policy PF-E.22:	The County shall encourage the local agencies responsible for flood control or storm drainage to control obnoxious odors or mosquito breeding conditions connected with any agency facility by appropriate measures.

Fire Protection and Emergency Medical Services

Policies in this section seek to ensure the prompt and efficient provision of fire and emergency medical facility and service needs, ensure adequate funding is available in new development areas, and protect the life and property of residents of and visitors to Fresno County.

Goal PF-H:	To ensure the prompt and efficient provision of fire and emergency medical facility and service needs, to protect residents of and visitors to Fresno County from injury and loss of life, and to protect property from fire.
Policy PF-H.1:	The County shall work cooperatively with local fire protection districts to ensure the provision of effective fire and emergency medical services to unincorporated areas within the County.
Policy PF-H.2:	Prior to the approval of a development project, the County shall determine the need for fire protection services. New development in unincorporated areas of the county shall not be approved until such time that fire protection facilities and services acceptable to the Public Works and Planning Director in consultation with the appropriate fire district are provided.

Goal PF-H:	To ensure the prompt and efficient provision of fire and emergency medical facility and service needs, to protect residents of and visitors to Fresno County from injury and loss of life, and to protect property from fire.
Policy PF-H.3:	The County shall require that new fire stations be located to achieve and maintain a service level capability consistent with services for existing land uses.
Policy PF-H.4:	The County shall reserve adequate sites for fire and emergency medical facilities in unincorporated locations in the County.
Policy PF-H.5:	The County shall require that new development be designed to maximize safety and minimize fire hazard risks to life and property.
Policy PF-H.6:	The County shall limit development to very low densities in areas where emergency response times will be more than 20 minutes.
Policy PF-H.7:	The County shall encourage local fire protection agencies in the County to maintain the following as minimum fire protection standards (expressed as Insurance Service Organization (ISO) ratings): a. ISO 4 in urban areas; b. ISO 6 in suburban areas; and c. ISO 8 in rural areas.
Policy PF-H.10:	The County shall ensure that all proposed developments are reviewed for compliance with fire safety standards by responsible local fire agencies per the Uniform Fire Code and other State and local ordinances.

Open Space and Conservation Element

The Open Space and Conservation Element is concerned with protecting and preserving natural resources, preserving open space areas, managing the production of commodity resources, protecting and enhancing cultural resources, and providing recreational opportunities. Applicable goals and policies are presented below.

Productive Resources

Water Resources

Policies in this section seek to protect and enhance the surface water and groundwater resources in the County. The policies address broad water planning issues, groundwater recharge, the relationship of land use decisions to water issues, and water quality problems.

Goal OS-A:	To protect and enhance the water quality and quantity in Fresno County's streams, creeks, and groundwater basins.
Policy OS-A.1:	The County shall develop, implement, and maintain a plan for achieving water resource sustainability, including a strategy to address overdraft and the needs of anticipated growth.
Policy OS-A.2:	The County shall provide active leadership in the regional coordination of water resource management efforts affecting Fresno County and shall continue to monitor and participate in, as appropriate, regional activities affecting water resources, groundwater, and water quality.
Policy OS-A.3:	The County shall provide active leadership in efforts to protect, enhance, monitor, and manage groundwater resources within its boundaries.
Policy OS-A.4:	The County shall develop and implement public education programs designed to increase public participation in water conservation and water quality awareness.
Policy OS-A.5:	The County shall encourage, where economically, environmentally, and technically feasible, efforts aimed at directly or indirectly recharging the County's groundwater.
Policy OS-A.6:	The County shall ensure that new development does not limit the capacity or function of groundwater recharge areas.
Policy OS-A.7:	The County shall direct, to the extent feasible, its available water resources to groundwater recharge areas.

Goal OS-A:	To protect and enhance the water quality and quantity in Fresno County's streams, creeks, and groundwater basins.
Policy OS-A.8	The County should, in cooperation with respective groundwater sustainability agencies, develop and maintain an inventory of sites within the County that are suitable for groundwater recharge.
Policy OS-A.9:	The County shall support and/or engage in water banking (i.e., recharge and subsequent extraction for direct and/or indirect use on lands away from the recharge area) based on the established criteria.
Policy OS-A.10	The County shall coordinate with the relevant Groundwater Sustainability Agency(ies) concerning their Groundwater Sustainability Plan(s) and refer any substantial proposed General Plan amendment to the agency for review and comment prior to adoption. The County shall give consideration to the adopted groundwater sustainability plan when determining the adequacy of water supply.
Policy OS-A.11:	The County shall permit and encourage, where economically, environmentally, and technically feasible, overirrigation of surface water as a means to maximize groundwater recharge.
Policy OS-A.12:	The County shall directly and/or indirectly participate in the development, implementation, and maintenance of a program to recharge the aquifers underlying the County. The program shall make use of flood and other waters to offset existing and future groundwater pumping.
Policy OS-A.13:	The County shall require the protection of floodplain lands and, where appropriate, acquire public easements for purposes of flood protection, public safety, wildlife preservation, groundwater recharge, access, and recreation.
Policy OS-A.14:	The County shall support the policies of the San Joaquin River Parkway Master Plan to protect the San Joaquin River as an aquatic habitat, recreational amenity, aesthetic resource, and water source.
Policy OS-A.15:	The County shall, where economically, environmentally, and technically feasible, encourage the multiple use of public lands, including County lands, to include groundwater recharge.

Natural Resources

Wetland and Riparian Areas

Policies in this section seek to protect riparian and wetland habitats in the County while allowing compatible uses where appropriate.

Goal OS-D:	To conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions will positively affect aesthetics, water quality, floodplain management, ecological function, and recreation/tourism.
Policy OS-D.1:	The County shall support the "no-net-loss" wetlands policies of the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game. Coordination with these agencies at all levels of project review shall continue to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed.
Policy OS-D.2:	The County shall require new development to fully mitigate wetland loss for function and value in regulated wetlands to achieve "no-net-loss" through any combination of avoidance, minimization, or compensation. The County shall support mitigation banking programs that provide the opportunity to mitigate impacts to rare, threatened, and endangered species and/or the habitat that supports these species in wetland and riparian areas.
Policy OS-D.3:	The County shall require development to be designed in such a manner that pollutants and siltation do not significantly degrade the area, value, or function of wetlands. The County shall require new developments to implement the use of best management practices to aid in this effort.
Policy OS-D.7:	The County shall support the management of wetland and riparian plant communities for passive recreation, groundwater recharge, nutrient storage, and wildlife habitats.

Vegetation

Policies in this section seek to protect native vegetation resources primarily on private land within the County.

Goal OS-F:	To preserve and protect the valuable vegetation resources of Fresno County.
Policy OS-F.1:	The County shall encourage landowners and developers to preserve the integrity of existing terrain and natural vegetation in visually-sensitive areas such as hillsides and ridges, and along important transportation corridors, consistent with fire hazard and property line clearing requirements.
Policy OS-F.2:	The County shall require developers to use native and compatible nonnative plant species, especially drought-resistant species, to the extent possible, in fulfilling landscaping requirements imposed as conditions of discretionary permit approval or for project mitigation.
Policy OS-F.6:	The County shall require that development on hillsides be limited to maintain valuable natural vegetation, especially forests and open grasslands, and to control erosion.
Policy OS-F.7:	The County shall require developers to take into account a site's natural topography with respect to the design and siting of all physical improvements in order to minimize grading.
Policy OS-F.9:	The County shall support the continued use of prescribed burning to mimic the effects of natural fires to reduce fuel volumes and associated fire hazards to human residents and to enhance the health of biotic communities.

Recreation and Cultural Resources

Parks and Recreation

Policies in this section seek to enhance recreational opportunities in the County by encouraging the further development of public and private recreation lands, and requiring development to help fund additional parks and recreation facilities.

Goal OS-H:	To designate land for and promote the development and expansion of public and private recreational facilities to serve the needs of residents and visitors.
Policy OS-H.11:	The County shall support the policies of the San Joaquin River Parkway Master Plan to protect the San Joaquin River as an aquatic habitat, recreational amenity, aesthetic resource, and water source.
Policy OS-H.13:	The County shall require that structures and amenities associated with the San Joaquin River Parkway be designed and sited to ensure that such features do not obstruct flood flows, do not create a public safety hazard, or result in a substantial increase in off-site water surface elevations, and that they conform to the requirements of other agencies having jurisdiction. For permanent structures, such as bridge overcrossings, the minimum level of flood design protection shall be the greater of the Standard Project Flood (which is roughly equivalent to a 250-year event) or the riverine requirements of other agencies having jurisdiction to ensure flood flows are not dammed and to prevent flooding on surrounding properties.

Historic, Cultural, and Geological Resources

Policies in this section seek to preserve the historic, archeological, paleontological, geological, and cultural resources of the County through development review, acquisition, encouragement of easements, coordination with other agencies and groups, and other methods.

Goal OS-J:	To identify, protect, and enhance Fresno County's important historical, archeological, paleontological, geological, and cultural sites and their contributing environment.
OS-J.1	The County shall encourage preservation of any sites and/or buildings identified as having historical significance pursuant to the list maintained by the Fresno County Historic Landmarks and Records Advisory Commission.
OS-J.2	The County shall consider historic resources during preparation or evaluation of plans and discretionary development projects.
OS-J.3	Whenever a historical resource is known to exist on a proposed project site, the County (i.e., Fresno County Historic Landmarks and Records Advisory Commission) shall evaluate and make recommendations to minimize potential impacts to said resource.
Policy OS-J.4:	The County shall require that discretionary development projects, as part of any required CEQA review, identify and protect important historical, archeological, paleontological, and cultural sites and their contributing environment from damage, destruction, and abuse to the maximum extent feasible. Project-level mitigation shall include accurate site surveys, consideration of project alternatives to preserve archeological and historic resources, and provision for resource recovery and preservation when displacement is unavoidable.

Fresno County Ordinances

The Fresno County General Plan provides policy direction for land use, development, open space protection, and environmental quality, but this policy direction must be carried out through numerous ordinances, programs, and agreements. The following ordinances are among the most important tools for implementing the general plan and/or are critical to the mitigation of hazards identified in this plan.

Emergency Organization (Title 2, Chapter 2.44)

The declared purposes of this chapter are to provide for the preparation and carrying out of plans for the protection of persons and property within the County in the event of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of the County with all other public agencies, corporations, organizations, and affected private persons.

Health Authority (Title 8, Chapter 8.70)

Among the primary purposes of the health authority are to meet the problems of delivery of publicly assisted medical care in the County and to demonstrate ways of promoting quality care and cost efficiency.

Groundwater Management (Title 14, Chapter 14.03)

This chapter protects the County's important groundwater resources by requiring a permit from the County to extract, on a long-term basis, groundwater for transfer outside the County, including groundwater extracted to replace a surface water supply that has been, is being, or will be transferred for long-term use outside of Fresno County. This chapter is limited to requiring a permit for the long-term direct or indirect transfer of groundwater outside the County and is not intended to regulate groundwater in any other way.

Building Code (Title 15, Chapter 15.08)

This chapter adopts the California Building Code, including the appendices, as referenced, except as otherwise provided in the 2001 California Building Standards Code and the Uniform Building Code Standards.

Fire Code (Title 15, Chapter 15.10)

This chapter adopts the California Fire Code as referenced in the 2001 California Fire Code.

Grading and Excavation (Title 15, Chapter 15.28)

This chapter establishes that Chapter 33 and Chapter 33 of the Appendix of the 1998 California Building Code is adopted by reference and except as otherwise provided is applicable to and shall cover all grading and excavation within the unincorporated area of the County.

Flood Hazard Areas (Title 15, Chapter 15.48)

It is the purpose of this chapter to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by 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; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of special flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

This chapter includes methods and provisions to:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Control filling, grading, dredging, and other development that may increase flood damage; and
- Prevent or regulate the construction of flood barriers that will unnaturally divert floodwaters or that may increase flood hazards in other areas.

Requirements of this chapter apply to all new development, substantial improvements, minor improvements, and conversions of existing nonresidential structures to residential uses within flood hazard areas. Notably, it requires that a development permit be obtained before start of construction or beginning of development within any area of special flood hazard. It appoints the director of the Public Works and Planning Department to administer and implement the chapter by granting or denying development permit applications in accordance with its provisions.

This chapter addresses the following for construction in areas of special flood hazard:

- Standards of construction
- Standards for storage of materials and equipment
- Standards for utilities
- Standards for subdivisions
- Standards for manufactured homes and manufactured home parks and subdivision
- Provisions for floodway development

California Department of Forestry State Responsibility Area Fire Safe Regulations of the County (Title 15, Chapter 15.60)

This chapter provides for basic emergency access, perimeter wildfire protection measures, signing and building numbering, private water supply reserves for emergency fire use, and vegetation modification.

Development requirements in this chapter address setbacks for structures, road improvements, road width, cul-de-sacs and dead-end roads, one-way roads, driveways, gates, road signs, building signs, flammable vegetation and fuels, water supply, and hydrant locations.

Fire District Development Impact Mitigation Fees (Title 15, Chapter 15.64)

The purpose of this chapter is to implement the Fresno County General Plan policy providing for the adoption of development impact mitigation fees and for the collection of such fees at the time of the issuance of building permits or other permits. Subject to the requirements of this chapter, such fees are to be allocated to a fire district within the Fresno County for the acquisition of capital facilities to ensure the provision of the capital facilities necessary to maintain current levels of fire protection services necessitated by new development.

Subdivisions (Title 17, Chapters 17.01-17.60)

Chapters 17.04 through 17.60 makeup Fresno County's subdivision ordinance, which is deemed necessary to protect the public health, safety, and general welfare. It addresses orderly growth and development of the County; beneficial use of land in the public interest; and conservation, stabilization, and protection of property values and assures adequate provision for necessary utilities, public roads, and other public conveniences in subdivided areas. The subdivision ordinance regulates the design and improvement of land divisions and the dedication of public

improvements needed in connection with land divisions. All land divisions must by law be consistent with the general plan and the zoning ordinance.

Drainage of Land (Title 17, Chapter 17.64)

Since the development of land for urban uses substantially accelerates the concentration of surface water and stormwater, it is necessary to require the construction of, and to establish and collect fees to defray the actual or estimated cost of, planned local drainage facilities for the control and safe disposal of surface water and stormwater from local drainage areas to promote and protect the public welfare, safety, peace, comfort, convenience, and the general welfare.

Fresno County Zoning Ordinance

The purpose of the zoning ordinance is to regulate the use of land in each zoning district. The ordinance typically establishes a list of land uses permitted in each district plus a series of specific standards governing lot size, building height, and required yard and setback provisions in the unincorporated area of Fresno-County in a manner consistent with the Fresno County General Plan. This ordinance incorporates zoning regulations implementing the Fresno County General Plan and all of its elements.

One of the zones created by the ordinance is the Open Space Conservation District (Section 815). This zone is intended to provide for permanent open spaces in the community and to safeguard the health, safety, and welfare of the people by limiting developments in areas where police and fire protection, protection against flooding by stormwater, and dangers from excessive erosion are not possible without excessive costs to the community.

Fresno Area Regional Groundwater Management Plan

The Fresno Area Regional Groundwater Management Plan is a comprehensive strategy to enhance and maintain the quantity and quality of local groundwater resources. It provides a vehicle for future groundwater management actions. As part of a regional effort, other basin- specific plans have also been developed for the Kings River and San Joaquin River basins. There are also efforts to create a statewide water management plan. All plans are coordinated for the County through the Public Works and Planning departments.

Fresno County Hazardous Waste Management Plan

The Fresno County Hazardous Waste Management Plan is designed to ensure that safe, effective, and economical facilities for the management of hazardous wastes are available when they are needed. To attain this goal, the plan establishes goals, policies, and programs to encourage the safe handling, storage, and transportation of hazardous materials. The Fresno County Environmental Health Department administers this plan.

Special Districts

There are numerous special districts that provide a variety of public services in Fresno County. Special districts can provide one or more types of public services, facilities, or infrastructure within a prescribed boundary, and they play an important role in growth management because the availability of their services can encourage or discourage new development. Special districts can tax the properties within their boundaries to pay for the services they provide. Monthly fees may also be assessed. Some of the special districts that provide mitigation-related services in Fresno County are presented below.

Fresno Metropolitan Flood Control District

The Fresno Metropolitan Flood Control District is a special act district. It was created to provide fully coordinated and comprehensive stormwater management and related services on a regional basis through a quasi-joint powers relationship between the Cities of Fresno and Clovis and the County of Fresno. The district service area includes most of the Fresno-Clovis metropolitan area (excluding the community of Easton), and unincorporated lands to the east and northeast.

The mission of the district is to provide to the citizens living within its boundaries the ability to control and manage the water resources of the area so as to prevent damage, injury, and inconvenience; to conserve such waters for local, domestic, and agricultural use; and to maximize the public use and benefit of the district's programs and infrastructure. The district maintains a services plan that presents district goals, program objectives, current program descriptions, and implementation strategies.

(See Annex M: Fresno Metropolitan Flood Control District for more information.)

Lower San Joaquin Levee District

The Lower San Joaquin Levee District is a special act district. It was created to operate, maintain, and repair levees, bypasses, and other facilities built in connection with the Lower San Joaquin River Flood Control Project. The district encompasses approximately 468 square miles in Fresno, Madera, and Merced counties, of which 94 square miles are in Fresno County.

(See Annex N: Lower San Joaquin Levee District for more information.)

Kings River Conservation District

The Kings River Conservation District is a special act district. It is responsible for planning for the proper management of water within its service area, including essential flood control and groundwater management services. The district contains about 2,049 square miles in Fresno, Kings, and Tulare counties. The Fresno County portion has 1,001 square miles. It encompasses the Cities of Clovis, Fresno, Fowler, Kerman, Kingsburg, Parlier, Reedley, San Joaquin, Sanger, and Selma and intervening agricultural lands.

(See Annex O: Kings River Conservation District for more information)

Fresno County Fire Protection Districts

Fire protection districts provide a variety of services, which may include fire protection, rescue, emergency medical, hazardous material emergency response, and ambulance services.

- Bald Mountain Fire Protection District
- Fig Garden Fire Protection District
- Fresno County Fire Protection District
- North Central Fire Protection District
- Orange Cove Fire Protection District

Fresno County Irrigation Districts

Irrigation districts provide water for irrigation to users within their boundaries. They may also use water under their control for other beneficial purposes and provide flood protection measures.

- Alta Irrigation District
- Central California Irrigation District
- Consolidated Irrigation District
- Fresno Irrigation District
- Hills Valley Irrigation District
- James Irrigation District
- Laguna Irrigation District
- Orange Cove Irrigation District
- Riverdale Irrigation District
- Tranquillity Irrigation District

Fresno County Drainage Districts

Drainage districts control storm and other waste waters within a district's boundaries, protect property and infrastructure within a district from damage by stormwater or wastewater, and conserve stormwater and waste water for beneficial purposes.

- Camp 13 Drainage District
- Dos Palos Drainage District
- Panoche Drainage District
- Silver Creek Drainage District

Fresno County Mosquito Abatement Districts

Mosquito abatement districts provide mosquito surveillance and control.

- Coalinga-Huron Mosquito Abatement District
- Consolidated Mosquito Abatement District
- Fresno Mosquito and Vector Control District

- Fresno-Westside Mosquito Abatement District

Fresno County Pest Control Districts

Pest control districts are comprised of local growers to control, eradicate, or respond to the effects of pests and/or diseases affecting crops.

- Central Valley Pest Control District
- West Fresno County Red Scale Protective District

Reclamation Districts

Reclamation districts reclaim and protect any body of swampland and overflowed salt marsh, tidelands, or other lands subject to overflow to irrigate lands inside or outside their boundaries. Services include drainage, levee maintenance, and irrigation services.

- No. 1606
- Zalda No. 801

Fresno County Resource Conservation Districts

Resource conservation districts address a wide variety of conservation issues such as forest fuel management, water and air quality, wildlife habitat restoration, soil erosion control, conservation education, and much more.

- Excelsior/Kings River Resource Conservation District
- Firebaugh Resource Conservation District
- James Resource Conservation District
- Los Banos Resource Conservation District
- Navelencia Resource Conservation District
- Panoche Resource Conservation District
- Poso Resource Conservation District
- San Luis Resource Conservation District
- Sierra Resource Conservation District (See Annex P)
- Tranquillity Resource Conservation District
- Westside Resource Conservation District

Fresno County Water Districts (California)

Water districts provide water services. Powers may include the acquisition and operation of works for the production, storage, transmission, and distribution of water for irrigation, domestic, industrial, and municipal purposes and any related drainage or reclamation works.

- Broadview Water District
- Eagle Field Water District
- Farmers Water District

- Firebaugh Canal Water District
- Fresno Slough Water District
- Garfield Water District
- International Water District
- Kings River Water District
- Liberty Water District
- Mercy Springs Water District
- Mid-Valley Water District
- Oro Loma Water District
- Pacheco Water District
- Panoche Water District
- Pleasant Valley Water District
- Raisin City Water District
- San Luis Water District
- Santa Rita Water District
- Stinson Water District
- Tri-Valley Water District
- Westlands Water District
- Wildren Water District

Fresno County Water Districts (County)

County water districts furnish imported water.

- Freewater County Water District
- Malaga County Water District
- Pinedale County Water District

Fresno County Local Boards, Commissions, and Committees

There are a number of local boards, commissions, and committees in Fresno County. Those that have responsibilities related to hazard mitigation are described briefly below.

- **Agricultural Land Conservation Committee**—This committee reviews cancellation of land conservation contracts and makes recommendations to the Board of Supervisors.
- **Association of Metropolitan Water Agencies**—This organization is charged with providing sufficient quality water to satisfy future requirements for municipal, industrial, and agricultural uses within the areas served by the member agencies.
- **Planning Commission**—This commission is charged with the review and approval or denial of discretionary land use permits. The Commission is also advisory to the Board of Supervisors on proposed amendments to the General Plan and the Zoning Ordinance.

Fire Safe Councils

The Fire Safe Council provides resources for establishing and maintaining local fire safe councils to mobilize Californians to protect their homes, communities, and environments from wildfire. These councils serve as forums for stakeholders to share and validate fire safety and fire planning information. There are two fire safe councils in Fresno County:

- Highway I-168 Fire Safe Council (northeastern Fresno County)
- Highway I-80 Oak to Timberline Fire Safe Council (southeastern Fresno County)

Both fire safe councils were active in the 2017-2018 update of the HMP and participated with the Sierra Resource Conservation District in the development and update of their annex (see Annex P).

4.5.2 Fresno County's Administrative/Technical Mitigation Capabilities

Table 4.79 identifies the County personnel responsible for activities related to mitigation and loss prevention in Fresno County.

Table 4.79 Fresno County's Administrative and Technical Mitigation Capabilities

Personnel Resources	Department/Position
Planner/engineer with knowledge of land development/land management practices	Public Works and Planning Development Services Division, principal planner/senior engineer
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Public Works and Planning Development Services Division, supervising plan check engineer/senior engineer
Planner/engineer/scientist with an understanding of natural hazards	Public Works and Planning Development Services Division (no one official is designated, all are familiar)
Personnel skilled in GIS	Public Works and Planning, Development Services Division, staff analyst; Computer Data Services
Full-time building official	Public Works and Planning Development Services Division, director
Floodplain manager	Public Works and Planning Development Services Division
Emergency manager	Office of Emergency Services
GIS data—Hazard areas	Public Works and Planning, Development Services Division, staff analyst (some)
GIS data—Critical facilities	Office of Emergency Services and Internal Services Department
GIS data—Land use	Public Works and Planning Development Services Division, staff analyst
GIS data—Assessor's data	Public Works and Planning, Development Services Division, staff analyst; Computer Data Services

Fresno County Department of Public Health

A number of important mitigation and emergency management programs and services are located in the Fresno County Department of Public Health, which provides health promotion, surveillance, and disease prevention services to protect the public health. Some of these are described below:

Office of Emergency Services and its Mission

The Fresno County Office of Emergency Services (OES) is a program located within the Department of Public Health, Environmental Health Division. Fresno County OES coordinates planning and preparedness, response and recovery efforts for disasters occurring within the unincorporated area of the County. The mission of the Fresno County Office of Emergency Services is to develop and maintain the capability to prepare for, mitigate, respond to, and recover from emergencies and disasters, and to ensure the most effective use of all available resources. To accomplish this mission OES communicates and coordinates with all levels of government and many other entities in order to minimize the impact of disasters and enable affected communities to return to pre-disaster conditions as soon as possible.

On November 14, 1995, the Fresno County Board of Supervisors adopted the State's Standardized Emergency Management System (SEMS), established the geographic area of the County of Fresno as the Fresno County Operational Area, and designated Fresno County as the Operational Area Lead Agency. Fresno County OES is mandated by the California Emergency Services Act (Chapter 7, Division 1, Title 2 of Government Code) to serve as the liaison between the State and all the local government political subdivisions comprising Fresno County. As the Operational Area lead agency, Fresno County OES maintains ongoing communication with local government agencies (County Departments, Incorporated Cities, Special Districts, and Public School Districts) as well as many state and federal agencies and nonprofit organizations to maintain and enhance the capability to respond to and recover from disasters.

During a Disaster

The Office of Emergency Services provides the initial staffing and coordination of the County's Emergency Operations Center (EOC), which is the primary coordination point for response to major emergencies and disasters. During a disaster event OES staff gathers information from the affected jurisdictions and determines the level of response required. OES acts as the link between local government agencies and the State to transmit emergency related information and to request necessary State and Federal assistance.

Between Disasters

The Office of Emergency Services coordinates a wide variety of emergency management functions including developing and updating response plans, maintaining and enhancing the emergency operations center and related equipment, administering emergency preparedness grants, assisting county agencies and local jurisdictions with emergency related activities, and identifying and coordinating appropriate emergency training activities

Fresno County Operational Area Master Emergency Services Plan

The program coordinates the development and maintenance of the Fresno County Operational Area Master Emergency Services Plan, which serves as a guide for the County's response to emergencies/disasters in the Fresno County Operational Area, and to coordinate and assist with disaster response in jurisdictions both within and outside of the Fresno County Operational Area.

Certified Unified Program Agency

The Certified Unified Program Agency (CUPA) is responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that require hazardous materials business plans, require California accidental release prevention plans or federal risk management plans, operate storage tanks, generate hazardous waste(s), and have onsite treatment of hazardous waste(s)/tiered permits.

Land Use Program

Land Use program staff are responsible for reviewing proposed land use development applications submitted to the various planning agencies in the County and providing comments regarding project compliance with the appropriate environmental health standards relative to the staff's areas of expertise. The program evaluates proposed land developments for compliance with laws and regulations pertaining to domestic and public water supplies and vector control, among other things.

Water Surveillance Program

The Water Surveillance Program permits, monitors, and inspects small public water systems and state small water systems within Fresno County and permits new water well construction, reconstruction of existing wells, and destruction of abandoned wells within unincorporated Fresno County. These activities are designed to help assure that a reliable supply of pure, wholesome, and potable water is provided to small public and state small water systems within Fresno County. In addition, the water well permitting program helps assure that private water wells are constructed to minimize the potential for contamination of the groundwater supply and eliminate safety hazards associated with abandoned wells.

Communicable Disease Division

The Communicable Disease Division of the Public Health Department participates in hazard mitigation in several ways, including immunizations, education, and preventive medication to prevent and/or control the spread of disease. The ultimate result is a reduction in human suffering, medical costs, and lost productivity.

In the case of a pandemic influenza or bio-terrorism event, the division would mobilize to mitigate the effects on the general population as well as first responders and essential personnel by administering antivirals, antibiotics, and immunizations. The County has a pandemic response plan that is implemented by this division.

Education and Prevention Services

Education and Prevention Services supports the public health objectives of the Department of Public Health. It conducts research on current health issues and, where appropriate, develops and implements programs to provide information, education, and services that promote and improve the public health and safety within the Fresno community. Staff also participate in a variety of public health partnerships with schools, community-based organizations, health and safety coalitions, public health agencies, managed care, medical institutions, and community members. Activities include:

- Conducting research and development on identified unmet public health needs;
- Developing, implementing, and evaluating primary prevention interventions intended to address targeted health needs of children, youth, and families;
- Providing consumer, youth, and employer health and wellness education;
- Creating and implementing informational marketing campaigns on health and safety topics;
- Coordinating selected training, assessment, and evaluation activities for the department.

Public Health Laboratory

The Public Health Laboratory provides surveillance and detects the presence of disease producing agents that have the potential to adversely affect the health of an entire community. The information generated by this testing is furnished to other agencies and departments to be used for the purpose of monitoring infectious disease outbreaks and environmental threats to the public's health. The information can then be used to plan containment strategies and assess the effectiveness of various health education programs.

Fresno County Heat Emergency Contingency Plan

Administered by a number of the departments within the Department of Public Health, the Fresno County Heat Emergency Contingency Plan was developed to reduce the incidence of morbidity and mortality associated with local extreme heat events. The plan describes County operations during heat-related emergencies and provides guidance for County departments and personnel.

Fresno County Department of Public Works and Planning

The Fresno County Department of Public Works and Planning is responsible for a wide variety of programs and activities related to planning, zoning, permits, water, community service districts, housing, community and economic development, and roads and bridges for the unincorporated portion of Fresno County. Most of the department's mitigation activities take place in the Development Services Division, which consists of the following sections:

- **Building and Safety Section**—Responsibilities include administration of building codes and regulations to ensure the public's safety.
- **Land Development, Policy Planning, and Environmental Analysis Units** - Responsibilities include processing of land use applications, land division, administration of the County's

general plan, Regional, Community and specific plans, urban growth management, and project-related amendments to General Plan and the Zoning Ordinance.

- **Development Engineering** – Responsibilities include processing grading permits, processing parcel maps and lot line adjustments.

Development Engineering is also responsible for floodplain administration and administers the National Flood Insurance Program (NFIP) for unincorporated areas of the County. The NFIP is a FEMA program that makes flood insurance available to communities that have enacted local ordinances restricting development within the 100-year floodplain. Fresno County has been an NFIP participant since 1982.

Floodplain management in Fresno County is based on mapping associated with the 2016 FEMA Flood Insurance Study, which contains revised and updated information on flood hazards in the geographic area of Fresno County, including the Cities of Clovis, Coalinga, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cover, Parlier, Reedley, Sanger, San Joaquin, and Selma and the unincorporated areas of Fresno County. This study developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management.

Community Development

The department's Community Development Division provides a variety of services and activities to improve the quality of life and ensure a healthy economy for residents of unincorporated Fresno County and its partner cities. The division is responsible for the administration of the Community Development Block Grant Program, which provides funding, including mitigation funding, to upgrade low and moderate income neighborhoods.

Fresno County Department of Agriculture

The Fresno County Department of Agriculture, under direction of the California Department of Food and Agriculture, is responsible for conducting regulatory and service functions pertaining to the multi-billion dollar agricultural industry in Fresno County. The primary purpose and objective of the department is the promotion and protection of the County agricultural industry and the general public. Three divisions carry out the department's program objectives:

- Pest Detection and Exclusion Division
- Environmental Protection and Pest Management Division
- Weights and Measures/Standardization and Statistics Division

County Administrative Office

The County Administrative Office functions as the operations arm of the County Board of Supervisors and carries out its mission of delivering the highest quality of public services. The office administers the County's \$1.45 billion dollar budget that funds services in public safety, law

enforcement, agriculture, public works, human services, libraries, and elections. It takes the lead in activities to improve the quality of life in Fresno County, including economic development, capital improvements, and tourism.

Fresno County Public Library

The Fresno County Public Library provides collections and services through its Central Resource Library and 34 branches. It is part of the San Joaquin Valley Library System, a cooperative network of nine public library jurisdictions in the counties of Fresno, Kern, Kings, Madera, Mariposa, and Tulare. The library is an excellent resource for information about hazards and emergency preparedness.

State and Federal Programs

A number of state and federal programs exist to provide technical and financial assistance to local communities for hazard mitigation. Some of the primary agencies/departments that are closely involved with local governments in the administration of these programs include:

- California Governor's Office of Emergency Services
 - State of California Multi-Hazard Mitigation Plan
- California Department of Water Resources (San Joaquin District)*
 - San Joaquin River Management Plan
- California Department of Forestry and Fire Protection (Fresno King's Unit)*
- California Environmental Protection Agency
- California Department of Fish and Game*
- California Department of Transportation (Caltrans)
- California Highway Patrol
- California State Parks and Recreation Department*
- California State Lands Commission*
- San Joaquin River Conservancy*
- Federal Emergency Management Agency (Region IX)
- U.S. Army Corps of Engineers (South Pacific Division/Sacramento District)*
- Bureau of Reclamation (Mid-Pacific Region, Hollister planning area)*
- USDA Forest Service (Pacific Southwest Region)*
- National Parks Service (Pacific West Region)*
- USDA Natural Resources Conservation Service (Fresno Service Center)*
- U.S. Environmental Protection Agency (Region IX)
- American Red Cross (Fresno/Madera)

*Owns and/or manages land and/or facilities (or has some sort of administrative role, e.g., fire protection) in the County, potential partner for mitigation activities

4.5.3 Fresno County's Fiscal Mitigation Capabilities

Table 4.80 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4.80. Fresno County's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Based on direction of chief administrative officer and Board approval
Capital improvements project funding	Yes	Based on direction of chief administrative officer
Authority to levy taxes for specific purposes	Yes	Based on approval by Board of Supervisors and taxpayers
Fees for water, sewer, gas, or electric services	No/Yes	
Impact fees for new development	Yes	Based on approval by Board of Supervisors
Incur debt through general obligation bonds	Yes	Based on approval by Board of Supervisors, via County election process
Incur debt through special tax bonds	Yes	Based on approval by Board of Supervisors, via County election process
Incur debt through private activities	Yes	Based on approval by Board of Supervisors
Withhold spending in hazard prone areas	Yes	Based on direction of chief administrative officer and Board approval



5 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the Fresno County Multi-Jurisdictional Hazard Mitigation Plan. It describes how the County and participating jurisdictions met the requirements for the following from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to the action plan in Section 5.3 Mitigation Action Plan. Taking all the above into consideration, the HMPC developed the following overall mitigation strategy:

- **Communicate** the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- **Implement** the action plan recommendations of this plan.
- **Use** existing rules, regulations, policies, and procedures already in existence. Given the flood hazard in the planning area, an emphasis should be placed on continued compliance with the National Flood Insurance Program and participation by all communities in the Community Rating System.
- **Monitor** multi-objective management opportunities so that funding opportunities may be shared and packaged, and broader constituent support may be garnered.

5.1 Goals and Objectives

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

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks. The HMPC held a series of meetings and exercises designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment with the HMPC. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and the ultimate mitigation strategy for the Fresno County planning area.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

During the 2009 planning process, HMPC members were given a list of sample goals to consider. They were told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. Each member was each given three index cards and asked to write a goal statement on each card. Goal statements were collected and grouped into similar themes and pasted onto the wall of the meeting room. The goal statements were then grouped into similar topics. New goals from the HMPC were discussed until the team came to consensus. Some of the statements were determined to be better suited as objectives or actual mitigation actions and were set aside for later use. Next, the HMPC developed objectives that summarized strategies to achieve each goal. During this plan update process, HMPC members reviewed the existing goals and objectives. In general, the committee found that the 2009 plan goals and objectives were still relevant and valid; however, following discussion the group decided to update Goal 2 to incorporate an emphasis on resilience.

Based on the risk assessment review and goal setting process, the HMPC identified the following goals and objectives, which provide the direction for reducing future hazard-related losses within the Fresno County planning area. One jurisdiction, the City of Kingsburg, chose to modify the countywide goals to better reflect the desires specific to their community. Kingsburg's modified goals are included in their jurisdictional annex to this plan.

Goal 1: Provide Protection for People's Lives from Hazards

Objective 1.1: Provide timely notification and direction to the public of imminent and potential hazards

Objective 1.2: Protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters

Objective 1.3: Improve community transportation corridors to allow for better evacuation routes for the public and better access for emergency responders

Goal 2: Improve All Communities' Resilience and Capabilities to Mitigate Hazards and Reduce Exposure to Hazard-Related Losses

Objective 2.1: Reduce wildfires/protect life, property, and natural resources from damaging wildfires

Objective 2.2: Reduce flood and storm-related losses

Objective 2.3: Reduce hazards that adversely impact the agricultural industry

Objective 2.4: Minimize the impact to the communities due to recurring drought conditions that impact both ground water supply and the agricultural industry

Objective 2.5: Minimize the risk/loss to endangered species, native plants, land (erosion), and native wildlife

Goal 3: Improve Community and Agency Awareness about Hazards and Associated Vulnerabilities that Threaten Fresno County Planning Area Communities

Objective 3.1: Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, what is vulnerable, and recommended mitigation and preparedness for identified hazards

Goal 4: Provide Protection for Critical Facilities, Utilities, and Services from Hazard Impacts

Goal 5: Maintain Coordination of Disaster Planning

Objective 5.1: Coordinate with changing U.S. Department of Homeland Security/FEMA needs

Objective 5.2: Coordinate with other community plans

Objective 5.3: Maximize the use of shared resources between jurisdictions and special districts for mitigation/communication

Objective 5.4: Standardize systems among agencies to provide for better interoperability

Goal 6: Maintain/Provide for FEMA Eligibility and Work to Position Jurisdictions for Grant Funding

Objective 6.1: Provide County departments and other jurisdictions with information regarding mitigation opportunities

Objective 6.2: As part of plan implementation, review actions in this plan on an annual basis to be considered for annual FEMA Pre-Disaster Mitigation grant allocations or after a presidential disaster declaration in California for Hazard Mitigation Grant Program funding as well as for other local, state, and federal funding opportunities

5.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 Identifying Hazards: Natural Hazards was evaluated. Only those hazards that were determined to be a priority hazard were considered further in the development of hazard-specific mitigation actions.

These priority hazards are:

- Agricultural Hazards
- Dam Failure
- Drought
- Earthquake
- Flood/Levee Failure
- Human Health Hazards
 - Epidemic/Pandemic
- Severe Weather
 - Extreme Temperatures
 - Heavy Rain/Thunderstorm/Hail/Lightning
 - Fog
 - Windstorm
- Soil Hazards
 - Land Subsidence
- Wildfire

Hazardous materials incident (release from a fixed facility or transportation accident) was also identified by the HMPC as a priority hazard, as noted in Section 4.4 Human-caused Hazards.

The HMPC eliminated the hazards identified below from further consideration in the development of mitigation actions because the risk of a hazard event in the County is unlikely or nonexistent, the vulnerability of the County is low, or capabilities are already in place to mitigate negative impacts. The eliminated hazards are:

- Avalanche
- Human Health Hazards
 - West Nile Virus
- Landslide
- Severe Weather
 - Snow
 - Tornado
- Soil Hazards
 - Erosion
 - Expansive Soils
- Volcano

It is important to note, however, that all the hazards addressed in this plan are included in the countywide multi-hazard public awareness mitigation action.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- **Prevention:** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural:** Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services:** Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them

At the mitigation strategy meeting the HMPC was also provided with a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The HMPC was also provided a handout that explains the categories and provided further examples. Another reference document titled “Mitigation Ideas” developed by FEMA was distributed to the HMPC via an online link. This document lists the common alternatives for mitigation by hazard. The HMPC was also instructed to consider both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix C provides the matrix of alternatives considered.

Each proposed action was written on a large sticky note and posted on flip charts in meeting room underneath the hazard it addressed.

5.2.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the Disaster Mitigation Act requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action included:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?
- What will the action cost?
- What is the timing of available funding?

The mitigation categories, multi-hazard actions, and criteria are included in Appendix C: Mitigation Categories, Alternatives, and Selection Criteria.

At the mitigation strategy meeting the HMPC used STAPLEE to determine which of the identified actions were most likely to be implemented and effective. With these criteria in mind, team members were given a set of four green sticky-dots. The team was asked to use the dots to prioritize projects with the above criteria in mind, essentially voting on the projects. The projects with the most dots became the higher priority projects. This process provided both consensus and priority for the recommendations. Follow-up meetings were held within each jurisdiction to finalize the

actions that are part of this plan. Participating jurisdictions were given the leeway to prioritize the actions specific to them, using the previously mentioned criteria.

This plan also carries forward many mitigation actions developed during the 2009 planning process. HMPC members and jurisdictional planning teams were asked to review their existing mitigation actions and report on the progress made toward implementation and decide whether and incomplete actions should be carried forward for continued or future implementation or be deleted. In some cases, mitigation actions were adjusted to reflect new situations or needs.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to collectively prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. After completing the prioritization exercise, some team members expressed concern that prioritizing all the actions as a group is not very effective, since many of the actions are jurisdiction- or department-specific. However, the team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support.

Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.3. Specifically, each action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to the determination of a High, Medium, or Low priority for each action.

Recognizing the limitations in prioritizing actions from multiple jurisdictions and departments and the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue mitigation action strategy development and implementation according to the nature and extent of damages, the level of protection and benefits each action provides, political support, project cost, available funding, and individual jurisdiction and department priority. This process drove the development of a prioritized action plan for the Fresno County planning area. Cost-effectiveness will be considered in greater detail through a formal benefit-cost analysis when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

5.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This action plan was developed to present the recommendations developed by the HMPC for how the Fresno County planning area can reduce the vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan’s goals.

5.3.1 Progress on Previous Mitigation Actions

Fresno County and the many of the participating jurisdictions have been successful in implementing actions identified in the 2009 LHMP Mitigation Strategy, thus, working steadily towards meeting the 2009 plan goals. Projects that helped meet five of the six goals have been completed as of early 2018.

The 2009 mitigation strategy contained 89 separate mitigation actions including 19 actions led by Fresno County. Of the County’s actions, three have been completed. Several others have had aspects implemented or are ongoing, such as ‘Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program.’ Across all jurisdictions, 18 actions from the 2009 Plan have been completed, including several by the City of Clovis. Table 5.1 provides a summary of the mitigation action projects completed from the 2009 Plan. More details on in-progress and ongoing actions are discussed in the “Status” associated with the County Mitigation Action details and jurisdictional annexes. These actions are included in Table 5.3.

Table 5.1 Mitigation Actions Completed from 2009 Plan

Jurisdiction	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals
Fresno County	Implement Mass Notification System for Fresno County	Multi-Hazard	High	1
	Develop and Conduct Disaster Response/Disaster Management Training for Designated County/City Staff	Multi-Hazard	Medium	2
	Install Automated Fog Warning System	Fog	High	1
City of Clovis (Annex A)	Establish Post-Disaster Action Plan for City Continuity of Operations Plan	Multi-Hazard	High	4
	Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment	Multi-Hazard	High	2
	Implement a System of Automatic Vehicle Location	Multi-Hazard	High	2
	Install Battery Back-Up Systems at Traffic Signals in the City of Clovis on Major Transportation Routes	Multi-Hazard	High	1, 4
	Replace Traffic Management Center Software and Herndon Avenue Traffic Signal Equipment and Implement Communications Upgrades	Multi-Hazard	Medium	1

Jurisdiction	Mitigation Action Title	Corresponding Hazard	Priority	Related Goals
	Modify and Enhance Emergency Traffic Control System	Multi-Hazard	Medium	1
	Implement a System to Share Information with City Police Officers/Employees (SharePoint)	Multi-Hazard	Medium	3, 5
	Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	Multi-Hazard	High	5
	Implement a Flood Awareness Program for the Public	Flood	Medium	3
City of Coalinga (Annex B)	Improve Nonstructural Earthquake Mitigation in Public Buildings	Earthquake	High	1, 4
	Inventory At-Risk Buildings	Earthquake	High	1
City of Kingsburg (Annex G)	Conduct Disaster Response Training	Multi-Hazard	High	2
	Replace Storm Drains on Lewis and Washington Streets	Flood	High	2
Sierra Resource Conservation District (Annex P)	Create an Integrated Regional Water Management Plan for Eastern Fresno County	Drought	Medium	5
	Conduct a Fractured Rock Groundwater Capacity Study for Eastern Fresno County	Drought	Medium	2

During the 2017-18 update, the actions from the 2009 plan were revisited, re-evaluated, and in some cases re-prioritized. During this process several actions were noted as not completed and no longer relevant to continue forward in the updated plan. Some actions were deleted because they were considered response actions rather than mitigation, while others were simply no longer a priority. The actions from the 2009 Plan that were not completed but are no longer being pursued are noted in the table below.

Table 5.2 Mitigation Actions Deleted

Jurisdiction	Mitigation Action Title	Corresponding Hazard	Related Goals	Reason for Deleting
Fresno County	Establish an Abandoned Water Well Program	N/A	N/A	Not tied to mitigation of a specific hazard
	Develop Mitigation and Monitoring Program for Groundwater Supplies in the Northeast Portion of the County	Drought	2	Replaced by new action #9 SGMA Compliance and Implementation

Jurisdiction	Mitigation Action Title	Corresponding Hazard	Related Goals	Reason for Deleting
	Create and Maintain a Water Stewardship Forum of Stakeholders in Northeastern Fresno County	Drought	2	Replaced by new action #9 SGMA Compliance and Implementation
	Control E. Coli through Wild Hog Population Management	Agricultural	2	No longer considered a relevant project
	Develop an Animal Carcass Disposal Plan	Multi-Hazard	2	Plan not necessary; Managed through State and other guidance
City of Coalinga	Provide Bilingual Neighborhood Emergency Response Team (NERT) Training to Community Residents and Businesses	Earthquake	2	Considered a Response Activity
City of Sanger (Annex I)	Implement a Flood Awareness Program for the Public	Flood	3	No longer a priority; replaced with flood awareness outreach targeting areas with localized flooding issues
	Install Battery Back-Up Systems at Traffic Signals in the City of Sanger on Major Transportation Routes	Multi-Hazard	1	No longer considered a priority
	Improve City's Floodplain Management Program and Apply to Community Rating System	Flood	2	Participation in the CRS no longer considered a priority
City of Selma (Annex J)	Construct a Railroad Crossing Underpass	Multi-Hazard	1	No longer considered a viable alternative
Fresno Metropolitan Flood Control District (Annex M)	Construct Control Structures and Flood Channel for Mud Creek Flows between the Gould and Fresno Canals	Flood	2	Replaced with New Project
	Construct Improvements to the Vernon Drain Between the Gould and Fresno Canals	Flood	2	Replaced with New Project

5.3.2 Continued Compliance with NFIP

Recognizing the importance of the NFIP in mitigating flood losses, an emphasis will be placed on continued compliance with the NFIP by Fresno County and other NFIP participating communities including the cities of Clovis, Coalinga, Firebaugh, Fowler, Fresno, Kingsburg, Mendota, Reedley, San Joaquin and Sanger. As NFIP participants, these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. The City of Selma has chosen not to participate in the NFIP for several years due to limited flood risk, though some Special Flood Hazard Area exists within city

limits. Other details related to NFIP participation are discussed in the flood vulnerability discussion in Chapter 4 and in the capability assessment in Section 4.5 and jurisdictional annexes.

5.3.3 Updated Mitigation Action Plan

The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act. Table 5.3 identifies the mitigation actions and lead jurisdiction for each action. Only those actions where the County is the lead jurisdiction, or are multi-jurisdictional, are detailed further in this section. Actions specific to other participating jurisdictions, or where other jurisdictions are taking the lead, are detailed in the jurisdictional annexes. The Multi-Hazard Seasonal Public Awareness Program was a former County action in the 2009 plan and has been revised to be a multi-jurisdictional, county-wide action in which all municipalities and participating special districts will be partners with the County to educate and disseminate information related to a community's risk and vulnerability to natural hazards and how individuals can take steps to lessen their risk to certain hazards. The program will focus on the hazards that pose the greatest risk to the communities, such as earthquake, drought, flooding, and wildfires. Specific details on this multi-jurisdictional action follow the summary table.

It is important to note that Fresno County and the participating jurisdictions have numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as community wildfire protection plans and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The Fresno County planning area also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

The results of the 2017-18 project identification and prioritization exercise are summarized below in Table 5.3. Included in the table are actions that are being carried forward from the 2009 plan, which are noted as continuing or deferred projects in the 'project status' column. Deferred projects are those that were identified in 2009 but not yet started. Continuing projects are those identified in 2009 that may have been started but either more work remains, or they are annually implemented projects. The actions are grouped by jurisdiction and priority. More detail about the actions identified for Fresno County follow the table, including a description of the activity, the entity responsible for implementation, any other alternatives considered, cost estimate, and a schedule for implementation. The jurisdictional annexes contain the detailed action item descriptions respective to each jurisdiction. The summary table can be used for reference during future HMPC meetings to track progress moving forward. Actions that mitigate losses to future development are denoted by an '*' in the table.

Table 5.3 Fresno County Mitigation Action Plan Summary Table

Action ID	Hazard Addressed	Mitigation Action Title	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Multi-Jurisdictional Mitigation Actions					
Multi-Jurisdictional 1	Multi-Hazard	Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program	High	3	Continuing
Fresno County Mitigation Actions					
County 1	Multi-Hazard	Identify Critical Facilities and Inspect for Vulnerability to Major Hazards	High	2	Continuing
County 2	Multi-Hazard	Upgrade or Replace Critical County Facilities Found to be Vulnerable to Major Hazards	High	4	Continuing
County 3	Multi-Hazard	Enhance the County Emergency Operations Center	High	2, 5	Continuing
County 4	Agricultural	Control Bubonic Plague through Coyote and California Ground Squirrel Population Management	High	2	Continuing
County 5	Dam Failure	Minimize Flood Events by Exercising Reclamation's Emergency Action Plan and Provide an Early Warning System to Downstream Emergency Response Agencies	High	1, 2	Continuing
County 6	Dam Failure	Update Dam Failure Evacuation Plan	Medium	1	New
County 7*	Drought, Subsidence	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New Project
County 8	Flood	Conduct Feasibility Study for Panoche-Silver Creek Flood Detention Facility (see Mendota)	High	2	Deferred
County 9	Flood	Investigate and Construct Water Storage Options for the Upper San Joaquin River Basin	High	2	Continuing
County 10	Flood	Analyze System, Condition, and Management of Flood Water Conveyance Facilities	High	2	Deferred
County 11*	Flood	Prepare Stormwater Drainage Master Plans	Medium	2	Continuing
County 12	Human Health	Control West Nile Virus through Beaver Population Management	High	2	Continuing
County 13	Wildfire/ Wind	Wildfire Defensible Fuel Modification Zones in Areas of Tree Mortality	High	2, 3	New Project

Action ID	Hazard Addressed	Mitigation Action Title	Priority	Related Goals	Action Status (New, Continuing, Deferred)
City of Clovis Mitigation Actions					
Clovis 1	Multi-Hazard	Construct a Water Intertie between the Cities of Clovis and Fresno	High	5	Continuing
Clovis 2	Multi-Hazard	Modernize Information Technology Backup Infrastructure	High	4	Continuing
Clovis 3	Multi-Hazard	Improve the City's Capabilities for Sheltering Animals in a Disaster	High	1	Continuing
Clovis 4	Multi-Hazard	Purchase Hazard Mitigation Public Notification Boards	High	1	Deferred
Clovis 5	Multi-Hazard	Improve Emergency Evacuation and Emergency Vehicle Routes	High	1, 4	Deferred
Clovis 6	Earthquake	Conduct a Seismic Vulnerability Assessment of City-Owned Critical Facilities	Medium	2	Continuing
Clovis 7	Flood	Construct Channel Improvements for Dog Creek Stream, South of Gettysburg-Ashlan	High	2	Continuing
Clovis 8*	Flood	Improve Flow Design Parameters for Big Dry Creek and the Enterprise Canal	High	2	Continuing
Clovis 9*	Flood	Improve City's Floodplain Management Program and Apply to Community Rating System	Medium	2	Continuing
Clovis 10*	Flood	Enforce Master Drainage Plan Requirements	Low	1	Continuing
Clovis 11	Other	Install a System of Surface Water Hazard Detection	High	2	Continuing
Clovis 12	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Coalinga Mitigation Actions					
Coalinga 1	Multi-Hazard	Plan for Alternative Water Sources for the Water System	High	2	New
Coalinga 2	Multi-Hazard	Plan for Water System Sustainability in the Event of Long Term Power Failure	High	4	New
City of Firebaugh Mitigation Actions					
Firebaugh 1	Flood	Assess Levee System for Necessary Improvements	Medium	1,2,4	New
Firebaugh 2	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Fowler Mitigation Actions					

Action ID	Hazard Addressed	Mitigation Action Title	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Fowler 1	Multi-Hazard	Install Back-up Power System for City Critical Facilities	High	4	New
Fowler 2	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Fresno Mitigation Actions					
Fresno 1	Multi-Hazard	Establish Post-Disaster Action Plan for City Continuity of Operations Plan	High	5	Continuing
Fresno 2	Multi-Hazard	Improve the City's Capabilities for Sheltering Animals in a Disaster	High	1	Continuing
Fresno 3	Multi-Hazard	Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment	High	2	Deferred
Fresno 4	Flood	Implement a Flood Awareness Program for the Public	Medium	3	Deferred
Fresno 5	Drought	Southwest Fresno - Recycled Water Distribution System Construction	High	2	New
Fresno 6	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Kerman Mitigation Actions					
Kerman 1	Flood	Construct California Avenue Parallel Storm Drain Line	High	2	Deferred
Kerman 2	Severe Weather: Fog	Install Warning Lights for the Intersection of State Route 145 and Highway 180	Medium	1	Deferred
Kerman 3	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Kingsburg Mitigation Actions					
Kingsburg 1	Multi-Hazard	Enhance Traffic Diversion System	High	1	Deferred
Kingsburg 2	Multi-Hazard	Create Emergency Evacuation Plan for Large Scale Incident	High	1	New
Kingsburg 3*	Multi-Hazard	Identify High Risk and High Value Target Areas	High	2	New
Kingsburg 4	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Mendota Mitigation Actions					

Action ID	Hazard Addressed	Mitigation Action Title	Priority	Related Goals	Action Status (New, Continuing, Deferred)
Mendota 1	Flood	Build a Stormwater Detention/Desilting Basin	High	1	Continuing
Mendota 2	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Reedley Mitigation Actions					
Reedley 1	Flood	Develop Stormwater Detention Basin	High	2	New
City of San Joaquin Mitigation Actions					
San Joaquin	Multi-Hazard	Construct Water Storage Tank and Booster Pump Station including emergency generators	High	2,4	New
City of Sanger Mitigation Actions					
Sanger 1	Multi-Hazard	Establish Post-Disaster Action Plan for City Continuity of Operations Plan	High	4	Continuing
Sanger 2	Multi-Hazard	Add Potable Water Storage Capacity (500,000 Gallon above Ground Tank) to the City of Sanger's Water System	High	2	Continuing
Sanger 3	Multi-Hazard	Provide Backup Power to City Pumps/Wells	High	1, 4	Continuing
Sanger 4	Flood	Replace Old Drainage System to Prevent Flooding	Medium	2	Continuing
Sanger 5	Flood	Provide Fire Department Office Security	Medium	4	Deferred
Sanger 6	Other	Provide Compound Security for Police and Fire Departments	Medium	4	Deferred
Sanger 7	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
City of Selma					
Selma 1	Multi-Hazard	Institute a Disaster Preparedness Education Program for the Public	High	3	Deferred
Selma 2	Flood	Install Back-up Power for Storm Drain Pumps	High	4	Deferred
Selma 3	Flood	Sheridan Street Pump Station	High	4	Deferred
Selma 4	Technological	Construct New Police and Fire Department Headquarters	High	2	Deferred
Selma 5	Drought	Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation	High	2	New
Fresno Metropolitan Flood Control District Mitigation Actions					

Action ID	Hazard Addressed	Mitigation Action Title	Priority	Related Goals	Action Status (New, Continuing, Deferred)
FMFCD 1	Flood	Construct the Gould Canal to Fancher Creek Detention Basin Pipeline	High	2, 4	New
FMFCD 2	Flood	Construct the Fancher Creek Detention Basin Pump Station and Telemetry System	High	2, 4	New
FMFCD 3*	Flood	Provide for Local Stormwater Drainage System Infrastructure	High	2	Continuing
FMFCD 4*	Flood	Retain 200-Year Flood Control Protection	Medium	2	Continuing
FMFCD 5	Flood	Retrofit Areas with Surface Outlets to Protect Existing Structures	Medium	2, 4	Continuing
FMFCD 6	Flood	Install Back-up Generators for Pump Only Facilities	Low	4	Deferred
FMFCD 7	Flood	Big Dry Creek Diversion Additional Drop Structure	Medium	4	New
Lower San Joaquin Levee District Mitigation Actions					
LSJLD 1	Flood	Institute a Dredging Management Program for the Purpose of Flood Damage Reduction	High	2	Continuing
LSJLD 2	Flood	Institute an Invasive Vegetation Management Program for the Purpose of Flood Damage Reduction	High	2	Continuing
Sierra Resource Conservation District Mitigation Actions					
SRCD 1	Multi-Hazard	Strengthen Non-Native Noxious Weed Control Efforts	Low	2	Deferred
SRCD 2	Dam Failure	Strengthen Dam Failure/Flood Planning, Coordination, and Training	Low	2	Deferred
SRCD 3	Wildfire	Improve Alternate Emergency Access Roads	High	1	Continuing
SRCD 4	Wildfire	Conduct Community Fuel Break Construction and Maintenance on a Landscape Scale	High	2	Continuing
SRCD 5	Wildfire	Create a Fuel Break Along Highway 168	High	2	Deferred
SRCD 6	Wildfire	Implement a Neighborhood Chipper Program	High	2	Continuing
SRCD 7	Wildfire	Conduct Prescribed Fires	High	2	Continuing
SRCD 8	Wildfire	Establish a System of Fire Pumper/Tanker Fill Stations and Water Storage	High	2	Continuing
SRCD 9	Wildfire	Implement a Public Fire Prevention, Survival, and Mitigation Education Program	Medium	3	Continuing

Action ID	Hazard Addressed	Mitigation Action Title	Priority	Related Goals	Action Status (New, Continuing, Deferred)
SRCD 10	Wildfire	Update Highway 168 FireSafe Council's Community Wildfire Protection Plan through CA FireSafe Council Funding	High	2	New
SRCD 11	Wildfire	Develop Wildfire Protection Plan with Oak to Timberline FireSafe Council through CA FireSafe Council Funding	High	5	New
SRCD 12	Wildfire	Implement a biomass utilization and dispositioning program for excessive forest and rangeland vegetation	High	2	New
SRCD 13	Wildfire	Partner with U.S. Forest Service to reduce fire risk in Wildland Urban Interface (WUI)	High	2	New
SRCD 14	Wildfire	Removal of Illegal marijuana grows to reduce fire risk in Wildland Urban Interface (WUI)	High	2	New
SRCD 15	Wildfire	Burns Flat Fuel Break	High	2	New
SRCD 16	Wildfire	Whispering Springs Fuel Break	High	2	New
SRCD 17	Wildfire	The Beal Fire Road Fuel Break	High	2	New
SRCD 18	Wildfire	Peterson Road Fuel Break	Medium	2	New
Westlands Water District					
WWD 1	Drought	Institute a Groundwater Replenishment and Drought Resiliency Project	High	2, 4	New
Kings River Conservation District					
KRCD 1	Multi-Hazard	Analysis of Levee Integrity and Improvement Project	High	1, 2	New

*Denotes a mitigation action that addresses future development

Multi-Jurisdictional Mitigation Actions

1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program

Hazards Addressed: Agricultural Hazards, Dam Failure, Drought, Earthquake Flood/Levee Failure, Human Health, Landslide, Severe Weather, Soil Hazards (subsidence), Wildfire, Volcano

Issue/Background: The jurisdictions within Fresno County are at risk to the natural hazards identified in this plan. Each hazard poses a different degree of risk and associated vulnerability, depending on the location within the County, but drought, flooding, wildfire and earthquake represent some of the most significant hazards. Some hazards such as flooding, have a high likelihood of occurrence, a specific location that would likely be impacted, and proven approaches that could reduce the impact. For other hazards, where either the likelihood of occurrence is very low, the area of likely impact is not specifically known, or there is very little that can be done to reduce the impacts. The public needs to be made aware of the hazards so they can take action to reduce potential impacts to their own personal property and safety. The County and HMPC,

including participating jurisdictions and special districts involved in the plan, have determined that public awareness is a key component of the overall mitigation strategy for this plan. People should have information describing historical events and losses, the likelihood of future occurrences, the range of possible impacts, appropriate actions to save lives and minimize property damage, and where additional information can be found. Any information provided through this effort should be accurate, specific, timely, and consistent with current and accepted local emergency management procedures as promoted by the California State Office of Emergency Services and the American Red Cross. This public outreach effort will be conducted annually and will include:

- Using a variety of information outlets, including local news media, social media, and web-based information;
- Creating and printing (where applicable) brochures, leaflets, water bill inserts, websites, and public service announcements;
- Displaying current brochures and flyers in County and City office buildings, libraries, and other public places;
- Developing public-private partnerships and incentives to support public education activities;
- Provide information on priority hazards including: Agricultural Hazards, Dam Failure, Drought, Earthquake, Flood/Levee Failure, Human Health, Severe Weather, Soil Hazards (subsidence), Wildfire;
- Provide information on water conservation, particularly during times of drought;
- Participation in statewide events such as The 2018 Great California ShakeOut earthquake awareness drill

Other Alternatives: Continue public information activities currently in place

Responsible Office: Fresno County Office of Emergency Services, Department of Public Works and Planning, and Chamber of Commerce; American Red Cross. All municipalities and special districts will be partners including:

- City of Clovis
- City of Coalinga
- City of Firebaugh
- City of Fowler
- City of Fresno
- City of Kerman
- City of Kingsburg
- City of Mendota
- City of Reedley
- City of San Joaquin
- City of Sanger
- City of Selma
- Fresno Metropolitan Flood Control District

- Lower San Joaquin Levee District
- Sierra Resource Conservation District (including Highway 168 Fire Safe Council and Oak to Timberline Fire Safe Council)
- Kings River Conservation District
- Westlands Water District

Priority (High, Medium, Low): High

Cost Estimate: \$5,000-20,000 annually, depending on printing and mailing costs, level of volunteer participation, and scope and frequency of events

Potential Funding: FEMA's Hazard Mitigation Grant Program, Fresno County funds, other available grants

Benefits (Avoided Losses): Heightened awareness that can lead to enhanced life safety, reduction in property losses; relatively low cost

Schedule: Part of seasonal multi-hazard public awareness campaign

Status: 2009 project, implementation ongoing at County level but revised in 2018 to make it more of a multi-jurisdictional effort.

Fresno County Multi-Hazard Mitigation Actions

1. Identify Critical Facilities and Inspect for Vulnerability to Major Hazards

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, volcano, hazardous materials

Issue/Background: The County has various facilities that may need to function in times of crisis and/or emergency.

- The facilities should be identified.
- The identified facilities should be reviewed and inspected to determine if the infrastructure can withstand and operate under critical conditions.
- Required upgrades to each of the facilities should be identified and prioritized.

Other Alternatives: No action

Responsible Office: Internal Services Department in coordination with Fresno County Department of Public Works and County OES

Priority (High, Medium, Low): High

Cost Estimate: Up to \$3 million, depending on the number of facilities identified for review

Potential Funding: Annual budgets

Benefits (Avoided Losses): The County will be able to develop a plan to methodically upgrade the infrastructure and systems necessary to operate in times of emergency.

Schedule: 1-5 years

Status: 2009 project, implementation in progress

2. Upgrade or Replace Critical County Facilities Found to be Vulnerable to Major Hazards

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, volcano, hazardous materials

Issue/Background: The County has various facilities that may need to function in times of crisis and/or emergency. The County should upgrade or replace those facilities found to be vulnerable in accordance with a developed prioritized schedule.

Other Alternatives: Contact other jurisdictions to determine if capacity exists to accommodate County critical functions within facilities they control.

Responsible Office: Fresno County Department of Public Works and Planning Capital Projects Division

Priority (High, Medium, Low): High

Cost Estimate: Unknown at this time, will depend on the number of facilities identified, total cost could approach \$100 million or more

Potential Funding: FEMA's Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program, state funds, Fresno County budgets

Benefits (Avoided Losses): The County will have reliable infrastructure and systems necessary to operate in times of emergency

Schedule: 2-10 years

Status: 2009 project, implementation in progress

3. Enhance the County Emergency Operations Center

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, human health hazards, severe weather, wildfire, volcano, hazardous materials

Issue/Background: The Emergency Operations Center (EOC) for Fresno County is located in multiple rooms on multiple floors within the Public Health Department. Because the EOC sections

are isolated, communications are limited, and section staff are unable to interact well. A centralized modern day EOC in a single location would greatly enhance communications and improve the effectiveness of those who work in it.

Other Alternatives: Enhance the EOCs of other jurisdictions and activate them in the event of an emergency

Responsible Office: Fresno County Office of Emergency Services

Priority (High, Medium, Low): High

Cost Estimate: \$2.5 million

Potential Funding: Fresno County General Fund, grants

Benefits (Avoided Losses): A modern EOC in one location would decrease emergency response time and the public notification process, reducing potential loss of life and damage. The more time people are given to prepare for a potential emergency, the better chance they have of avoiding the effects of that event. The benefits would reduce set-up time currently needed. This would result in greater efficiencies that could leverage current technologies and result in improved communication and save time, money and lives through a faster response

Schedule: within 5-10 years

Status: 2009 project, implementation in progress; Some improvements are in place. A centralized EOC is not yet in place.

Fresno County Agricultural Hazards Mitigation Actions

4. Control Bubonic Plague through Coyote and California Ground Squirrel Population Management

Issue/Background: Bubonic plague is endemic to parts of Fresno County. Coyotes and the California ground squirrel are free ranging wildlife that are present in all of Fresno County. Coyotes and ground squirrels cause extensive agricultural livestock, crop, and property damage. Coyotes are very mobile and can travel 20 to 25 miles in a day. Coyotes are known to carry and transmit diseases to humans, domestic animals, and livestock. Coyotes are carriers of the bubonic plague bacteria, which they receive from the bite of an infected flea. Coyotes can spread the disease to various California ground squirrel colonies. Human interaction with ground squirrels in open spaces, parks, and recreational areas can potentially result in bubonic plague infection through flea bites. Blood samples from coyotes can be tested for the presence of bubonic plague.

Other Alternatives: No action

Responsible Office: Fresno County Department of Agriculture Wildlife Damage Management

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Potential Funding: Fresno County General Fund, California Department of Public Health, unrefunded gas tax

Benefits (Avoided Losses):

- One human life saved is \$3.1 million
- Avoids disease transmission to humans
- Reduces the discomfort and adverse effects of flea bites

Schedule: Annually, June through October

Status: 2009 project, continuing implementation on an as needed basis

Fresno County Dam Failure Mitigation Actions

5. Minimize Flood Events by Exercising Reclamation's Emergency Action Plan and Provide an Early Warning System to Downstream Emergency Response Agencies

Issue/Background: Friant Dam was constructed in 1942 and is located 20 miles northeast of the City of Fresno. It serves as a water conservation and flood control facility. The dam has a structural height of 319 feet with a top of crest elevation of 581.25 feet. Millerton Lake reservoir has a storage capacity of 520,500 acre-feet.

The Bureau of Reclamation has the ability to divert water to the Friant Kern Canal, Madera Canal, and the San Joaquin River. During unforeseen events, the Bureau of Reclamation may be required to release water into the San Joaquin River that may exceed the river channel capacity.

Other Alternatives: Divert flood water to the Friant Kern Canal and the Madera Canal, reduce encroachment of development in the San Joaquin River floodplain, construct a new storage facility

Responsible Office: Bureau of Reclamation, South Central California Area Office-Fresno; U.S. Army Corps of Engineers Sacramento Branch

Priority (High, Medium, Low): High

Cost Estimate: \$5,000-10,000 to exercise and update emergency action plan

Potential Funding: FEMA's Hazard Mitigation Grant Program, state funding, other available grants

Benefits (Avoided Losses): Minimized risk of loss of life and property damage

Schedule: 1-3 years

Status: 2009 project, continuing ongoing implementation

6. Update Dam Failure Evacuation Plan

Issue/Background: New statutes in the California Water code will require dam operators to update inundation maps. Development of new inundation maps will need to be incorporated into the County's dam failure evacuation plans. This will impact at least 23 dams within the County.

Other Alternatives: None

Responsible Office: County OES, PW and Sheriff's Office

Priority (High, Medium, Low): Medium

Cost Estimate: \$150,000-\$200,000

Potential Funding: Annual budget, grants

Benefits (Avoided Losses): This plan will provide updated information that will enable an effective method for warning and evacuating downstream residents if a dam were to fail. This will enable the lives of many residents to be saved.

Schedule: 1-3 years depending on when updated inundation maps are completed

Status: New project

Fresno County Drought and Subsidence Mitigation Actions

7. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Issue/Background: Like many groundwater basins throughout the State, all four of the groundwater subbasins that underlay Fresno County are in overdraft condition and three (Kings, Westside, and Delta-Mendota) have been prioritized by DWR as critical, meaning, underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. Recognizing the importance of groundwater and the consequences of overuse, the Sustainable Groundwater Management Act (SGMA) was signed into law in 2014, to address the sustainable management of groundwater in California. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). Each GSA is required to develop and implement, no later than January 31, 2020, a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that

requirement could result in the State asserting its power to manage local groundwater resources. Fresno County is working cooperatively with multiple GSAs within the four subbasins located within Fresno County towards the preparation and implementation of required GSPs. Maintaining sustainable groundwater supplies will provide insurance against periods of long-term drought, and assist in the mitigating the potential for land subsidence.

As required in §10724(a) of the Water Code, the areas within the priority basins that underlay Fresno County that are not within the management area of one of these GSAs, the County is presumed to be the GSA for that area. There are nineteen (19) GSAs that have been formed within Fresno County, of these the County is the Authority for two GSAs (Management Area ‘B’, and Management Area ‘A’). The Westside Subbasin is covered by two GSAs, as such the County and Westlands Water District work cooperatively through an MOU. Other jurisdictions in Fresno County have formed their own GSAs (City of Firebaugh and City of Mendota) for the portions of the Delta-Mendota Subbasin that underlay each jurisdictions boundary. While other jurisdictions have formed a GSA along with other local agencies as a joint powers authority, listed below. These jurisdictions have similar mitigation actions and can be found in their respective jurisdictional annexes.

North Kings GSA: City of Fresno, City of Clovis and City of Kerman

South Kings GSA: City of Fowler, City of Kingsburg, City of Sanger

Central Kings GSA: City of Selma

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: Responsibilities for compliance with the Sustainable Groundwater Management Act have been assumed through the formation of Groundwater Sustainability Agencies within the four Fresno County groundwater subbasins recognized by the California Department of Water Resources. Fresno County is generally party to each of the GSAs within Fresno County by agreement or memorandum of understanding.

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

Fresno County Flood/Levee Failure Mitigation Actions

8. Conduct Feasibility Study for Panoche-Silver Creek Flood Detention Facility

Issue/Background: Panoche-Silver Creek downstream of the California Aqueduct causes frequent flooding of Belmont Avenue, a major transportation corridor connecting west Fresno County to I-5, the future Route 180 alignment, and the City of Mendota, a downstream community. Flooding occurs during normal-intensity storm events. High-intensity events result in extended road closures in an area of the County with limited transportation corridors. A feasibility study is needed to assess feasibility and location of facilities to route flood flows to a detention reservoir.

Other Alternatives: None identified

Responsible Office: Joint, possible partners include California Department of Water Resources, Bureau of Reclamation, Fresno County, City of Mendota, Westlands Water District

Priority (High, Medium, Low): High

Cost Estimate: \$1.2 million

Potential Funding: State or federal grant sources

Benefits (Avoided Losses): Finding potential solution to reduce traffic disruptions

Schedule: 2-5 years

Status: 2009 project; Deferred. As of March 2018, Project has not started but a need for the project remains.

9. Investigate and Construct Water Storage Options for the Upper San Joaquin River Basin

Issue/Background: The Upper San Joaquin River Storage Investigation will investigate feasibility and cost to provide on- or off-stream storage in the upper San Joaquin River Basin. The objectives are conjunctive beneficial uses, including restoration of the San Joaquin River, increased management and exchange opportunities to secure and stabilize deliveries to urban and agricultural uses, flood control, recreation, reduced groundwater overdraft, and potentially hydropower.

Other Alternatives: No action

Responsible Office: California Department of Water Resources, Bureau of Reclamation

Priority (High, Medium, Low): High

Cost Estimate: Study—to be determined; resulting project—\$1-1.5 billion

Potential Funding: State or federal sources

Benefits (Avoided Losses): Reduction of flood risk downstream of Friant Dam

Schedule: 5-10 years

Status: 2009 project; As of March 2018, a draft Environmental Impact Statement has been completed and funding is being sought for implementation

10. Analyze System, Condition, and Management of Flood Water Conveyance Facilities

Issue/Background: Flood water conveyance occurs over a disparate system of natural and manmade channels, levees, irrigation canals, and ad-hoc structures whose primary function may be for purposes other than flood management. A systemwide inventory and analysis is needed to develop priorities across many jurisdictions, both public and private, for rehabilitation and upgrade of critical flood management facilities, including public and private levees.

Other Alternatives: No action

Responsible Office: Potentially San Joaquin Valley-wide, possible lead or joint lead entities include California Department of Water Resources; Bureau of Reclamation; irrigation, water, and conservation districts; regional partners through integrated regional water management plans; Fresno County

Priority (High, Medium, Low): High

Cost Estimate: \$5 million (Fresno County)

Potential Funding: State and federal grant funding

Benefits (Avoided Losses): Reduced flood risk and flood losses

Schedule: 10-20 years

Status: 2009 project; Deferred. As of March 2018 implementation of this project has not started but a study is still needed.

11. Prepare Stormwater Drainage Master Plans

Issue/Background: Some unincorporated communities in Fresno County do not have master plans for stormwater drainage, which provide for flow, collection, and diversion of stormwater from

public streets to detention or recharge facilities. Lacking appropriate drainage, stormwater may flood streets and/or property, and standing water may persist, leading to health or traffic safety concerns.

Other Alternatives: No action

Responsible Office: Special or community service districts or County service area zones of benefit

Priority (High, Medium, Low): Medium

Cost Estimate: \$150,000-500,000 per community

Potential Funding: Undetermined

Benefits (Avoided Losses): Reduced property damage and adverse impacts on health and traffic safety

Schedule: 3-5 years

Status: 2009 project; Continuing

Fresno County Human Health Hazards: West Nile Virus Mitigation Actions

12. Control West Nile Virus through Beaver Population Management

Issue/Background:

Between 2003 and 2016, there were over 6,000 cases of West Nile virus in California; 248 of those cases resulted in fatalities. On August 2, 2007, the governor of California declared a disaster in three California counties because of deaths related to the virus. Fresno County had 242 cases with 10 fatalities between the years of 2003 and 2016. Fresno County has averaged one virus-related death and 17 virus cases per year since 2003.

West Nile virus is transmitted by mosquitoes. One breeding area for mosquitoes is beaver ponds. Beavers are native to Fresno County, and their dams create ponds in waterways. Beaver dams cause streams and waterways to overflow, which causes flooding of farm and private land. The resulting excess standing water provides another breeding source for mosquitoes. The Mosquito Abatement District estimates that removing the beaver ponds from waterways near residential areas will reduce mosquito populations, thus potentially reducing the number of West Nile virus infections.

Other Alternatives: No action

Responsible Office: Fresno County Department of Agriculture Wildlife Damage Management

Priority (High, Medium, Low): High

Cost Estimate: \$10,000-25,000

Potential Funding: California Department of Public Health, Fresno County general fund

Benefits (Avoided Losses):

- Reduction of incidence of infection and resulting fatalities: .5 human lives saved is \$1.55 million
- Reduction in the number of cases, resulting in improved human health and reduced medical costs
- Reduction in discomfort and adverse effects of mosquito bites
- Reduction in treatments to suppress mosquito population by the Mosquito Abatement District and related jurisdictions
- Reduction of future costs associated with mosquito control
- Repeated removal of beaver dams

Schedule: Annually, February through June

Status: 2009 project, continuing implementation on an as needed basis

Fresno County Wildfire and Wind Mitigation Actions

13. Wildfire Defensible Fuel Modification Zones in Areas of Tree Mortality

Issue/Background: The foothill and mountain areas of Fresno County have been severely impacted by the drought and subsequent bark beetle outbreak since 2014. This has caused tree mortality across 216,000 acres and over 21 million trees have died. Not only have the trees died but the brush and shrubs throughout the County have died back creating an additional fuel load. All the communities in these areas are at an increased risk of a damaging wildland fire due to the mortality and fuel loading. Much of this mortality is on open land, both private and public, that will not get removed causing an increased ground fuel loading that will persist for decades to come. The Communities, businesses and local infrastructure will need increased Defensible Fuel Modification Zones (DFZ's) and hazard tree removal to reduce the damaging effects of a wildland fire. In addition this project would help mitigate wind-fall hazards on property and people.

Other Alternatives: In the past CAL FIRE, United State Forest Service and local fire safe councils have been creating DFZ's throughout the County in high fire prone areas. Due to the change in the fuels and health of the forest all communities in the affected areas are at high risk and need to implement integrated community DFZ's. These community DFZ's need to tie into existing DFZ's, roads, designated escape routes and homeowner defensible space to create a network that allows for increased community protection. Ingress and egress corridors need to be created by removing both dead trees and brush for the public to evacuate safely and allow emergency response personnel safe access. These DFZ's will need to be created using heavy equipment, masticators, hand crews and prescribed fire to remove dead trees, reduce understory brush and remove ground

fuels. This network will need to be maintained over time and retreatment of the fuels will need to occur every 3 to 7 years for them to be effective. Community education related to fire safety, building construction, evacuation procedures and fuels management is a main part of this plan to be successful.

Responsible Office: CAL FIRE, County (Public Works, OES), USFS; partner agencies include Fire Safety Councils, PG&E, Cal Trans

Priority (High, Medium, Low): High

Cost Estimate: \$10,000,000

Potential Funding: CAL FIRE grants, CAL OES funds, FEMA grants, County funds, CAL FIRE Unit funds, USDA Forest Service funds, Private funds and other funds not currently identified

Benefits (Avoided Losses): By completing these types of projects, it is estimated to reduce the impacts of fire to over 4,816 residences, numerous businesses and critical infrastructure directly affected by the tree mortality.

Schedule: September 1, 2015 until completed through 2020

Status: New project in 2018



6 PLAN ADOPTION

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from Fresno County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. This adoption also establishes compliance with AB 2140 requiring adoption by reference or incorporation into the safety element of the general plan. The governing board for each participating jurisdiction has adopted this multi-hazard mitigation plan by passing a resolution. A copy of the generic resolution and the executed copies are included in Appendix A: Adoption Resolutions.



7 PLAN IMPLEMENTATION AND MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

7.1 Implementation

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the participating jurisdictions will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

Implementation will be accomplished by adhering to the schedules identified for each action (see Chapter 5 Mitigation Actions for the County and the actions detailed in the jurisdictional annexes) and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits of each project to the Fresno County community and its stakeholders. These efforts include the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. The three main components of implementation are:

- IMPLEMENT the action plan recommendations of this plan;
- UTILIZE existing rules, regulations, policies and procedures already in existence; and
- COMMUNICATE the hazard information collected and analyzed through this planning process so that the community better understands what can happen where, and what they can do themselves to be better prepared. Also, publicize the “success stories” that are achieved through the HMPC’s ongoing efforts.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the Fresno County community and its stakeholders. This effort is achieved through the routine actions of

monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

One example of an important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as the general plans for Fresno County and the participating jurisdictions. The County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Simultaneously to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the participating jurisdictions will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, special district budgeted funds, state and federal earmarked funds, and other grant programs, including those that can serve or support multi-objective applications.

7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

With adoption of this plan, the participating jurisdictions will be tasked with plan implementation and maintenance. The participating jurisdictions, led by the Fresno County Office of Emergency Services, agrees to:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the Fresno County Board of Supervisors and the governing boards of the other participating jurisdictions; and
- Inform and solicit input from the public.

The primary duty of the participating jurisdictions is to see the plan successfully carried out and to report to their community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website (and others as appropriate).

7.2 Maintenance/Monitoring

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance/Monitoring Schedule

The Emergency Manager in the Fresno County Office of Emergency Services within the Department of Public Health is responsible for initiating plan reviews and will consult with the heads of participating departments and other participating jurisdictions. In order to monitor progress and update the mitigation strategies identified in the action plan, the Fresno County Office of Emergency Services will revisit this plan annually and after a hazard event. The annual review will be conducted by re-convening the HMPC in November of each year.

This plan will be updated, approved and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000 unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With the initial approval of this plan occurring in mid-2018, the plan will need to be updated, reviewed by Cal OES and FEMA Region IX, and re-adopted by all participating jurisdictions no later than June of 2023. The County will monitor planning grant opportunities from Cal OES and FEMA for funds to assist with the update. These grants should be pursued as early as 2021, as some grants have a three-year performance period to expend the funds, plus there is no guarantee that the grant will be awarded when initially submitted. This allows time to resubmit the grant in 2022 if needed.

7.2.2 Maintenance Evaluation Process

The planning team will continually observe the incorporation process, evaluation method, updating method, continued public participation, and completion of the action/projects to assure that the planning team and the plan itself are performing as anticipated. By monitoring these processes, the planning team will then be able to evaluate them at the time of the plan update, determining if any changes are needed.

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions,

- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

The HMPC will use the following process to evaluate progress and any changes in vulnerability as a result of plan implementation.

- A representative from the responsible entity identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the HMPC on project status and provide input on whether the project as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the project does not meet identified objectives, the HMPC will determine what alternate projects may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.
- New projects identified will require an individual assigned to be responsible for defining the project scope, implementing the project, and monitoring success of the project.
- Projects that were not ranked high priority but were identified as potential mitigation strategies will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation.
- Changes will be made to the plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with established criteria, the time frame, priorities, and/or funding resources.

Updating of the plan will be by written changes and submissions, as the Fresno County Office of Emergency Services deems appropriate and necessary, and as approved by the Fresno County Board of Supervisors and the governing boards of the other participating jurisdictions. Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Document hazard events and impacts that occurred within the five-year period;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate documentation of continued public involvement;
- Incorporate documentation to update the planning process that may include new or additional stakeholder involvement;
- Incorporate growth and development-related changes to building inventories;
- Incorporate new project recommendations or changes in project prioritization;

- Include a public involvement process to receive public comment on the updated plan prior to submitting the updated plan to Cal OES/FEMA; and
- Include re-adoption by all participating entities following Cal OES/FEMA approval.

7.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other County and City plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in Section 7.1 of this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. This point is re-emphasized here. As described in this plan's capability assessment, the County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

These existing mechanisms include (but not limited to) the following:

- County and city general and master plans
- County and city emergency operations plans
- County and city ordinances
- Flood/stormwater management/master plans
- Community Wildfire Protection plans
- Drought management and response plans
- Capital improvement plans and budgets
- Other plans and policies outlined in the capability assessments in the jurisdictional annexes
- Other plans, regulations, and practices with a mitigation focus

HMPC members involved in the updates to the planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc, as appropriate. As an action step to ensure integration with other planning mechanisms the County Office of Emergency Services Manager or designee will discuss this topic at the annual meeting of the HMPC previously described in the Maintenance Schedule. The HMPC will discuss if there are opportunities to incorporate the plan into other planning mechanisms and who would be responsible for leveraging those opportunities. HMPC members representing local jurisdictions will work with their jurisdictional planning teams to integrate their identified mitigation actions into their own local plans and programs. Efforts to integrate the hazard mitigation plan into local plans, programs, and policies will be reported on at the annual HMPC plan review meeting, and a record of successful integration efforts will be kept.

Examples of a process for incorporation of the LHMP into existing planning mechanisms include:

- As recommended by Assembly Bill (AB) 2140, each community should adopt (by reference or incorporation) this LHMP into the Safety Element of their General Plan(s). Evidence of such adoption (by formal, certified resolution) shall be provided to Cal OES and FEMA.
- Integration of wildfire actions identified in this mitigation strategy with the actions and implementation priorities established in existing Community Wildfire Protection Plans (CWPPs). This has already occurred and will continue to occur as the CWPPs are updated and implemented. Specifically, key people responsible for development of the Highway 168 Fire Safe Council CWPP and Oak to Timberline Fire Safe Council CWPP participated as a member of the HMPC in the original development and 2017-2018 update of this LHMP. They identified key projects in the CWPPs and integrated them into the Mitigation Strategy of this LHMP. Likewise, actual implementation of these wildfire projects will likely occur through the CWPP implementation process through the efforts of these same individuals.
- Using the risk assessment information to update the hazard analysis in the Fresno County Operational Area Master Emergency Services Plan.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

7.2.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. Efforts will be made to involve the public in the plan maintenance, evaluation, and review process. This includes maintaining a digital version of the plan on the County Office of Emergency Services website for public review. In addition, information on who to contact within the Office of Emergency Services will be posted with the plan. The Emergency Manager in the Fresno County Office of Emergency Services will maintain a file of comments received for reference during the next five-year update. Any revisions to the plan that may occur as a result of a disaster will also be made public and posted on the County website.

The next five-year update process also provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. A public hearing(s) or survey to receive public comment on the plan will be held during the plan update period. When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process, including those who joined the HMPC after the initial effort, to update and revise the plan. Public notice will be posted and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets as well as email and social media announcements.

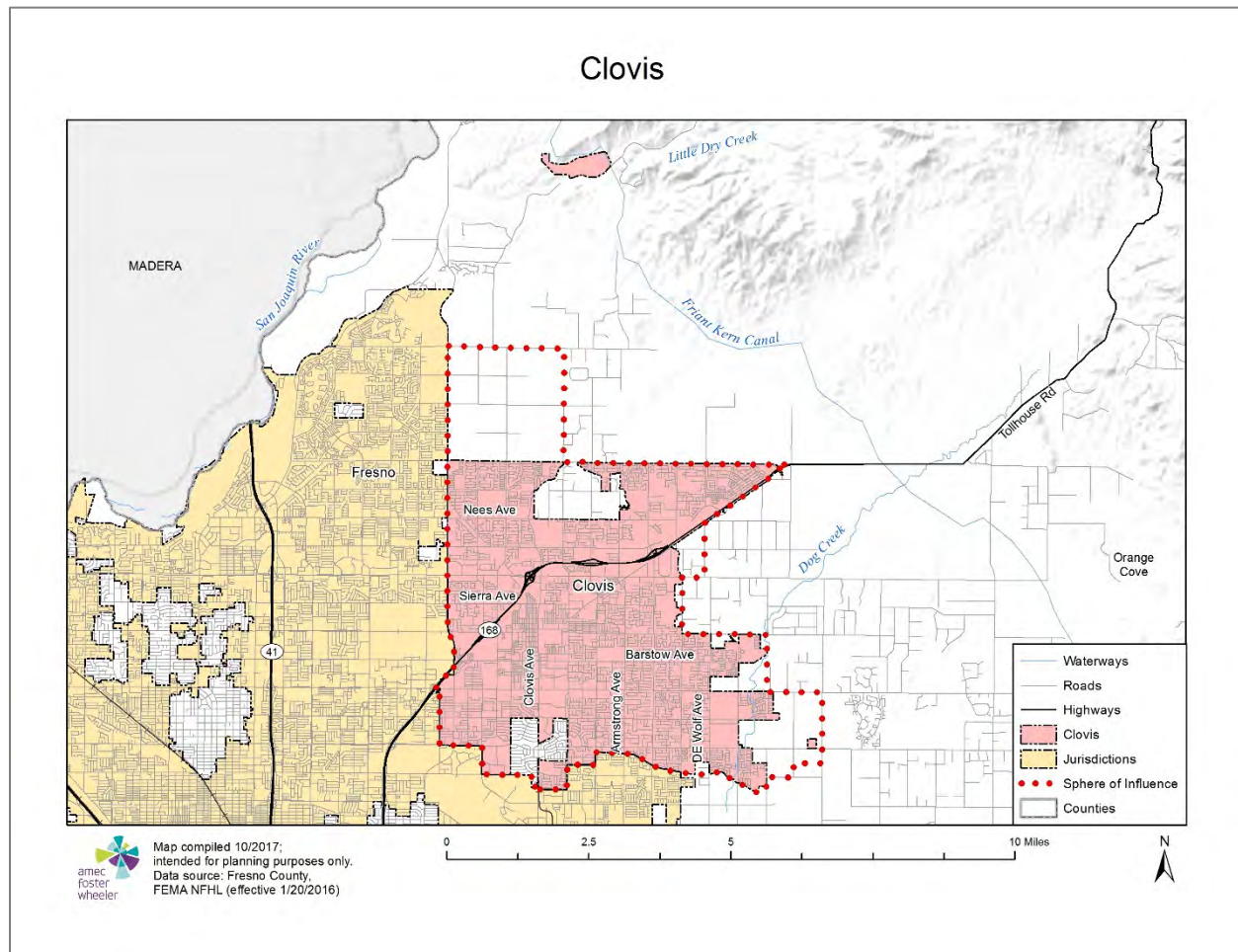
Continued public outreach and education is also an aspect of the mitigation strategy in Chapter 5 of this plan through inclusion of an action to develop and conduct a multi-hazard seasonal public awareness program on an annual basis.

Activities related to public involvement during the 2017-2018 update are documented in Chapter 3 and Appendix E.

A.1 Community Profile

Figure A.1 displays a map and the location within Fresno County of the City of Clovis and its Sphere of Influence.

Figure A.1: The City of Clovis



A.1.1 Geography and Climate

Located in the northeast quadrant of the Fresno-Clovis Metropolitan Area in northern Fresno County, Clovis is situated in the midst of the agriculturally rich San Joaquin Valley. It covers a roughly 21,108-acre area that encompasses the City of Clovis and unincorporated Fresno County, inclusive of the City's Sphere of Influence. Over the past decade, the City has annexed land in the southeast near Dog Creek and expanded its Sphere of Influence in the north. All lands outside of the City's Sphere of Influence are regulated by the Fresno County General Plan and zoning designations. However, state law requires that cities plan for areas outside of their immediate jurisdiction if the areas have a direct relationship to planning needs.

Clovis consists of three distinct geographical areas: The City, which represents the incorporated City within the City limit boundaries; the Sphere of Influence, which corresponds to the City's existing Sphere of Influence; and the study area, which includes unincorporated Fresno County lands outside of the City's Sphere of Influence. Immediately beyond Clovis to the northeast are the western foothills of the Sierra Nevada Mountains. The City of Fresno and its Sphere of Influence are located to the southwest. The southwestern portion of Clovis is characterized by mostly urbanized land uses, whereas the northern and eastern portions of Clovis are predominantly rural in nature, comprised of agricultural, rural, residential, and vacant land uses.

Clovis has an average annual temperature of 63.2°F and receives 10.2 inches of rain. While the average is relatively temperate, summer and winter months bring unique weather patterns to the region. During the winter, high temperatures hover around 55°F. Combined with the regional geography and precipitation during this time, Clovis experiences numerous days with dense fog, which has its greatest impact on transportation: accident rates jump 50 percent on foggy days.

During the summer months, the region has extended periods where temperatures exceed 100°F. While the average temperature is 90°F during the summer, these extended heat waves impact the medically fragile, elderly, and animal populations. In addition to heat waves, the Fresno County region continues to suffer regular drought due to lower than normal snowpack in the Sierra Nevada, which supplies water for agricultural use and replenishes the groundwater supply.

A.1.2 History

The City of Clovis was named after the spirited pioneer, Clovis M. Cole, who spent nearly all of his life in the vicinity. The area was known for the thousands of acres of wheat that he had cultivated. The first thoughts of settlement, however, are credited to Padre Martin, who explored the area in 1806 while searching for a mission site. Missionaries and trappers were the first nonnative people to roam the area. Miners soon followed during the gold rush, displacing the many Native American tribes that were settled in the foothills and near the rivers.

Another early settler, Marcus Pollasky, proposed and coordinated the construction of a railroad through the grain, cattle, and mining country and into the timber-rich forests of the nearby Sierra. The City eventually grew up around the San Joaquin Division of the Southern Pacific Railroad, which played an important role in the founding and growth of Clovis. In addition to the arrival of the railroad, the completion of the 42-mile-long Shaver log flume, development of the 40-acre Clovis mill and finishing plant, expansion of grain production, and the livestock industry all contributed to the founding of Clovis in 1891. The City was incorporated in 1912.

A.1.3 Economy

The City's economic base consists of retail sales and services and light manufacturing. Availability of housing, quality hospital care, excellent schools with modern facilities, responsive safety

services, a mild climate, access to varied recreational opportunities, and strong community identity all contribute to Clovis' reputation as a great place to live.

Clovis has actively maintained a small-town community spirit as envisioned by its founders, exemplified by such community events as the annual Rodeo Days, Big Hat Days, and Clovisfest celebration. This community pride, combined with Clovis' unique growth opportunities, continues to attract new residents, developers, businesses, and industries to the City.

Select estimates of economic characteristics for the City of Clovis are shown in Table A.1.

Table A.1: City of Clovis' Economic Characteristics, 2015

Characteristic	City of Clovis
Families below Poverty Level	11.7%
All People below Poverty Level	13.8%
Median Family Income	\$72,787
Median Household Income	\$62,666
Per Capita Income	\$28,686
Population in Labor Force	49,156
Population Employed*	44,086
Unemployment	10.0%
Number of Companies	7,100

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables A.2 and A.3 show how the City of Clovis' labor force breaks down by occupation and industry based on estimates from the 2015 American Community Survey.

Table A.2: City of Clovis' Employment by Occupation, 2015

Occupation	# Employed	% Employed
Sales and Office Occupations	11,587	26.3
Management, Business, Science, and Arts Occupations	17,568	39.8
<i>Management, Business, and Financial Occupations</i>	<i>(6,296)</i>	<i>(14.3)</i>
<i>Computer, Engineering, and Science Occupations</i>	<i>(1,871)</i>	<i>(4.2)</i>
<i>Education, Legal, Community Service, Arts, and Media Occupations</i>	<i>(5,570)</i>	<i>(12.6)</i>
<i>Healthcare Practitioner and Technical Occupations</i>	<i>(3,831)</i>	<i>(8.7)</i>
Service Occupations	7,971	18.1
Production, Transportation, and Material Moving Occupations	3,732	8.5
Natural Resources, Construction, and Maintenance Occupations	3,228	7.3
Total	194,640	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table A.3: City of Clovis' Employment by Industry, 2015

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	12,511	28.4
Retail Trade	4,850	11.0
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	4,354	9.9
Manufacturing	2,843	6.4
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	3,953	9.0
Construction	2,376	5.4
Finance and Insurance, and Real Estate and Rental and Leasing	2,686	6.1
Public Administration	3,734	8.5
Other Services, Except Public Administration	1,992	4.5
Wholesale Trade	1,557	3.5
Transportation and Warehousing, and Utilities	1,699	3.8
Agriculture, Forestry, Fishing and Hunting, and Mining	664	1.5
Information	867	2.0
Total	194,640	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

A.1.4 Population

In 2015, according to the U.S. Census Bureau's American Community Survey 5-Year Estimates, the total population for the City of Clovis was estimated at 100,437. Select demographic and social characteristics for the City of Clovis from the 2015 American Community Survey are shown in Table A.4.

Table A.4: City of Clovis' Demographic and Social Characteristics, 2015

Characteristic	City of Clovis
Gender/Age	
Male	48.3%
Female	51.7%
Median age	34.3
Under 5 years	6.5%
Under 18 years	27.4%
65 years and over	11.7%
Race/Ethnicity*	
White	71.1%
Asian	10.7%
Black or African American	2.7%
American Indian/Alaska Native	1.1%
Hispanic or Latino (of any race)	27.8%
Education	
High school graduate or higher	88.9%
Disability Status	
Population 5 years and over with a disability	12.9%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 96.1% reporting one race

A.2 Hazard Identification and Summary

Clovis' planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Clovis (see Table A.5). In the context of the plan's planning area, there are no hazards that are unique to Clovis.

Table A.5: City of Clovis—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	Medium
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Medium
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Medium
<div> <div> Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area </div> <div> Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years. </div> <div> Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid </div> <div> Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact </div> </div>				

A.3 Vulnerability Assessment

The intent of this section is to assess Clovis' vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Clovis' HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Clovis.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table A.5). Identifying these differences helps the reader to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County.

Note: The hazard "Significance" reflects overall ranking for each hazard, and is based on the City of Clovis' HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table A.5 reflect the hazards that could potentially affect City. Those of Medium or High significance for the City of Clovis are identified below. The discussion of vulnerability for each of the following hazards is located in Section A.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include flood/levee failure and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incident
- human health hazards: epidemic/pandemic
- severe weather: extreme cold/freeze, extreme heat, fog, windstorm, winter storm
- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Clovis, those hazards are as follows:

- human health hazards: West Nile Virus
- severe weather: heavy rain/thunderstorm/hail/lightning, tornado
- soil hazards
- volcano

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. **Avalanche** and **landslide** are considered Not Applicable (N/A) to the City of Clovis.

A.3.1 Assets at Risk

This section considers Clovis' assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table A.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Clovis.

Table A.6: 2017 Property Exposure for the City of Clovis by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	9	9	\$2,557,614	\$2,557,614	\$5,115,228
Commercial	857	3,214	\$938,241,308	\$938,241,308	\$1,876,482,616
Exempt	292	715	\$0	\$0	\$0
Industrial	226	439	\$122,817,146	\$184,225,719	\$307,042,865
Multi-Residential	593	7,233	\$521,005,521	\$260,502,761	\$781,508,282
Open Space	1	6	\$316,603	\$316,603	\$633,206
Residential	29,590	29,949	\$5,545,158,353	\$2,772,579,177	\$8,317,737,530
Total	31,568	41,565	\$7,130,096,545	\$4,158,423,181	\$11,288,519,726

Source: Fresno County 2017 Parcel and Assessor data

Since the 2009 Plan, the City of Clovis has experienced notable increases in commercial and residential properties and property values at risk. Compared to improved values from the Fresno County Assessor's Office's 2007 Certified Roll Values, commercial improved value has increased by 53.3 percent and total residential improved value has increased by 30.0 percent. Assets directly owned and controlled by the City of Clovis include a range of properties and equipment from each department.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation.

An inventory of critical facilities in the City of Clovis from Fresno County GIS is provided in Table A.7 and illustrated in Figure A.2.

Table A.7: City of Clovis' Critical Facilities

Facility Type	Counts
CalARP	2
Colleges & Universities	6
Courthouse	1
Fire Station	6
Health Care	1
Nursing Home	3
Police	2
School	37
Urgent Care	1
Total	59

Source: Fresno County, HIFLD 2017

FEMA's Hazus-MH loss estimation software uses three categories of critical assets. Essential facilities are those that if damaged would have devastating impacts on disaster response and recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are the third category.

Essential Facilities

Essential facilities as identified by Hazus-MH are as follows:

- Clovis Fire/Police Department Headquarters—1233 Fifth Street
- Clovis Fire Stations
 - CFD 1—633 Pollasky
 - CFD 2—2300 Minnewawa
 - CFD 3—555 North Villa
 - CFD 4—2427 Armstrong

- CFD 5—790 North Temperance
- CFD Logistics Center—650 Fowler
- Clovis Community Medical Center—2755 Herndon
- Kaiser Medical Offices—2071 Herndon
- Central Valley Indian Health Inc.— 20 North DeWitt

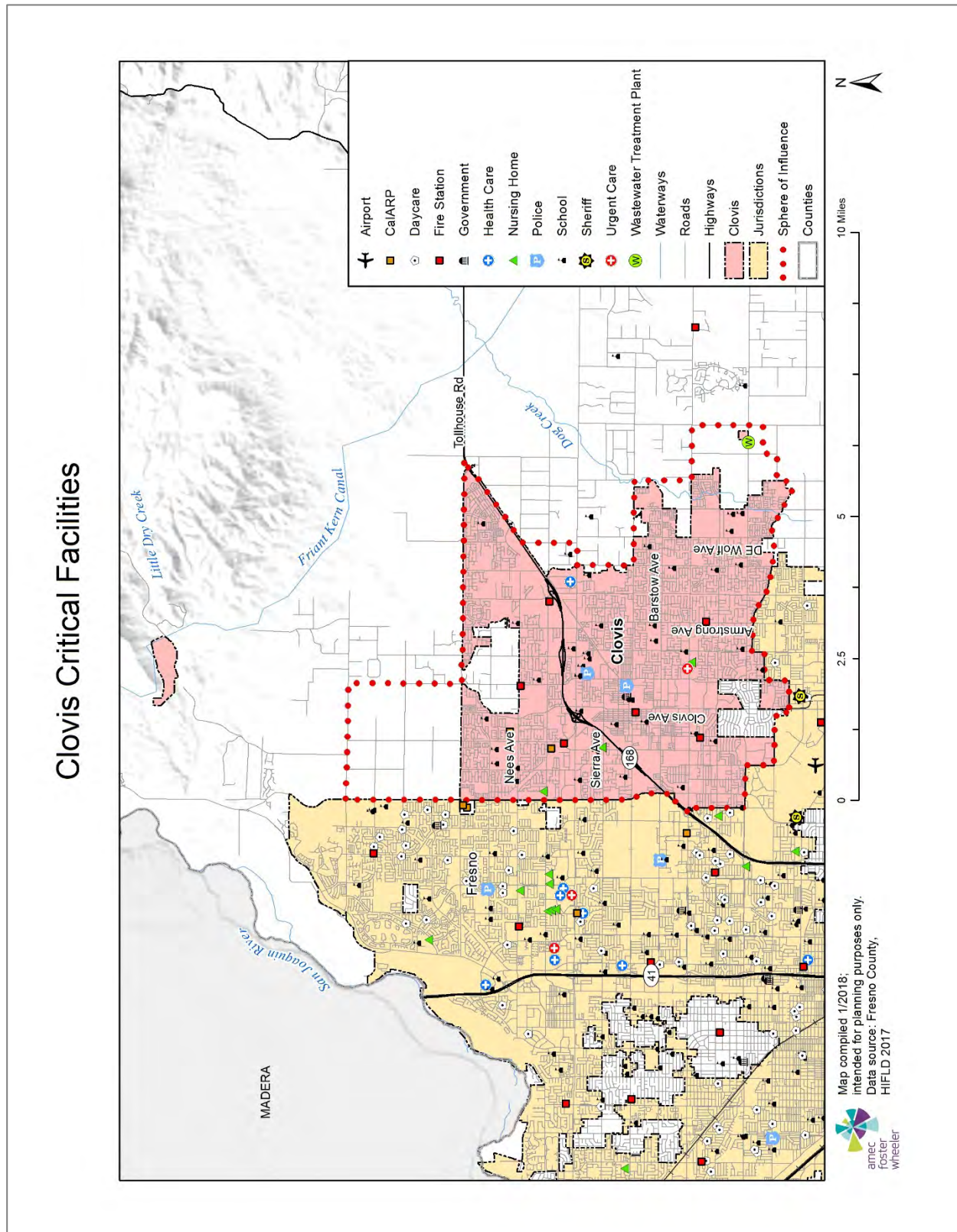
High Potential Loss Facilities

High potential loss facilities as identified by FEMA Hazus-MH are located throughout Clovis. Clovis works closely with the Clovis Unified School District, Fresno Metropolitan Flood Control District, and elder care property owners in monitoring and assessing facilities that fall into this category that are not owned by the City.

Transportation and Lifeline Facilities

Transportation and lifeline facilities are located in the center and northeast portion of Clovis. Highway 168 is the major thoroughfare through Clovis. The surface water treatment plant converts raw water from the Enterprise Canal (originating from the Kings River) into potable water for the residents of Clovis. This additional water production enables the City to turn off a portion of its groundwater wells throughout the year, resulting in the replenishment of the water table. The plant is capable of treating and delivering up to 15 million gallons per day of potable water to the City's customers (expandable to 45 million gallons per day).

Figure A.2: City of Clovis' Critical Facilities



Historic Resources

While the City of Clovis has no registered state or federal historic sites, there are several assets within Clovis that define the community and represent the City's history. Some of the historical sites of importance to Clovis are listed below.

- The Tarpey Depot—Northeast corner of Pollasky and Fourth
- First National Bank of Clovis/Clovis Museum—Southeast corner of Pollasky and Fourth*
- Carnegie Library Building—325 Pollasky*
- Hoblitt/Clovis Hotel —Northwest corner of Pollasky and Fourth
- American Legion—Southeast corner of Fourth and Woodworth
- Dr. McMurtry Home—431 Fourth
- May Case Home—420 Woodworth
- Whiton Home—446 Woodworth
- Burke Home—460 Woodworth
- United Methodist Church—Southwest corner of Woodworth and Fifth
- Mayo/Flume House—406 Fifth Street
- Masonic Temple—Northwest corner of Fifth and DeWitt
- The Jackson/Brandon Home—406 DeWitt
- Clovis M. Cole Home—304 Harvard
- Blasingame House—406 Oxford
- Richard Norrish Home—36 Pollasky
- Agnes G. de Jahn House—6 Pollasky
- Gibson Home 940—Third Street*
- Clovis Union High School—901 Fifth
- Clovis Water Towner—Southeast corner of Clovis
- Nestor Freitas Hall—500 Club
- John Good Building—Northwest corner of Clovis and Fifth
- McFarland Building—Southeast corner of Fifth and Pollasky
- Lewis Gibson Store—Northwest corner of Fifth and Pollasky
- Ingmire House—Seventh and Pollasky
- Macias House—931 Pollasky

* Fresno County Historical Landmarks

Economic Assets

Clovis is the home of two of the largest agile manufactures in the Central Valley—PELCO (1,600 employees) and Anlin (350 employees). Loss of either employer would have the net result of 2,000 displaced employees and sales tax revenue in the millions of dollars.

Growth and Development Trends

Clovis continues to be the premier choice for housing developers and home buyers in the Fresno/Clovis metropolitan area. The City has been aided by an outstanding school district, which ranks among the best in the nation. The City has a reputation for being a safe and friendly community to raise a family. However, land is costly and becoming very short in supply for housing, commercial, and industrial development. As Clovis strives to be more than a bedroom community, attention needs to be paid to preserving land for job generating activity in order to meet the jobs/housing balance.

Continued growth and development trends continue to be addressed at a local level and regional level through the Local Agency Formation Commission. These agencies coordinate to develop solutions that mitigate the impact of growth to land use, transportation, land use, air quality and access to services. Hazard vulnerability and mitigation is addressed through these governing bodies based on the subject matter expertise of local public safety agencies or special districts who have the jurisdictional authority in particular areas.

Table A.8 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2015. As of 2015, the population of Clovis was 95,631 with an average growth rate of 5.03 percent.

Table A.8: City of Clovis' Change in Population and Housing Units, 2010-2015

2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2015
95,631	100,437	+5.03	35,306	36,270	+2.73

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2011-2015 5-Year Estimates

Of the 36,270 housing units in Clovis, 95.2 percent are occupied. Owner-occupied units account for 60.2 percent of all occupied housing. Single family detached homes comprise 72.0 percent of the housing stock in the City.

The southwestern portion of Clovis is characterized by mostly urbanized land uses, whereas the northern and eastern portions of Clovis are predominantly rural in nature and characterized by agricultural, rural, residential and vacant land uses.

California state law (Government Code Section 65302) requires each city and county to have an adopted general plan, a blueprint for future growth and development that addresses issues directly related to land use decisions (see Figure A.3 for current land use designations). The law specifies that each general plan address seven issue areas: land use, circulation, open space, conservation, housing, safety, and noise. Adopted in 1993, the City of Clovis General Plan Program provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition. Estimates are

made about future population, household types, and employment base, so that plans for land use, circulation, and facilities can be made to meet future needs. The general plan represents an agreement on the fundamental values and vision that is shared by the residents and the business community of Clovis and the surrounding area of interest. Its purpose is to provide decision makers and City staff with direction for confronting present issues as an aid in coordinating planning issues with other governmental agencies and for navigating the future.

Clovis' 2014 general plan is an update, expansion, and reorganization of the 1993 general plan. Significant changes to the planning area have occurred, expanding the boundaries of the new planning area to the north and east to include both a Sphere of Influence and a study area beyond the sphere. Pressure for development in the metropolitan area in and around the City of Clovis, the need for linkage to the regional transportation network, and the desire to establish Clovis in a pivotal position in the regional context warrant the decision to greatly expand the planning area as the foundation for the update and augmentation of the general plan. Clovis' general plan consists of eight separate elements:

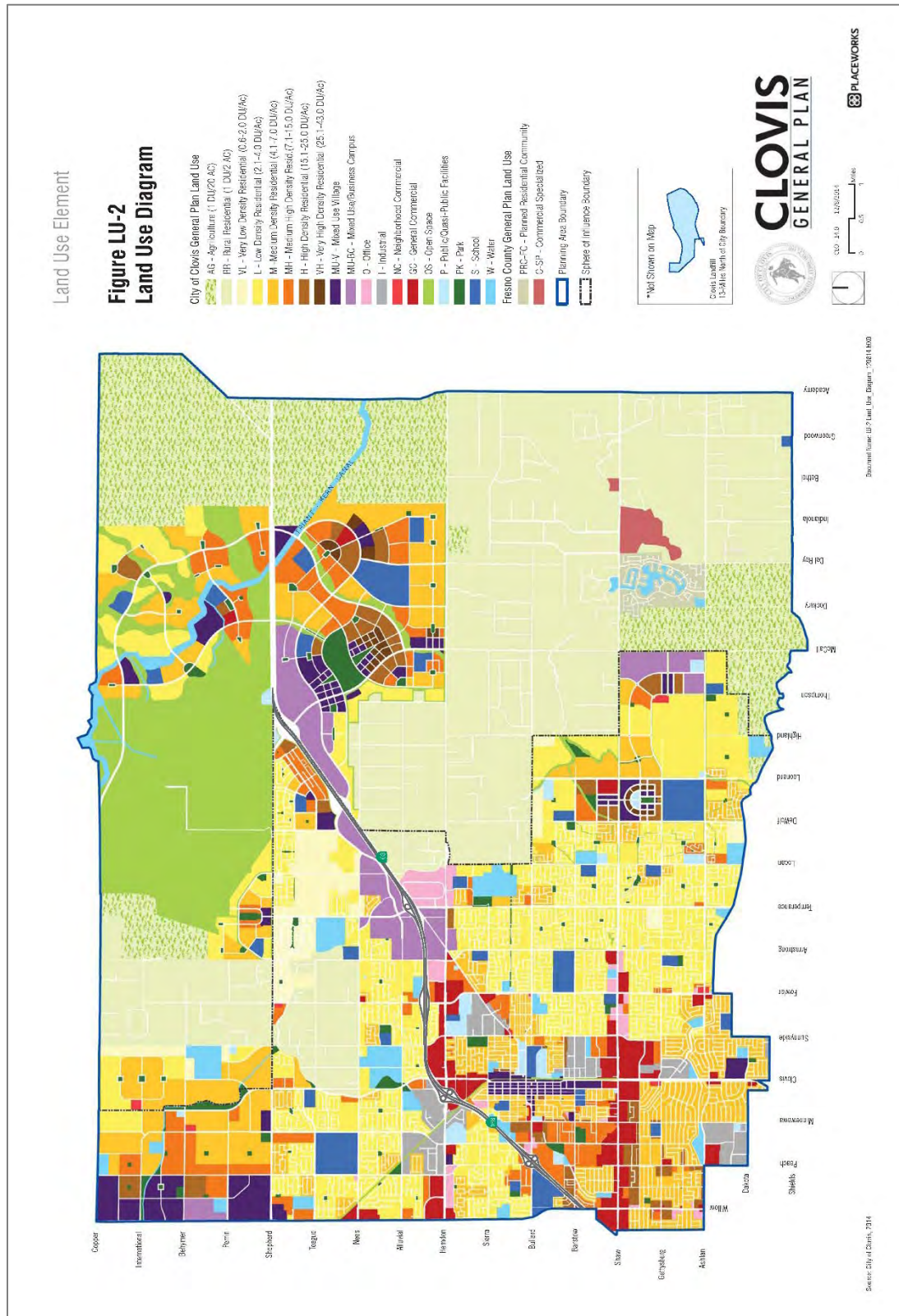
1. Land Use
2. Economic Development
3. Circulation
4. Housing
5. Public Facilities and Services
6. Environmental Safety
7. Open Space and Conservation
8. Air Quality

Mitigation activities continue to be done in accordance with applicable state and federal requirements for floodplain management and in coordination with the Fresno Metropolitan Flood Control District which maintains regional responsibility for water management. Additional mitigation measures for critical infrastructure protection and rehabilitation are done through the City's Capital Improvement Project (CIP) budget. To date, those mitigation projects have included fire station security, water/sewer infrastructure improvements and City Hall building rehabilitation.

For more information on hazard mitigation-related aspects of the general plan, see the discussion in Section A.4.1 Regulatory Mitigation Capabilities.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

Figure A.3: City of Clovis' Land Use Designations



A.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (according to HMPC member input) it differs from that of the overall County.

Table A.6 above shows Clovis' exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County as a whole).

Note: The risk and vulnerability related to windstorm and winter storm hazards in Clovis do not differ from those of the County at large. Please refer to Chapter 4 Risk Assessment of the main plan for more details on these hazards.

Agricultural Hazards

Agricultural hazards are considered a lower significance hazard for the City of Clovis than for the overall planning area due to the limited role of agriculture in the City's land use and economy. The medium significance reflects the impacts the City would experience as a result of the importance of agriculture to the overall planning area.

Dam Failure

Potential flooding also exists in the form of reservoirs to the northeast and southeast of Clovis: Fancher Creek Reservoir and Big Dry Creek Reservoir. The major inundation areas from potential overflows from the Big Dry Creek Reservoir affect a major part of the northwesterly portion of Clovis as well as the northwesterly portions of the current City Sphere of Influence and City boundaries.

The Big Dry Creek Dam, approximately 3.5 miles upstream from the City of Clovis, impounds stormwater runoff from Big Dry Creek in the Big Dry Creek Reservoir. The Big Dry Creek Reservoir is owned and operated by the Fresno County Metropolitan Flood Control District and is intended primarily for flood control of winter runoff from the Dry Creek and Dog Creek watersheds. In the 1990s, modifications were made to increase the capacity of the reservoir, and it now provides protection against the 200-year flood.

Under wet conditions, the Big Dry Creek Reservoir captures runoff and controls releases into artificial ditches and canals, which drain into either Little Dry Creek, located north of the reservoir, or in a southerly direction into Mill Ditch. Flows from Little Dry Creek and Mill Ditch eventually drain to the San Joaquin River. Flows from the reservoir can also be diverted into Dog Creek, which also eventually drains into the San Joaquin River. During dry weather conditions, the

reservoir does not discharge water and is normally empty, with the exception of a 156 acre-foot residual pool. The top of the pool remains below the elevation of an existing discharge gate.

Drought

In 1988, 45 California counties experienced water shortages that adversely affected about 30 percent of the state's population, much of the dry farmed agriculture, and over 40 percent of the irrigated agriculture. Fish and wildlife resources suffered, recreational use of lakes and rivers decreased, forestry losses and fires increased, and hydroelectric power production decreased. Since 1976, Clovis has experienced one state declaration for drought within Fresno County and one U.S. Department of Agriculture declaration for crop losses associated with drought.

The City of Clovis rated drought as a lower priority hazard than for the County as a whole. In part, drought is of lower significance because unlike the unincorporated County and smaller jurisdictions, the City is not dependent on agriculture, which is highly vulnerable to drought.

Earthquake

Clovis is subject to relatively low seismic hazards compared to many other parts of California. The primary seismic hazard is ground shaking produced by earthquakes generated on regional faults. The northwest-trending Clovis fault is believed to be located approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a few miles south of Fancher Creek. It is considered a pre-Quaternary fault or fault without recognized Quaternary displacement. This fault is not necessarily inactive.

The most probable sources of earthquakes that might cause damage in Clovis are the Owens Valley Fault Group about 68 miles to the northeast, the Foothills Suture Fault Zone approximately 75 miles to the north, the San Andreas fault approximately 80 miles to the southwest, and the White Wolf fault located about 120 miles to the south. A maximum probable earthquake on any of the major faults would produce a maximum ground acceleration in the area of about 0.1g as ground deceleration generally decreases with increasing distance from the earthquake source.

Several unreinforced masonry buildings are located in the Old Town part of the City. The recreation building also may be vulnerable to earthquakes.

Flood/Levee Failure

Clovis is traversed by three natural stream systems. Each of these systems consists of substreams or creeks that collect together to discharge to a centralized natural drainage channel. These systems are the Red Bank, Fancher, and Dog Creek System; the Dry and Dog Creek System; and the Pup Creek/Alluvial Drain System. The latter is a tributary of the original Dry Creek channel. These stream systems collect storm runoff from the foothills east of Clovis and convey such runoff through the Clovis/Fresno metropolitan areas to the Fresno Slough, which is located west of the City of Fresno.

Many of these channels have been modified over time such that they have become dual use stormwater conveyance channels and irrigation water conveyance channels. Those streams that have not been used for irrigation purposes have essentially remained in their natural state and have flowed uncontrolled during storm runoff events. These stream channels have limited flow capacity. In some cases, the uncontrolled grading of land has obliterated or severely modified the natural channels to the extent that their flow capacity has been seriously limited. Flooding has been a serious problem in the Clovis/Fresno metropolitan area when these channel capacities are exceeded.

The flat slope characteristics in Clovis that exhibit natural slopes of less than .001 feet per foot can make the control of drainage runoff difficult and many natural depressions within the flat topography naturally collect and pond stormwater runoff. Nevertheless, the soils within or relatively near the stream courses tend to be the loamy, well-drained soils with high permeability.

The major sources of flooding include areas along the Pup Creek alignment from the northeasterly portion of the Clovis through the center of the City of Clovis. Most of this flooding is confined to the areas in and around the Pup Creek channel. Pup Creek enters the northeastern portion of the City of Clovis near the intersection of Armstrong and East Bullard avenues. Most flood flows enter a culvert at Minnewawa Avenue, north of Barstow Avenue, and are conveyed to Dry Creek in the vicinity of North Helm and Mitchell Avenues. Dry Creek enters the northwestern portion of the City of Clovis near the intersection of the Union Pacific Railroad and Herndon Avenue. The creek flows out of the City at the southwestern corporate limits just south of the intersection of Shaw and Winery avenues.

Other areas of flooding are related to the Alluvial Drain area, the Big Dry Creek Reservoir and its possible overflow areas, along the Dog Creek channel alignment, and in low depressed areas along the easterly sides of the Enterprise Canal. Small areas of localized flooding occur in the southeastern part of the City during periods of moderate rainfall or heavy cloudburst storms. There are also a number of ponding areas in the City:

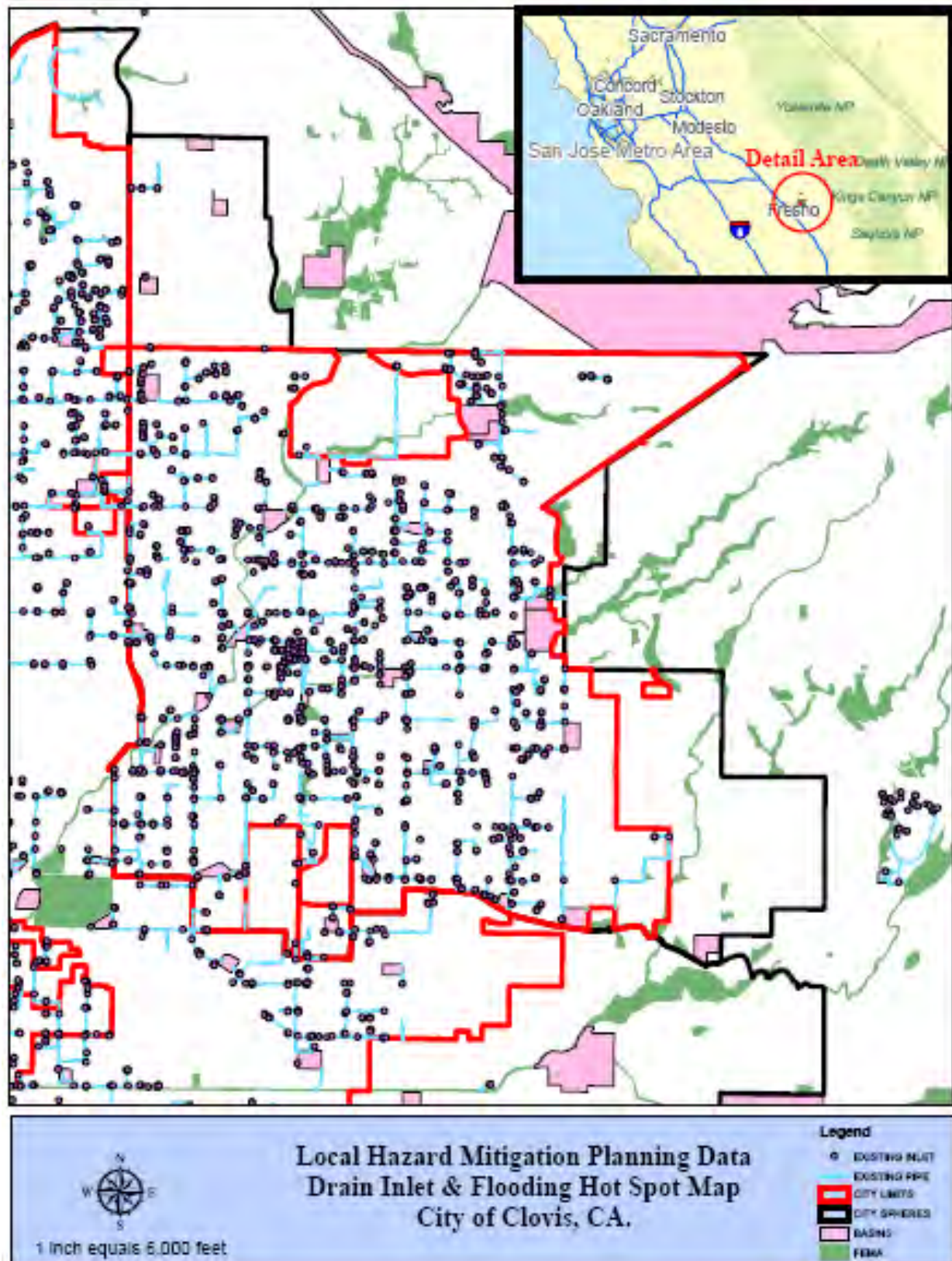
- The ponding area at the northern corporate limits of the City of Clovis, east of Dry Creek and north of the railroad, is caused by the limited channel capacity of Dry Creek from the vicinity of Herndon Avenue to the vicinity of Nees Avenue outside the corporate limits of the City of Clovis.
- The ponding area along Pup Creek between Minnewawa and Peach avenues is caused by excessive overland losses from Dry Creek and limited culvert capacity for Pup Creek at Minnewawa Avenue.
- The ponding area south of Pup Creek and east of the railroad between Jefferson and Barstow avenues is caused by excessive overbank losses on Pup Creek crossing back over the railroad and from a local drainage problem east of Brookhaven Avenue.

The City of Clovis actively uses GIS and FEMA's Flood Insurance Rate Map (FIRM) to assess flood risk and infrastructure mitigation. According to the City's FIRM, all City facilities are within

B, C, or X zones, which are outside the 100-year floodplain; insurance purchase is not required in these zones. While past flooding has resulted in reimbursable expenses, the majority of the costs were for emergency protective measures and not direct property loss.

Figure A.4 shows the City inlet system compared to the FEMA 100-year floodplain threat.

Figure A.4: City of Clovis' Drain Inlet and Flooding Hot Spot Map



Flood protection in Clovis is afforded by Big Dry Creek Dam on Dry Creek. Big Dry Creek Dam is located approximately 3.5 miles upstream of the City of Clovis. Its main purpose is flood control, and it has a storage capacity of 16,250 acre-feet. Big Dry Creek Reservoir has prevented an estimated \$15 million in damage in the Fresno-Clovis area since its completion in 1948.

Even with significant investment in planning/mitigation and water management through Fresno Metropolitan Flood Control District, portions of the City of Clovis, the Sphere of Influence areas, and the unincorporated Fresno County area, have been subject to historical flooding. Flooding occurred in January 2006 (CDAA-2006-01) and March of 2006 (CDAA-2006-03). The combined impact of these storms left Clovis with \$14,562 in damage that was reimbursable since Fresno County received state declarations for the storms. In both instances, there were short periods when intersections were closed due to flooding and customers could not reach businesses.

According to FEMA's 2016 Flood Insurance Study (FIS), damaging floods also occurred in the area in 1938, 1955, 1958, 1969, and 1978. Details on some of these events follow:

- **December 1955**—Pup Creek overflowed and flooded more than 20 homes in the vicinity of Clovis Avenue and Ninth Street. Floodwater two feet deep in some places blocked streets and disrupted traffic.
- **March 1958**—Pup Creek overflowed and flooded areas along Ninth Street. Floodwater was up to three feet deep, but damage was limited to streets, external residential improvements, and disruption of traffic.
- **January-February 1969**—Creeks and canals in the area overflowed and inundated agricultural land, residential property, and streets and roads. Many homes were evacuated and others protected by sandbags. Traffic was disrupted by flooded streets and roads. Dry Creek and tributaries flooded approximately 1,400 acres and caused an estimated \$329,000 in damage below Big Dry Creek Reservoir.
- **February 1978**—Pup Creek overflowed. Residential property was inundated, homes were evacuated, roads and streets were closed, and traffic was disrupted. The recurrence interval of this flood was 74 years.

The 2016 FIS also notes problems of localized flooding in the City of Clovis. Localized flooding primarily occurs in areas east of Clovis Avenue and south of Shaw Avenue in addition to an area south of Keats Avenue and an area south of Celeste Street. In each of these locations, flooding is common following moderate rainfall or heavy cloudburst storms.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Clovis was created (see Figure A.5). Tables A.9 and A.10 summarize the values at risk in the City's 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Figure A.5: City of Clovis' 100- and 500-Year Floodplains

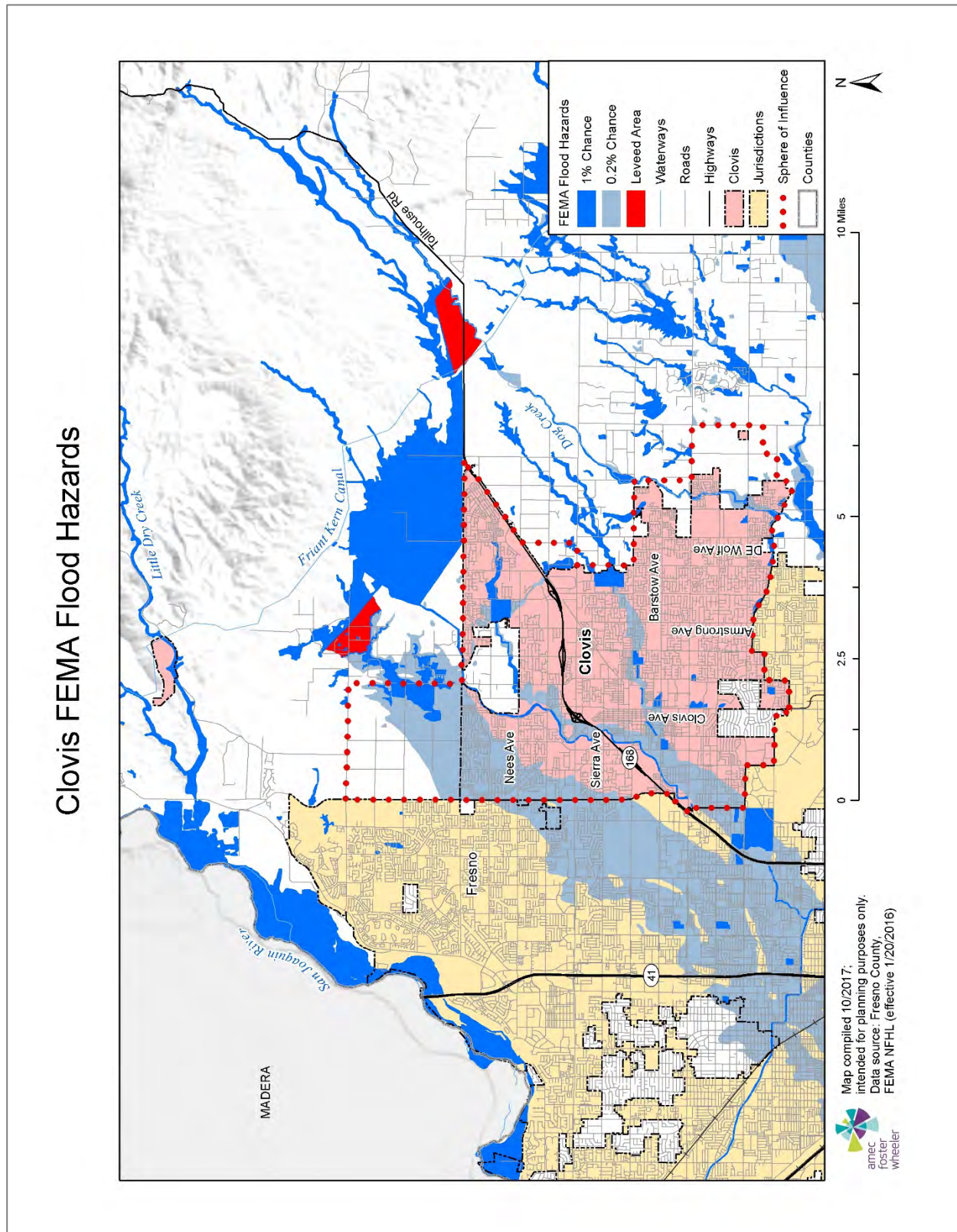


Table A.9: City of Clovis' FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	19	24	\$9,800,415	\$9,800,415	\$19,600,830	\$4,900,208
Exempt	8	8	\$0	\$0	\$0	\$0
Industrial	14	27	\$2,479,947	\$3,719,921	\$6,199,868	\$1,549,967
Multi-Residential	6	40	\$3,863,098	\$1,931,549	\$5,794,647	\$1,448,662
Residential	123	133	\$30,418,012	\$15,209,006	\$45,627,018	\$11,406,755
Total	170	232	\$46,561,472	\$30,660,891	\$77,222,363	\$19,305,591

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table A.10: City of Clovis' FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	0	\$88,794	\$88,794	\$177,588	\$44,397
Commercial	152	927	\$218,953,803	\$218,953,803	\$437,907,606	\$109,476,902
Exempt	47	176	\$0	\$0	\$0	\$0
Industrial	17	38	\$6,781,245	\$10,171,868	\$16,953,113	\$4,238,278
Multi-Residential	146	2,599	\$149,271,660	\$74,635,830	\$223,907,490	\$55,976,873
Residential	5,766	5,804	\$1,092,919,916	\$546,459,958	\$1,639,379,874	\$409,844,969
Total	6,129	9,544	\$1,468,015,418	\$850,310,253	\$2,318,325,671	\$579,581,418

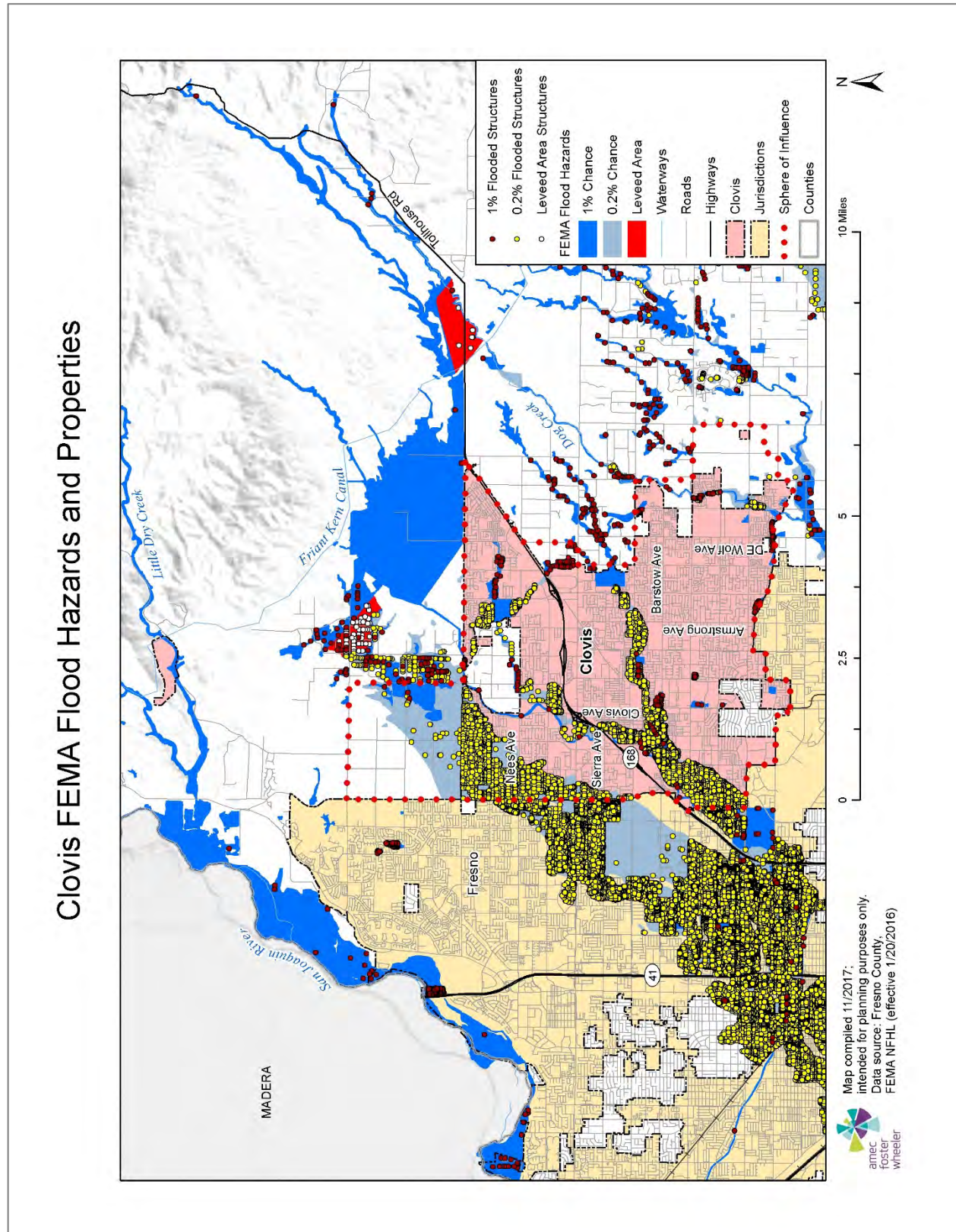
Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Clovis has significant assets at risk to the 100-year and greater floods. 170 improved parcels are located within the 100-year floodplain for a total value of over \$77 million. An additional 6,129 improved parcels valued at over \$2.3 billion fall within the 500-year floodplain.

Applying the 25 percent damage factor as previously described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly \$19 million in damage in the City of Clovis and a 0.2 percent chance in any given year of a 500-year flood causing roughly \$599 million in damage (combined damage from both floods). Figure A.6 shows the properties at risk to flooding in and around the City of Clovis in relation to the mapped floodplain.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Figure A.6: City of Clovis' Properties at Risk in 100- and 500-Year Floodplains



Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the average number of persons per household (3.17). The following are at risk to flooding in the City of Clovis:

- 100-year flood—409 people
- 500-year flood—18,741 people
- **Total flood**—19,150 people

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Clovis joined the National Flood Insurance Program (NFIP) on March 16, 1983. NFIP Insurance data indicates that as of March 30, 2017, there were 103 flood insurance policies in force in the City with \$31,999,500 of coverage. Of the 103 policies, 100 were residential (97 for single-family homes) and 3 were nonresidential. There were 12 policies in A zones, and the remaining 91 were in B, C, and X zones.

There have been 14 historical claims for flood losses totaling \$134,920.02. All claims were for residential properties; 12 were in A zones and 2 were in B, C or X zones; and 13 were pre-FIRM structures (the one post-FIRM structure with a reported loss was in a B, C, or X zone). According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table A.11 lists the critical facilities in the City's 100- and 500-year floodplains. The impact to the community could be great if these critical facilities are damaged or destroyed during a flood event.

Table A.11: Critical Facilities in the 100- and 500-Year Floodplains: City of Clovis

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Colleges & Universities	-	1
Nursing Home	-	1
School	-	6
Total	-	8

Source: Fresno County, HIFLD 2017

There are no critical facilities in the City's 100-year floodplain, but according to the risk assessment for the County, floods in Clovis tend to be 500-year events. Thus, it is particularly important to note that the critical facilities in the 500-year floodplain are all facilities that serve vulnerable populations and thus should be given special attention.

Hazardous Materials Incident

Hazardous materials likely to be involved in a spill or release within the City include herbicides, pesticides, chemicals in gas, liquid, solid, or slurry form; flammables; explosives; petroleum products; toxic wastes; and radioactive substances. The County Health Department is the designated administering agency for the Fresno County area hazardous material monitoring program.

There are two CalARP hazardous materials facilities located in the City of Clovis. As identified in Table A.12, there are three critical facilities in Clovis located within a half mile of a CalARP facility.

Table A.12: Critical Facilities within ½ mile of CalARP Facility: City of Clovis

Critical Facility Type	Count
Fire Station	1
School	2
Total	3

Source: Fresno County, HIFLD 2017

Severe Weather: Extreme Cold/Freeze

Figure A.7 below illustrates the average temperature by month. From the figure, one can see that December and January have the greatest potential for extreme cold/freeze with an average minimum temperature of 37.5°F. In Clovis, it is not uncommon to have consecutive days with a minimum overnight low temperature of 32°F. Clovis has been impacted by severe freezing in winters past. Most notable were the freezes of 1997/98 and 2006/2007. Severe cold/freeze declarations occurred in 1990, 1998, and 2001. These incidents impacted local agriculture and City infrastructure. Estimated agricultural losses in 2006/2007 totaled \$1 million with another \$10,000 in damage to infrastructure. The following chronicles historic periods of extreme cold in Clovis:

Low Temperature of 20°F or Below

- 2 days from 1/16/1888–1/17/1888
- 2 days from 1/6/1913–1/7/1913
- 2 days from 1/10/1949–1/11/1949
- 3 days from 12/22/1990–12/24/1990

Low Temperature of 24°F or Below

- 4 days from 1/14/1888–1/17/1888
- 4 days from 1/3/1949–1/6/1949
- 5 days from 1/3/1950–1/7/1950
- 6 days from 12/12/1963–1/17/1963
- 5 days from 12/31/1975–1/4/1976

- 6 days from 12/21/1990–12/26/1990

Low Temperature of 28°F or Below

- 12 days from 1/7/1888–1/18/1888
- 7 days from 1/12/1963–1/18/1963
- 9 days from 1/17/1966–1/25/1966
- 14 days from 12/20/1990–1/2/1991
- 8 days from 1/20/1998–12/27/1998

Low Temperature of 32°F or Below

- 21 days from 1/3/1947–1/22/1947
- 15 days from 12/28/1960–1/11/1961
- 15 days from 1/11/1963–1/25/1963
- 16 days from 12/19/1990–1/2/1991
- 19 days from 1/6/2007–1/24/2007

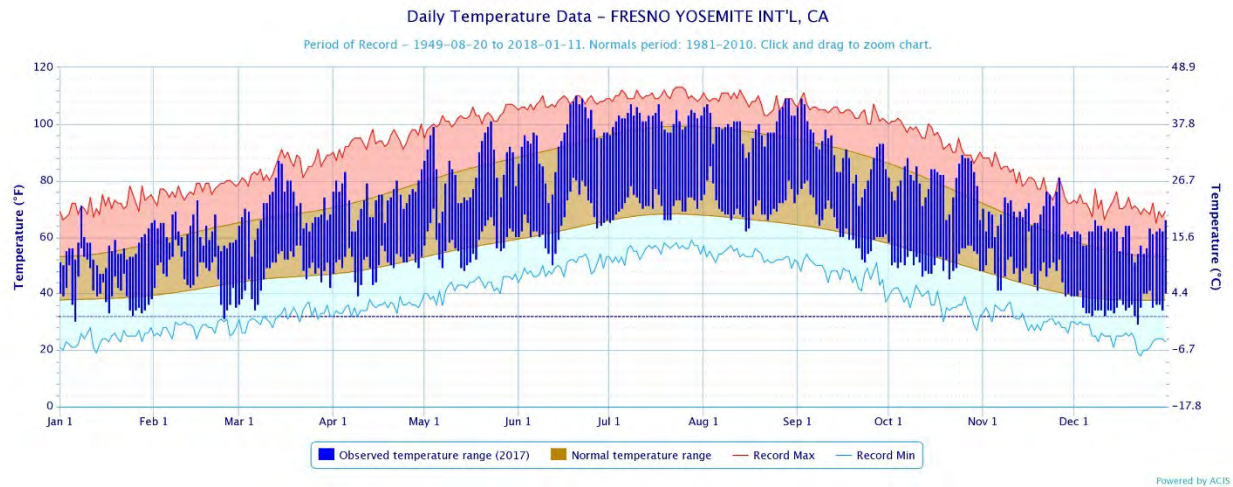
During the January 2007 freeze (CDAA 2007-02), Clovis experienced 19 days of consecutive low temperatures at or below 32°F. In response, Clovis coordinated the resources and staff necessary to establish a warming station at the Clovis Senior Center. Public safety personnel continually monitored calls for service related to vulnerable populations, such as the homeless and seniors who might have needed these services. In addition, fire prevention staff checked on mobile home residents during their normal smoke alarm check/installs. Fortunately, Clovis residents were prepared, and the City did not have to open a warming center.

School facilities incurred \$55,000 in damage. In the urban area, there was some damage to wells, and some small businesses reported leaky/broken sprinkler pipes. City damage reimbursable through the state declaration totaled \$9,373. Agricultural losses were greatest in the citrus growing and packaging industry. Local growers/packers included P&R Farms and Harlan Ranch. Since P&R Farms primarily handles stone fruit (i.e., peaches, apricots), impact to their crops was minimal. Harlan Ranch suffered 100 percent crop loss due to the fact that their primary commodity was citrus, and they had planted over 100 new acres of trees. At last check, their crop loss was \$2.5 million. While some oranges were juiced, Harlan Ranch representatives said the juice market was break-even at best.

Severe Weather: Extreme Heat

The following data support the City of Clovis' decision to rate extreme heat a medium significance hazard (higher than the overall County rating). As recently as 2006 and 2007, Clovis experienced heat waves that exceeded 24 days. While no direct loss of livestock was reported, the City staffed cooling centers to protect vulnerable populations, and there were several power outages that rotated through the area. Figure A.7. shows historical temperatures in Clovis.

Figure A.7: Historical Temperatures in Clovis



Source: High Plains Regional Climate Center; climod.unl.edu

It is not uncommon in Clovis to have consecutive days over 100°F. In the past decade (2008-2017), There were 62 periods of three days or longer where temperatures remained above 100 degrees. The longest period of extreme temperatures occurred in August of 2012, where daily high temperatures remained above 100°F for 19 consecutive days. The highest temperature reached was 112°F, which occurred once in July of 2008 and again in July of 2009. The following chronicles heat waves in Clovis prior to 2006:

High Temperature of 112°F or Greater

- 4 days from 7/30/1908 – 8/2/1908
- 5 days from 7/22/2006–7/26/2006

High Temperature of 110°F or Greater

- 4 days from 6/29/1891–7/2/1891
- 4 days from 7/8/1896–7/11/1896
- 6 days from 7/26/1898–7/31/1898
- 5 days from 7/5/1905–7/9/1905
- 5 days from 7/29/1908–8/2/1908
- 4 days from 7/24/1931–7/27/1931
- 5 days from 7/22/2006–7/26/2006

High Temperature of 105°F or Greater

- 10 days from 7/28/1889–8/6/1889
- 9 days from 7/6/1896–7/14/1896
- 10 days from 7/18/1931–7/27/1931
- 9 days from 7/21/1980–7/29/1980

- 14 days from 7/17/1988–7/30/1988
- 9 days from 7/13/2005–7/21/2005
- 12 days from 7/16/2006–7/27/2006

High Temperature of 95°F or Greater

- 51 days from 6/23/1908–8/12/1908
- 53 days from 7/6/1910–8/27/1910
- 51 days from 7/7/1939–8/26/1939
- 50 days from 6/6/1967–8/24/1967
- 51 days from 6/30/2006–8/19/2006

In response to extreme heat events in 2007, the City implemented Phase II of the City’s Heat Emergency Plan, which entailed opening facilities and using volunteer staff from 12–10 p.m. to provide cooling for individuals impacted by the heat. The cost to provide this level of service was negligible since the facility used was already open and volunteers staffed the center. While few people sought relief, the most significant benefit was from volunteers checking the welfare of vulnerable seniors who rely on swamp coolers for cooling and who cannot always determine their physiological need for hydration. For the summer, Phase II of the plan was activated seven times. Over 20 individuals sought refuge in the center, and volunteers placed over 183 personal welfare calls to the medically fragile. In Clovis, there was no loss of human or livestock life.

Severe Weather: Fog

In Fresno/Clovis, the average number of days with dense fog per year is 35.1 (see Table A.13). The most consecutive days with dense fog were the following:

- 14 days from 12/19/1929-1/2/1930
- 16 days from 12/13/1985-12/28/1985

Table A.13: Average Number of Days in Fresno/Clovis with Dense Fog

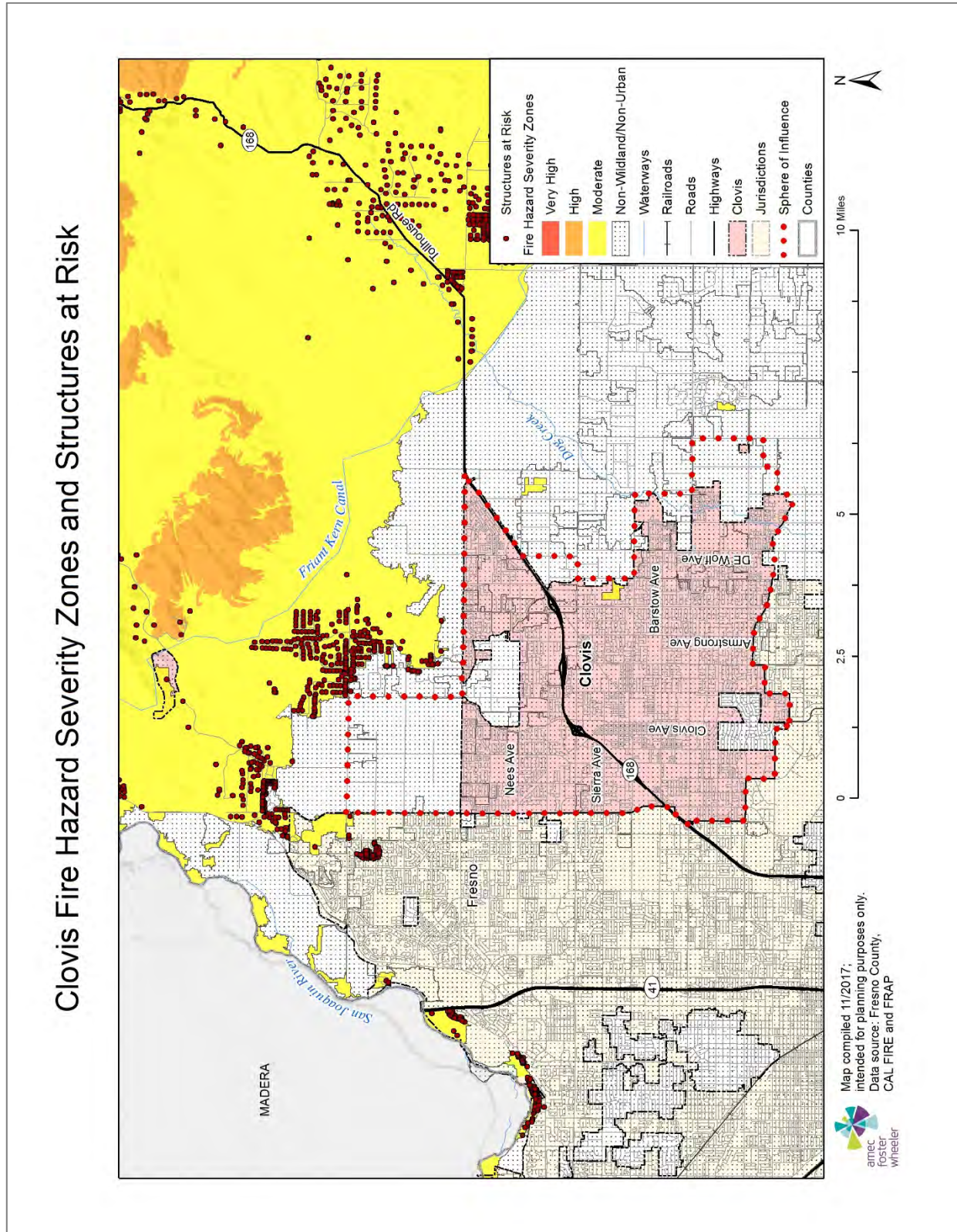
Month	Number of Days
January	11.5
February	5.1
March	1.5
April	0.2
May	0
June	0
July	0
August	0
September	0
October	0.6
November	5.2
December	11.0
Annual	35.1

Wildfire

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Clovis was created (see Figure A.8). An analysis was performed using GIS software that determined that there were not any critical facilities in wildfire threat zones in Clovis.

Only one parcel in Clovis is considered at risk to moderate fire severity, and it does not have any improved value, indicating lower risk to wildfire in the City compared to the Fresno County planning area as a whole.

Figure A.8: City of Clovis' Wildfire Threat



A.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Clovis' updated capabilities are summarized below.

A.4.1 Regulatory Mitigation Capabilities

Table A.14 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Clovis.

Table A.14: City of Clovis' Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	2014
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	
Building code	Yes	Version: 2016
Fire department ISO rating	Yes	Rating: 2
Erosion or sediment control program	Yes	
Stormwater management program	Yes	
Site plan review requirements	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	2017
Other special plans		
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016

The City of Clovis General Plan Program, 2014

The City of Clovis General Plan Program serves as the blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition (see the discussion in Section A.3.1 Growth and Development Trends).

The general plan includes a Safety Element that focuses on safety issues to be considered in planning for the present and future development of the Clovis planning area. Identified hazards include fire, geologic/seismic, flooding, and hazardous materials. Mitigation-related goals, policies, and actions are presented below.

Goal 1: Protect the Clovis community from hazards associated with the natural environment.	
Policy 1.1:	Minimize risks of personal injury and property damage associated with natural hazards.
	Actions: <ul style="list-style-type: none"> • Educating the community on procedures regarding preparedness and response to natural disasters providing information describing procedures and evacuation routes to be followed in the event of a disaster. • Establishing design criteria for publicly accessible stream corridors, detention basins, and drainage facilities to minimize potential for accidents and injury. • Preserve as open space areas along waterways, detention basins, and ponding areas, and in areas of wildfire and known flooding hazards where building for human occupancy is hazardous.
Policy 1.2:	Provide flood protection for existing development and for areas planned for new development.
	Actions: <ul style="list-style-type: none"> • Coordinate with the Fresno Metropolitan Flood Control District (FMFCD) in its efforts to enact a program of channel preservation, renovation, and maintenance. • Support the FMFCD in the creation of an inventory of all streams draining from the foothills areas and identifying all channels that have been obliterated or altered. • Require, as a condition of development, protection of channel alignments, identification of floodway areas, and construction of channel improvement so that projected 100-year flood flows can pass without affecting new development. • Utilize zoning and other land use regulation to limit and or prohibit development in flood-prone areas. • Map dam inundation areas and develop, maintain, and inform the public of an evacuation procedure for all affected areas in the event of failure of dams.
Policy 1.3:	Utilize the unprotected 100-year floodplain for low density uses such as agriculture, open space, recreation, and for reclaiming water and wetlands.
	Actions: <ul style="list-style-type: none"> • Establish development set-back requirements from natural water courses that traverse the project areas.
Policy 1.4:	Mitigation potential adverse impacts of geologic and seismic hazards.
	Actions: <ul style="list-style-type: none"> • Require geologic and soils studies to identify potential hazards as part of the approval process for all new development prior to grading activities. • Conduct a building survey to identify structures that are substandard in terms of seismic safety. Develop a program to bring these structures up to current seismic safety code standards. • Require that underground utilities be designed to withstand seismic forces. • Coordinate with the FMFCD to regularly inspect and repair levees as part of their proposed program of channel preservation, renovation, and maintenance.

Goal 1:	Protect the Clovis community from hazards associated with the natural environment.
	<ul style="list-style-type: none"> • Incorporate appropriate earthquake prevention standards into the uniform technical codes and require that all new structures are engineered to meet seismic safety code standards.

The Public Facilities Element of the general defines policy for public facilities and services, including infrastructure, and addresses the issues of providing adequate infrastructure and community services to expanding populations by planning in conjunction with land use. Clovis' infrastructure consists of water, wastewater, storm drainage/flood control, and solid waste systems. The element does not address how new facilities and infrastructure are sited in regard to known hazard areas. It does include hazard-related policies to provide effective storm drainage facilities for planned development by maintaining agreement with the Fresno Metropolitan Flood Control District to reduce the effect that development has on natural watercourses and to ensure that adequate water supply can be provided through water reuse and water conservation.

Clovis Municipal Code

The following ordinances are used for implementing the general plan and/or are critical to the mitigation of hazards identified in this plan.

Zoning Ordinance (Title 9—Chapter 9.08)

The purpose of the Zoning Ordinance is to encourage, classify, designate, regulate, restrict, and segregate the highest and best locations for, and uses of, buildings, structures, and land for agriculture, residence, commerce, trade, industry, water conservation, or other purposes in appropriate places; to regulate and limit the height, number of stories, and size of buildings and other structures hereafter designed, erected, or altered; to regulate and determine the size of yards and other open spaces; and to regulate and limit the density of population, and for such purposes to divide the City into districts of such number, shape, and area as may be deemed best suited to provide for their enforcement. Further, the Zoning Ordinance addresses the following:

- Most appropriate uses of land
- Conservation and stabilization of property values
- Provision of adequate open space for light and air and to prevent and fight fires
- Prevention of undue concentration of population
- Lessening of congestion of streets
- Facilitation of adequate provision of community utilities, such as transportation, water, sewerage, schools, parks, and other public requirements
- Promotion of the public health, safety, and general welfare

Site Plan Ordinance (Title 9—Chapter 9.56)

The site plan review is performed by the Clovis Planning and Development Services Department. During the review, the owner of a parcel is required to submit a plan to scale demonstrating all of the uses for a specific parcel of land. This review ensures compliance with applicable law and the zoning requirements within the City.

Subdivision Ordinance (Title 9—Chapter 9.100)

The Subdivision Ordinance specifically provides for proper grading and erosion control and prevention of sedimentation or damage to off-site property. Each local agency may by ordinance regulate and control other subdivisions, provided that the regulations are not more restrictive than the regulations commencing in California Government Code Section 66410.

Erosion or Sediment Control Program (Title 9—Chapter 9.2.309)

Every map approved pursuant to the provisions of the Subdivisions Ordinance are conditioned on compliance with the requirements for grading and erosion control, including the prevention of sedimentation or damage to off-site property, set forth in Appendix Chapter 70 of the California Building Code, as adopted and amended by the City.

Flood Hazard Ordinance (Title 8—Chapter 8.12)

Flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards that increase flood heights and velocities also contribute to flood loss. It is the purpose of the Flood Hazard Ordinance to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by 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; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of special flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

In order to reduce flood losses, the ordinance includes methods and provisions to:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Control filling, grading, dredging, and other development which may increase flood damage; and

- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

Emergency Services Ordinance (Title 4—Chapter 4.2)

The declared purposes of the Emergency Services Ordinance are to provide for the preparation and carrying out of plans for the protection of persons and property within the City in the event of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of the City with all other public agencies, corporations, organizations, and affected private persons.

Stormwater Management Program (Emergency Flood Control Procedures 2007-2008)

The City's Public Utilities Department has three Stormwater Patrol teams, made up of 22 public utilities employees, to implement emergency flood control measures. The plan contains information and procedures to rapidly address flooding throughout the City. Contact information and team assignment data is updated regularly as are geographic locations subject to flooding. Appendices include suppliers/contractors, storm basin list, problem drain lists, and partnerships and agencies with shared responsibility for storm preparedness, mitigation, and response.

Five-Year Community Investment Program

The Five-Year Community Investment Program (CIP) represents an effort to identify major capital needs and schedule projects consistent with community priorities and available funding. A major portion of the funding for these projects comes from development fees. Projects identified in the CIP are broken down as follows:

- **General Government Facilities**—The capital projects for the General Government Facilities program consist of acquisition of new facilities, improvement to existing facilities, and maintenance of existing improvements required by City departments to enable them to adequately carry out their mission.
- **Sewer Capital Projects**—The Enterprise budget includes projects that will repair and/or replace existing sanitary sewer mains that are severely deteriorated or are not adequately sized for the flows being experienced. The Developer budget includes the debt service payments for the 2007 Sewer Revenue Bond for the Sewage Treatment and Water Reuse Facility.
- **Parks Improvements**—These primarily consist of master planning and design and construction of park improvements. Community park improvements are funded by development fees and state grants when available. Neighborhood parks are installed by development. Park fees are paid by all new developments constructed within the City of Clovis.
- **Street Improvements**—These include traffic signal installation, street repair and improvement, sidewalk installation/modification, and design work throughout the City.

- **Water**—This includes projects that will continue to improve the water distribution system, and improve water quality through the addition of treatment facilities at existing wells, and increase the reliability of the water supply by the addition of auxiliary power generators.
- **Refuse**—This includes regulatory design and maintenance of City-owned landfill and associated projects.
- **Clovis Community Development Agency**—This focuses on projects that provide affordable housing in the community and on encouraging and enhancing the business environment of Clovis.
- **Police/Fire**—This addresses facility design and maintenance for satellite locations and main headquarters.

Economic Development Strategy, 2014

On July 14, 2014, the City Council adopted an updated Economic Development Strategy, developed by the City's Economic Development Strategy Advisory Committee (EDSAC) and based on presentations from experts regarding perspectives on current markets, the regulatory environment, access to capital, characteristics of the local labor force, public incentive programs, and the local commercial and industrial real estate market.

The City of Clovis adopted the initial Economic Development Strategy in March 1998. The 1998 strategy included a mission statement as well as goals and objectives for three individual strategies: Industrial Development, Commercial Development, and Tourism. The City of Clovis believes that these three individual strategies make up the basis for a well-rounded economic development program. If progress is made in the implementation of the stated goals and objectives in each of these strategies, the City will be better able to create the wealth necessary to provide municipal services to Clovis residents and businesses.

City of Clovis Emergency Operations Plan

The City of Clovis Emergency Operations Plan (EOP) Basic Plan addresses the planned response for the City of Clovis to emergencies associated with disasters, technological incidents, or other dangerous conditions created by either man or nature. It provides an overview of operational concepts, identifies components of the City emergency management organization, and describes the overall responsibilities of local, state, and federal entities. The City will place emphasis on emergency planning; training of full-time, auxiliary, and reserve personnel; public awareness and education; and assuring the adequacy and availability of sufficient resources to cope with emergencies. Emphasis will also be placed on mitigation measures to reduce losses from disasters, including the development and enforcement of appropriate land use, design, and construction regulations.

The EOP's section on hazard mitigation establishes actions, policies, and procedures for implementing Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act following a presidentially declared emergency or major disaster. It also assigns hazard

mitigation responsibilities to various elements of federal, state, and local governments in California.

Heat Emergency Contingency Plan

The Heat Emergency Contingency Plan describes City operations during heat-related emergencies and provides guidance for City departments and personnel. It recognizes the need to communicate and coordinate with local agencies and mobilize and initiate actions in advance of local requests and supports local actions according to the Standardized Emergency Management System and the National Incident Management System. The plan goal is to reduce the incidence of morbidity and mortality associated with local extreme heat events.

Urban Water Management Plan

Clovis proactively manages water supplies and has policies in place to effectively deliver water to local residents. In order to appropriately manage water resources within Clovis, the City updated its Urban Water Management Plan in 2005 in coordination with the City of Fresno, County of Fresno, Fresno Irrigation District, and Fresno Metropolitan Flood Control district. The City of Clovis utilizes many water management tools and options to maximize water resources and minimize the need to import water. The City has an existing groundwater management plan (1997) and is involved in the Fresno-Area Regional Groundwater Management Plan.

Clovis Unified School District Hazard Mitigation Plan

The Clovis Unified School District is a K-12 public school system that serves the Cities of Clovis and Fresno, some unincorporated areas of Fresno County, and the rural community of Friant. It covers approximately 198 square miles and has a student population of nearly 38,000. The overall goal of the Clovis Unified School District Hazard Mitigation Plan is to reduce or prevent injury and damage from natural hazards in the District by addressing the hazards that present the greatest risk to the District, its students, staff, facilities, infrastructure, properties, and the natural environment. The plan examines past events and hazard mitigation programs already in place and prioritizes additional mitigation activities for the District. Planning goals include facilitating the integration of City and County hazard mitigation planning activities into District efforts.

A.4.2 Administrative/Technical Mitigation Capabilities

Table A.15 identifies the personnel responsible for activities related to mitigation and loss prevention in Clovis.

Table A.15: City of Clovis' Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	City Planner
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Building Official
Planner/engineer/scientist with an understanding of natural hazards	Yes	City Engineer
Personnel skilled in GIS	Yes	Senior IT Analyst
Full time building official	Yes	Building Official
Floodplain manager	Yes	Building Official
Emergency manager	Yes	Life Safety Enforcement Manager
Grant writer	Yes	Various
Other personnel		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	IT Division and Planning/Development Services
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	Facebook, NextDoor

A.4.3 Fiscal Mitigation Capabilities

Table A.16 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table A.16: City of Clovis' Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	No

A.4.4 Mitigation Outreach and Partnerships

The City of Clovis has two fire prevention specialists dedicated to public education, reaching 17,000 kids per year in the school system. The city also runs a responsible water use outreach program to encourage conservation and efficiency. Additionally, the City has a Community Emergency Response Team volunteer program and a Citizens On Patrol volunteer group.

A.4.5 Other Mitigation Efforts

The fire department is accredited through the Commission on Fire Accreditation International, which is part of the Center for Public Safety Excellence. Additionally, the City is recognized by the National Weather Service as a StormReady Community.

A.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the City of Clovis has several existing mechanisms in place that already help to mitigate hazards. In addition to these existing capabilities, there are also opportunities for the City to expand or improve on these policies and programs to further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Additional training opportunities will help to inform City staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train City staff on mitigation and the hazards that pose a risk to the City of Clovis will lead to more informed staff members who can better communicate this information to the public.

A.5 Mitigation Strategy

A.5.1 Mitigation Goals and Objectives

The City of Clovis adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Engineering Division may utilize the hazard information when implementing the City's Community Investment Program and the Planning and Building Divisions may utilize the hazard information when reviewing a site plan or other type of development applications. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Clovis will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1983. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits

for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

A.5.2 Completed 2009 Mitigation Actions

The City of Clovis completed nine mitigations actions identified in the 2009 plan. These completed actions are as follows:

- Establish Post-Disaster Action Plan for City Continuity of Operations Plan
- Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment
- Implement a System of Automatic Vehicle Location
- Install Battery Back-Up Systems at Traffic Signals in the City of Clovis on Major Transportation Routes
- Replace Traffic Management Center Software and Herndon Avenue Traffic Signal Equipment and Implement Communications Upgrades
- Modify and Enhance Emergency Traffic Control System
- Implement a System to Share Information with City Police Officers/Employees (SharePoint)
- Integrate Local Hazard Mitigation Plan into Safety Element of General Plan
- Implement a Flood Awareness Program for the Public

These completed actions have reduced vulnerability to hazards and increased local capability to implement additional mitigation actions.

A.5.3 Mitigation Actions

The planning team for the City of Clovis identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. Actions with an “*” are those that mitigate losses to future development.

In addition to implementing the mitigation actions below the City of Clovis will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Construct a Water Intertie between the Cities of Clovis and Fresno

Hazard(s) Addressed: Multi-Hazard: dam failure, drought, earthquake, flood, severe weather, wildfire, hazardous materials

Issue/Background: The City of Clovis operates a water system that serves over 95,000 residents. During rolling power blackouts or earthquakes or due to potential contamination of the water supply, there is a need to have a backup supply of potable water available. The City has an agreement with the City of Fresno to construct an intertie between the two water systems to act as an emergency backup.

Other Alternatives: The City has backup power at many of its facilities but not all of them. Additionally, backup power will not help if the issue is unrelated to a power blackout.

Responsible Office: City of Clovis Public Utilities Department Water Division

Priority (High, Medium, Low): High

Cost Estimate: \$890,000

Potential Funding: City of Clovis Water Enterprise Fund

Benefits (Avoided Losses): This will prevent the loss of human life, illness, customer confidence, and revenue.

Schedule: Estimated completion in 2019

Status: 2009 project, implementation in progress

2. Modernize Information Technology Backup Infrastructure

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, volcano, hazardous materials

Issue/Background: During the last emergency operations center exercise, it became evident that many of the technology systems needed to coordinate services during a disaster were limited or not available at all. Personal computer systems were out of date, the telecommunications system and phones were not properly functioning, and many resources (software applications) were not configured or available. The City could benefit from disaster recovery/business continuity technology systems that use virtualization and storage area network backup infrastructure systems for emergency operations center operations.

Other Alternatives: Tapes and backup systems that are not real time are not as reliable and cause delays in data restoration.

Responsible Office: City of Clovis Information Services Division

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Potential Funding: General fund

Benefits (Avoided Losses): Ensures business continuity and avoids downtime. Thus, speeds up relief efforts during a disaster.

Schedule: Estimated completion in 2020

Status: 2009 project, implementation in progress

3. Improve the City's Capabilities for Sheltering Animals in a Disaster

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, wildfire, hazardous materials

Issue/Background: During a disaster, not only do people need to be rescued, but their pets do also. Hurricane Katrina showed the nation that shelters do not typically allow pets, so pets may be left behind when their owners evacuate. The care of the animals left behind falls to local animal shelters. Currently, the City of Clovis Animal Shelter does not have the supplies to handle a large scale animal emergency. The City has approximately 8,000 licensed dogs. If a disaster occurred, they would only be able to house 102 of them. Overcrowding of animals usually causes diseases and loss of animal life. Purchasing new cages would alleviate some of the overcrowding created by a disaster.

Other Alternatives: Ask other agencies for supplies, if they have them available.

Responsible Office: City of Clovis Police Department

Priority (High, Medium, Low): High

Cost Estimate: \$44,000

Potential Funding: General fund

Benefits (Avoided Losses): This will cut down on the spread of disease and animal loss during an emergency or disaster.

Schedule: Estimate completion in 2020

Status: 2009 project, implementation in progress

4. Purchase Hazard Mitigation Public Notification Boards

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, wildfire, hazardous materials

Issue/Background: Purchase mobile self-contained changeable message signs to pre-alert motorists to avoid a “real time” traffic (or other) hazard.

Other Alternatives: Rely on contract service providers who may not be able to respond with adequate resources in a timely fashion.

Responsible Office: City of Clovis Engineering Division Traffic Management Group, Public Utilities Department Streets Division, Police Department, and Fire Department

Priority (High, Medium, Low): High

Cost Estimate: 4 signs @ \$35,000 each = \$140,000

Potential Funding: Departmental operational budgets or grant funding

Benefits (Avoided Losses): Provides the ability for City forces to aid emergency response crews by dispatching mobile sign units to be stationed at critical locations to alert motorists and citizens of potential hazard areas. This will allow for better routing of nonessential vehicle traffic that may impede the delivery of critical health and safety services and ultimately result in quicker overall response delivery times.

Schedule: Estimate completion in 2019/2020

Status: 2009 project, implementation not yet started

5. Improve Emergency Evacuation and Emergency Vehicle Routes

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, wildfire, hazardous materials

Issue/Background: Currently, there are several street segments within the City of Clovis that could serve as evacuation routes or detour routes in the event of a disaster. These segments are currently deficient in terms of traffic carrying capacity and serviceability. Improvements to these routes would provide the additional pavement width necessary to provide increased flexibility and capacity in routing traffic and emergency vehicles. Routes include:

- Shepherd Avenue from Clovis to Fowler (1 mile)
- Nees Avenue from Clovis to Armstrong (1.6 miles)
- Alluvial Avenue from Sunnyside to Temperance (1.25 miles)
- Sunnyside Avenue from Nees to Shepherd (1 mile)

Other Alternatives: No action. Existing road segments would remain constricted, impeding evacuation expediency and limiting detour alternatives.

Responsible Office: City of Clovis Public Utilities Department—Long-term Maintenance, City of Clovis Engineering Department—Construction

Priority (High, Medium, Low): High

Cost Estimate: \$7,500,000

Potential Funding: None identified, potential for federal or state grant funding

Benefits (Avoided Losses): Improved traffic flow and increased flexibility in moving traffic and emergency vehicles during a disaster

Schedule: One year

Status: 2009 project, implementation not yet started

6. Conduct a Seismic Vulnerability Assessment of City-Owned Critical Facilities

Hazard(s) Addressed: earthquake

Issue/Background: The City is interested in performing a building-specific, seismic vulnerability assessment of City-owned critical facilities constructed prior to 1980 (including infrastructure). Included in this assessment will be recommended mitigation alternatives that meet goals and objectives of this plan.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services—Building

Priority (High, Medium, Low): Medium

Cost Estimate: \$200,000

Potential Funding: General fund, FEMA's Pre-Disaster Mitigation grants

Benefits (Avoided Losses): This will prevent the loss of human life, economic loss, and property loss.

Schedule: Long term

Status: 2009 project, implementation in progress

7. Construct Channel Improvements for Dog Creek Stream, South of Gettysburg-Ashlan

Hazard(s) Addressed: flood

Issue/Background: Dog Creek has been identified in the Fresno Metropolitan Flood Control District's (FMFCD) Rural Streams Program as a facility that needs master planned drainage improvements to adequately convey rural stream floodwaters. The FMFCD requires all development within rural stream areas to provide and construct the necessary channel

improvements. The channel improvements required of Dog Creek include relocation/reconstruction of the existing channels geometry to allow a flow of 315 cubic feet per second to be passed. In order to meet this flow capacity, Dog Creek must have geometry of approximately 60 feet in width and 12 feet in depth.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$700,000

Potential Funding: California Department of Water Resources grant

Benefits (Avoided Losses): The project goals and objectives are to improve flood management of Dog Creek for future development, as planned for in the area, thus minimizing the potential of rural stream flows to flood urbanized areas. Development activity in the City of Clovis is managed through the FMFCD for both urbanized development and rural stormwater flows. FMFCD policy does not allow for the mixing of urban and rural flows in the same channel.

Schedule: Long term

Status: 2009 project, implementation in progress

8. Improve Flow Design Parameters for Big Dry Creek and the Enterprise Canal*

Hazard(s) Addressed: flood

Issue/Background: In order to meet the Fresno Metropolitan Flood Control District's flow design parameters for Big Dry Creek and the Enterprise Canal, the existing siphon at the confluence of the two waterways needs to be replaced with a similar type structure. The new structure will have enhanced flow measurement and control for both the Big Dry Creek and Enterprise Canal and would incorporate a walkway to accommodate a path along Big Dry Creek for the general public.

The primary purpose of the project is to provide for the long term integrity of the siphon to pass Big Dry Creek and Enterprise Canal flows. The existing structure on the Enterprise Canal (located beneath Dry Creek) was constructed in the early 1900s (estimated 1915). The replacement of this structure is essential to the reliable delivery of water over the long term. The existing structure consists of a box culvert with an integrally constructed weir. Material strength testing was conducted at the siphon, which included two concrete cores and rebar mapping of the top slab. This testing determined that the concrete compressive strength was a minimum of 4,300 pounds per square inch. Several large cracks were found in the center culvert wall approximately ¼ inch wide by 10 feet long. The cut-off wall located at the end of the apron extending from the weir

structure had significant damage where rebar has been exposed and pieces of concrete have broken off.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, City of Clovis Public Utilities Department, Fresno Irrigation District, Fresno County, City of Fresno, Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$845,000

Potential Funding: California Department of Water Resources grant

Benefits (Avoided Losses): The project goals and objectives are to provide for the long-term integrity of the siphon to carry Dry Creek and Enterprise Canal flows.

Schedule: Long term

Status: 2009 project, implementation in progress

9. Improve City's Floodplain Management Program and Apply to Community Rating System*

Hazard (s) Addressed: flood

Issue/Background: Seek Community Rating System (CRS) classification improvements within the capabilities of City programs, including adoption and administration of FEMA-approved ordinances and flood insurance rate maps.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness

Priority (High, Medium, Low): Medium

Cost Estimate: \$300,000

Potential Funding: General fund, FEMA's Pre-Disaster Mitigation grants

Benefits (Avoided Losses): Participation in the CRS and improvements outlined by the system will translate into improved flood mitigation and reduced flood insurance rates for local citizens. Ultimately, it will prevent the loss of human life and economic and property losses.

Schedule: Long term

Status: 2009 project, implementation in progress

10. Enforce Master Drainage Plan Requirements*

Hazard(s) Addressed: flood

Issue/Background: The City of Clovis requires a master drainage plan as part of the approval process for all specific plans and large development projects as determined by the City's Public Works director. The master drainage plan requirements consider cumulative regional drainage and flooding mitigation. The intent of a master drainage plan is to ensure that the overall rate of runoff from a project does not exceed pre-development levels. If necessary, this objective shall be achieved by incorporating run-off control measures to minimize peak flows and/or assistance in financing or otherwise implementing comprehensive drainage plans. Enforcement will include review of development during and after construction to ensure that drainage requirements have been implemented as proposed.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness

Priority (High, Medium, Low): Low

Cost Estimate: Developer-based funding under specific plan requirements

Potential Funding: Developer-based funding under specific plan requirements

Benefits (avoided Losses): This will prevent the loss of human life and economic and property losses and addresses flood mitigation with future development. Enforcement of these requirements ensures that the overall rate of runoff from a project does not exceed pre-development levels, thus prevents making stormwater flooding worse.

Schedule: Long term

Status: 2009 project, implementation in progress

11. Install a System of Surface Water Hazard Detection

Hazard(s) Addressed: hazardous materials

Issue/Background: The City operates a surface water treatment plant that supplies water to a community of over 95,000 people. The water is delivered to the plant via an open canal that travels approximately 30 miles from the source to the plant. There have been several incidents where items have been dumped into the canal, requiring the plant to shut down. The City is concerned that the dumping of hazardous chemicals could occur and, without some advance notification, that the chemicals could get through the treatment plant and into the distribution system, making customers sick.

Equipment is available that can be installed upgradient from the plant that will sample the water, analyze the water on-site, and provide notification to the plant prior to it reaching the plant.

Other Alternatives: Continue patrolling the canal on a daily basis.

Responsible Office: City of Clovis Public Utilities Department Water Division

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Potential Funding: City of Clovis Water Operations Fund

Benefits (Avoided Losses): This will prevent the loss of human life, illness, customer confidence, and revenue.

Schedule: Estimate completion in 2019

Status: 2009 project, implementation in progress

12. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Clovis and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Clovis has become a joint power authority of the North Kings Groundwater Sustainability Agency, other members of the Agency include the County of Fresno, City of Kerman, City of Fresno Biola Community Services District, Garfield Water District and International Water District. As a member of the North Kings GSA, the City of Clovis is required to participate in the development and implementation, no later than January 31, 2020, of a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the North Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: City Engineer and North Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

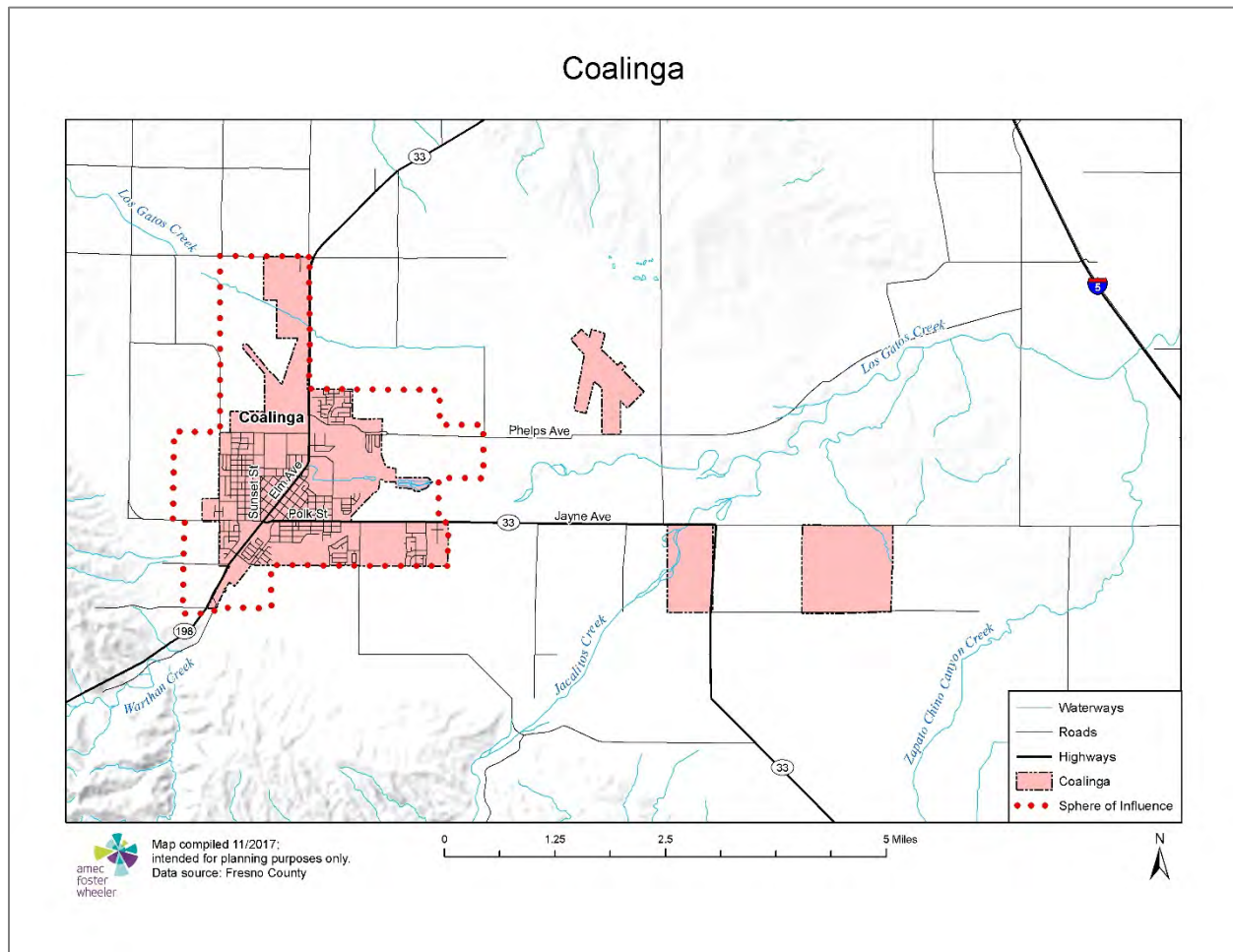


ANNEX B: CITY OF COALINGA

B.1 Community Profile

Figure B.1 displays a map and the location within Fresno County of the City of Coalinga and its Sphere of Influence.

Figure B.1: The City of Coalinga



B.1.1 Geography and Climate

The City of Coalinga is located in the southwestern portion of the San Joaquin Valley in an area known as Pleasant Valley. Over the past decade, the City boundaries have not changed, but the City did annex land southeast of State Route 33, outside the current Sphere of Influence. The City and its Sphere of Influence cover 5,161 acres, 4,133 acres of which are within the City limits.

Access to Coalinga is by State Routes 198 and 33. Interstate 5 is located approximately 13 miles to the east. Existing development in the City is characterized by residential neighborhoods with commercial uses concentrated along State Routes 198 and 33 and Polk Street.

The City of Coalinga lies over or near more than one earthquake fault and lateral or blind thrust fault. It is approximately 29 miles from the Town of Parkfield, which is located on the San Andreas fault and has been the site of an earthquake study since the late 1970s.

The climate is mild and damp in the winter and hot and dry in the summer. High temperatures average 64°F in January and 103°F in July. Low temperatures average 29°F in January and 53°F in July. Annual precipitation is 8.4 inches.

B.1.2 History

The following history of Coalinga is from the City of Coalinga General Plan Update, 2007:

For many centuries, numerous tribes of Native Americans, all belonging to the Yokut, inhabited the San Joaquin Valley. Although it is not clear when the first people made their way to Coalinga, it is known that the Tache (Tachi), one of the largest of all the Yokut tribes, found a permanent water supply at a place called Posa Chanet near the City's present site. From this encampment, the Tache scoured the hills for trade goods. They discovered oil seeps and thick tar. Oil was an important item to early inhabitants of the Pleasant Valley. Seepages in the area provided asphalt used to line baskets and was a good traded among other tribes. Eventually, Spaniards and Basques, who wanted the land for its cattle and sheep grazing potential, displaced the Indians.

As new settlers came to the west seeking a new life and greater opportunities, interest in oil seepages inspired an oil rush in 1865. In 1867, a specialized oil-drilling rig, shipped from the east coast, began drilling for oil north of the present site of Coalinga. However, shipping problems caused early interest to die down; the world had not yet discovered the full potential of petroleum.

In the late 1800s, stories of shearherders who burned rocks at night to keep warm drew the attention of Messer's Robins and Rollins, English second sons. Excited by the promise of coal in the area, they established a mine in a slash of hillside where the Coalinga Rifle Range now exists. It was never profitable. The coal was actually shale. However, the potential of coal from the mine and in nearby Priest Valley was enough to induce the Southern Pacific Railroad to extend its southern route. It crossed Huron and stretched slightly beyond the Coalinga area.

There is debate about how Coalinga got its name. The usual version is that while deposits of oil saturated shale, or "coal," were being mined in the hills nearby "Coaling Station A," "Coaling Station B," and "Coaling Station C" were situated along the rail line for loading purposes. "Coaling Station A" was eventually shortened to "Coalinga." This story does not stand close scrutiny, and a more likely explanation is that Coalinga was given the final "a" for musical effect. The truth may never be known, since the great quake and fire in San Francisco in 1906 destroyed the Southern

Pacific Railroad's office and all its records. Whatever the origin, "Coalinga" was in use fairly quickly after the rail line opened in July 1888.

The extension of the railroad coincided with a significant worldwide interest in oil production. A second oil rush occurred around 1890. By 1910, Coalinga was the third largest shipping point for the railroads in California with nearly all tonnage connected to oil production.

The town grew quickly in the late 1800s. In 1889, the Coalinga post office was established. In 1891, Southern Pacific Railroad purchased the 160-acre homestead of M.L. Curtis for \$900 and laid out the town site of Coalinga as a square cut diagonally by the railroad tracks. Street numbers from one to eight went north to south and the letters A to H from west to east. The Coalinga Women's Improvement Society later changed the alphabetical names to botanical ones. A succession of historically important oil wells brought "boomers" into Coalinga by the thousands.

With over 15 years of continuous prosperity behind them, a handful of local citizens began the process of incorporation, which was completed in April 1906. In 1909, the Coalinga Chamber of Commerce was organized, and in its first report dated April 16, 1910, they excitedly spoke about the promise of the City. The Coalinga oil field was the largest in California. In September 1909, the Silver Tip well, located just one-half mile from the City limits, blew with the greatest gusher known in California at that time. This discovery caused enough excitement among the financiers of California that the Los Angeles Stock Exchange was closed on a Friday in November and a special excursion train traveled to Coalinga so potential investors could marvel at the sight.

During the early years of production, there were several important developments in Coalinga. In 1904, a six-inch oil pipeline was laid from Coalinga to Monterey on the coast (104 miles) to provide tanker oil for overseas buyers. The pipeline was built in 90 days and crossed two mountain ranges with maximum elevation of 2,000 feet. In 1916, Coalinga oilfield workers fought for and won the industry's first eight-hour workday. In 1919, A&W Root Beer was formulated in downtown Coalinga. During World War II, Signal Hill oil in Long Beach was brought in. The supply was so great that the existing pipeline flow from Coalinga to the Los Angeles refineries was revered and excess Signal Hill oil was stored in a massive tank farm called Caliola about 10 miles east of Coalinga. Coalinga's oil fields produced some of the oil industry's giants, including R.C. Baker, founder of Baker Oil Tools. His original buildings in Coalinga are now home of the R.C. Baker Memorial Museum, which focuses on oil as well as pioneer life in the Coalinga area.

From the outset, it was said that whiskey was easier to get than water in Coalinga. The natural well water had high amounts of dissolved minerals in it, making it suitable for only the most basic uses of washing and irrigating. To meet this challenge, Coalinga's drinking water was imported. Until 1960, the major source of drinking water was Southern Pacific water wells in Armona. In time, a municipal water service was provided for the central area of town.

In 1960, Coalinga was selected for experimental systems to soften hard water and make it suitable for human consumption. The first of these was an ionic system that was later replaced by the

reverse osmosis method. In April 1972, Coalinga received its first delivery of San Luis Canal water from the state water system.

B.1.3 Economy

While oil was the staple of the local economy, agriculture always played an important role. Before 1972, agriculture was limited to cotton and other salt water resistant crops. With the arrival of canal water, the area has become a region of specialty crops, which include lettuce, tomatoes, asparagus, and a variety of nut and fruit trees.

While there was open speculation that Coalinga would not survive the May 1983 earthquake, the disaster became the catalyst that inspired revitalization. In 1988, the residents approved a bond issue for a new \$14 million community hospital facility to replace the one destroyed in the earthquake. Coalinga completed an 800-acre annexation to include Pleasant Valley State Prison and the new airport in the City limits in 1991. In 1994, the Department of Corrections located a major prison facility in Pleasant Valley. With this as an economic base, the City developed a 40-acre industrial park. To address concerns about proximity to schools and associated noise hazards, the airport was relocated four miles to the east. A brand new \$8 million airport facility was built in 1996. The Coalinga Regional Medical Center was completed in 2002, and construction of a new mental health facility, the Coalinga State Hospital, was completed in the spring of 2005. In the oilfields, a process of steam injection promises to produce \$2.3 billion more barrels of oil, perhaps as much as has already been mined.

Since the 1983 earthquake, significant efforts have been made to rebuild and revitalize the City. These efforts, combined with Coalinga's central geographical location and proximity to the busy Interstate 5 corridor, are expected to diversify the City's economy as state growth continues.

Select estimates of economic characteristics for the City of Coalinga from the American Community Survey (ACS) are shown in Table B.1.

Table B.1: City of Coalinga's Economic Characteristics, 2015

Characteristic	City of Coalinga
Families below Poverty Level	19.7%
All People below Poverty Level	23.2%
Median Family Income	\$58,936
Median Household Income	\$51,860
Per Capita Income	\$17,787
Population in Labor Force	5,969
Population Employed*	5,341
Unemployment	10.5%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables B.2 and B.3 show how the City of Coalinga's labor force breaks down by occupation and industry based on 5-year estimates from the 2015 American Community Survey.

Table B.2: City of Coalinga's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Management, Business, Science and Arts Occupations	1,657	31.0
<i>Management, Business, and Financial Occupations</i>	<i>(487)</i>	<i>(9.1)</i>
<i>Computer, Engineering, and Science Occupations</i>	<i>(86)</i>	<i>(1.6)</i>
<i>Education, Legal, Community Service, Arts, and Media Occupations</i>	<i>(359)</i>	<i>(10.1)</i>
<i>Healthcare Practitioner and Technical Occupations</i>	<i>(725)</i>	<i>(13.6)</i>
Sales and Office Occupations	1,013	19.0
Service Occupations	993	18.6
Natural Resources, Construction, and Maintenance Occupations	950	17.8
Production, Transportation, and Material Moving Occupations	728	13.6
Total	5,341	100.00

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table B.3: City of Coalinga's Employment by Industry, 2015

Industry	# Employed	% Employed
Educational Services, and Health Care, and Social Assistance	1,722	32.2
Agriculture, Forestry, Fishing and Hunting, and Mining	694	13.0
Public Administration	569	10.7
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	469	8.8
Transportation and Warehousing, and Utilities	456	8.5
Retail Trade	446	8.4
Construction	336	6.3
Other Services, Except Public Administration	166	3.1
Professional, Scientific, and Management, and Administrative and Waste Management Services	143	2.7
Manufacturing	137	2.6
Information	104	1.9
Finance and Insurance, and Real Estate and Rental and Leasing	67	1.3
Wholesale Trade	32	0.6
Total	5,341	100.00

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

B.1.4 Population

According to the California Department of Finance, the City of Coalinga's population was estimated to be 16,982 at the start of 2017. Select demographic and social characteristics for the City of Fresno from the U.S. Census Bureau's 2015 American Community Survey 5-year estimates are shown in Table B.4.

Table B.4: City of Coalinga's Demographic and Social Characteristics, 2015*

Characteristic	City of Coalinga
Gender/Age	
Male	62.8%
Female	37.2%
Median age	33.4
Under 5 years	6.6%
Under 18 years	22.2%
65 years and over	6.6%
Race/Ethnicity**	
White	58.0%
Asian	2.7%
Black or African American	7.7%
American Indian/Alaska Native	0.7%
Hispanic or Latino (of any race)	51.1%
Education	
High school graduate or higher	73.0%
Disability Status	
Population 5 years and over	10.3%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Based on a 2015 estimated population of 16,940

**Of the 94.4% reporting one race

B.2 Hazard Identification and Summary

Coalinga’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the City (see Table B.5). In the context of the planning area, there are no hazards unique to Coalinga.

Table B.5: City of Coalinga—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Unlikely	Critical	Low
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	High
Flood/Levee Failure	Extensive	Likely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Unlikely	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Medium
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	High
<div> <div> Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area </div> <div> Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years. </div> <div> Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid </div> <div> Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact </div> </div>				

B.3 Vulnerability Assessment

The intent of this section is to assess Coalinga’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. Additional criteria for assessing vulnerability are identified below.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Coalinga’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Coalinga.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table B.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Coalinga’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table B.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Coalinga are identified below. The discussion of vulnerability related information for each of the following hazards is located in Section B.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include drought, earthquake, and wildfire.

- drought
- earthquake
- flood/levee failure
- hazardous materials incidents
- human health hazards: epidemic/pandemic
- severe weather: extreme cold; extreme heat; windstorm; winter storm
- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Coalinga, those hazards are as follows:

- agricultural hazards*
- dam failure*
- human health hazards: West Nile Virus
- landslide
- fog
- heavy rain/thunderstorm/hail/lightning
- tornado
- soil hazards
- volcano

Note on Agricultural Hazards*: Although ranked High by the County, the City ranks it as Low. According to the Committee, as the City's economy has diversified and become less reliant on agriculture, vulnerability to this hazard has declined, resulting in a lower overall priority rating.

Note on Dam Failure*: Although the County ranks dam failure as High in significance, the City determined the hazard to be of Low significance given that the only dam in the City is the Silt Pond dam, an extremely small dam at just 25 acres-feet of capacity.

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. **Avalanche** is considered not applicable to the City of Coalinga.

B.3.1 Assets at Risk

This section considers Coalinga's assets at risk, including population (previously discussed in Section B.1.4); values at risk; critical facilities and infrastructure; and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a

disaster it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table B.6 shows the 2017 values at risk broken down by property type for the City of Coalinga.

Table B.6: 2017 Property Exposure for the City of Coalinga by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	2	2	\$169,412	\$169,412	\$338,824
Commercial	207	456	\$50,008,372	\$50,008,372	\$100,016,744
Exempt	51	75	\$0	\$0	\$0
Industrial	45	57	\$10,263,329	\$15,394,994	\$25,658,323
Multi-Residential	184	337	\$64,311,054	\$32,155,527	\$96,466,581
Residential	2,782	2,870	\$268,992,081	\$134,496,041	\$403,488,122
Total	3,271	3,797	\$393,744,248	\$232,224,345	\$625,968,593

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Coalinga from Fresno County GIS is provided in Table B.7 and mapped in Figure B.2.

Table B.7: City of Coalinga's Critical Facilities

Critical Facilities Type	Number
Airport	1
Colleges & Universities	2
Communications	1
Department of Public Works	1
Fire Station	3
Health Care	1
Police	3
School	10
Total	22

Source: Fresno County, HIFLD 2017

Figure B.2: City of Coalinga's Critical Facilities

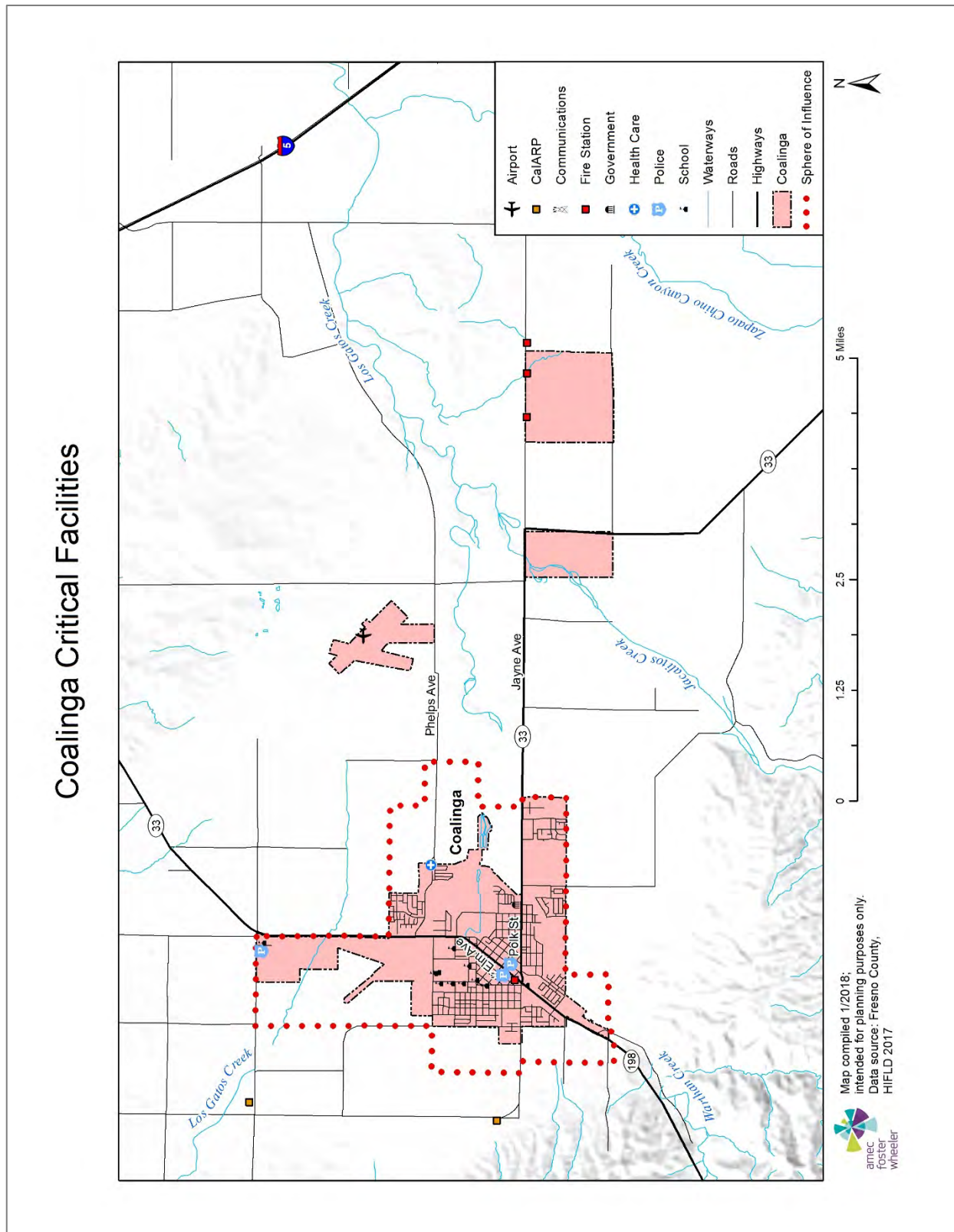


Table B.8 lists particular critical facilities and other community assets identified by Coalinga’s planning team as important to protect in the event of a disaster.

Table B.8: Specific Critical Facilities and Other Community Assets Identified by the City of Coalinga’s Planning Team

Name of Asset	Replacement Value (\$)	Occupancy/ Capacity #
City Hall Building, 160 W. Elm Avenue	1,925,148	15,791
City Hall Building (Building Expansion), 155 W. Durian Avenue	4,901,358	21,060
Corporation Yard, 135 Sacramento	33,101	1,600
Coalinga Airport Facility	6,602,127	
Waste Water Treatment Facility, 60500 Jayne Ave	528,000	
Water Filtration Plant, 25034 W. Palmer Avenue	684,1332	
Water System, Palmer Avenue Tank	188,515	250,000 gallons
Water System, Oil King Tank	377,029	500,000 gallons
Water System, Derrick Avenue Tank	3,198,468	8,000,000 gallons
Water System, Palmer Avenue Tank	1,421,543	3,000,000 gallons
Water System, Calaveras Avenue Tank	1,444,290	5,000,000 gallons
Palmer Ave, Repeater Station, Emergency Communications	9,198	
Fire Station, City	1,421,543	12,254

Growth and Development Trends

Table B.9 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2017.

Table B.9: City of Coalinga’s Change in Population and Housing Units, 2010-2017

2010 Population	2017 Population Estimate	Estimated Percent Change 2010-2017	2010 # of Housing Units	2017 Estimated # of Housing Units	Estimated Percent Change 2010-2017
13,380	16,982	+26.92	4,344	4,482	+3.18

Source: U.S. Census Bureau 2010 Census; California Department of Finance, www.dof.ca.gov/Forecasting

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

B.3.2 Estimating Potential Losses

Table B.6 above shows Coalinga’s exposure to hazards in terms of number and value of structures. Fresno County’s assessor’s data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. Impacts of past events and vulnerability to specific hazards are further discussed below in accordance with the criteria identified under section B.3 Vulnerability Assessment and

Table B.5 above. (See Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Drought

The risk and vulnerability factors for this hazard are not unique to the City and the hazard potentially impacts the entire planning area. Please see the main plan's coverage of the Drought hazard in Section 4.

Earthquake

There are several faults in the vicinity of Coalinga that could cause problems in the future. These include the Nuñez fault, located about ten kilometers northwest of Coalinga; the Coalinga fault, located five kilometers northeast of Coalinga; and the New Idria fault; located approximately 21 miles northwest of Coalinga. The U.S. Geological Survey is predicting an earthquake in Parkfield in Monterey County, approximately 15 miles southwest of Coalinga. Coalinga is the only urban area in the County directly affected by earthquake-related settlement.

Two earthquakes of note that occurred in or near Coalinga are described below:

- **May 2, 1983**—In Coalinga, a surface rupture occurred along the Nuñez fault. The main shock was magnitude 6.7 on the Richter scale. Approximately 800 buildings were destroyed, and 1,000 people left homeless. No deaths resulted, but 200 people were injured. Private homeowner losses exceeded \$25 million. Public agency losses approximated \$6 million. The commercial section of Coalinga was heavily damaged; however, most schools and the hospital received only slight damage. Production in nearby oil fields was shut down. The City was left with numerous vacant parcels and city-owned lots. Local, state, and federal disaster declarations resulted.
- **August 4, 1985**—A magnitude 6.0 earthquake occurred that was centered about 10.5 kilometers east of Coalinga.

Flood/Levee Failure

According to FEMA's 2016 Flood Insurance Study (FIS), Coalinga's principal flood problems are associated with Los Gatos Creek and Warthan Creek. The Los Gatos Creek headwaters are approximately 22 miles northwest of the City in the eastern foothills of the Coast Range. The creek enters the northern portion of the City flowing east-southeast. The creek flows just north of the sewage treatment plant. The Warthan Creek headwaters are located approximately 16 miles southwest of the City in the eastern foothills of the Coast Range. Warthan Creek enters Coalinga from the south and flows through the southeastern portion of the City before leaving just north of the intersection of East Polk Street and Alicia Avenue. From there, the creek continues for less than a mile to its confluence with Los Gatos Creek just northwest of the sewage treatment plant. Some areas in the City are subject to shallow overland flooding caused by insufficient channel capacity of Los Gatos Creek or insufficient levee height on Warthan Creek.

According to the 2016 FIS, floods occurred in or around Coalinga in 1952, 1958, 1962, 1966, 1969, 1976, and 1978. Details on some of these events follow:

- **April 1958**—Flooding affected mainly agricultural lands and public facilities, such as roads and bridges.
- **December 1966**—Flooding caused extensive road and bridge damage in the upper reaches of Los Gatos and Warthan Creeks. East of the City, sewage treatment facilities and the levees along Warthan Creek were damaged, the Los Gatos Creek channel was severely eroded, and there was extensive damage to utilities and agricultural land. Damage totaled approximately \$570,000, and floodwater inundated 4,500 acres.
- **February 1969**—The largest and most damaging flood in Coalinga’s recorded history occurred when floodwater from Los Gatos and Warthan Creeks covered 16,600 acres and caused approximately \$4.5 million in damage. Flooding extended from the foothills west of the City to the valley east of the City. Bridges and roads were washed out, agricultural land was eroded, farm and ranch improvements and petroleum installations were damaged and destroyed, areas were isolated, traffic was disrupted, and residential and commercial areas in the northwest and southeast portions of the City were damaged.
- **February 1978**—Flooding occurred along Los Gatos Creek from the foothills to the valley floor and damaged agricultural lands, roads and bridges, and utilities. An estimated 4,500 acres were flooded. Damage totaled \$160,000.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Coalinga was created (see Figure B.3). Tables B.10 and B.11 summarize the values at risk in the City’s 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Figure B.3: City of Coalinga's 100- and 500-Year Floodplains

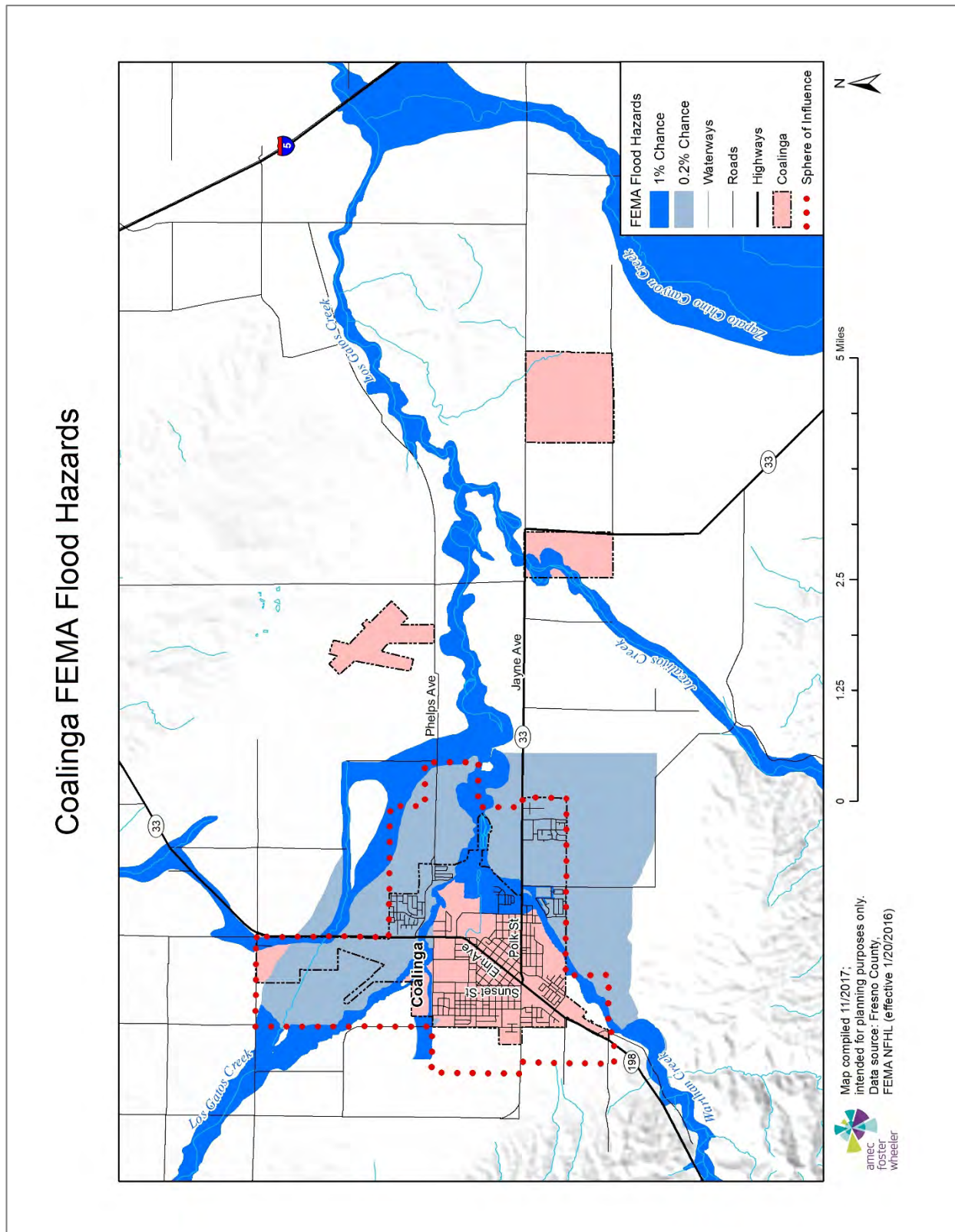


Table B.10: City of Coalinga's FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	1	\$66,463	\$66,463	\$132,926	\$33,232
Commercial	3	109	\$1,088,393	\$1,088,393	\$2,176,786	\$544,197
Exempt	1	1	\$0	\$0	\$0	\$0
Multi-Residential	3	5	\$82,927	\$41,464	\$124,391	\$31,098
Residential	101	105	\$8,863,171	\$4,431,586	\$13,294,757	\$3,323,689
Total	109	221	\$10,100,954	\$5,627,905	\$15,728,859	\$3,932,215

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table B.11: City of Coalinga's FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	7	70	\$4,983,568	\$4,983,568	\$9,967,136	\$2,491,784
Exempt	6	6	\$0	\$0	\$0	\$0
Industrial	3	2	\$4,264,378	\$6,396,567	\$10,660,945	\$2,665,236
Multi-Residential	2	14	\$9,920,000	\$4,960,000	\$14,880,000	\$3,720,000
Residential	565	574	\$81,806,142	\$81,806,142	\$163,612,284	\$40,903,071
Total	583	666	\$100,974,088	\$98,146,277	\$199,120,365	\$49,780,091

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

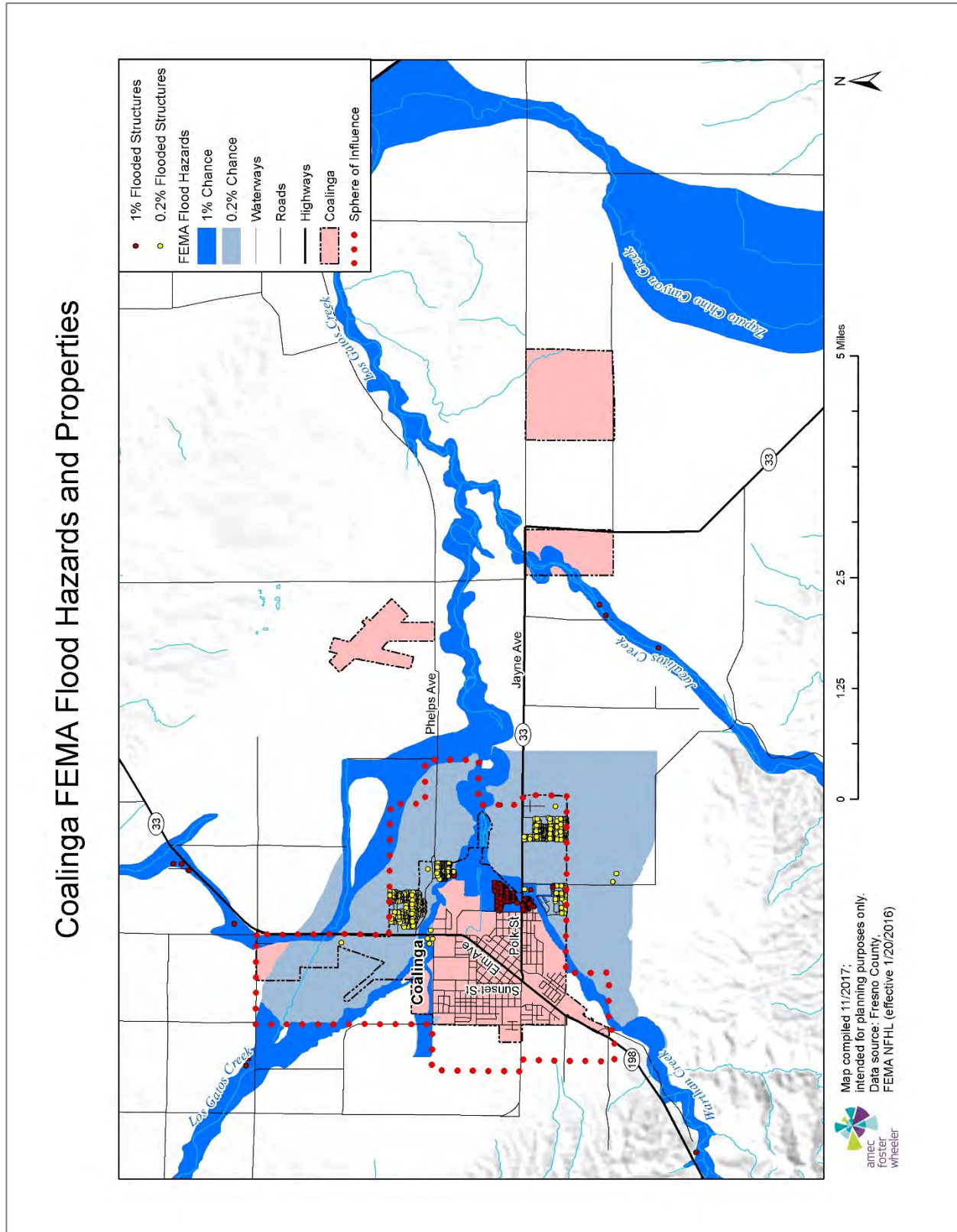
Based on this analysis, the City of Coalinga has significant assets at risk to the 100-year and greater floods. There are 109 improved parcels within the 100-year floodplain for a total value of roughly \$15.7 million. An additional 583 improved parcels valued at roughly \$199 million fall within the 500-year floodplain.

Applying the 25 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly \$3.9 million in damage in the City of Coalinga and a 0.2 percent chance in any given year of a 500-year flood causing roughly \$53.7 million in damage (combined damage from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Properties at risk to flooding are shown in relation to the floodplain in Figure B.4.

Figure B.4: City of Coalinga's Properties at Risk in the 100- and 500-Year Floodplains



Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the U.S. Census Bureau 2016 estimate for the average number of persons per household (3.17). The following are at risk to flooding in the City of Coalinga:

- 100-year flood—320 people
- 500-year flood—1,797 people
- **Total flood**—2,117 people

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Coalinga joined the National Flood Insurance Program (NFIP) on August 23, 1982. NFIP Insurance data indicates that as of June 30, 2017 there were 60 flood insurance policies in force in the City with \$12,902,300 of coverage. This coverage represents a 38 percent decrease in coverage over the past decade. Of the 60 policies in force, all were residential. Fifty of the policies were in A Zones (A01-30 & AE Zones and AO Zones) and the remaining 10 were in B, C, and X zones. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction. There have been no historical claims for flood losses.

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table B.12 lists the critical facilities in the City's 100- and 500-year floodplains.

Table B.12: Critical Facilities in the 100- and 500-Year Floodplains: City of Fresno

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Colleges & Universities	1	0
Department of Public Works	1	0
Health Care	-	1
Total	2	1

Source: Fresno County, HIFLD 2017

Hazardous Materials Incident

Hazardous materials likely to be involved in a spill or release within the City include herbicides, pesticides, chemicals in gas, liquid, solid, or slurry form; flammables; explosives; petroleum products; toxic wastes; and radioactive substances. The County Health Department is the designated administering agency for the Fresno County area hazardous material monitoring program.

A total of 5 incidents have occurred in the City of Coalinga between 2009 and 2016, including one fixed site incident (at a building), three storage tank/platform/pipeline (not specified), and one mobile vehicle incident. Four of the five incidents were related to oil spills, with one unknown material spill. No property damage and no injuries were reported. (Source: <http://www.rtk.net/erns/search.php>)

There are no identified CalARP hazardous materials facilities located in the City of Coalinga.

Human Health Hazards: Epidemic/Pandemic

The risk and vulnerability factors for this hazard are not unique to the City and the hazard potentially impacts the entire planning area. Please see the main plan's coverage of this hazard in Section 4.

Severe Weather: Extreme Cold/Freeze

The City of Coalinga does not have a record of past severe weather events, but significantly low temperatures have occurred in the City. Extreme cold can be exacerbated by winds, as the most common wind condition in Coalinga, is caused by severe winter storms.

Severe Weather: Extreme Heat

The City of Coalinga has experienced very high temperatures. High temperatures have exceeded 110°F and resulted in loss of crops, livestock, and wages (workers were sent home) as well as the temporary closure of schools. Very high temperatures in August 1997 contributed to five deaths. Also, during California's fire season, high temperatures have hampered firefighting efforts.

Wildfire

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a fire map for the City of Coalinga was created (see Figure B.5). An analysis was performed using GIS software to determine where populations, values at risk, and critical facilities are located within wildfire threat zones. Tables B.13 and B.14 show the values at risk in the high and moderate wildfire threat zones (there are no values at risk in the very high threat zone). Among the City's critical facilities, two are located in wildfire threat zones: a maintenance yard is in the high fire hazard zone and a health care facility is in the moderate fire hazard zone.

Table B.13: Values at Risk to Wildfire (High Threat) in the City of Coalinga

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	1	\$66,463	\$66,463	\$132,926
Commercial	4	118	\$1,419,770	\$1,419,770	\$2,839,540
Multi-Residential	3	5	\$151,816	\$75,908	\$227,724
Residential	234	244	\$29,036,494	\$14,518,247	\$43,554,741

Total	242	368	\$30,674,543	\$16,080,388	\$46,754,931
--------------	------------	------------	---------------------	---------------------	---------------------

Sources: Fresno County 2017 Parcel and Assessor data

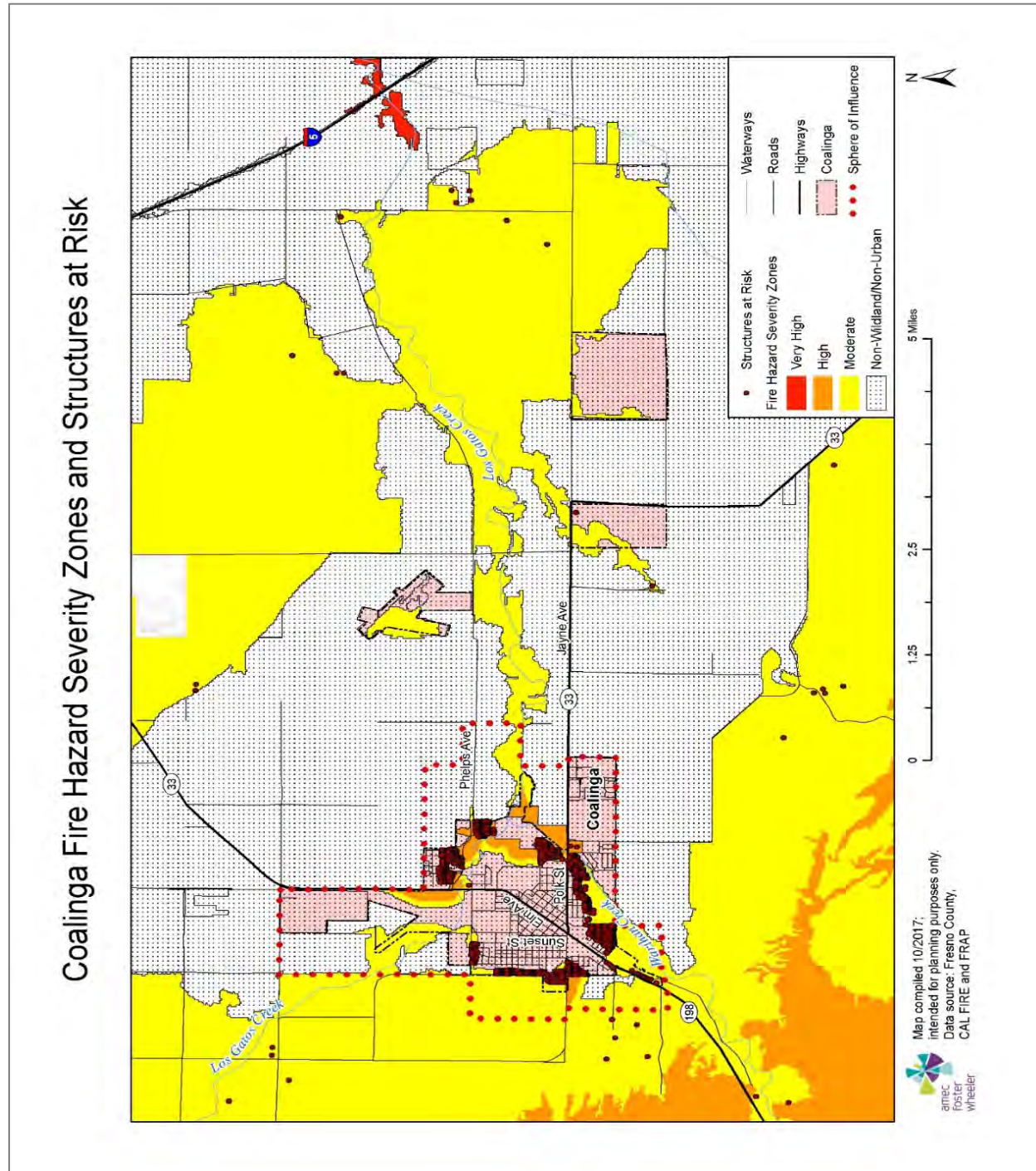
Table B.14: Values at Risk to Wildfire (Moderate Threat) in the City of Coalinga

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	1	\$102,949	\$102,949	\$205,898
Commercial	3	59	\$1,996,374	\$1,996,374	\$3,992,748
Exempt	3	2	\$0	\$0	\$0
Industrial	16	16	\$1,780,623	\$2,670,935	\$4,451,558
Multi-Residential	12	18	\$15,122,867	\$7,561,434	\$22,684,301
Residential	542	554	\$58,954,216	\$29,477,108	\$88,431,324
Total	577	650	\$77,957,029	\$41,808,799	\$119,765,828

Sources: Fresno County 2017 Parcel and Assessor data

Based on this analysis, the City of Coalinga has significant assets at risk to a wildfire. There are 242 improved parcels valued at roughly \$46.8 million within the high wildfire threat zone. Based on the average household factor for Fresno County and the number of residential properties at risk, there are 751 people living within the high threat zone. There are an additional 1,756 people and 577 improved parcels valued at roughly \$119.8 million within the moderate wildfire threat zone. The majority of the parcels in both of these zones are residential.

Figure B.5: City of Coalinga's Wildfire Threat



B.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into four sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation outreach and partnerships.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Coalinga's updated capabilities are summarized below.

B.4.1 Regulatory Mitigation Capabilities

Table B.15 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Coalinga.

Table B.15: City of Coalinga's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	Certified by Council 2009
Zoning ordinance	Yes	Currently adopted
Subdivision ordinance	Yes	Uses by reference Subdivision Map Act
Site plan review requirements	Yes	Included in Zoning Ordinance
Growth management ordinance	No	Included in Zoning Ordinance and proposed in general plan update
Floodplain ordinance	Yes	Adopted in 2006 in accordance with FEMA and OES guidelines and FEMA approved
Other special purpose ordinance (stormwater, water conservation, wildfire)	No	Storm Water Master Plan, approved April 3, 2008
Building code	Yes	Adopted by reference in the Municipal Code
Fire department ISO rating	Yes	Rating: 3
Erosion or sediment control program	No	By reference in Subdivision Map Act and Zoning Ordinance/Building Code
Stormwater management program	No	Adopted Storm Water Master Plan
Capital improvements plan	Yes	Five-year implementation plan
Economic development plan	No	RDA % yr. Implementation Plan
Local emergency operations plan	Yes	
Other special plans	Yes	Wastewater Master Plan Water Master Plan, Natural Gas Master Plan, Downtown Design Guidelines, Residential Design Guidelines

Regulatory Tool	Yes/No	Comments
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016

B.4.2 Administrative/Technical Mitigation Capabilities

Table B.16 identifies the personnel responsible for activities related to mitigation and loss prevention in Coalinga.

Table B.16: City of Coalinga’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Community Development Director
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Tri-City Engineering
Planner/engineer/scientist with an understanding of natural hazards	Yes	
Personnel skilled in GIS	No	
Full time building official	Yes	
Floodplain manager	Yes	City Engineer
Emergency manager	Yes	City Manager
Grant writer	Yes	Community Development Director
Other personnel	No	
GIS Data—Land use	No	Participation with Fresno County
GIS Data—Links to Assessor’s data	No	Participation with Fresno County
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	Civil defense horn
Other	Yes	Community Development Director

B.4.3 Fiscal Mitigation Capabilities

Table B.17 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table B.17: City of Coalinga’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	Development impact fees
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Connection fees, utility fees, and development impact fees
Impact fees for new development	Yes	Sec. 66000 Development Impact Fee
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

B.4.4 Mitigation Outreach and Partnerships

The City of Coalinga partnered with the Coalinga-Huron Unified School District in the development of the Coalinga-Huron Unified School District Natural Hazards Mitigation Plan, which was completed in 2005.

B.4.5 Opportunities for Enhancement

Based on the capabilities assessment, the City of Coalinga has several existing mechanisms in place that already help to mitigate hazards. In addition to these existing capabilities, there are also opportunities for the City to expand or improve on these policies and programs to further protect the community. These opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Stormwater Management Program. One opportunity of enhancement for the City is to build on its existing Storm Water Master Plan, approved in 2008, and create a stormwater management program with staff to help implement and enforce the existing Master Plan as well as develop an update for the plan.
- Develop a Drought Contingency Plan that will help to create a framework for drought response and mitigation in the City of Coalinga.

B.5 Mitigation Strategy

B.5.1 Mitigation Goals and Objectives

The City of Coalinga adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Community Development Department, which is comprised of the Planning, Engineering, and Building and Code Enforcement divisions, may utilize the hazard information when reviewing site plans or building permit applications. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Coalinga will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1982. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

B.5.2 Completed 2009 Mitigation Actions

The City of Coalinga completed two mitigation actions identified in the 2009 plan. These completed actions are:

- Inventory At-Risk Buildings
- Improve Nonstructural Earthquake Mitigation in Public Buildings

Completing these actions has reduced the City of Coalinga's vulnerability to hazards and increased the City's capability to implement additional mitigation actions.

Note: There is one action from the City of Coalinga's 2009 mitigation strategy that the City has not completed but has decided not to carry forward and recommend for implementation in this plan. The deleted action and the reason for their deletion are as follows:

- Provide Bilingual Neighborhood Emergency Response Team (NERT) Training to Community Residents and Businesses – *upon review, this action was considered a response-related activity rather than hazard mitigation*

B.5.3 Mitigation Actions

The planning team for the City of Coalinga identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

In addition to implementing the mitigation actions below the City of Coalinga will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought, earthquake, and wildfire. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Plan for Alternative Water Sources for the Water System

Hazard(s) Addressed: drought, earthquake, wildfire

Issue/Background: The City of Coalinga currently receives its water from the California Aqueduct. This canal system is approaching 50 years old and is likely to need some major repairs in the future. The current water system is capable of supplying water to the city for 4-5 days in the event water from the aqueduct is lost. Having wells as a backup water supply will also help mitigate drought by providing a reliable source in case of low water supply in the California Aqueduct.

Ideas for Implementation: Construct two new wells as backup water sources for the City.

Other Alternatives: Rely on truck delivery of water as the only alternative

Responsible Office: City of Coalinga Public Works

Priority (High, Medium, Low): High

Cost Estimate: \$300,000 (\$150,000 per well. Two wells needed. One at water treatment plant and one in town)

Potential Funding: Water enterprise funds/bond.

Benefits (Avoided Losses): The City will have an alternative water source in the event that the California Aqueduct is not able to provide sufficient supply.

Schedule: Preliminary engineering 2/2018. Design 5/2018. Construction 9/2018.

Status: New project

2. Plan For Water System Sustainability In The Event of Long Term Power Failure

Hazard(s) Addressed: drought, earthquake, severe weather, wildfire

Issue/Background: The City of Coalinga currently receives its water from the California Aqueduct and the Pleasant Valley Canal system. Water that has been treated at the Water Treatment Plant (WTP) is pumped uphill with electric water pumps to Palmer Tank, and the water gravity feeds from that location to the remainder of the water system. If there is a loss of power, the main link of the water system is removed. This project would evaluate the cost/benefit of installing an emergency generator which would keep the plant operational during this loss of power.

Ideas for Implementation: Install an emergency generator to power the Water Treatment Plant during power outages.

Other Alternatives: Rely on truck delivery of water as the only alternative

Responsible Office: City of Coalinga Public Works

Priority (High, Medium, Low): High

Cost Estimate: \$150,000

Potential Funding: Water enterprise funds/bond.

Benefits (Avoided Losses): The Water Treatment Plant will not be vulnerable to power outages.

Schedule: Preliminary engineering 02/2018. Design 04/2018. Construction 06/2018.

Status: New project

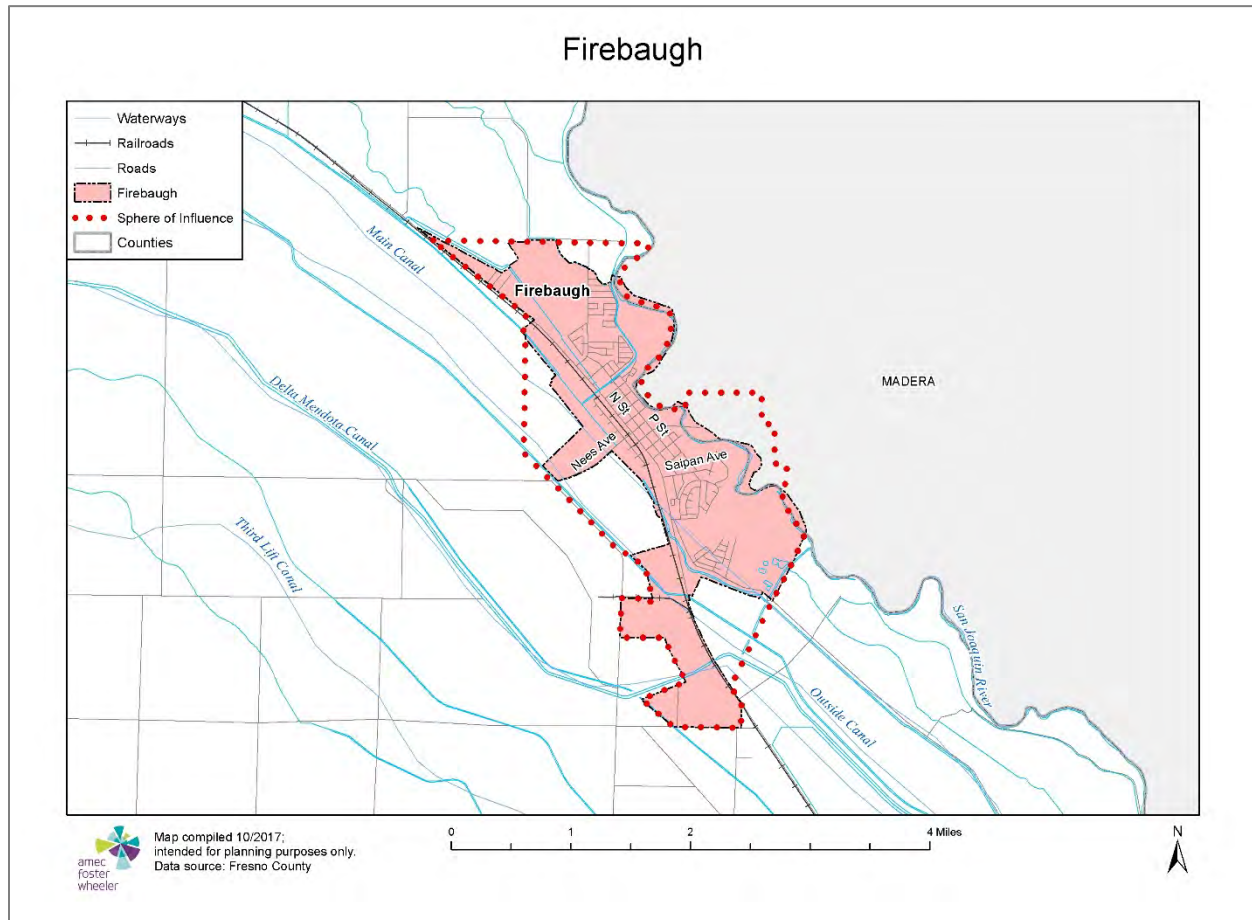


ANNEX C: CITY OF FIREBAUGH

C.1 Community Profile

Figure C.1 displays a map and the location within Fresno County of the City of Firebaugh and its Sphere of Influence.

Figure C.1: The City of Firebaugh



C.1.1 Geography and Climate

Firebaugh is situated in western Fresno County along the Madera County border, approximately 38 miles west of the City of Fresno. The City sits on the west bank of the San Joaquin River. Firebaugh and its Sphere of Influence cover a 3,411-acre area, 2,408 acres of which is within the city limits. The San Joaquin Valley Railroad passes through downtown Firebaugh, as does State Route 33, which connects the City with the Mendota, approximately 7 miles to the south.

C.1.2 History

In 1854, Andrew Firebaugh established a trading post and ferry on the San Joaquin River. Known as Firebaugh's Ferry, it was a station on the great Butterfield Overland Stage Route. Andrew Firebaugh also built the first road over Pacheco Pass, and in 1872, he was one of the founders of the "The Academy," Fresno County's first secondary school. When he died in 1875, he was buried on his homestead some ten miles above there on the Tollhouse Road. Firebaugh is one of the oldest historical towns on the Westside of the San Joaquin River, and Firebaugh's Ferry was the major crossing for prospectors heading for gold country. The City of Firebaugh was incorporated in 1914.

C.1.3 Economy

Select estimates of economic characteristics for the City of Firebaugh are shown in Table C.1.

Table C.1: City of Firebaugh's Economic Characteristics, 2015

Characteristic	City of Firebaugh
Families below Poverty Level	27.8%
All People below Poverty Level	33.5%
Median Family Income	\$41,104
Median Household Income	\$39,150
Per Capita Income	\$12,490
Population in Labor Force	3,828
Population Employed*	3,354
Unemployment	12.4%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables C.2 and C.3 detail how the City of Firebaugh labor force breaks down by occupation and industry based on estimates from the 2015 American Community Survey.

Table C.2: City of Firebaugh's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Natural Resources, Construction, and Maintenance Occupations	1,373	40.9
Service Occupations	627	18.7
Production, Transportation, and Material Moving Occupations	533	15.9
Management, Business, Science, and Arts Occupations	463	13.8
Sales and Office Occupations	358	10.7
Total	3,354	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table C.3: City of Firebaugh's Employment by Industry, 2015

Industry	# Employed	% Employed
Agriculture, Forestry, Fishing and Hunting, and Mining	1,248	37.2
Educational Services, and Health Care and Social Assistance	491	14.6
Other Services, Except Public Administration	231	6.9
Transportation and Warehousing, and Utilities	226	6.7
Manufacturing	221	6.6
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	217	6.5
Wholesale Trade	175	5.2
Finance and Insurance, and Real Estate and Rental and Leasing	134	4.0
Retail Trade	131	3.9
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	129	3.8
Construction	108	3.2
Public Administration	43	1.3
Information	0	0.0
Total	3,354	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

C.1.4 Population

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the 2015 population for the City of Firebaugh was estimated at 8,084. Select demographic and social characteristics for the City of Firebaugh from the 2015 ACS are shown in Table C.4.

Table C.4: City of Firebaugh Demographic and Social Characteristics, 2015

Characteristic	City of Firebaugh
Gender/Age	
Male	53.6%
Female	46.4%
Median age	25.6
Under 5 years	7.3%
Under 18 years	34.8%
65 years and over	5.1%
Race/Ethnicity*	
White	83.0%
Asian	0.0%
Black or African American	0.0%
American Indian/Alaska Native	0.9%
Hispanic or Latino (of any race)	92.9%
Education	
High school graduate or higher	41.6%
Disability Status	
Population 5 years and over with a disability	10.0%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 98.3% reporting one race

C.2 Hazard Identification and Summary

Firebaugh’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Firebaugh (see Table C.5). In the context of the plan’s planning area, there are no hazards that are unique to Firebaugh.

Table C.5: City of Firebaugh—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	High
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	High
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Likely	Critical	Medium
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

C.3 Vulnerability Assessment

The intent of this section is to assess Firebaugh’s vulnerability separate from that of the planning area as a whole, which has already been assessed in **Section 4.3 Vulnerability Assessment** in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the outreach process in 2017-2018. Firebaugh is a new jurisdiction that participated in the 2017-2018 Fresno County Multi-Hazard Mitigation Plan Update. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table C.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Firebaugh’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table C.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Firebaugh are identified below. The discussion of vulnerability for each of the following hazards is located in Section C.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include agricultural hazards, dam failure, drought, flood/levee failure and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood
- hazardous materials incident
- human health hazards: epidemic/pandemic
- severe weather: fog; windstorm; winter storm
- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Firebaugh, those hazards are as follows:

- human health hazards: West Nile Virus
- severe weather: extreme cold/freeze, extreme heat, heavy rain/thunderstorm/hail/lightning, tornado
- soil hazards
- volcano

Additionally, the City's planning team decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and probability of occurrence. **Avalanche** and **landslide** are considered not applicable to the City of Firebaugh.

C.3.1 Assets at Risk

This section considers Firebaugh's assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table C.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Firebaugh.

Table C.6: 2017 Property Exposure for the City of Firebaugh by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	0	\$36,439	\$36,439	\$72,878
Commercial	113	193	\$15,960,117	\$15,960,117	\$31,920,234
Exempt	29	235	\$0	\$0	\$0
Industrial	48	66	\$42,456,095	\$63,684,143	\$106,140,238
Multi-Residential	54	112	\$16,678,150	\$8,339,075	\$25,017,225
Open Space	1	0	\$1,944	\$1,944	\$3,888
Residential	1,313	1,418	\$115,759,507	\$57,879,754	\$173,639,261
Total	1,559	2,024	\$190,892,252	\$145,901,471	\$336,793,723

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation.

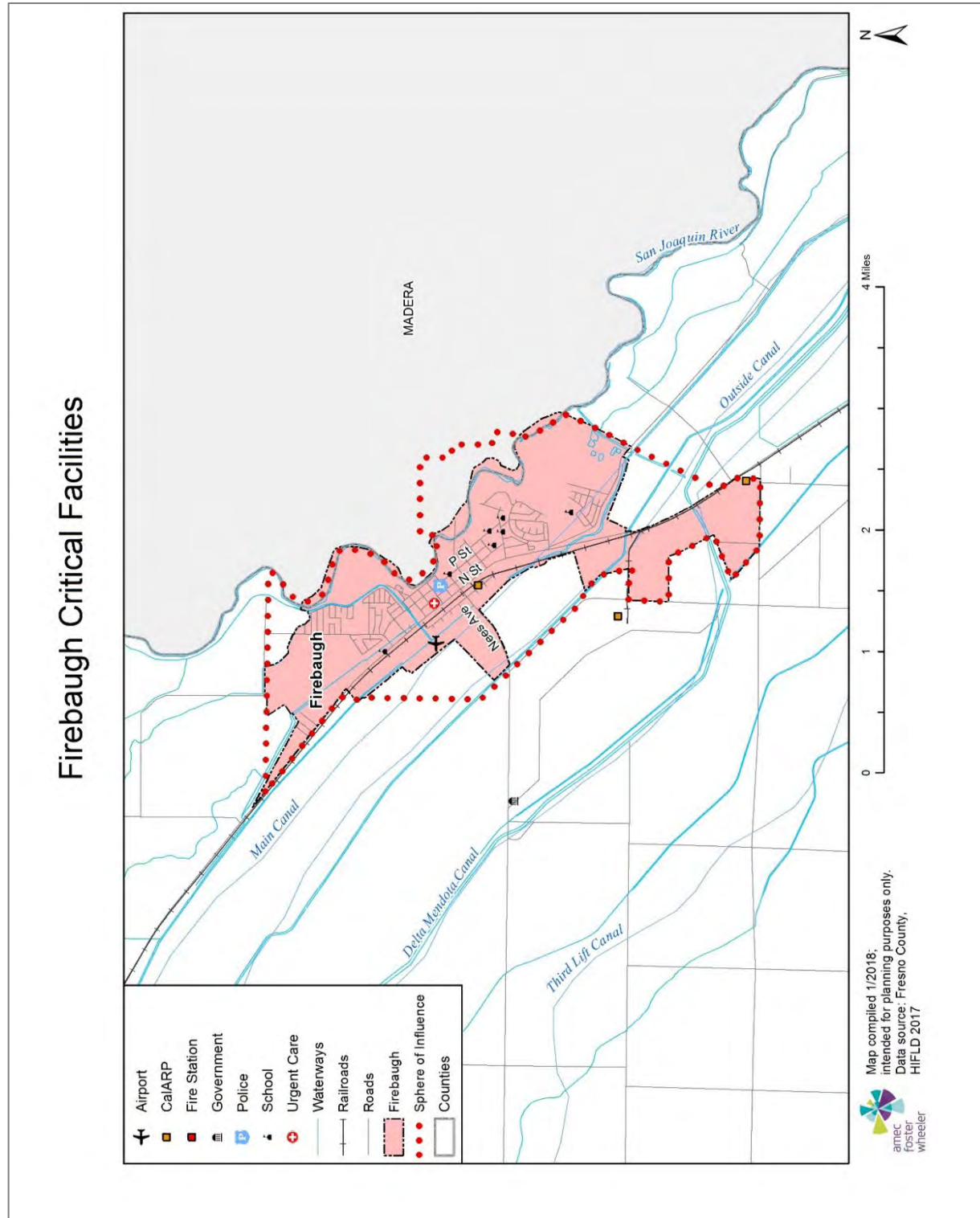
An inventory of critical facilities in the City of Firebaugh is provided in Table C.7 and mapped in Figure C.2.

Table C.7: City of Firebaugh's Critical Facilities

Critical Facility Type	Count
Airport	1
CalARP	2
Fire Station	1
Police	1
School	9
Urgent Care	1
Total	15

Source: Fresno County, HIFLD 2017

Figure C.2: City of Firebaugh's Critical Facilities



Historic Resources

The City of Firebaugh does not have any properties listed on the National Register of Historic Places. However, the City is home to a historical jail. Completed around 1885, this jail is one of only two Lincoln-log style jails still in existence in California. This unique type of construction has no frame and uses square nails and wood plank floors. The partially restored jail had been placed at various locations throughout Firebaugh before being moved to its final resting place at the Firebaugh Rodeo Grounds, which is east of its original site on the northwest corner of P and 13th Street.

Economic Assets

Often referred to as the Hub of the Great West Side, Firebaugh is probably best known as an important agricultural area. Major crops grown in the area include fruits, vegetables, nuts and fiber crops including tomato, garlic, cantaloupes, and cotton. Along with agriculture, diversity has been developing Firebaugh; new growth in manufacturing, packing and processing plants has enhanced Firebaugh's economic outlook.

Growth and Development Trends

The City's 2030 General Plan Proposed Land Use Map is shown in Figure C.3. For the City's Sphere of Influence, the General Plan proposes mostly industrial uses in the southwest as well as some expansion of residential, park, open space, and agricultural uses to the east.

Table C.8 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2015. As of 2015, the population of Firebaugh was 8,084 with an average growth rate of 7.09 percent.

Table C.8: City of Firebaugh's Change in Population and Housing Units, 2010-2015

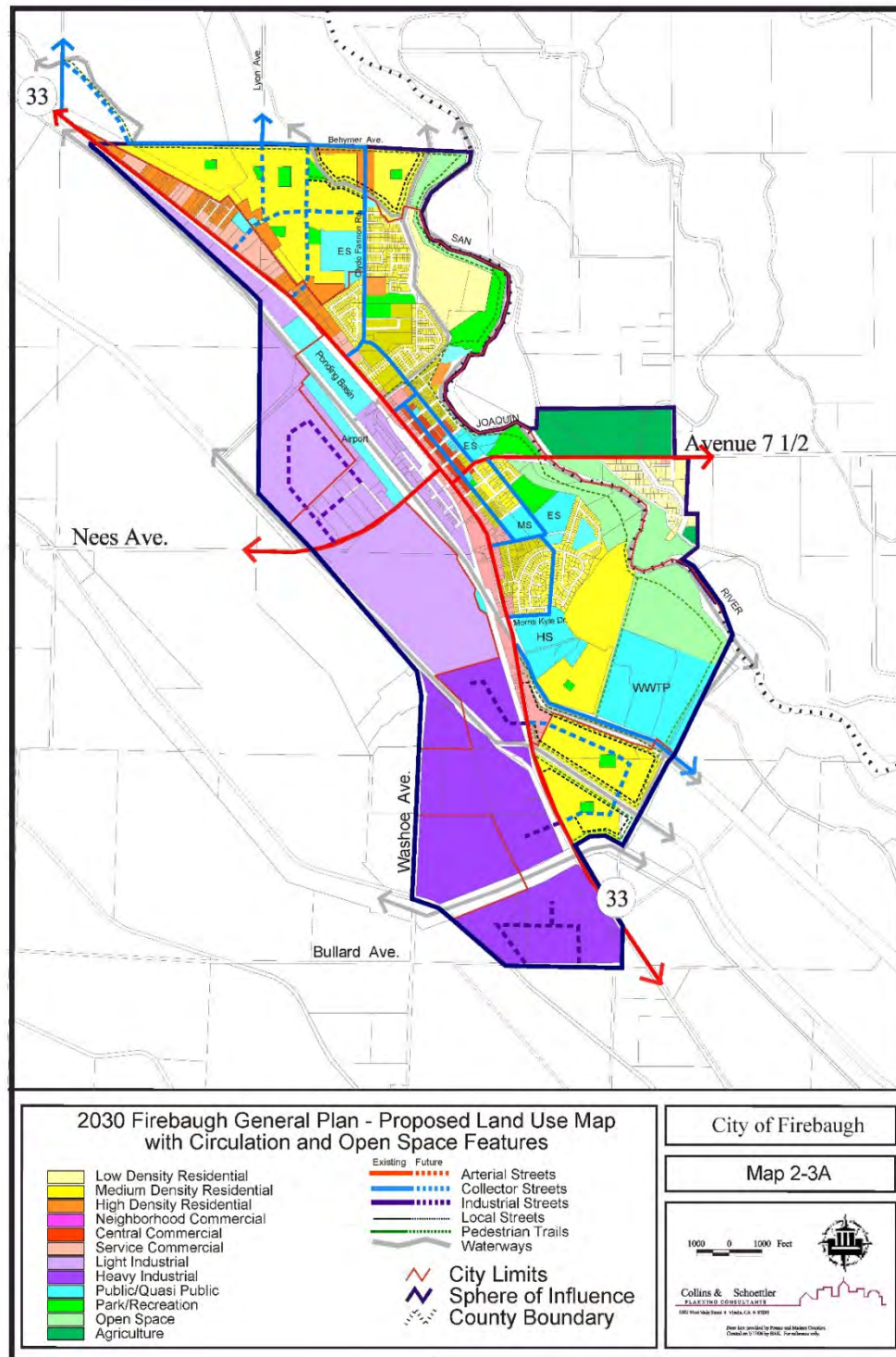
2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2015
7,549	8,084	+7.09	2,096	2,248	+7.25

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2011-2015 5-Year Estimates

Of the 2,096 housing units in Firebaugh, 93.1 percent are occupied. Owner-occupied units account for 52.5 percent of all occupied housing. Single family detached homes comprise 62.8 percent of the housing stock in the City, and mobile homes account for another 8.5 percent of the housing stock.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

Figure C.3: City of Firebaugh's Proposed Land Use Map



C.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table C.6 above shows Firebaugh's exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 1,213 parcels in the 100- and 500-year floodplains in the City of Firebaugh. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County as a whole).

Note: Earthquake, Epidemic/Pandemic, Fog, Windstorm, and Winter Storm are considered Medium priority hazards by the City of Firebaugh but are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to these hazards.

Agricultural Hazards

Given that agriculture is the predominant industry in the City of Firebaugh, agricultural hazards such as pests and blight, as well as other natural hazards like extreme heat, drought, and flood, which can have secondary adverse effects on crop production, are significant hazards in the City.

Dam Failure

The City of Firebaugh is downstream from the Mendota Diversion dam, which could cause flooding in the event of a failure. Additionally, the HMPC reported that due to Firebaugh's location on the San Joaquin River and the size of the Friant Dam impoundment on Millerton Lake, the City could also be impacted in the event of a failure of that structure.

Drought

While the HMPC noted that drought is a significant hazard to the City, the local risk and vulnerability to drought does not differ substantially from that of the overall county. See Chapter 4 Risk Assessment for overall risk and vulnerability to drought.

Flood/Levee Failure

The most recent FEMA Flood Insurance Rate Map (FIRM) affecting the City of Firebaugh was updated in February 2009. According to the FIRM, large portions of the planning area are subject to 100-year (or 1-percent-annual-chance) flooding by the San Joaquin River and areas in the south of the planning area are subject to flooding by the Panoche Creek.

According to FEMA’s 2016 Flood Insurance Study (FIS), damaging floods occurred in Firebaugh and the surrounding area in 1958, 1969, and 1983. Details on some of these events follow:

- **April 1958**—The Panoche Creek flooded 9,700 acres and estimated damages totaled \$457,000. Losses consisted of damage to crops and farm equipment, erosion, deposition of debris, and the costs of levee and road repairs. Saturated levees were reinforced to protect against possible flooding.
- **February 1969**—Panoche Creek flooded 18,400 acres in 1969 resulting in \$1,797,000 in damages.
- **1983**—Ponding due to seepage occurred at the local high school. Levee freeboard was less than 3 feet at this time. Flood losses were limited to bank erosion and costs of flood fighting.

The City of Firebaugh is also vulnerable to levee failure. Portions of Firebaugh fall within both National Levee Inventory leveed areas and State leveed areas. See Chapter 4 Risk Assessment for a map of leveed areas in Fresno County.

Values at Risk

Exposure to levee failure was assessed by comparing parcel data to the mapped leveed areas. Tables C.9 and C.10 detail the properties at risk to levee failure in National Levee Inventory leveed areas and State leveed areas, respectively.

Table C.9: City of Firebaugh’s NLI Levee Failure Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Multi-Residential	0	1	\$0	\$0	\$0	\$0
Residential	11	11	\$1,437,732	\$1,437,732	\$2,875,464	\$718,866
Total	11	12	\$1,437,732	\$1,437,732	\$2,875,464	\$718,866

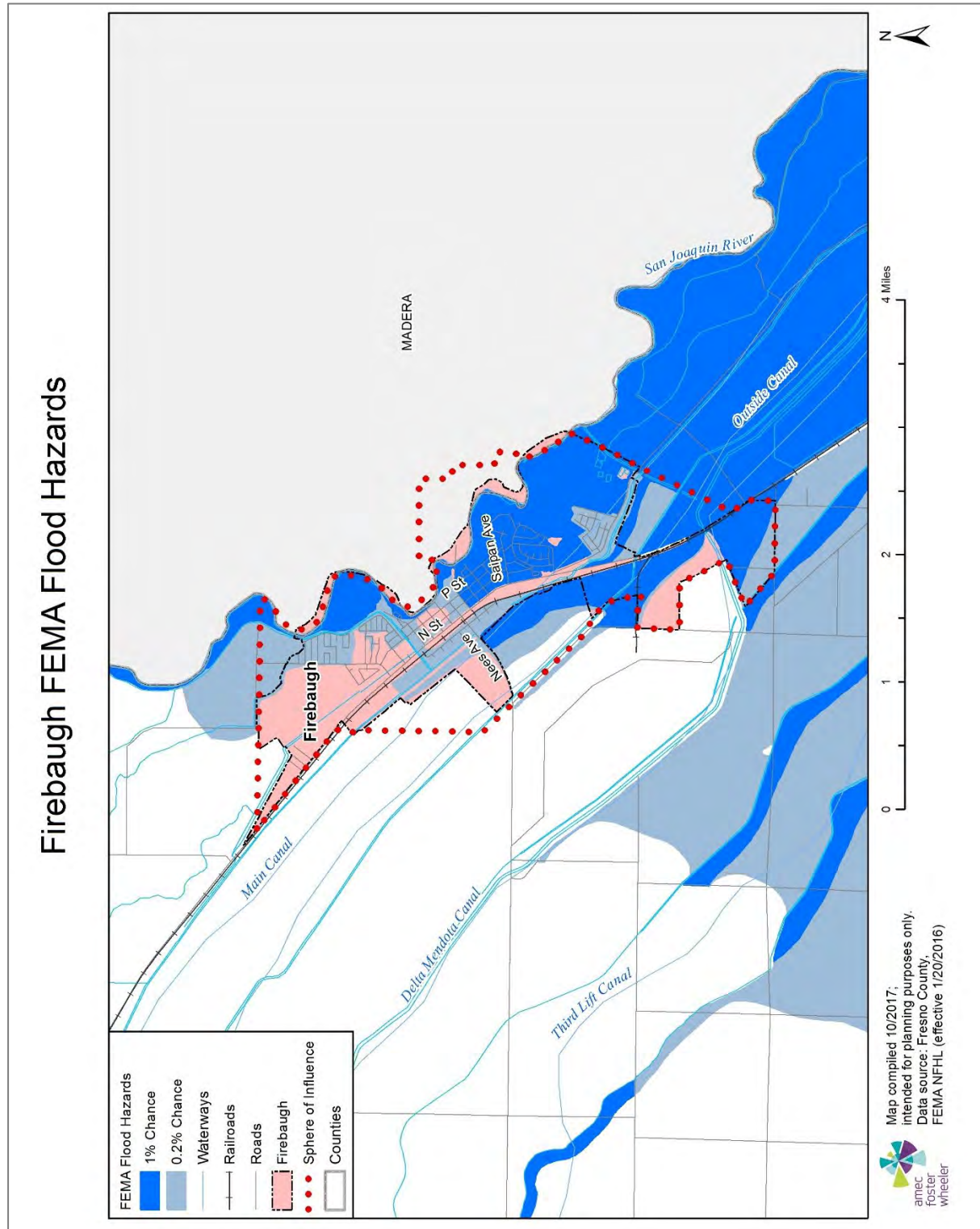
Source: Fresno County 2017 Parcel and Assessor data; NLI Leveed Area

Table C.10: City of Firebaugh’s State Levee Failure Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	38	87	\$3,665,735	\$3,665,735	\$7,331,470	\$1,832,868
Exempt	17	108	\$0	\$0	\$0	\$0
Multi-Residential	18	23	\$7,687,873	\$3,843,937	\$11,531,810	\$2,882,952
Residential	941	1,004	\$86,244,613	\$43,122,307	\$129,366,920	\$32,341,730
Total	1,014	1,222	\$97,598,221	\$50,631,978	\$148,230,199	\$37,057,550

Source: Fresno County 2017 Parcel and Assessor data; State Leveed Area

Figure C.4: City of Firebaugh's 100- and 500-Year Floodplains



Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Firebaugh was created (see Figure C.4). Tables C.11 and C.12 summarize the values at risk in the City’s 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Table C.11: City of Firebaugh’s FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	19	38	\$2,522,513	\$2,522,513	\$5,045,026	\$1,261,257
Exempt	5	13	\$0	\$0	\$0	\$0
Industrial	2	2	\$12,834,356	\$19,251,534	\$32,085,890	\$8,021,473
Multi-Residential	15	52	\$2,675,394	\$1,337,697	\$4,013,091	\$1,003,273
Open Space	1	0	\$1,944	\$1,944	\$3,888	\$972
Residential	422	437	\$36,007,506	\$18,003,753	\$54,011,259	\$13,502,815
Total	464	542	\$54,041,713	\$41,117,441	\$95,159,154	\$23,789,789

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table C.12: City of Firebaugh’s FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	40	52	\$4,915,782	\$4,915,782	\$9,831,564	\$2,457,891
Exempt	7	36	\$0	\$0	\$0	\$0
Industrial	26	43	\$2,479,229	\$3,718,844	\$6,198,073	\$1,549,518
Multi-Residential	33	57	\$8,674,096	\$4,337,048	\$13,011,144	\$3,252,786
Residential	643	689	\$62,499,899	\$62,499,899	\$124,999,798	\$31,249,950
Total	749	877	\$78,569,006	\$75,471,573	\$154,040,579	\$38,510,145

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

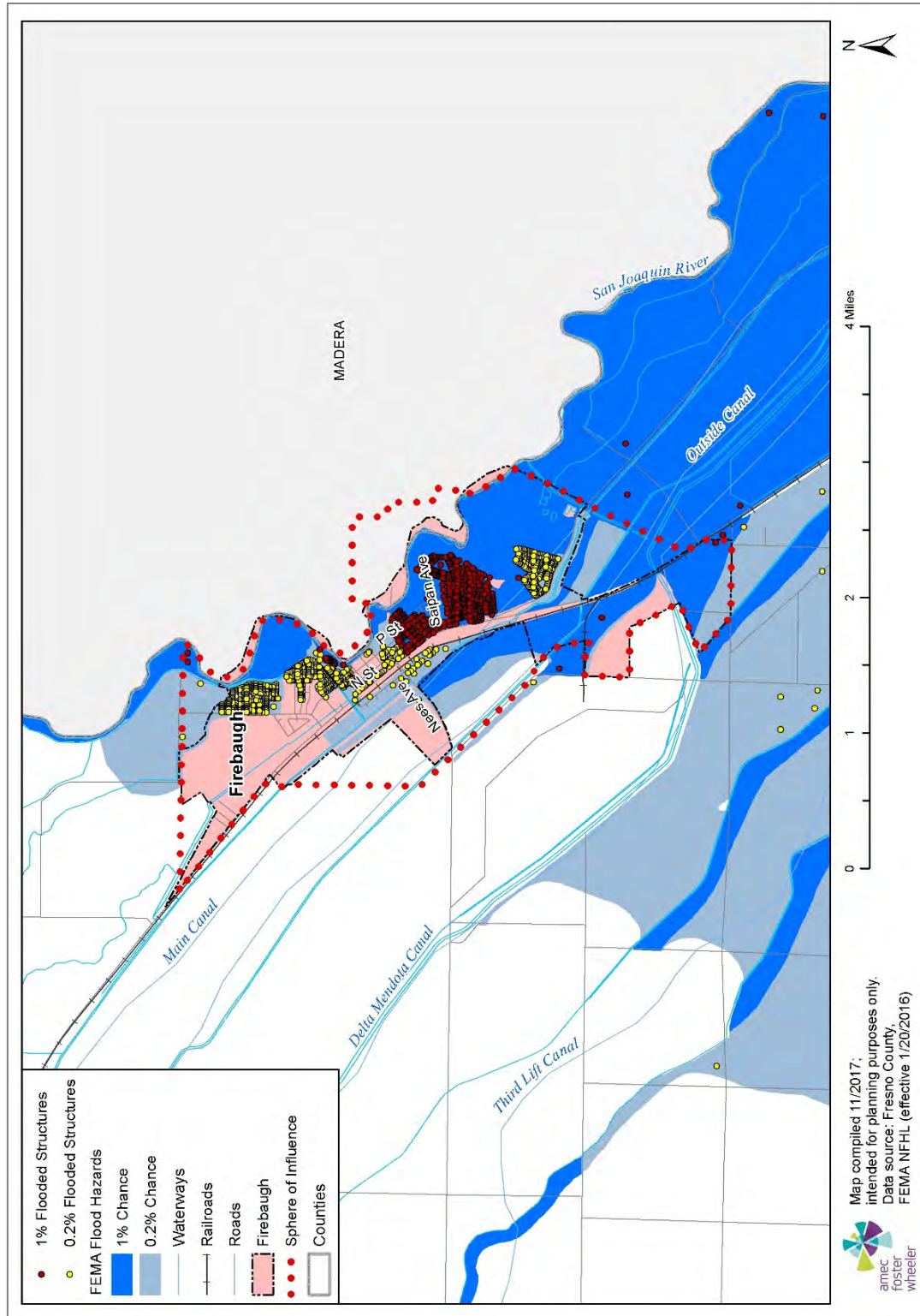
Based on this analysis, the City of Firebaugh has substantial assets at risk to the 100-year and 500-year floods. A total of 464 improved parcels are located within the 100-year floodplain, with a total value at risk of over \$95.1 million. An additional 749 improved parcels valued at over \$154 million fall within the 500-year floodplain.

Applying the 25 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing nearly \$23.8 million in damage in the City of Firebaugh and a 0.2 percent chance of a 500-year flood causing roughly \$62.3 million in damage (combined from both floods). Actual loss for both flood scenarios would likely be higher due to the inclusion of the seven additional “exempt” parcels for which building value is unknown.

Properties at risk to flooding in Firebaugh are shown in relation to the mapped floodplains in Figure C.5.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are likely below the actual market values. Thus, the actual value of assets at risk may be higher than those included herein.

Figure C.5: City of Firebaugh's Properties at Risk in the 100- and 500-Year Floodplains



In addition to the 100-year and 500-year floodplains mapped by FEMA, the California Department of Water Resources maintains Best Available Maps (BAM) which include the floodplains in the Sacramento and San Joaquin River Basins, based on a study performed in 2002 by the U.S. Army Corps of Engineers (USACE). Though limited to the San Joaquin River as a flood source and thus not as comprehensive as the FEMA FIRM, the USACE study shows additional differentiation in flood risk by modeling the 200-year floodplain (the flood with a 0.5 percent annual chance of occurring). Table C.13 summarizes the values at risk by property type within the 200-year floodplain and loss estimates to the 200-year storm using the same methodology described above.

Table C.13: City of Fresno's FEMA 0.5% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	89	151	\$12,131,355	\$12,131,355	\$24,262,710	\$6,065,678
Exempt	24	217	\$0	\$0	\$0	\$0
Industrial	11	27	\$2,887,362	\$4,331,043	\$7,218,405	\$1,804,601
Multi-Residential	37	59	\$13,259,756	\$6,629,878	\$19,889,634	\$4,972,409
Residential	824	908	\$69,399,956	\$34,699,978	\$104,099,934	\$26,024,984
Total	985	1,362	\$97,678,429	\$57,792,254	\$155,470,683	\$38,867,671

Sources: Fresno County 2017 Parcel and Assessor data; CA DWR BAM; USACE

Population at Risk

Using parcel data from the County, the digital flood insurance rate map, and the mapped leveed areas, population at risk was calculated for the 100-year and 500-year floods as well as for levee failure based on the number of residential properties at risk and the U.S. Census Bureau 2016 estimate for the average number of persons per household (3.17). The following are at risk to flooding in the City of Firebaugh:

- 100-year flood—1,385 people
- 500-year flood—2,143 people
- **Total flood**—3,528 people
- National Levee Inventory levee failure—35 people
- State levee failure—3,040 people

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Firebaugh joined the National Flood Insurance Program (NFIP) on August 23, 1982. NFIP Insurance data indicates that as of June 6, 2017, there were 159 flood insurance policies in force in the City with \$31,729,100 of coverage. All but one of the policies were residential (157 were for single-family homes), and 145 policies were for A and AH Zones, while the remaining 14 policies were in B, C, and X zones. Of the 159 policies, 127 were for pre-FIRM structures and 32 were for post-FIRM structures.

According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction. There have not been any historical claims for flood losses in the City of Firebaugh.

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table C.14 lists the critical facilities in the City's 100- and 500-year floodplains. The impact to the community could be great if these critical facilities are damaged or destroyed during a flood event.

Table C.14: Critical Facilities in the 100- and 500-Year Floodplains: City of Firebaugh

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Airport	-	1
CalARP	1	1
School	1	1
Urgent Care	-	1
Total	2	4

Source: Fresno County GIS, HIFLD 2017, FEMA 2009 FIRM

Wildfire

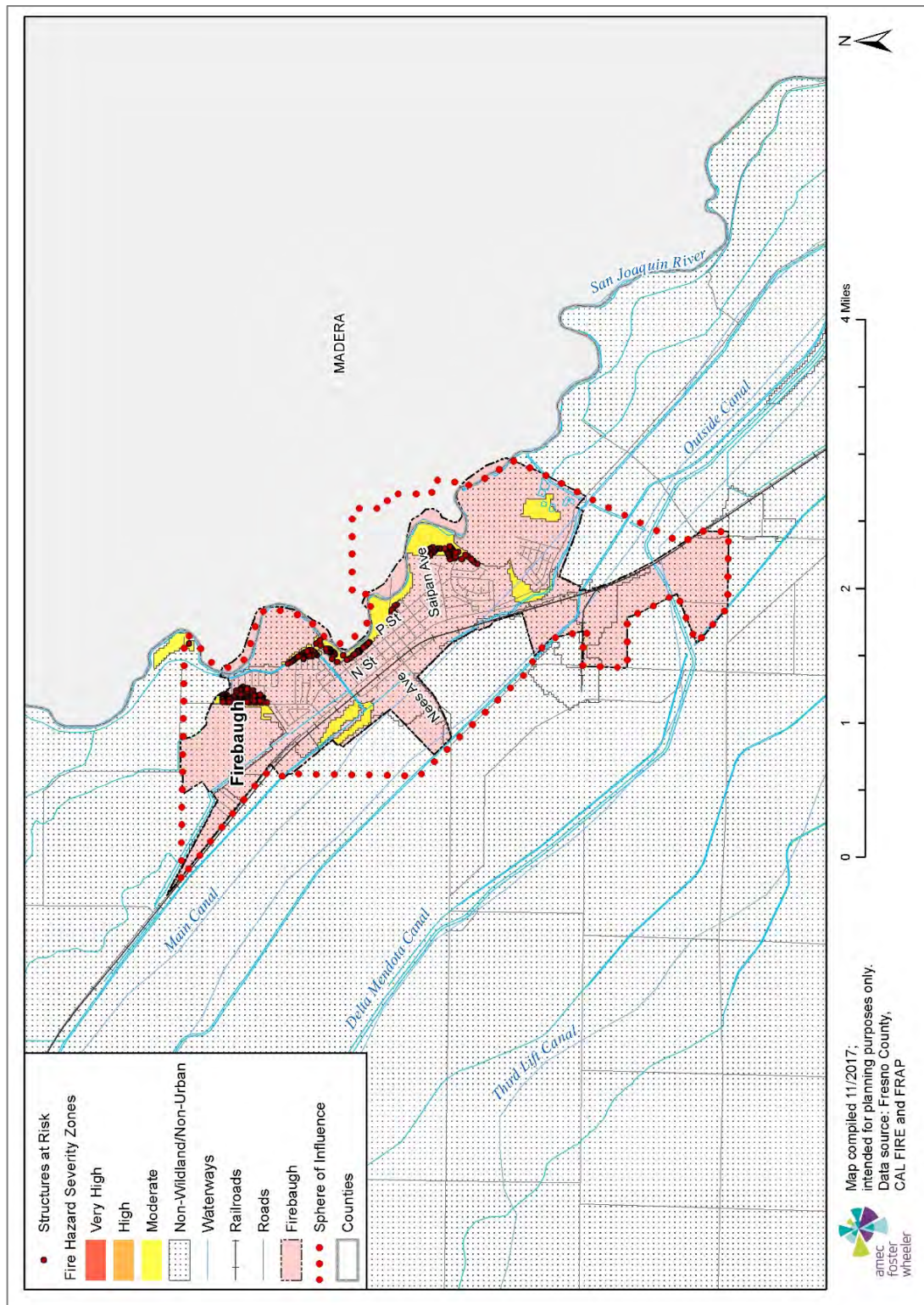
Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Firebaugh was created (see Figure C.6). An analysis was performed using GIS software that determined that there are 213 parcels at risk to moderate wildfire severity within the City of Firebaugh. This wildfire risk is detailed in Table C.15 below.

Table C.15: Property at Risk to Moderate Wildfire Severity: City of Firebaugh

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Commercial	1	16	\$125,911	\$125,911	\$251,822
Exempt	2	2	\$0	\$0	\$0
Multi-Residential	3	3	\$490,684	\$245,342	\$736,026
Residential	207	228	\$16,863,015	\$8,431,508	\$25,294,523
Total	213	249	\$17,479,610	\$8,802,761	\$26,282,371

Most parcels at risk to wildfire in the City of Firebaugh are residential uses and are located in the eastern side of the City along the San Joaquin River.

Figure C.6: City of Firebaugh's Wildfire Threat



C.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Firebaugh's updated capabilities are summarized below.

C.4.1 Regulatory Mitigation Capabilities

Table C.16 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Firebaugh.

Table C.16: City of Firebaugh's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General or Comprehensive plan	yes	
Zoning ordinance	yes	
Subdivision ordinance	yes	
Growth management ordinance	yes	
Floodplain ordinance	yes	
Other special purpose ordinance (stormwater, steep slope, wildfire)	no	
Building code	yes	
Fire department ISO rating	yes	Rating of 5
Erosion or sediment control program	no	
Stormwater management program	yes	
Site plan review requirements	yes	
Capital improvements plan	yes	
Economic development plan	yes	
Local emergency operations plan	yes	
Other special plans	no	

Regulatory Tool	Yes/No	Comments
Flood insurance study or other engineering study for streams	yes	
Elevation certificates (for floodplain development)	yes	

C.4.2 Administrative/Technical Mitigation Capabilities

Table C.17 identifies the personnel responsible for activities related to mitigation and loss prevention in Firebaugh.

Table C.17: City of Firebaugh's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	yes	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	yes	
Planner/engineer/scientist with an understanding of natural hazards	yes	
Personnel skilled in GIS	no	
Full time building official	no	Part-time
Floodplain manager	yes	
Emergency manager	yes	Police Chief
Grant writer	no	
Other personnel	no	
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	no	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	yes	

C.4.3 Fiscal Mitigation Capabilities

Table C.18 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table C.18: City of Firebaugh's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	yes
Capital improvements project funding	yes
Authority to levy taxes for specific purposes	no
Fees for water, sewer, gas, or electric services	yes
Impact fees for new development	yes
Incur debt through general obligation bonds	yes
Incur debt through special tax bonds	yes
Incur debt through private activities	no

Financial Resources	Accessible/Eligible to Use (Yes/No)
Withhold spending in hazard prone areas	yes

C.4.4 Opportunities for Enhancement

Based on the capabilities assessment, the City of Firebaugh has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. Some of the possible opportunities for enhancement of the City's existing mitigation program are listed below.

- Ensuring existing warning systems for levees are up to date and working efficiently
- Developing an Evacuation Plan in partnership with the County and specific to levee failure
- Develop a Drought Contingency Plan that will help to create a framework for drought response and mitigation in the City of Firebaugh

C.5 Mitigation Strategy

C.5.1 Mitigation Goals and Objectives

The City of Firebaugh adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Public Works Department may utilize the hazard information when implementing Capital Improvement projects and the Community Development Department may utilize the hazard information when reviewing a site plan or other type of development application. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Firebaugh will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1982. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development

mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

C.5.2 Mitigation Actions

The planning team for the City of Firebaugh identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

In addition to implementing the mitigation action below the City of Firebaugh will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Assess Levee System for Necessary Improvements

Hazard(s) Addressed: Flood

Issue/Background: Firebaugh is located along the San Joaquin River and as a result has had to deal with flooding issues/dangers due to high river flows, low levees, and levee failures along the San Joaquin River. This project would assess the levee system for needed improvements to provide protection to the 100-year flood event. Specific repairs and enhancements would be completed as a result of the assessment.

Other Alternatives: None

Responsible Office: City of Firebaugh

Priority (High, Medium, Low): Medium

Cost Estimate: \$2,000,000

Potential Funding: Grants, City Funding

Benefits (Avoided Losses): This will reduce risk of flooding in the City of Firebaugh and prevent property damage.

Schedule: Long-term 2023; on hold until funding is acquired

Status: New project

2. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Delta-Mendota subbasin underlays the City of Firebaugh and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Firebaugh being a local agency (as defined by §10723 of the Water Code) which overlays the Delta-Mendota basin, the City has become a GSA for the portion of the basin which the city boundaries overlays. The Firebaugh GSA is required to develop and implement, no later than January 31, 2020, a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. The Firebaugh GSA is part of a multi-agency GSP that is being prepared by the San Joaquin River Exchange Contractors Water Authority. The City of Firebaugh and Firebaugh GSA will actively participate in the development and implementation of the planning process. The development of the City of Firebaugh GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Firebaugh.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: City Engineer, and Firebaugh GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

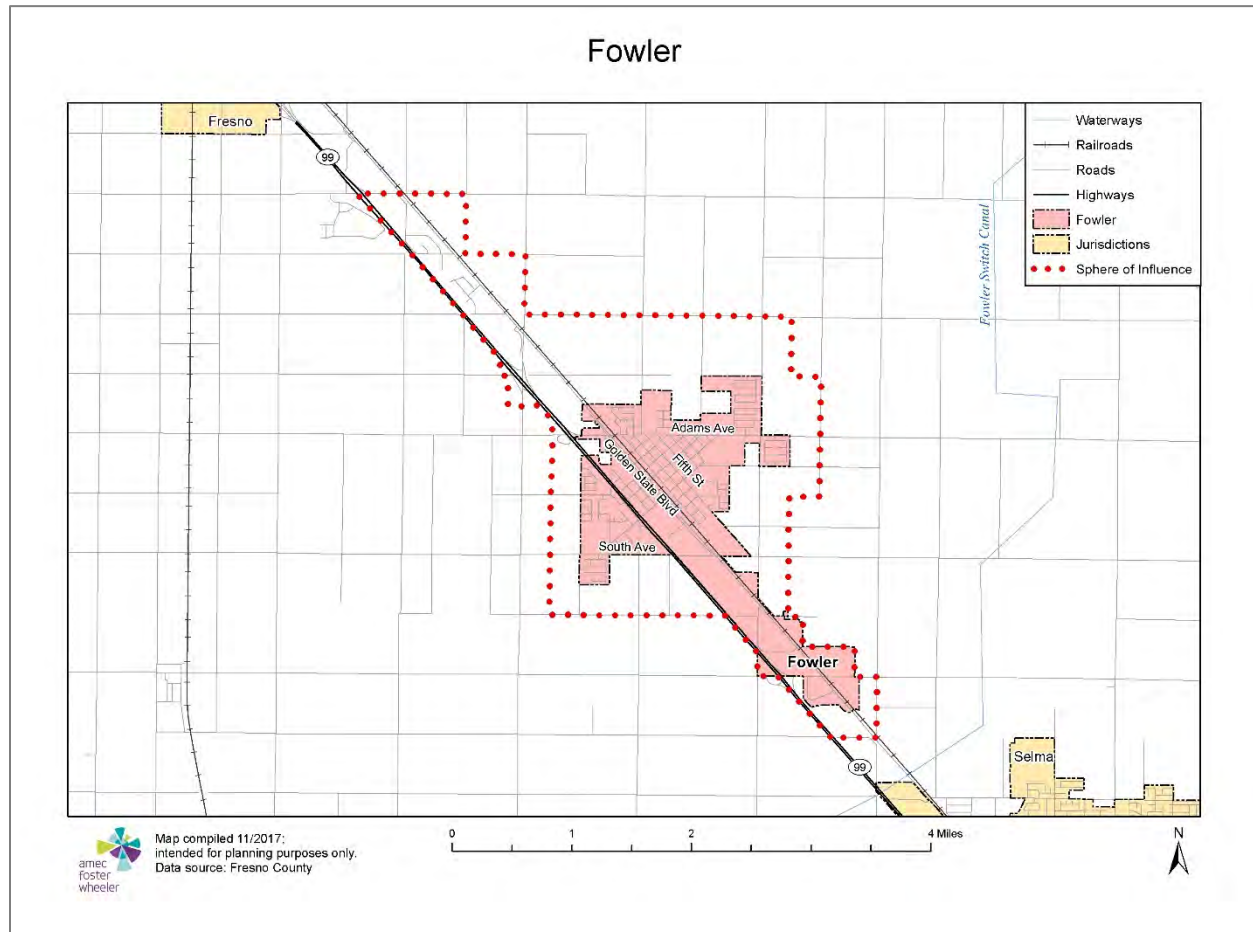


ANNEX D: CITY OF FOWLER

D.1 Community Profile

Figure D.1 displays a map and the location within Fresno County of the City of Fowler and its Sphere of Influence.

Figure D.1: The City of Fowler



D.1.1 Geography and Climate

The City of Fowler is located in central Fresno County, approximately 10 miles south of the City of Fresno and 3 miles north of the City of Selma. The City sits along State Highway 99, which connects to major points north and south, but is otherwise surrounded by agricultural land.

D.1.2 History

The following historical background is reported in the City of Fowler Revitalization Plan:

“The community of Fowler was established in 1872 when State Senator Thomas Fowler implemented the “Fowler Switch” along the southern extension of the Central Pacific Railway. In its early years the community was a center for the cattle ranching industry, and activity surrounded the railroad tracks within the historic core. The City incorporated in 1908. The Sanborn Company produced Fire Insurance maps in the early years of Fowler’s development which provide insight on how the community grew and changed. In 1896 the City was contained largely within a 16-block area bordered by Mariposa Street to the north, the Southern Pacific railway tracks to the west, Fifth Street to the east, and Fresno Street to the south. Blocks were laid out in a uniform grid that measured 400’ long by 320’ wide and included north-south alleys measuring 20’ in width. Despite the small size of the community, Merced Street east of the railroad had already become a center of commercial activity, with several buildings lining the public right-of-way. By 1945 the City had expanded all the way to Adams Avenue to the north but had not grown much past Vine Street to the south. Although the gridiron pattern of rectangular blocks continued, the town remained compact and walkable in form. Merced Street east of the railway tracks continued as a commercial center, adding new businesses and institutions along its route.”

D.1.3 Economy

Select estimates of economic characteristics for the City of Fowler are shown in Table D.1.

Table D.1: City of Fowler’s Economic Characteristics, 2016

Characteristic	City of Fowler
Families below Poverty Level	22.6%
All People below Poverty Level	23.9%
Median Family Income	\$48,279
Median Household Income	\$47,572
Per Capita Income	\$18,305
Population in Labor Force	2,762
Population Employed*	2,491
Unemployment	9.8%

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables D.2 and D.3 detail how the City of Fowler labor force breaks down by occupation and industry based on estimates from the 2016 American Community Survey.

Table D.2: City of Fowler's Employment by Occupation, 2016

Occupation	# Employed	% Employed
Service Occupations	648	26.0
Sales and Office Occupations	606	24.3
Management, Business, Science, and Arts Occupations	585	23.5
Production, Transportation, and Material Moving Occupations	363	14.6
Natural Resources, Construction, and Maintenance Occupations	289	11.6
Total	2,491	100.0

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

Table D.3: City of Fowler's Employment by Industry, 2016

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	604	24.2
Retail Trade	339	13.6
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	315	12.6
Agriculture, Forestry, Fishing and Hunting, and Mining	303	12.2
Public Administration	203	8.1
Manufacturing	177	7.1
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	106	4.3
Construction	102	4.1
Wholesale Trade	96	3.9
Other Services, Except Public Administration	89	3.6
Transportation and Warehousing, and Utilities	88	3.5
Finance and Insurance, and Real Estate and Rental and Leasing	57	2.3
Information	12	0.5
Total	3,354	100.0

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

D.1.4 Population

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the 2016 population for the City of Fowler was estimated at 6,083. Select demographic and social characteristics for the City of Fowler from the 2016 ACS are shown in Table D.4.

Table D.4: City of Fowler Demographic and Social Characteristics, 2016

Characteristic	City of Fowler
Gender/Age	
Male	50.6%
Female	49.4%
Median age	30.8
Under 5 years	8.8%
Under 18 years	31.9%
65 years and over	10.6%
Race/Ethnicity*	
White	67.0%
Asian	11.8%
Black or African American	0.4%
American Indian/Alaska Native	0.3%
Hispanic or Latino (of any race)	69.5%
Education	
High school graduate or higher	71.1%
Disability Status	
Population 5 years and over with a disability	11.4%

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

*Of the 97.0% reporting one race

D.2 Hazard Identification and Summary

Fowler’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Fowler (see Table D.5). In the context of the plan’s planning area, there are no hazards that are unique to Fowler.

Table D.5: City of Fowler—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Low
Drought	Significant	Likely	Critical	High
Earthquake	Significant	Occasional	Critical	Medium
Flood/Levee Failure	Extensive	Likely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Critical	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Low

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Limited	Likely	Limited	Low
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact		

D.3 Vulnerability Assessment

The intent of this section is to assess Fowler’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the outreach process in 2017-2018. Fowler is a new jurisdiction that participated in the 2017-2018 Fresno County Multi-Hazard Mitigation Plan Update. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table D.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Fowler HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table D.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Fowler are identified below. The discussion of vulnerability for the following hazards is located in Section D.3.2 Estimating Potential Losses. Based on this analysis, the priority hazard (High Significance) for mitigation is drought.

- drought
- flood/levee failure

Note: agricultural hazards, earthquake, hazardous materials incidents, epidemic/pandemic, and windstorm are considered hazards of Medium Significance by the City of Fowler but are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to these hazards.

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Fowler, those hazards are as follows:

- dam failure
- human health hazards: West Nile Virus
- severe weather: extreme cold/freeze, extreme heat, fog, heavy rain/thunderstorm/hail/lightning, tornado, winter storm
- soil hazards
- volcano
- wildfire

Additionally, the City’s Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and probability of occurrence. **Avalanche** and **landslide** are considered not applicable to the City of Fowler.

D.3.1 Assets at Risk

This section considers Fowler’s assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table D.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Fowler.

Table D.6: 2017 Property Exposure for the City of Fowler by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	0	\$330,857	\$330,857	\$661,714
Commercial	88	127	\$30,650,189	\$30,650,189	\$61,300,378
Exempt	25	49	\$0	\$0	\$0
Industrial	51	42	\$59,105,587	\$88,658,381	\$147,763,968
Multi-Residential	46	68	\$9,122,044	\$4,561,022	\$13,683,066
Open Space	2	0	\$79,731	\$79,731	\$159,462
Residential	1,589	1,717	\$232,217,149	\$116,108,575	\$348,325,724
Total	1,802	2,003	\$331,505,557	\$240,388,754	\$571,894,311

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation.

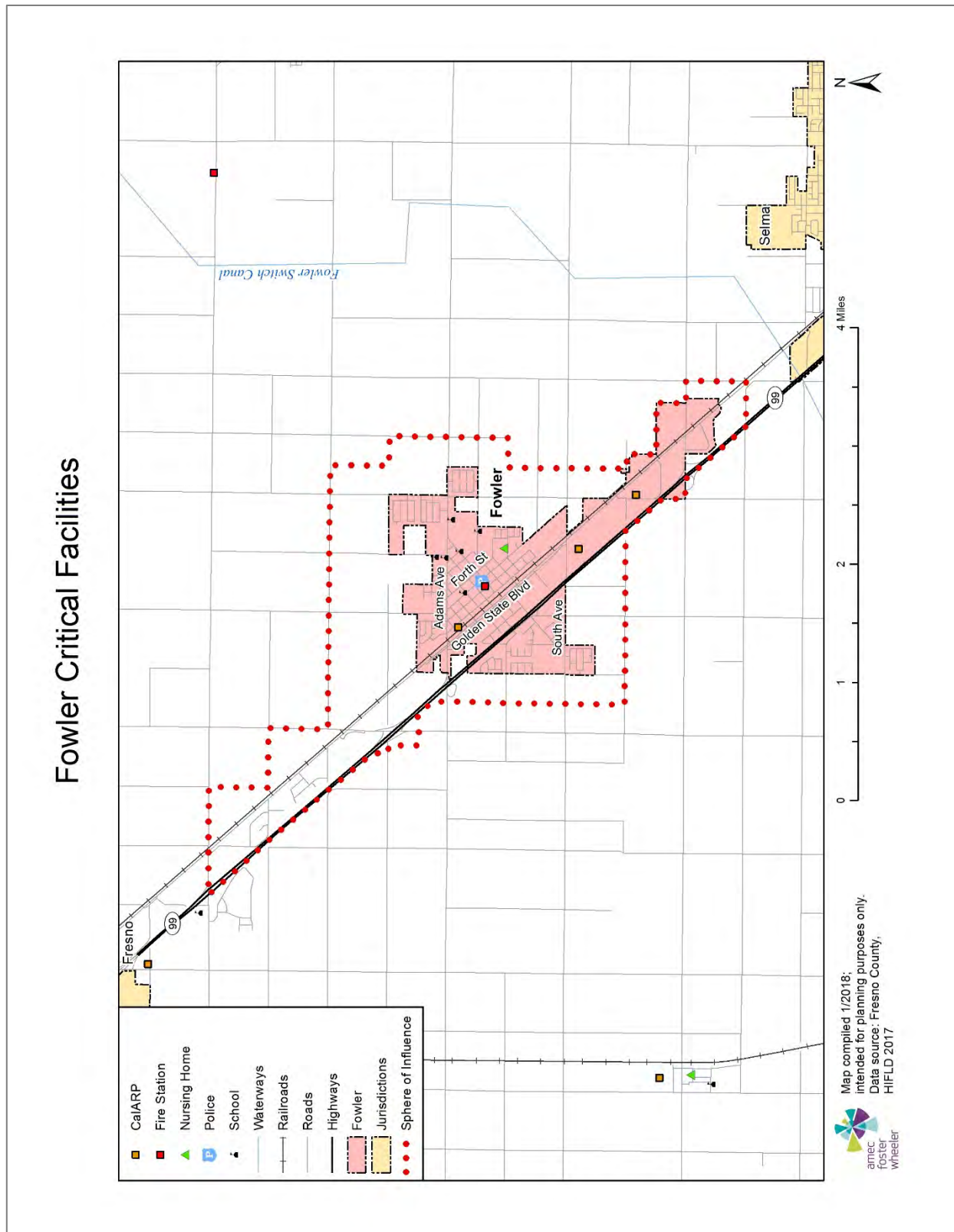
An inventory of critical facilities in the City of Fowler is provided in Table D.7 and mapped in Figure D.2.

Table D.7: City of Fowler's Critical Facilities

Critical Facility Type	Number
CalARP	3
Fire Station	1
Nursing Home	1
Police	1
School	9
Total	15

Source: Fresno County, HIFLD 2017

Figure D.2: City of Fowler's Critical Facilities



Historic Resources

The City of Fowler does not have any properties listed on the National Register of Historic Places. However, the City does have one property, Fowler's Switch, listed on the California Register of Historic Resources. Fowler's Switch was registered as a landmark on the California Register in 1973.

Economic Assets

The City of Fowler operates a Revolving Business Loan Program to support local businesses using economic development grants from the State's Community Development Block Grant (CDBG) program. Some of the businesses that have already benefited from this program are: Dave's Auto Service, Bobby Salazar's Taqueria, H & H Tire, Central Valley Honda-Polaris, Empire Equipment Company, and Picker Parts. The business loans are provided as "gap financing" in conjunction with the business' own primary financing for their project. One of the requirements of qualifying for a business loan is that the project must create a minimum amount of jobs for a targeted income group, calculated at 80% of the area median income. The City has also used the CDBG funds to provide infrastructure improvement grants, which have helped make facilities available for businesses to locate to properties in Fowler.

Growth and Development Trends

The City's 2025 General Plan Land Use Map is shown in Figure D.2. For the City's Sphere of Influence, the General Plan proposes a ring of agricultural use, along with heavy industrial uses north and south along the Highway 99 corridor as well as some expansion of residential uses to the east and west.

Table D.8 illustrates how the City has grown in terms of population but has experienced a decline in the number of housing units between 2010 and 2016. As of 2016, the population of Firebaugh was 6,083 with an average growth rate of 9.21 percent.

Table D.8: City of Fowler's Change in Population and Housing Units, 2010-2016

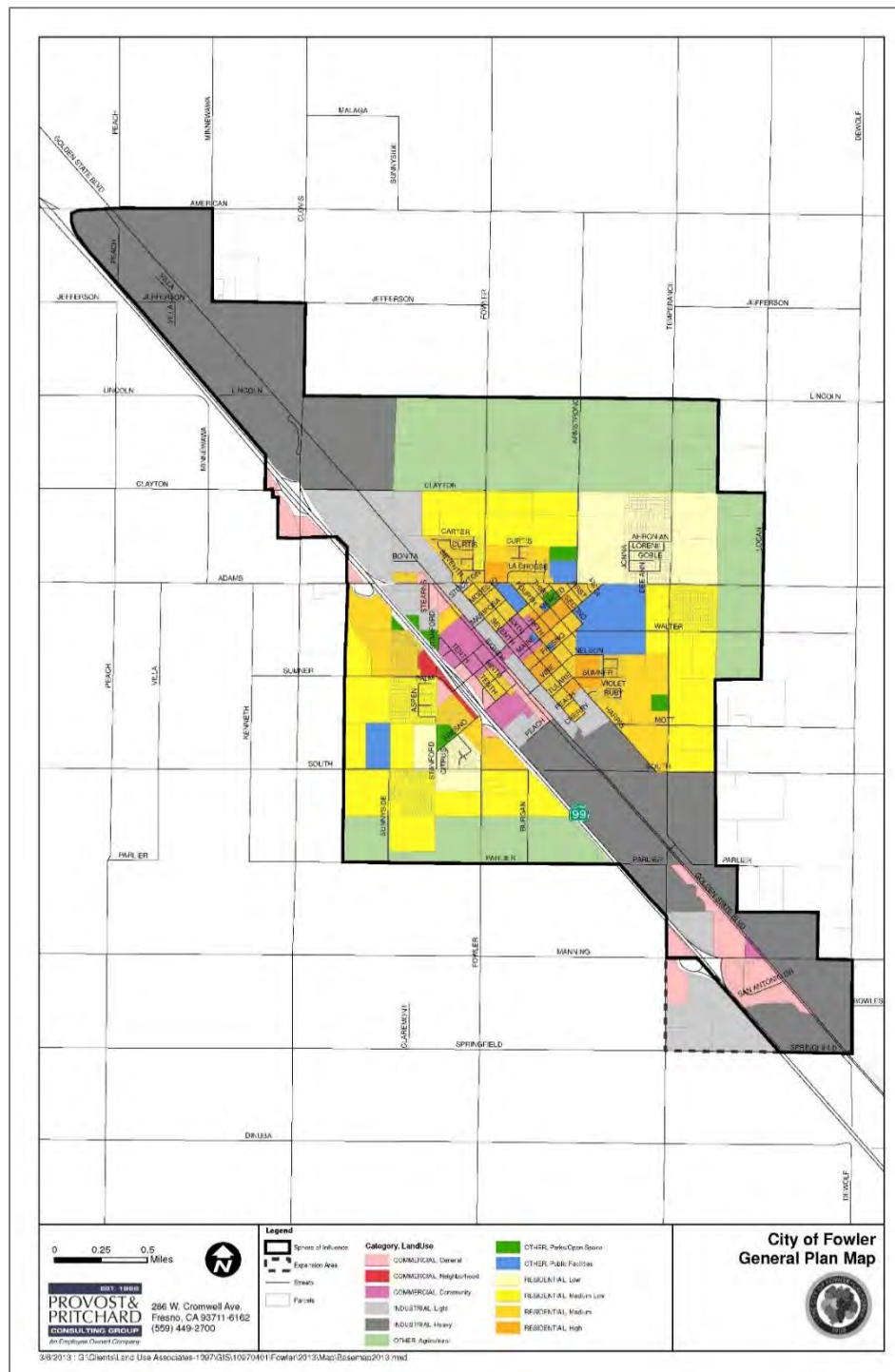
2010 Population	2016 Population Estimate	Estimated Percent Change 2010-2016	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2016
5,570	6,083	+9.21	1,842	1,803	-2.12

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2012-2016 5-Year Estimates

Of the 1,803 housing units in Firebaugh, 98.3 percent are occupied. This low vacancy rate indicates a need for additional units, which may suggest development will occur in the near future. Owner-occupied units account for 53.8 percent of all occupied housing. Single family detached homes comprise 71.8 percent of the housing stock in the City.

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

Figure D.3: City of Fowler’s Land Use Map



D.3.2 Estimating Potential Losses

Table D.6 above shows Fowler's exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 69 parcels in the 100- and 500-year floodplains in the City of Fowler. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County as a whole).

Drought

Due to the importance of agriculture drought can have a significant impact on the local economy.

Flood/Levee Failure

The most recent FEMA Flood Insurance Rate Map (FIRM) affecting the City of Fowler was updated in February 2009. According to the FIRM, small portions of the planning area along Highway 99 and the railroad are subject to 100-year (or 1-percent-annual-chance) and 500-year (0.2-percent-annual-chance) flooding.

Based on the description of principal flood problems around the City of Fowler in FEMA's 2016 Flood Insurance Study (FIS), damaging floods primarily occur as a result of heavy rains overwhelming the storm drainage system capacity.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Fowler was created (see Figure D.4). Tables D.9 and D.10 summarize the values at risk in the City's 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Figure D.4: City of Fowler's 100- and 500-Year Floodplains

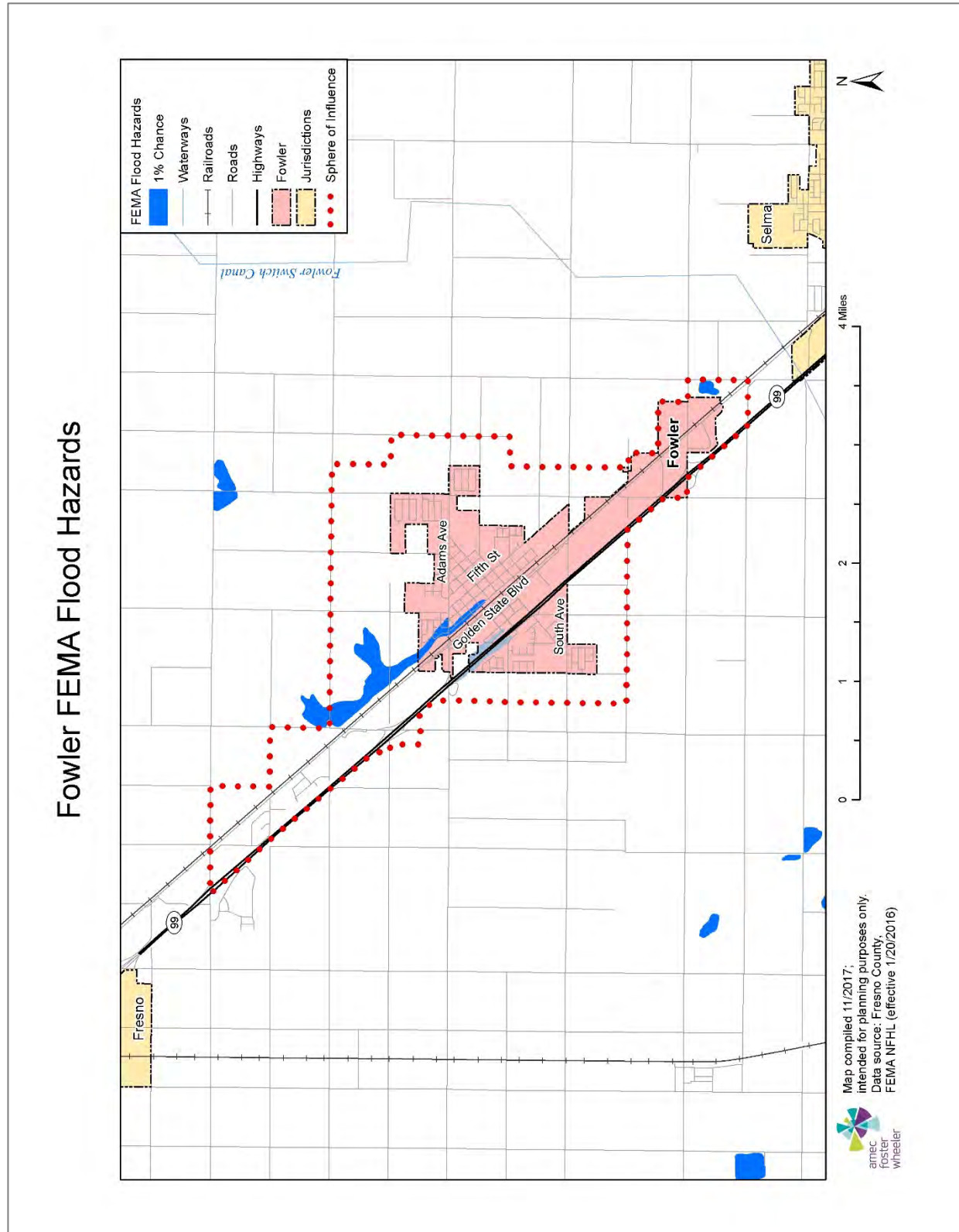


Table D.9: City of Fowler's FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	5	5	\$2,157,956	\$2,157,956	\$4,315,912	\$1,078,978
Multi-Residential	3	3	\$175,279	\$87,640	\$262,919	\$65,730
Residential	45	49	\$3,918,323	\$1,959,162	\$5,877,485	\$1,469,371
Total	53	57	\$6,251,558	\$4,204,757	\$10,456,315	\$2,614,079

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table D.10: City of Fowler's FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Residential	16	5	\$1,449,011	\$1,449,011	\$2,898,022	\$724,506
Total	16	5	\$1,449,011	\$1,449,011	\$2,898,022	\$724,506

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Fowler has limited assets at risk to the 100-year and 500-year floods but nonetheless is vulnerable to flooding. A total of 53 improved parcels are located within the 100-year floodplain, with a total value at risk of nearly \$10.5 million. An additional 16 improved parcels valued at over \$2.8 million fall within the 500-year floodplain.

Applying the 25 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing over \$2.6 million in damage in the City of Firebaugh and a 0.2 percent chance of a 500-year flood causing roughly \$3.3 million in damage (combined from both floods).

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are likely below the actual market values. Thus, the actual value of assets at risk may be higher than those included herein.

Population at Risk

Using parcel data from the County, the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the U.S. Census Bureau 2016 estimate for the average number of persons per household (3.17). The following are at risk to flooding in the City of Fowler:

- 100-year flood—342 people
- 500-year flood—51 people
- **Total flood—393 people**

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Fowler joined the National Flood Insurance Program (NFIP) on September 24, 1984. NFIP Insurance data indicates that as of June 6, 2017, there were 22 flood insurance policies in force in the City with \$5,787,700 of coverage. Of the 22 policies, 18 were residential (for single-family homes), and 4 policies were non-residential. There were 17 policies in A Zones, while the remaining 5 policies were in B, C, and X zones (3 of these were preferred risk policies). Of the 22 policies, 18 were for pre-FIRM structures and 4 were for post-FIRM structures.

There has been one historical loss in the City of Fowler, which occurred in a pre-FIRM structure in a B, C, or X Zone. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. There are no critical facilities located in the 100- or 500-year floodplain in the City of Fowler.

D.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Fowler's updated capabilities are summarized below.

D.4.1 Regulatory Mitigation Capabilities

Table D.11 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Fowler.

Table D.11: City of Fowler's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General or Comprehensive plan	Yes	June 2004
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Growth management ordinance	No	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, steep slope, wildfire)	No	
Building code	Yes	
Fire department ISO rating		
Erosion or sediment control program		
Stormwater management program		
Site plan review requirements	Yes	
Capital improvements plan		
Economic development plan		
Local emergency operations plan		
Other special plans	Yes	Revitalization Plan
Flood insurance study or other engineering study for streams	Yes	Effective 1/20/2016
Elevation certificates (for floodplain development)		

D.4.2 Administrative/Technical Mitigation Capabilities

Table D.12 identifies the personnel responsible for activities related to mitigation and loss prevention in Fowler.

Table D.12: City of Fowler's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Consultant
Engineer/professional trained in construction practices related to buildings and/or infrastructure		
Planner/engineer/scientist with an understanding of natural hazards		
Personnel skilled in GIS		
Full time building official	Yes	
Floodplain manager	Yes	
Emergency manager		
Grant writer		
Other personnel		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)		
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)		

D.4.3 Fiscal Mitigation Capabilities

Table D.13 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table D.13: City of Fowler Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	
Incur debt through special tax bonds	
Incur debt through private activities	
Withhold spending in hazard prone areas	

D.4.4 Opportunities for Enhancement

Based on the capabilities assessment, the City of Fowler has several existing mechanisms in place that already help to mitigate hazards. In addition to these existing capabilities, there are also opportunities for the City to expand or improve on these policies and programs to further protect the community. Some of the possible opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Drought Contingency Plan that will create a framework for drought response and mitigation.
- Develop a stormwater management program to identify problem areas and mitigation alternatives.

D.5 Mitigation Strategy

D.5.1 Mitigation Goals and Objectives

The City of Fowler adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Building and Code Enforcement Department may utilize the hazard information when reviewing a building permit application. While the Economic

Development Corporation, which contracts with the City in economic development opportunities will use the hazard information when working on expansion plans with existing business as well as when recruiting new businesses to the City. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Fowler will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1984. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

D.5.2 Mitigation Actions

The planning team for the City of Fowler identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

In addition to implementing the mitigation action below the City of Fowler will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Install Back-up Power System for City Critical Facilities

Hazard(s) Addressed: Multi-Hazard: earthquake, flood, severe weather, wildfire, hazardous materials

Issue/Background: The City Hall, Police Department, and Fire Department have no generators for back-up power. It is important that essential services remain operational in the event of a large-scale power outage that often is associated with major hazard impacts. This project would result

in installation of emergency generators at each facility. Each facility would be assessed for proper generator sizing and hook-up.

Other Alternatives: None

Responsible Office: City Hall

Priority (High, Medium, Low): High

Cost Estimate: \$500,000

Potential Funding: Not yet identified

Benefits (Avoided Losses): Generators will keep operation ongoing during outages at these critical facilities

Schedule: 2020

Status: New Project

2. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Fowler and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Fowler has become a joint power authority of the South Kings Groundwater Sustainability Agency, other members of the Agency include the City of Kingsburg, City of Parlier and City of Sanger. As a member of the South Kings GSA, the City of Fowler is required to participate in the development and implementation, no later than January 31, 2020, of a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the South Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Fowler.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: Public Works and South Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

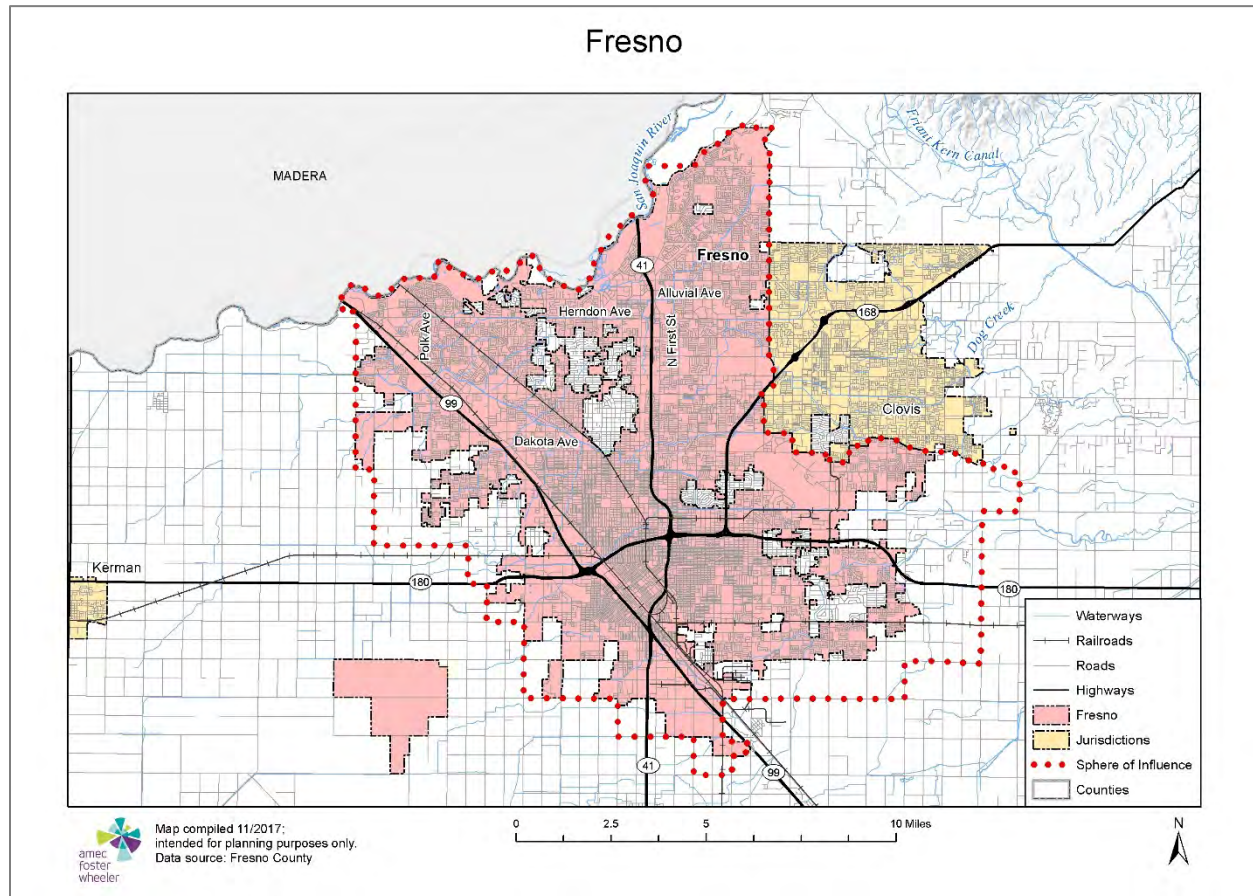
Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

E.1 Community Profile

Figure E.1 displays a map and the location within Fresno County of the City of Fresno and its Sphere of Influence.

Figure E.1: The City of Fresno



E.1.1 Geography and Climate

The City of Fresno and its Sphere of Influence encompass a 100,400-acre area in central Fresno County. Over the past decade, the City has expanded into the northern, northwestern, and eastern reaches of its Sphere of Influence. Except for the deep channel of the San Joaquin River at the northern boundary of the City, Fresno's topography is generally level and slopes gently to the southwest. The upper San Joaquin River lies at the City's northerly boundary and has carved a deep channel, confining the river between steep bluffs that range from 20 to approximately 100 feet in height.

Fresno has a Mediterranean climate, averaging over 262 sunny days per year and little or no measurable precipitation from June through September. Annual rainfall typically totals 12-14 inches in episodic events lasting up to a few days at most. Fresno's prevailing winds are typically light and from the northwest.

Storms with strong weather disturbances (lightning and very agitated winds) may occur from autumn months through the spring, with the strength of the storm dependent upon temperature gradients between moving weather fronts.

Winter mornings in December and January approach freezing but only rarely reach as low as, or below, 32°F; winter daytime high temperatures almost always approach or exceed 40°F. Snowfall is an extremely rare and transient phenomenon; the last recorded snowfall in Fresno was ½ inch on December 20, 1998. The Tule fog, a thick ground fog that settles in the San Joaquin Valley from late fall through early spring, is the leading cause of weather-related accidents in California. In addition to causing visibility issues, "black ice" from precipitated fog may temporarily affect some roadways and bridges during the winter.

Summer daytime peak temperatures are high in Fresno. Some heat waves last over a week with daytime highs well over 100°F and issuance of health advisories. Summer evenings provide for some cooling of 10-15°F with the early morning daybreak hours cooling by 20-30°F, depending on humidity (low humidity allows for more radiant cooling).

Geography and climate combine to create a general accumulation of air pollutants in the San Joaquin Valley (and in the City of Fresno) that occasionally result in unhealthy air quality conditions. Air quality problems are exacerbated by dust storms, human activities (e.g., vehicle emissions and fireplace and wood stove use), atmospheric photochemical processes, and forest fires from local and regional fires. The City has chronically failed to attain some of the national and state ambient air quality standards, but due to the efforts of the California Air Resources Board and the regional San Joaquin Valley Unified Air Pollution Control District, progress toward attainment of ozone (oxidant) and particulate matter standards is being made. Carbon monoxide standards were deemed to have been attained in the 1990s.

E.1.2 History

Development of what today is the City of Fresno began in 1871, when the Central Pacific Railroad chose the Fresno Station for its San Joaquin Valley rail line. The City soon became the County seat and the shipping and distribution hub for the region's agricultural industry. An economic boom across California in the 1880s helped transform Fresno from a village to a city, and helped drive its incorporation in 1885. Today, the City of Fresno is the center of trade, commerce, finance, and transportation for the San Joaquin Valley.

E.1.3 Economy

The most comprehensive economic data available for the City of Fresno comes from the U.S. Census Bureau by way of the American Community Survey (ACS). Select estimates of economic characteristics for the City of Fresno are shown in Table E.1.

Table E.1: City of Fresno's Economic Characteristics, 2015

Characteristic	City of Fresno
Families below Poverty Level	24.4%
All People below Poverty Level	29.8%
Median Family Income	\$45,806
Median Household Income	\$41,531
Per Capita Income	\$19,465
Population in Labor Force	231,332
Population Employed*	198,113
Unemployment	14.3%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables E.2 and E.3 show how the City of Fresno's labor force breaks down by occupation and industry based on 5-year estimates from the 2015 American Community Survey.

Table E.2: City of Fresno's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Management, Business, Science and Arts Occupations	57,374	29.0
<i>Management, Business, and Financial Occupations</i>	<i>(20,767)</i>	<i>(10.5)</i>
<i>Computer, Engineering, and Science Occupations</i>	<i>(6,018)</i>	<i>(3.0)</i>
<i>Education, Legal, Community Service, Arts, and Media Occupations</i>	<i>(20,262)</i>	<i>(10.2)</i>
<i>Healthcare Practitioner and Technical Occupations</i>	<i>(10,327)</i>	<i>(5.2)</i>
Sales and Office Occupations	49,752	25.1
Service Occupations	41,528	21.0
Production, Transportation, and Material Moving Occupations	26,738	13.5
Natural Resources, Construction, and Maintenance Occupations	22,721	11.5
Total	198,113	100.00

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table E.3: City of Fresno's Employment by Industry, 2015

Industry	# Employed	% Employed
Educational Services, and Health Care, and Social Assistance	48,557	24.5
Retail Trade	23,337	11.8
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	20,643	10.4
Professional, Scientific, and Management, and Administrative and Waste Management Services	16,742	8.5
Manufacturing	14,869	7.5

Industry	# Employed	% Employed
Public Administration	12,030	6.1
Finance and Insurance, and Real Estate and Rental and Leasing	10,875	5.5
Other Services, Except Public Administration	10,710	5.4
Construction	10,586	5.3
Agriculture, Forestry, Fishing and Hunting, and Mining	10,446	5.3
Transportation and Warehousing, and Utilities	9,476	4.8
Wholesale Trade	7,158	3.6
Information	2,684	1.4
Total	198,113	100.00

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

With the depressed real estate and construction market and economic recession toward the end of the 2000-2010 decade, unemployment rates increased to a peak of 18.0 percent in 2010. Since then, the unemployment rate has steadily decreased. The most recent annual data from the State of California Employment Development Department indicates that in 2016 there were 238,400 people in the City of Fresno labor force. Of these, 214,000 were employed; 24,400 were not. The unemployment rate was 10.2 percent.

E.1.4 Population

According to the California Department of Finance, Fresno's population was estimated to be 520,778 in 2016. Select demographic and social characteristics for the City from the U.S. Census Bureau's 2015 American Community Survey 5-year estimates are shown in Table E.4.

Table E.4: City of Fresno's Demographic and Social Characteristics, 2015*

Characteristic	City of Fresno
Gender/Age	
Male	49.2%
Female	50.8%
Median age	30.0
Under 5 years	8.9%
Under 18 years	29.5%
65 years and over	9.9%
Race/Ethnicity**	
White	52.2%
Asian	13.0%
Black or African American	7.9%
American Indian/Alaska Native	1.1%
Hispanic or Latino (of any race)	48.5%
Education	
High school graduate or higher	75.2%
Disability Status	
Population 5 years and over	11.75%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Based on a 2015 estimated population of 510,451

**Of the 95.4% reporting one race

For information about how some of these demographics affect social vulnerability and how they compare to other Fresno County jurisdictions, California, and the United States, see “Social Vulnerability” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan. A more in-depth look at the population of the City of Fresno, including the City’s special needs populations, is available in the City of Fresno General Plan 2015-2023 Housing Element commissioned by the City of Fresno Development and Resource Management Department and prepared by MIG, Inc (available at www.fresno.gov/housingelement).

E.2 Hazard Identification and Summary

The City of Fresno’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Fresno (see Table E.5). In the context of the plan’s planning area, there are no hazards unique to Fresno.

Table E.5: City of Fresno—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Low
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Significant	Unlikely	Limited	Medium
Drought	Significant	Likely	Critical	High
Earthquake	Extensive	Occasional	Critical	Medium
Flood/Levee Failure	Significant	Occasional	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Critical	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Unlikely	Negligible	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Occasional	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Limited	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Medium
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths		

Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.	Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact
---	---

E.3 Vulnerability Assessment

The intent of this section is to assess the City of Fresno’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify related vulnerabilities unique to each jurisdiction. In addition, the City of Fresno’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Fresno.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table E.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects overall ranking for each hazard, and is based on the City of Fresno’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table E.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Fresno are identified below. The discussion of vulnerability for each of the following hazards is located in Section E.3.2 Estimating Potential

Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include drought, flood/levee failure, and hazardous materials incidents.

- dam failure
- drought
- earthquake
- epidemic/pandemic
- extreme heat
- flood/levee failure
- fog
- hazardous materials incidents
- wildfire
- windstorm

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Fresno, those hazards ranked Low are as follows:

- agricultural hazards*
- human health hazards: West Nile Virus
- landslide
- severe weather: heavy rain/thunderstorm/hail/lightning, tornado
- soil hazards
- volcano
- extreme cold
- winter storm

Note on Agricultural Hazards*: Agricultural hazards are ranked Low in the City of Fresno than for the County overall (ranked High) because very little land in the City is used for agricultural purposes.

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. **Avalanche** is considered Not Applicable (N/A) to the City of Fresno.

E.3.1 Assets at Risk

This section considers Fresno's assets at risk, including values at risk; critical facilities and infrastructure; historic, cultural, and natural resources; economic assets; and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the

information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table E.6 shows the 2017 values at risk broken down by property type for the City of Fresno.

Table E.6: 2017 Property Exposure for the City of Fresno by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	76	53	\$2,887,304	\$2,887,304	\$5,774,608
Commercial	6,110	24,004	\$5,471,778,084	\$5,471,778,084	\$10,943,556,168
Exempt	1,012	3,881	\$0	\$0	\$0
Industrial	2,575	5,630	\$1,420,216,900	\$2,130,325,350	\$3,550,542,250
Multi-Residential	5,793	52,504	\$2,416,885,833	\$1,208,442,917	\$3,625,328,750
Open Space	1	1	\$150,882	\$150,882	\$301,764
Residential	113,468	117,771	\$15,122,142,902	\$7,561,071,451	\$22,683,214,353
Unknown	2	2	\$530,082	\$530,082	\$1,060,164
Total	129,037	203,846	\$24,434,591,987	\$16,375,186,070	\$40,809,778,057

Source: Fresno County 2017 Parcel and Assessor data

Since the 2009 Plan, the City of Fresno has experienced notable increases in agricultural, commercial, and residential properties and property values at risk. Compared to improved values from the Fresno County Assessor's Office's 2007 Certified Roll Values, agricultural improved value has increased by 254.2 percent, commercial improved value has increased by 299.8 percent and total residential improved value has increased by 265.8 percent. Part of this dramatic increase in exposure of commercial and residential properties can be attributed to annexations of previously unincorporated County land that have occurred within the last decade.

Critical Facilities and Infrastructure

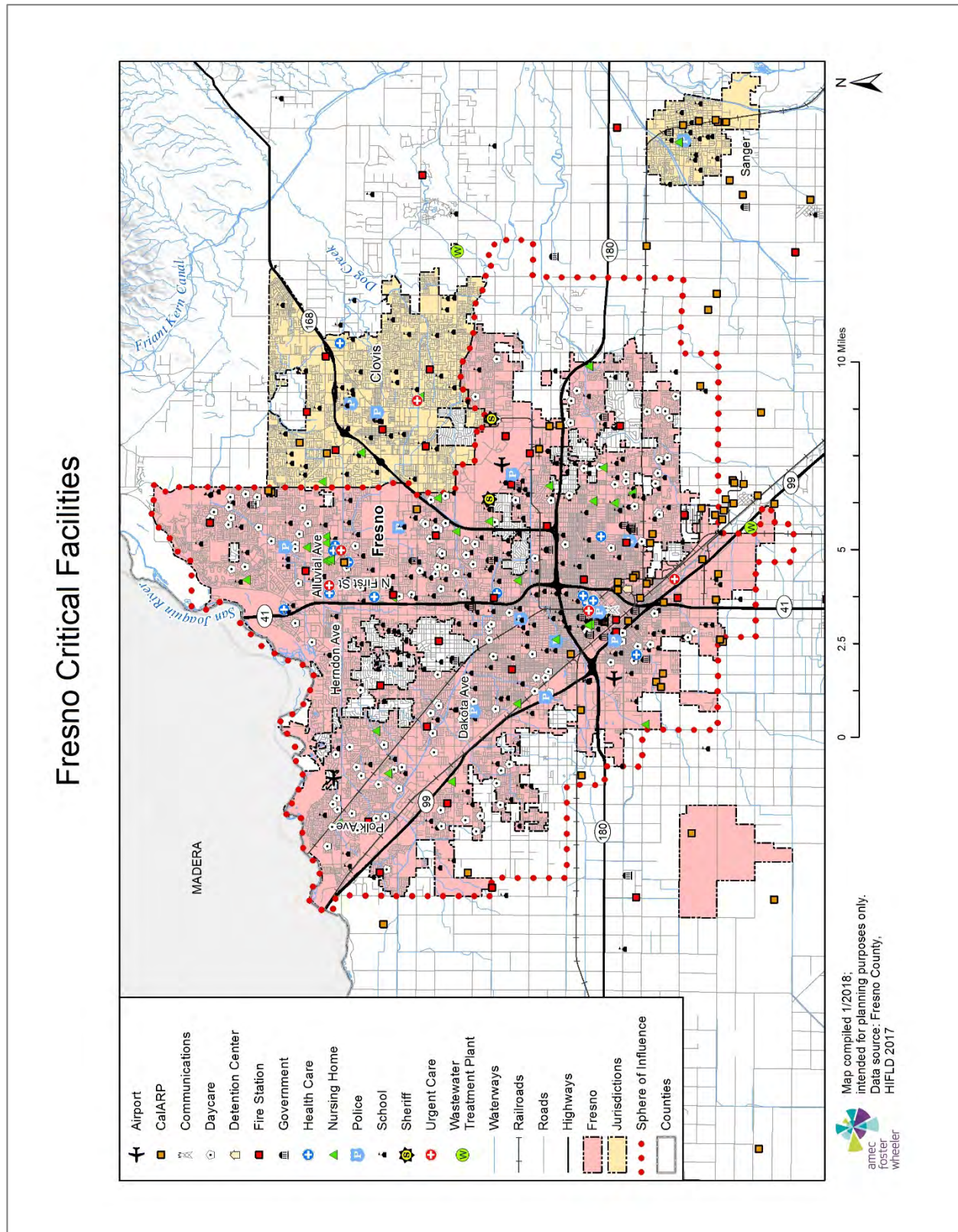
A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Fresno from Fresno County GIS is provided in Table E.7 and mapped in Figure E.2.

Table E.7: City of Fresno's Critical Facilities

Critical Facility Type	Number
Airport	3
Behavioral Health	4
CalARP	28
Colleges & Universities	14
Communications	1
County Government	4
Courthouse	1
Daycare	155
Department of Agriculture	2
Department of Public Health	4
Department of Public Works	1
Department of Social Services	9
Detention Center	4
District Attorney	2
Fire Station	21
General Services	3
Health Care	12
Nursing Home	27
Police	10
School	183
Sheriff	3
Supplemental College	4
Urgent Care	4
Total	499

Source: Fresno County, HIFLD 2017

Figure E.2: City of Fresno's Critical Facilities



The list of specific critical facilities and community assets is maintained by the City of Fresno Police Department. The Fresno Urban Area Critical Infrastructure List is considered confidential and may be accessed through the Fresno Police Department Homeland Security Division.

Historic, Cultural, and Natural Resources

Historic and Cultural Sites

The Cultural Resource Facility located on the California State University, Bakersfield campus maintains a database, maps, and descriptive surveys of prehistoric sites in the Fresno area. Details of the locations are kept confidential due to the risk of theft or vandalism of artifacts. The general location of these sites is along the San Joaquin River and its bluffs, where permanent Native American settlements were established near a permanent water supply and seasonal salmon fishery.

The City of Fresno maintains a local official register of historic resources (available from the historic preservation officer in the City's Planning and Development Department). There are approximately 284 properties on the register. Twenty-one of the properties were demolished or destroyed by fire after being placed on the list, and three other properties have been relocated to sites outside the City of Fresno. The local register includes 31 properties that are on the National Register of Historic Places (see Table E.8).

Table E.8: City of Fresno's Properties on the National Register of Historic Places

Property Name	Address	Date Listed
Azteca Theater	836-840 F Street	4/21/2017
Bank of Italy	1015 Fulton Mall	10/29/1982
Brix, H. H., Mansion	2844 Fresno Street	9/15/1983
Einstein House	1600 M Street	1/31/1978
Forestiere Underground Gardens	5021 W. Shaw Avenue	10/28/1977
Fresno Bee Building	1555 Van Ness Avenue	11/1/1982
Fresno Brewing Company Office and Warehouse	100 M Street	1/5/1984
Fresno County Hall of Records	2281 Tulare Street	12/22/2011
Fresno Memorial Auditorium	2425 Fresno Street	5/10/1994
Fresno Republican Printery Building	2130 Kern Street	1/2/1979
Fresno Sanitary Landfill	West and Jensen Avenues	8/7/2001
Holy Trinity Armenian Apostolic Church	2226 Ventura Street	7/31/1986
Hotel Californian	851 Van Ness Avenue	4/21/2004
Kearney, M. Theo, Park and Mansion	7160 Kearney Boulevard	3/13/1975
Kindler, Paul, House	1520 E. Olive Avenue	10/29/1982
Maulbridge Apartments	2344 Tulare Street	5/6/1982
Meux House	1007 R Street	1/13/1975
Old Administration Building, Fresno City College	1101 University Avenue	5/1/1974
Old Fresno Water Tower	2444 Fresno Street	10/14/1971
Pantages, Alexander, Theater	1400 Fulton Street	2/23/1978
Physicians Building	2607 Fresno Street	11/20/1978

Property Name	Address	Date Listed
Rehorn House	1050 S Street	1/8/1982
Romain, Frank, House	2055 San Joaquin Street	1/11/1982
San Joaquin Light & Power Corporation Building	1401 Fulton Street	1/3/2006
Santa Fe Hotel	935 Santa Fe Avenue	3/14/1991
Santa Fe Passenger Depot	2650 Tulare Street	11/7/1976
Southern Pacific Passenger Depot	1033 H Street	3/21/1978
Tower Theatre	1201 N. Wishon Avenue	9/24/1992
Twining Laboratories	2527 Fresno Street	3/26/1991
Warehouse Row	722, 744, and 764 P Street	3/24/1978
YWCA Building	1660 M Street	9/21/1978

Source: National Register of Historic Places, www.nps.gov/nr/

Other historic resources in the City of Fresno include the following historic districts:

- The Porter Tract Historic District (45 homes)
- The Chandler Field/Fresno Municipal Airport Historic District (four historic structures)
- The Wilson Island Historic District (78 homes)
- The Huntington Boulevard Historic Districts (81 homes)

As comprehensive as the City's register may be, it does not include all properties in the City with potential historic or cultural significance. The list is continually being expanded as sites are discovered through routine analysis of proposed development areas and through proposed new listings of historic districts. The pool of potentially historic properties also changes through time, since federal law provides for a 50-year retrospective review, which now encompasses the post-World War II building boom era. Ten properties that were recommended for the City's register but were denied inclusion by the Fresno City Council are still recognized for their historic/cultural significance (heritage properties), which is taken into account when any actions are undertaken on them pursuant to provisions of the California Environmental Quality Act. (Three of these properties have been since been demolished.)

While a detailed assessment of seismic and flood risks for the listed properties in Fresno is currently beyond the available staff resources of the City's Historic Preservation Office, it can be generally assumed that most of the structures have not been seismically reinforced and that their masonry is vulnerable to strong ground shaking.

While many of the structures are in Fresno's old downtown and were built when this area was largely within the 100-year floodplain of the Fresno Stream Group, efforts by the Fresno Metropolitan Flood Control District in conjunction with the U.S. Army Corps of Engineers and the City of Fresno have provided for flood detention structures and ponding basins that have greatly reduced the size and extent of the floodplain in the downtown, helping to preserve these historic resources.

Natural Resource Areas

San Joaquin River Corridor

While the City maintains many community and neighborhood parks, its natural resources are primarily along the San Joaquin River. Owing to the year-round presence of water, the river bottom and bluffs host the richest aquatic and riparian forest biota in the City. It is in this area where migratory waterfowl and federally and state-listed endangered wildlife are most likely be encountered. These species include the valley elderberry longhorn beetle, the giant garter snake, and the American bald eagle (recently recommended for delisting from the National Endangered Species list).

Over past decades, land in the river corridor has been purchased and aggregated by state agencies (Department of Fish and Game, San Joaquin River Conservancy), by nonprofit groups (San Joaquin River Parkway Trust, Fresno Sportsmen's Club), and by the City and County (the City's Woodward Park and Milburn Unit, the County's Lost Lake Park). The ultimate goal of the San Joaquin River Conservancy Plan is to fashion a regional parkway with continuity of wildlife corridors and to manage it for joint recreational, habitat conservation, and floodplain protection uses.

Due to its location, this natural resource area is flood-prone. In some areas, this risk has been increased due to removal of massive amounts of sand and gravel (from mining), which lowered the ground surface over past decades. While the native riparian plants and animals have largely evolved with coping mechanisms for periodic severe flooding, any developed recreation facilities would be at risk. The face of the bluff is also very vulnerable to wildfire because of its vegetative overgrowth and nearly vertical slopes. Fire prevention efforts are difficult here because the soils are too unstable for vegetative removal projects or for irrigation that would keep the plants well-watered.

Vernal Pool Areas

In the northerly parts of the City, outside the river corridor, certain clay soils have the capacity to form impermeable hardpans and layers that do not allow rapid percolation of rainwater. During the rainy season, shallow vernal pools form that are populated by a host of specialized plants and animals. Many species associated with vernal pools are federally and state-listed species (e.g., the California tiger salamander, various types of fairy shrimp crustaceans, orcutt grass, button celery species, meadowfoam, and owl clover). Vernal pools are also heavily utilized by nonlisted species, such as migratory waterfowl, rodents, furbearing predators, and raptors that prey on other animals.

Wildfire is not considered a major risk to these natural communities, because they evolved with dry season fires as a common occurrence (the plants have very resistant seeds and the crustaceans and amphibians go into protected parts of their life cycles such as deep dormancy). Human encroachment through agriculture and land development is the greatest risk to vernal pool areas. If the clay layers are disrupted by "deep ripping" plowing, water cannot accumulate on the surface and the pools will not form. If the land is subjected to year-round irrigation, specially adapted

vernal pool species will be out-competed by other species. Conversion of land to urban development with structures, paving, lawns, pets, and people will destroy vernal pool natural communities.

Economic Assets

The City of Fresno's economic sector includes both private and public entities that have been compiled into clusters in order to identify key economic assets. These ten clusters, known as the Regional Job Initiative (RJI) clusters, are Advanced Manufacturing, Clean Energy, Construction, Food Processing, Healthcare, Info Processing (Call Centers, Logistics, and Distribution), Software Development, Tourism, and Water Technology. Among these clusters are major employers like Saint Agnes, Pelco, Gottschalks, and Ruiz Foods that both boost Fresno's economic growth and provide employment opportunities.

If a disaster struck the City, it could have a severe impact on Fresno's economic assets. Sectors of greatest concern include all the RJI clusters, but in particular Food Processing, which includes the agricultural industry, and Healthcare.

Growth and Development Trends

The City of Fresno is growing at a rapid pace. Its expansion from incorporation in 1885 to the present day (August 2017) is illustrated in Figure E.3. Even more growth is anticipated in the years to come, based on current trends.

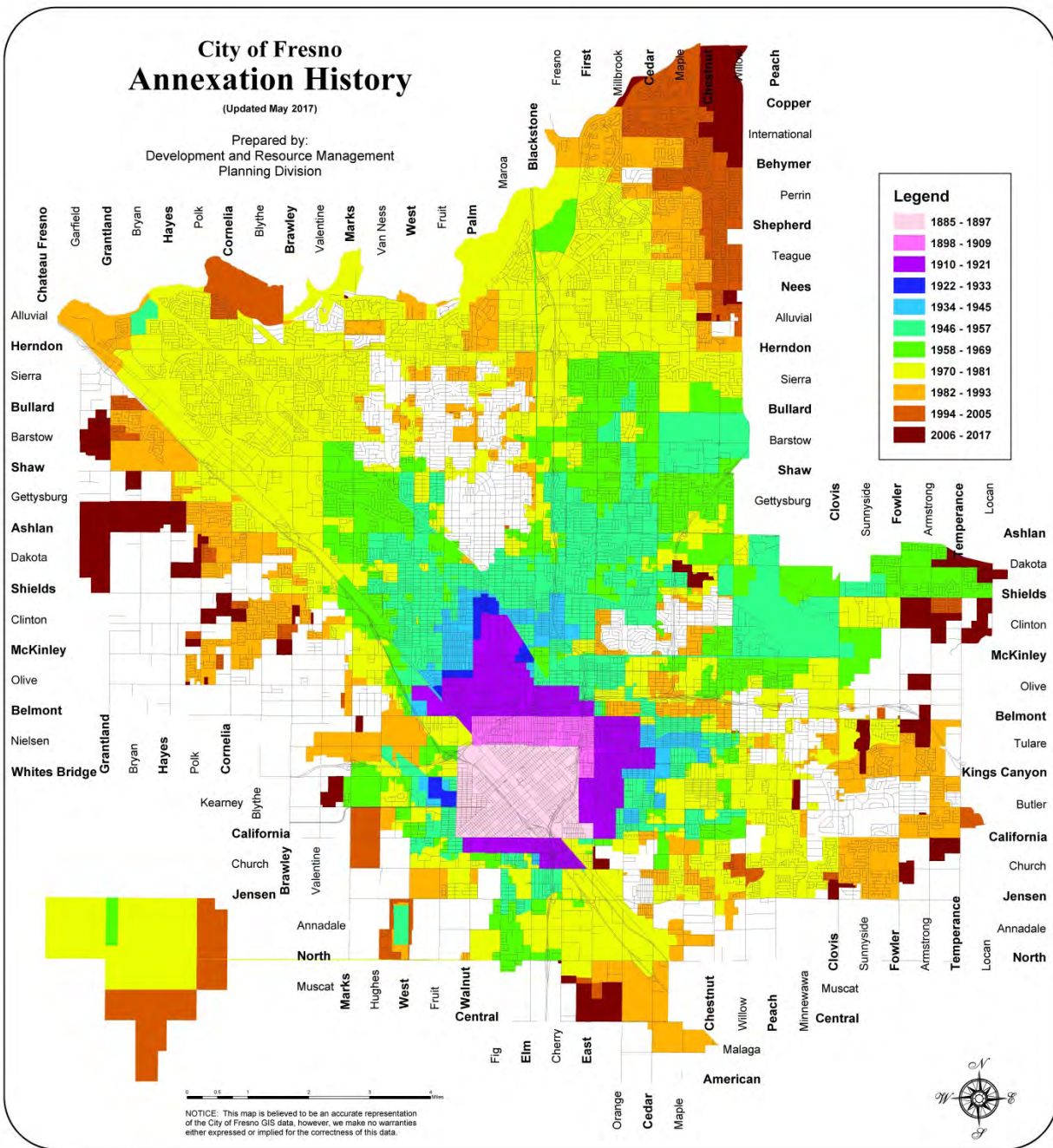
Table E.9 illustrates how the City has grown in terms of population and number of housing units between 2011 and 2017 alone.

Table E.9: City of Fresno's Change in Population and Housing Units, 2011-2017

2011 Population	2017 Population Estimate	Estimated Percent Change 2011-2017	2011 # of Housing Units	2017 Estimated # of Housing Units	Estimated Percent Change 2011-2017
498,664	525,832	+5.49	172,171	178,819	+3.86

Source: California Department of Finance, www.dof.ca.gov/Forecasting

Figure E.3: City of Fresno's Annexation History



Source: City of Fresno Development Department. This map is believed to be an accurate representation of the City of Fresno GIS data, however, we make no warranties either expressed or implied for the correctness of this data.

By December 31, 2035 (the “Horizon” year of the most recent Fresno General Plan), it is estimated that 771,000 people will reside in the Fresno Metropolitan Area (which would include County islands and areas inside the City’s Sphere of Influence but not yet annexed). This figure of 771,000 would be 64 percent of the projected 2035 Fresno County population of 1,201,416 (State of California Department of Finance population projections).

As of August of 2017, the City of Fresno comprised 115.3 square miles of annexed (incorporated) land within its 161.8-square mile Sphere of Influence. Development had reached the natural and political northerly boundary of the City, the San Joaquin River, and began expanding to the west and southeast through conversion of rural residential and agricultural land. Within the Sphere of Influence, there continued to be “County islands” and partially urbanized fringe areas. An urban unification annexation program may reduce the numbers and sizes of these enclaves in the coming decade.

The Fresno General Plan made a concerted effort to revitalize the City’s downtown by balancing new growth areas to geographically recenter the downtown. With construction of a major sewer trunk along the Grantland Avenue alignment and proposed construction of new wastewater and water treatment plants in the southeastern area, the City’s future growth is expected to concentrate primarily to the west and southeast.

The Fresno Metropolitan Flood Control District (FMFCD) has commenced major flood control facility construction on Fancher Creek in the eastern portion of the City’s Sphere of Influence. Since the Fresno General Plan was completed in December 2014, the FMFCD will compile technical studies and update its master service plan in conjunction with the City’s land use plan for this new growth area.

The Fresno General Plan also directed that new development be more compact and that single-family residential densities be higher than the City’s traditional 4± dwelling units/acre pattern for subdivisions. The recently adopted Fulton Corridor Specific Plan and Downtown Neighborhoods Community Plan and other plan amendments and projects in process (and proposed in the future) feature smaller lots, multi-story housing, multi-family units, and reduced setbacks.

Unless the cost of manufactured housing units would provide a substantial savings over site-built homes, it is not expected that the proportion of manufactured housing in the City of Fresno will greatly increase. It is possible that there will be some increase as producers of these units create models with appropriate roof pitches and other features to meet the City’s design review standards.

More information about the City of Fresno’s growth and current housing stock is available in the City of Fresno General Plan 2015-2023 Housing Element commissioned by the City of Fresno Development and Resource Management Department and prepared by MIG, Inc (available at www.fresno.gov/housingelement). More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

E.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table E.6 above shows Fresno's exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Agricultural Hazards

Agricultural hazards are ranked with a Low significance in the City of Fresno; lower than for the County overall (ranked High) because very little land in the City is used for agricultural purposes. Agricultural losses due to hazard events have greater economic impact on the small communities and rural areas of the County than on the City of Fresno. However, ornamental and garden plants in the City, and pets and incidental livestock kept within City limits, may become involved in any countywide responses to crop pests or infectious agents, because these urban plants and animals provide reservoirs for the diseases and crop pests that threaten the County's agriculture.

Dam Failure

The National Inventory of Dams lists five dams located in the City of Fresno, including the Redbank Creek Detention basin, Fancher Creek Detention, Friant Millerton Road Embankment A, Redbank, and Friant Dike 3.

Drought

Annual rainfall in the City of Fresno is typically 12-14 inches. This makes the region vulnerable to episodic drought and to chronic drawdown of aquifer levels (the U.S. Environmental Protection Agency has designated the groundwater below Fresno as a sole source aquifer). Water in this aquifer has historically flowed through permeable strata from north and northeast toward the south and west, but the aquifer has been so affected by drawdown that a "cone of depression" has been created, reversing the historic flow directions (the "groundwater gradient") in portions of west and south Fresno.

In the last 10 years the City of Fresno has made strides to reduce dependence on groundwater by setting a course to implement water plans, which include the Urban Water Management Plan, Recycled Water Waster Plan, and the recently adopted Water Capital Program. A surface water treatment plant is currently under construction in Southeast Fresno and should be completed by 2018. When operational, the plant will maximize use of Fresno's surface water allocations during

normal years and allow the City to reduce overuse of groundwater. Recycled water use will also grow in Fresno with the new recycled water mains now being constructed. The City has plans to use 25,000 acre-feet per year of recycled water for irrigating open spaces, parks, street medians and golf courses.

Earthquake

The seismic hazard in the City of Fresno is low relative to California coastal and mountain communities and is lower than in the Sierra and western areas of Fresno County. There are no known earthquake faults underlying Fresno, and the City has never been the epicenter of a known seismic event. However, Fresno is considered to have a moderate risk of earthquake damage due to the presence of major fault systems to the west, south, and east and due to Fresno's large population and number of buildings, critical facilities, and infrastructure and other development that could be vulnerable to more severe ground shaking.

Historically, Fresno has sustained very little damage from major earthquakes occurring on California's major faults: the Owens Valley earthquake of 1872 toppled an unreinforced masonry (brick) church steeple. More recent major earthquakes in the past four decades (with epicenters near Coalinga and the Bay Area) have resulted in perceptible tall building swaying in Fresno, minor injuries (attributable to shelved items falling), and slight damage (e.g., minor cracked plaster, etc.). To date, no soil liquefaction has been observed in Fresno from any seismic event.

The most serious impacts of an earthquake in Fresno would probably arise from damage to large dams in the Sierra Nevada on the upper reaches of the San Joaquin River very close to active Long Valley Caldera-related faults. Should either of the two most easterly (and largest) dams in this area be severely damaged or breached, the resulting sequential dam failures could cause floodwaters to overtop Friant Dam northeast of the City. While the dam failure inundation map for Friant shows that most of the flooded area would be expected in the northwest part of town (where the confining river bluffs are not as high), there are some residences and important infrastructure in the river channel itself that would be inundated and gravely damaged (or destroyed), including highway bridges and the inlet of the Friant-Kern Canal, which supplies Bureau of Reclamation surface water to the Fresno area and to other communities in the southern San Joaquin Valley.

Epidemic/Pandemic

Fresno's population includes many residents who have limited access to health care, with causes related to low household income levels, lack of insurance coverage, a limited number of primary health care facilities and acute care beds, a low ratio of public health and medical professionals to population, and language barriers. Highly communicable diseases tend to affect a large percentage of the City, perhaps due to large household size and the mobility of the population. If a highly communicable disease outbreak occurred that caused serious or life-threatening illness for most infected persons, health care and other public service systems would experience disruption or breakdown and would require outside intervention with resources from other communities, the state, or the federal government.

Extreme Cold/Freeze

Freeze events occur occasionally in Fresno, but impacts are greater to the agriculture industry in the County than to the City. In January 2007, overnight minimum temperatures fell below freezing between January 6 and 10. The event led to a presidential disaster declaration due to the estimated \$710 million in agricultural damage in the Central and South Valley. The 2007 event occurred in another eight-year interval after the devastating citrus freezes of 1998 and 1990. The event caused frozen pipes in Fresno but little other property damage. The City also has a plan for freezing temperature events and opens warming centers. These centers are primarily geared toward the homeless population.

Extreme Heat

Fresno uses a local version of the California State Plan for Extreme Heat. This plan was used during the extreme heat event during the summer of 2006 and worked well. The City operates cooling centers, which are primarily geared toward the homeless. Public notification for extreme heat events is conducted through the Public Affairs office in coordination with Fresno County.

Expansive Soils

These types of soils occur in northern Fresno in the far northeastern portions of its Sphere of Influence (in the “Copper River” area). Expansive clay soils can cause cavitation over time and require special construction standards for foundations.

Flood

As noted in the preceding section, there is some flood risk to the City from San Joaquin River major dam failure inundation, but the more common flood risk, repetitively experienced in Fresno, is that of shallow “sheet” flooding from major precipitation events. Except for the San Joaquin River, streams in the Fresno-Clovis Metropolitan Area originate in the Sierra foothills to the east and extend into the valley floor west of State Route 99 by way of dual-use irrigation and storm runoff channels and disperse into numerous smaller irrigation canals. Overflow from these canals and urban stormwater from intense precipitation events is sent back to the San Joaquin River or to farmland southwest of Fresno via spillway channels.

In the City of Fresno, these canals and channels are under control of the Fresno Irrigation District, an independent public agency, but their use during storm events is shared by another independent district, the Fresno Metropolitan Flood Control District (FMFCD). The FMFCD was created to develop flood control facilities to prevent further repetitive losses created by the Fresno Stream Group and to provide an urban drainage network. This District is responsible for administering a Storm Drainage and Flood Control Master Plan. The City’s municipal code supports these efforts by including a Drainage Fee Ordinance to ensure that grading and development comply with the FMFCD’s Master Plan and standards and provide proportionate shares of storm drain and ponding basin infrastructure.

The City of Fresno's Floodplain Ordinance further coordinates and supports FMFCD efforts. This ordinance and the Fresno General Plan Safety Element policies require conformance to FEMA floodplain management policies and to those of California's Central Valley Flood Prevention Board (which regulates the designated floodway along the San Joaquin River channel). Still, in areas not completely developed to urban standards, areas where the urban drainage network is not yet completed, and in some County "island" areas (land within the City that the County has authority over), stormwater drainage facilities may not prevent localized shallow flooding during intense runoff events.

According to FEMA's 2016 Flood Insurance Study (FIS), the following major canals and ditches run through the City:

- **Central Canal** flows southwest through the southeastern part of the City of Fresno.
- **Dry Creek Canal** begins at the confluence of Mill Ditch and Herndon Canal, just downstream of North Millbrook Avenue, and flows southwest through the southwestern portion of the City.
- **Fancher Creek Canal** flows southwest along the eastern corporate limits of the City of Fresno and joins Central Canal at the southeast corner of the City.
- **Herndon Canal** begins at the confluence of Mill Ditch and Dry Creek Canal. It flows west through the center of the City of Fresno, then flows northwest through the northwestern part of the City.
- **Mill Ditch** flows west along East McKinley Avenue to its confluence with Herndon and Dry Creek Canals.

The FIS details the City of Fresno's flood history as follows:

In February 1884, flood flows from streams of the Fresno-Clovis group inundated the business section of the City of Fresno. Frequent flooding was a problem in the City throughout the 1880. Suburban areas of the City were flooded in spring 1920; the downtown area was inundated in 1923; flooding occurred in the Fig Garden area in 1936; and parts of the City, especially in the northeast section, were flooded in March 1938. Since the 1938 flood, which had an estimated discharge of 2,700 cubic feet per second (cfs) on Dry Creek at the Big Dry Creek Dam site, high flows occurred on that stream in December 1955 (3,800 cfs), January 1969 (5,700 cfs), and February 1969 (4,500 cfs). During December 1955, approximately 500 acres of agricultural and suburban land were flooded by overflow from irrigation canals, and damage, mostly to public facilities, totaled approximately \$50,000. The largest and most damaging flood period was January and February 1969, when the combined discharges of Dry, Dog, Redbank, Fancher, and Mud Creeks flooded an estimated 14,500 acres and caused almost \$4.7 million in damage. Most of the flooding was in the eastern and northeastern parts of the City. It occurred because many of the streams in the Fresno-Clovis group discharged floodwater into various irrigation canals, causing them to overflow.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Fresno was created (see Figure E.4). Tables E.10 and E.11 summarize the values at risk in the City’s 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Figure E.4: City of Fresno's 100- and 500-Year Floodplains

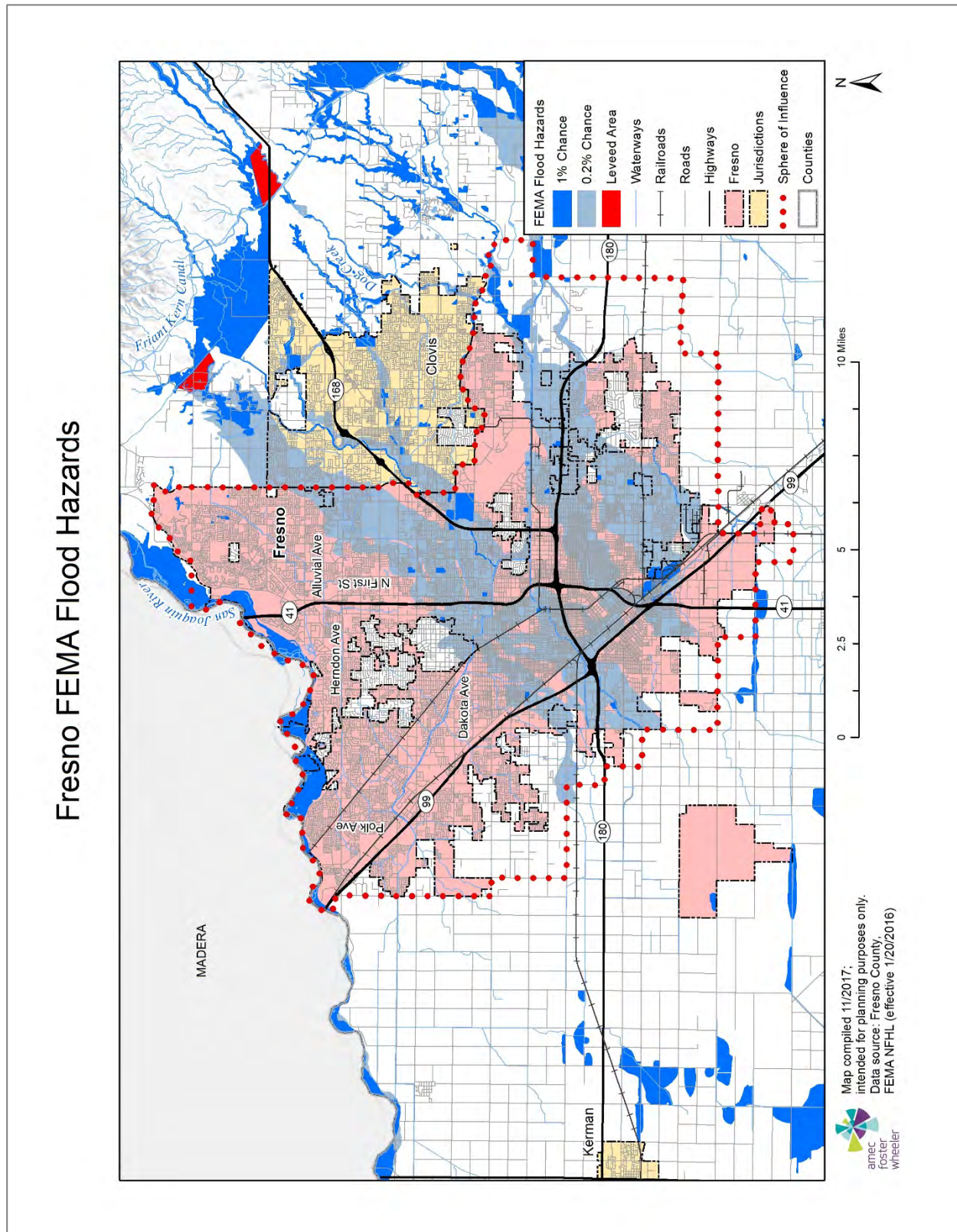


Table E.10: City of Fresno's FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	0	\$60,933	\$60,933	\$121,866	\$30,467
Commercial	23	210	\$6,222,246	\$6,222,246	\$12,444,492	\$3,111,123
Exempt	29	35	\$0	\$0	\$0	\$0
Industrial	70	107	\$30,681,072	\$46,021,608	\$76,702,680	\$19,175,670
Multi-Residential	11	84	\$2,529,983	\$1,264,992	\$3,794,975	\$948,744
Residential	97	120	\$23,269,875	\$11,634,938	\$34,904,813	\$8,726,203
Total	231	556	\$62,764,109	\$65,204,716	\$127,968,825	\$31,992,206

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table E.11: City of Fresno's FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	29	29	\$746,974	\$746,974	\$1,493,948	\$373,487
Commercial	2,814	9,030	\$1,574,492,657	\$1,574,492,657	\$3,148,985,314	\$787,246,329
Exempt	381	1,404	\$0	\$0	\$0	\$0
Industrial	745	1,435	\$309,126,790	\$463,690,185	\$772,816,975	\$193,204,244
Multi-Residential	2,299	20,013	\$797,001,401	\$398,500,701	\$1,195,502,102	\$298,875,525
Residential	31,581	32,817	\$2,677,387,750	\$2,677,387,750	\$5,354,775,500	\$1,338,693,875
Total	37,849	64,728	\$5,358,755,572	\$5,114,818,267	\$10,473,573,839	\$2,618,393,460

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

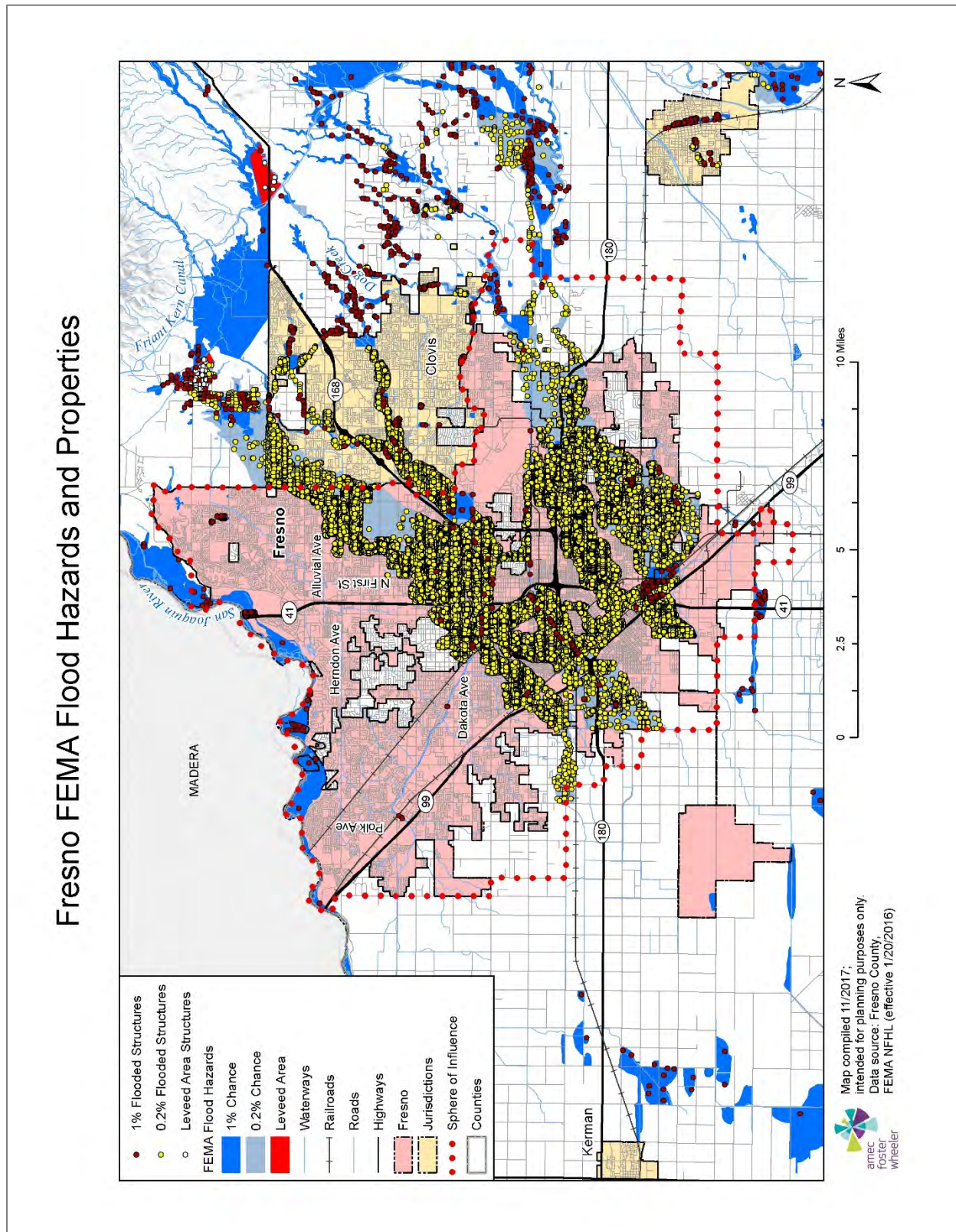
Based on this analysis, the City of Fresno has significant assets at risk to the 100-year and greater floods. There are 231 improved parcels within the 100-year floodplain for a total value of roughly \$128 million, including building and content value. An additional 37,849 improved parcels valued at roughly \$10.5 billion fall within the 500-year floodplain.

Applying the 25 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly \$32.0 million in damage in the City of Fresno and a 0.2 percent chance in any given year of a 500-year flood causing roughly \$2.65 billion in damage (combined damage from both floods).

Properties at risk to flooding are shown in relation to the mapped floodplains in Figure E.5.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Figure E.5: City of Fresno's Properties at Risk in the 100- and 500-Year Floodplains



In addition to the 100-year and 500-year floodplains mapped by FEMA, the California Department of Water Resources maintains Best Available Maps (BAM) which include the floodplains in the Sacramento and San Joaquin River Basins, based on a study performed in 2002 by the U.S. Army Corps of Engineers (USACE). Though limited to the San Joaquin River as a flood source and thus not as comprehensive as the FEMA FIRM, the USACE study shows additional differentiation in flood risk by modeling the 200-year floodplain (the flood with a 0.5 percent annual chance of occurring). Table E.12 summarizes the values at risk by property type within the 200-year floodplain and loss estimates to the 200-year storm using the same methodology described above.

Table E.12: City of Fresno's FEMA 0.5% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	0	\$60,933	\$60,933	\$121,866	\$30,467
Commercial	3	139	\$4,322,495	\$4,322,495	\$8,644,990	\$2,161,248
Exempt	5	5	\$0	\$0	\$0	\$0
Residential	18	19	\$12,103,507	\$6,051,754	\$18,155,261	\$4,538,815
Total	27	163	\$16,486,935	\$10,435,182	\$26,922,117	\$6,730,529

Sources: Fresno County 2017 Parcel and Assessor data; CA DWR BAM; USACE

Based on this analysis, there are 27 parcels within the 200-year floodplain valued at nearly \$10.5 million. Applying the 25 percent damage factor, there is a 0.5 percent annual chance of a 200-year flood causing \$6.73 million in damage in the City of Fresno.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Fresno joined the National Flood Insurance Program (NFIP) on December 1, 1982. In addition to providing insurance for properties at risk of flooding, the program collects and publishes statistics on flood-related losses in participating jurisdictions.

NFIP insurance data for the City of Fresno indicates that as of March 30, 2017, there were 323 flood insurance policies in force in the City with \$99,316,700 in coverage. This coverage represents a decline of nearly 200 policies over the last decade. Of the 323 policies, 277 were residential (267 for single-family homes) and 46 were nonresidential. 56 of the policies were in A zones (including A01-30, AE, AO, and AH), and the remaining 267 policies were in B, C, and X zones. Policies in B, C, and X zones have increased slightly over the past decade, while policies in the 100-year floodplain have dramatically declined.

There have been 81 historical claims for flood losses totaling \$765,183; 73 were for residential properties; 37 were in A zones and 36 were in B, C, or X zones; and 54 were pre-FIRM structures (17 of the 19 post-FIRM structures with reported losses were in a B, C, or X zone). According to the FEMA Community Information System accessed 9/17/2018 there was one Repetitive Loss and no Severe Repetitive Loss properties located in the jurisdiction.

Population at Risk

Using parcel data from the County, the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the U.S. Census Bureau 2016 estimate for the average number of persons per household (3.17). The following are at risk to flooding in the City of Fresno:

- 100-year flood—342 people
- 500-year flood—107,400 people
- **Total flood**—107,742 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table E.13 lists the critical facilities in the City's 100- and 500-year floodplains.

Table E.13: Critical Facilities in the 100- and 500-Year Floodplains: City of Fresno

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Airport	-	1
Behavioral Health	-	1
CalARP	1	12
Colleges & Universities	-	5
Communications	-	1
County Government	-	2
Daycare	-	52
Department of Agriculture	-	2
Department of Public Health	-	2
Department of Social Services	-	6
District Attorney	-	1
Fire Station	-	7
General Services	-	3
Health Care	-	1
Nursing Home	-	12
Police	-	5
School	-	68
Urgent Care	-	2
Total	1	183

Source: Fresno County, HIFLD 2017

Hazardous Materials Incident

The following are the primary concerns for the City of Fresno related to hazardous materials release:

- Train derailments

- Kinder-Morgan pipeline
- Chevron petroleum pipelines
- Storage facilities

There are 28 CalARP hazardous materials facilities located in the City of Fresno. As detailed in Table E.14, there are 62 critical facilities located within a half mile of a CalARP facility.

Table E.14: Critical Facilities within ½ mile of CalARP Facility: City of Fresno

Critical Facility Type	Count
Colleges & Universities	1
Communications	1
County Government	4
Courthouse	1
Daycare	11
Department of Public Health	2
Department of Social Services	4
Detention Center	4
District Attorney	2
Fire Station	4
Health Care	3
Nursing Home	4
Police	1
School	17
Sheriff	1
Supplemental College	1
Urgent Care	1
Total	62

Source: Fresno County, HIFLD 2017

For more information on this hazard please refer to the main plan, Section 4.

Severe Weather: Fog

The risk and vulnerability factors for fog in the City is not unique from the County at large. Please refer to the main plan's discussion of the fog hazard in section 4.

Severe Weather: Windstorm

Fresno's prevailing winds are typically light and from the northwest. High wind conditions are occasionally created by strong weather fronts. Occasionally, there are funnel clouds of low intensity. Past structural damage has been light, infrequent, and very limited in geographic extent. Injuries have been extremely rare. Most of this damage has occurred secondary to large trees being blown over. The City's design wind load, the level of wind force that new structures are required to be engineered to withstand, is 70 mph.

Soil Hazards: Land Subsidence

Despite long-term over-drafting of groundwater that has lowered the static water table under Fresno by as much as 100 feet over the past century, ground level subsidence has not been noted in the vicinity of the City (this is probably due to the geologic strata underlying the City, which features layers of clay and hardpan interleaved with sand and gravel layers).

Wildfire

Similar to many areas of the County, Fresno has high temperatures in the summer with low rainfall creating fire hazard conditions. There is some wildfire risk in the San Joaquin River Bluff area in northern Fresno due to vegetation and steep slopes.

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Fresno was created (see Figure E.6). An analysis was performed using GIS software to determine where populations, values at risk, and critical facilities are located within wildfire threat zones. Table E.15 shows the values at risk in the moderate wildfire threat zone (there are no values at risk in the high or very high threat zones). There are not any critical facilities in wildfire threat zones in the City of Fresno.

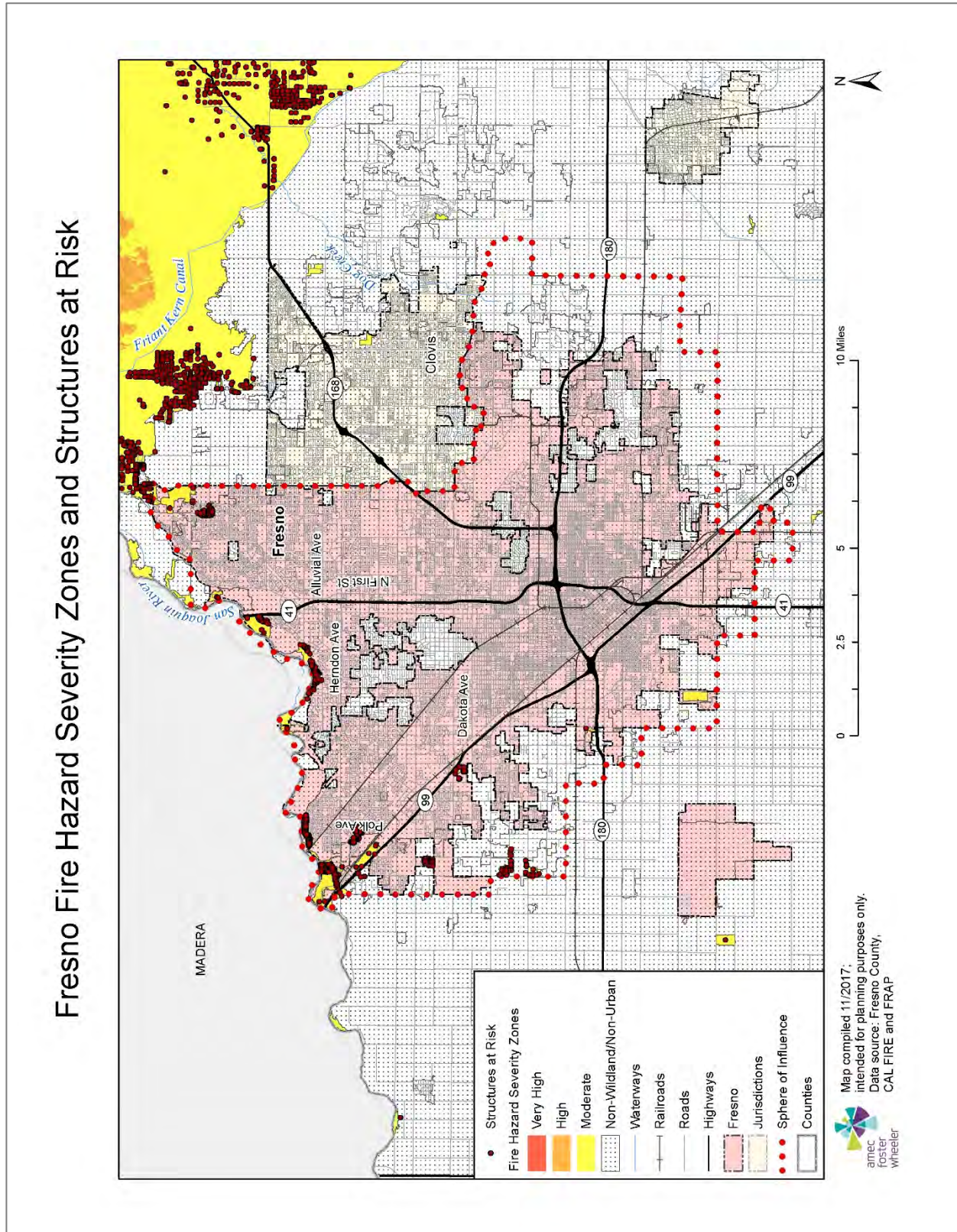
Table E.15: Values at Risk to Wildfire (Moderate Threat) in the City of Fresno

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	0	\$60,933	\$60,933	\$121,866
Commercial	13	36	\$24,379,836	\$24,379,836	\$48,759,672
Exempt	12	13	\$0	\$0	\$0
Industrial	4	4	\$2,105,480	\$3,158,220	\$5,263,700
Multi-Residential	1	16	\$255,200	\$127,600	\$382,800
Residential	772	779	\$180,172,709	\$90,086,355	\$270,259,064
Total	803	848	\$206,974,158	\$117,812,944	\$324,787,102

Sources: Fresno County 2017 Parcel and Assessor data

Based on this analysis, the City of Fresno's moderate wildfire threat affects 2,450 people and 803 improved parcels valued at roughly \$324,787,102. Almost all of the parcels at risk are in the San Joaquin River corridor, where development is very restricted due to flood risk and bluff instability. Other parcels are in industrial areas along the western edge of the City, where the City's weed abatement ordinances (requiring vegetation control by April) would reduce the wildfire risk.

Figure E.6: City of Fresno's Wildfire Threat



E.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Fresno's updated capabilities are summarized below.

E.4.1 Regulatory Mitigation Capabilities

Table E.16 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Fresno.

Table E.16: City of Fresno's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General Plan	Yes	The Fresno General Plan has a Noise and Safety Element with policies for wildland fire hazards, seismic/geologic hazards, storm drainage and flood control, hazardous materials, airport safety, and emergency response
Zoning Ordinance	Yes	Fresno Municipal Code Chapter 15; Zoning Ordinance has requirements related to health and safety (e.g., dwelling unit density controls, building setbacks for fire protection, masonry walls along major streets)
Subdivision Ordinance	Yes	Fresno Municipal Code Chapter 15 requires multiple points of access for ingress/egress, fire protection provisions, etc.
Development Permit (formerly Site Plan Review) requirements	Yes	Required for all nonresidential development projects and multi-family projects over two units; required for duplexes in some zone districts; plot plan review required for even single-family residential construction
Growth Management Ordinance	Yes	Fresno Municipal Code Chapter 12 provides for extension of urban infrastructure and services including sewer treatment, water supply, and fire protection
Floodplain Ordinance	Yes	Fresno Municipal Code Chapter 13 (local building codes) includes the Flood Damage Prevention Ordinance
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	- Within the Zoning Ordinance, there is a Bluff Preservation Overlay district with requirements for soil stability analysis and setbacks from the San Joaquin bluff edge

Regulatory Tool	Yes/No	Comments
		- Pretreatment Ordinance and environmental control program for wastewater system to prevent and abate any hazardous material releases
Building Code	Yes	Version: 2016 California Building Code with a few City modifications: fire sprinkler ordinance, swimming pool ordinance, and security ordinance
Fire Department ISO Rating	Yes	Rating: 3
Erosion or Sediment Control Program	Yes	The Bluff Preservation Ordinance, as well as grading plan review and stormwater pollution prevention plans, which are required for all development projects through project conditions and CEQA review
Stormwater Management Program	Yes	In conjunction with Cal-EPA, Regional Water Quality Control Board, and Fresno Metropolitan Flood Control District
Capital Improvements Plan	Yes	Public Works Department and Department of Public Utilities formulate and administer these plans
Economic Development Plan	Yes	Fresno Redevelopment Agency and Economic Development Division of the Planning and Development Department
Local Emergency Operations Plan	Yes	Ratified by City Council in 2005 and last updated in 2015
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

Fresno General Plan (Adopted December 18, 2014)

The Fresno General Plan is a blueprint of how the City anticipates directing and managing growth while minimizing potential impacts for existing and future generations. It provides long-range planning strategies for the continued development, enhancement, and revitalization of the Fresno Metropolitan Area. The plan goals are the guiding principles and provide the framework for the objectives and policies that can be found in the plan elements. The following general plan goals directly or indirectly mitigate hazards identified in this plan:

- **Goal 9**—Promote a city of healthy communities and improve quality of life in established neighborhoods.
 - *Emphasize supporting established neighborhoods in Fresno with safe, well maintained, and accessible streets, public utilities, education and job training, proximity to jobs, retail services, health care, affordable housing, youth development opportunities, open space and parks, transportation options, and opportunities for home grown businesses.*
- **Goal 12**— Resolve existing public infrastructure and service deficiencies, make full use of existing infrastructure, and invest in improvements to increase competitiveness and promote economic growth.
 - *Emphasize the fair and necessary costs of maintaining sustainable water, sewer, streets, and other public infrastructure and service systems in rates, fees, financing and public investments to implement the General Plan. Adequately address accumulated deferred maintenance, aging infrastructure, risks to service continuity, desired standards of service to meet quality-of-life goals, and required infrastructure to support growth, economic competitiveness and business development.*
- **Goal 16**— Protect and improve public health and safety.

Some of the elements of the General Plan also contain objectives and policies relevant to protecting human health and safety (e.g., supporting objectives and policies in the Public Utilities and Services Element direct that amendments to construction and fire codes to reduce the level of risk to life and property from fire commensurate with the City’s fire suppression capabilities and that fire and police services be provided). Because the Noise and Safety Element is the portion of the General Plan most relevant to hazard mitigation, select objectives and policies are extracted and included below.

The Noise and Safety Element

The Noise and Safety Element seeks to reduce deaths, injuries, illnesses, damage to property, and economic and social dislocation that could result from hazards. Of specific relevance to this plan, it addresses seismic and geologic conditions, flooding, hazardous materials, and emergency response.

Seismic and Geologic Hazards

NS-2. Objective: Minimize risks of property damage and personal injury posed by geologic and seismic risks.
NS-2-a. Policy: Seismic Protection. Ensure seismic protection is incorporated into new and existing construction, consistent with the Fresno Municipal Code.
NS-2-b. Policy: Soil Analysis Requirement. Identify areas with potential geologic and/or soils hazards, and require development in these areas to conduct a soil analysis and mitigation plan by a registered civil engineer (or engineering geologist specializing in soil geology) prior to allowing on-site drainage or disposal for wastewater, stormwater runoff, or swimming pool/spa water.
NS-2-c. Policy: Landfill Areas. Require proposed land uses on or near landfill areas to be designed and maintained to comply with California Code of Regulations, Title 27, Section 21190, Post Closure Land Use.
NS-2-d. Policy: Bluff Preservation Overlay Zone. Per the requirements of the Bluff Preservation Overlay Zone District and Policy POSS-7-f (Chapter 5, Parks and Open Space), the following standards shall be applicable for property located within the Bluff Preservation zone: <ul style="list-style-type: none"> Require proposed development within 300 feet of the toe of the San Joaquin River bluffs to undertake an engineering soils investigation and evaluation report that demonstrates that the site is sufficiently stable to support the proposed development, or provide mitigations to provide sufficient stability; and Establish a minimum setback of 30 feet from the San Joaquin River bluff edge for all buildings, structures, decks, pools and spas (which may be above or below grade), fencing, lighting, steps, etc. <ul style="list-style-type: none"> An applicant may request to reduce the minimum setback to 20 feet from the bluff edge if it can be demonstrated, to the satisfaction of the City’s Building Official and the Planning Director, that the proposed building, structure, deck, pool and/or spas (which may be above or below grade), fencing, steps, etc., will meet the objectives of the Bluff Preservation Overlay Ordinance. In no case shall the setback be reduced to less than 20 feet.

Flooding Hazards

NS-3. Objective: Minimize the risks to property, life, and the environment due to flooding and stormwater runoff hazards.
NS-3-a. Policy: Stormwater Drainage and Flood Control Master Plan. Support the full implementation of the FMFCD Storm Drainage and Flood Control Master Plan, the completion of planned flood control and drainage system facilities, and the continued maintenance of stormwater and flood water retention and conveyance facilities and capacities. Work with the FMFCD to make sure that its Storm Drainage and Flood Control Master Plan is consistent with the General Plan.

NS-3-b. Policy: Curb and Gutter Installation. Coordinate with Fresno Metropolitan Flood Control District (FMFCD) to install curbing, gutters, and other drainage facilities with priority to existing neighborhoods with the greatest deficiencies and consistent with the Storm Drainage and Flood Control Master Plan.
NS-3-c. Policy: Dual Use Facilities. Support multiple uses of flood control and drainage facilities as follows: <ul style="list-style-type: none"> • Use, wherever practical, FMFCD facilities for groundwater management and recharge; and • Promote recreational development of ponding basin facilities located within or near residential areas, compatible with the stormwater and groundwater recharge functions.
NS-3-d. Policy: Landscaped Buffer. City will support the development of FMFCD ponding basins including the landscaping and irrigation for the top one third of the side sloped areas consistent with the FMFCD Basin Design Criteria.
NS-3-e. Policy: Pollutants. Work with FMFCD to prevent and reduce the existence of urban stormwater pollutants pursuant to the requirements of the National Pollution Discharge Elimination Systems Act.
NS-3-f. Policy: Flooding Emergency Response Plans. Work with responsible agencies to update emergency dam failure inundation plans, evacuation plans and other emergency response plans for designated flood-prone areas, including the San Joaquin river bottom.
NS-3-g. Policy: Essential Facilities Siting Outside of Floodplains. Avoid siting emergency response and essential public facilities, such as fire and police stations, within a 100-year floodplain, unless it can be demonstrated that the facility can be safely operated and accessed during flood events.
NS-3-h. Policy: Runoff Controls. Implement grading regulations and related development policies that protect area residents from flooding caused by urban runoff produced from events that exceed the capacity of the Storm Drainage and Flood Control Master Plan system of facilities. Place all structures and/or flood-proofing in a manner that does not cause floodwaters to be diverted onto adjacent property, increase flood hazards to other property, or otherwise adversely affect other property.
NS-3-i. Policy: New Development Must Mitigate Impact. Require new development to not significantly impact the existing storm drainage and flood control system by imposing conditions of approval as project mitigation, as authorized by law. As part of this process, closely coordinate and consult with the FMFCD to identify appropriate conditions that will result in mitigation acceptable and preferred by FMFCD for each project. <i>Commentary: The City recognizes the expertise and significant role of the FMFCD, and will give the highest deference to its recommendations for mitigation measures, consistent with applicable law.</i>
NS-3-j. Policy: National Flood Insurance Program. Continue to participate in the National Flood Insurance Program (NFIP) by ensuring compliance with applicable requirements. Review NFIP maps periodically to determine if areas subject to flooding have been added or removed and make adjustments to the Land Use Diagram Figure LU-1.
NS-3-k. Policy: 100-Year Floodplain Policy. Require developers of residential subdivisions to preserve those portions of development sites as open space that may be subject to 100-year flood events, unless the flood hazard can be substantially mitigated by development project design.
NS-3-l. Policy: 200-Year Floodplain Protection. Promote flood control measures that maintain natural conditions within the 200-year floodplain of rivers and streams and, to the extent possible, combine flood control, recreation, water quality, and open space functions. Discourage construction of permanent improvements that would be adversely affected by periodic floods within the 200-year floodplain, particularly in the San Joaquin river bottom.
NS-3-m. Policy: Flood Risk Public Awareness. Continue public awareness programs to inform the general public and potentially affected property owners of flood hazards and potential dam failure inundation. Remind households and businesses located in flood-prone areas of opportunities to purchase flood insurance.
NS-3-n. Policy: Precipitation Changes. Work with FMFCD to evaluate the planned and existing stormwater conveyance system in light of possible changes to precipitation patterns in the future.

Hazardous Materials

NS-4. Objective: Minimize the risk of loss of life, injury, serious illness, and damage to property resulting from the use, transport, treatment, and disposal of hazardous materials and hazardous wastes.
NS-4-a. Policy: Processing and Storage. Require safe processing and storage of hazardous materials, consistent with the California Building Code and the Uniform Fire Code, as adopted by the City.
NS-4-b. Policy: Coordination. Maintain a close liaison with the Fresno County Environmental Health Department, Cal-EPA Division of Toxics, and the State Office of Emergency Services to assist in developing and maintaining

hazardous material business plans, inventory statements, risk management prevention plans, and contingency/emergency response action plans.
NS-4-c. Policy: Soil and Groundwater Contamination Reports. Require an investigation of potential soil or groundwater contamination whenever justified by past site uses. Require appropriate mitigation as a condition of project approval in the event soil or groundwater contamination is identified or could be encountered during site development.
NS-4-d. Policy: Site Identification. Continue to aid federal, State, and County agencies in the identification and mapping of waste disposal sites (including abandoned waste sites), and to assist in the survey of the kinds, amounts, and locations of hazardous wastes.
NS-4-e. Policy: Compliance with County Program. Require that the production, use, storage, disposal, and transport of hazardous materials conform to the standards and procedures established by the County Division of Environmental Health. Require compliance with the County's Hazardous Waste Generator Program, including the submittal and implementation of a Hazardous Materials Business Plan, when applicable.
NS-4-f. Policy: Hazardous Materials Facilities. Require facilities that handle hazardous materials or hazardous wastes to be designed, constructed, and operated in accordance with applicable hazardous materials and waste management laws and regulations.
NS-4-g. Policy: Hazmat Response. Include policies and procedures appropriate to hazardous materials in the City's disaster and emergency response preparedness and planning, coordinating with implementation of Fresno County's Hazardous Materials Incident Response Plan.
NS-4-h. Policy: Household Collection. Continue to support and assist with Fresno County's special household hazardous waste collection activities, to reduce the amount of this material being improperly discarded.
NS-4-i. Policy: Public Information. Continue to assist in providing information to the public on hazardous materials.

Emergency Response

NS-6. Objective: Foster an efficient and coordinated response to emergencies and natural disasters.
<p>NS-6-a. Policy: County Multi-Jurisdiction Hazard Mitigation Plan. Adopt and implement the Fresno County Multi-Jurisdiction Hazard Mitigation Plan and City of Fresno Local Hazard Mitigation Plan Annex.</p> <p><i>Commentary: The federal Disaster Mitigation Act of 2000 requires that cities, counties, and special districts have a Local Hazard Mitigation Plan to be eligible to receive FEMA hazard mitigation funds. Cities and counties can adopt and use all or part of a regional multi-jurisdictional plan, such as the one prepared by Fresno County, in lieu of preparing all or part of a Local Hazard Mitigation Plan.</i></p>
NS-6-b. Policy: Disaster Response Coordination. Maintain coordination with other local, State, and Federal agencies to provide coordinated disaster response.
NS-6-c. Policy: Emergency Operations Plan. Update the City's Emergency Operations Plan periodically, using a whole community approach which integrates considerations for People with access and functional needs in all aspects of planning.
<p>NS-6-d. Policy: Evacuation Planning. Maintain an emergency evacuation plan in consultation with the Police and Fire Departments and other emergency service providers, which shows potential evacuation routes and a list of emergency shelters to be used in case of catastrophic emergencies.</p> <p><i>Commentary: The evacuation plan will be flexible in order to consider many scenarios and multiple modes of transportation beyond private automobiles. It will provide special provisions for disadvantaged populations, such as those with physical disabilities or those with low or very low incomes, and for areas with fewer resources through neighborhood emergency preparedness programs.</i></p>
<p>NS-6-e. Policy: Critical Use Facilities. Ensure critical use facilities (e.g. City Hall, police and fire stations, schools, hospitals, public assembly facilities, transportation services) and other structures that are important to protecting health and safety in the community remain operational during an emergency.</p> <ul style="list-style-type: none"> • Site and design these facilities to minimize their exposure and susceptibility to flooding, seismic and geological effects, fire, and explosions. • Work with the owners and operators of critical use facilities to ensure they can provide alternate sources of electricity, water, and sewerage in the event that regular utilities are interrupted in a disaster.
NS-6-f. Policy: Emergency Vehicle Access. Require adequate access for emergency vehicles in all new development, including adequate widths, turning radii, hard standing areas, and vertical clearance.

NS-6-g. Policy: Emergency Preparedness Public Awareness Programs. Continue to conduct programs to inform the general public, including people with access and functional needs, of the City's emergency preparedness and disaster response procedures.

Fresno Flood Plain Ordinance

The City of Fresno's Flood Plain Ordinance was revised in the late 1990s and formally adopted by the Fresno City Council on September 20, 2005. (In late 2007, the Fresno Municipal Code was republished with its chapters somewhat reorganized. There was no change in the text of the Flood Plain Ordinance at that time, but due to the reorganization of its content, its most recent adoption effective date is January 17, 2008.) The Fresno Flood Plain Ordinance is Article 6 of Chapter 11 of the Fresno Municipal Code.

The purpose of this ordinance is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by 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; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

In order to accomplish its purposes, the ordinance includes the following methods and provisions:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction
- Control filling, grading, dredging, and other development which may increase flood damage
- Prevent or regulate the construction of flood barriers which will unnaturally divert flood water or which may increase flood hazards in other areas
- Control the alteration of natural flood plains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters

This ordinance applies to all areas of special flood hazards within the jurisdiction of the City as identified by FEMA's Flood Insurance Study for Fresno County, California and incorporated areas dated September 30, 2005, with accompanying Flood Insurance Rate Maps, and all subsequent amendments and/or revisions. It appoints the building official to administer, implement, and enforce the ordinance by granting or denying development permits in accord with its provisions.

This ordinance includes the following standards of construction related to special flood hazard areas:

- Anchoring
- Construction materials and methods
- Elevation and floodproofing
- Residential construction
- Nonresidential construction
- Flood venting
- Standards for utilities
- Standards for subdivisions
- Standards for manufactured homes
- Standards for recreational vehicles
- Floodways
- Standards for storage of materials and equipment

In conjunction with Fresno's Drainage Fee Ordinance (Fresno Municipal Code Chapter 12, Article 19), which requires local grading and development to conform to the Fresno Metropolitan Flood Control District Master Drainage Plan and to provide proportionate shares of drainage infrastructure, the Fresno Flood Plain Ordinance and its preceding Flood Damage Prevention Ordinance have reduced flood damage losses in the City.

National Flood Insurance Program/Community Rating System

The City of Fresno joined the National Flood Insurance Program (NFIP) on December 1, 1982. It has been a member of the Community Rating System (CRS) since October 1, 1992. The City's Floodplain Administrator duties are assigned to the building official. The Building and Safety Division of the Planning and Development Department works to improve the City's CRS rating, which determines the price paid for flood insurance policies issued in the jurisdiction. The rating is based on detailed biannual audits conducted by FEMA and/or a designee agency (currently, the California Department of Water Resources). The primary means of improving and maintaining a good CRS rating is through administration of the Fresno Flood Plain Ordinance. As part of its efforts to improve its community rating, the City of Fresno has hosted periodic FEMA Region IX NFIP/CRS training.

The City's current CRS rating from October 2016 is Class 8, which reflects the loss of two class levels in the most recent audit.

San Joaquin River Bluff Preservation Ordinance, 1980

After an interagency San Joaquin River Reconnaissance Plan was completed in the late 1970s, the City of Fresno adopted the San Joaquin River Bluff Specific Plan to preserve this important open space and habitat feature and to safeguard the bluff face, which is the most unstable geologic feature in the City. The San Joaquin River Bluff Specific Plan was later subsumed by the 1988 Bullard Community Plan, which carried forward protective policies for this area of Fresno.

The regulation of land use, development, and grading in this portion of Fresno is ongoing pursuant to the Bluff Preservation Ordinance. This ordinance, part of the City's zoning regulations, delineates an overlay zone district along the river bluff (the Bluff Preservation Overlay District), established allowable and prohibited land uses, and set forth conditions and requirements for using or modifying property in the district. The regulations of the district are deemed to be necessary for the preservation of the special qualities of the bluffs and for the protection of the health, safety, and general welfare of owners and users of property in the area.

The Bluff Preservation Ordinance is administered by the Fresno Development and Resource Management Department through its special permit process and grading plan checks. Anyone applying for a building permit is required to submit a site plan review with accompanying soil investigation and evaluation report (prepared by an appropriately licensed professional engineer or registered geologist). The Department's Code Enforcement Division also conducts periodic surveillance of bluff properties for grading and construction done without permits and institutes abatement actions when these conditions are discovered.

Hazardous Material Incident Safeguards

The Fresno Fire Department works with Fresno County Environmental Health to review hazardous material business plans that detail flammable, explosive, toxic, and otherwise hazardous materials used by businesses in the City. The Fire Department has its own permitting requirement for liquid and gaseous fuel tanks to ensure that they are installed and maintained safely. The City's Hazardous Materials Response Unit (housed in a City fire station) maintains the capability to quickly characterize material releases and spills, to evaluate risks to life and property, and to implement appropriate controls and evacuation measures.

Fire Prevention Policy

The City of Fresno has some of the most progressive and effective fire prevention policies and regulations in the nation relating to water supply (fire flow) required for development, ingress and egress from developed buildings and subdivisions, on-site automatic fire suppression systems (sprinkler and on-site private hydrants), building addressing to facilitate rapid emergency response, marking of unsafe buildings (those older structures with hazardous conditions or a lack of water supply), and instant aid/mutual aid with adjacent fire departments belonging to Fresno County special districts and the City of Clovis.

In addition to its extensive network of well-trained and well-equipped firefighting stations, the Fresno Fire Department has a Fire Prevention Bureau, under supervision of the City's fire marshal, to administer regulations adopted and referenced by the Fresno Municipal Code Chapter 6, Article 5 relating to fire prevention. The Fire Prevention Bureau carries out these responsibilities by conducting routine inspections of all public and commercial buildings, performing detailed development permit and construction plan checks, and investigating arson.

Another component of the City's overall fire protection program is the administration of its public nuisance ordinances to require properties to be kept clean and free of flammable debris and to annually abate weeds and overgrown vegetation before these materials can dry out in the spring to pose a wildfire hazard (Fresno Municipal Code Chapter 10, Article 6 relating to public nuisance abatement). The Planning and Development Department Code Enforcement Division and Department of Public Utilities Community Sanitation Division coordinate their efforts to enforce the nuisance abatement regulations and provide cleanup services when property owners do not take care of matters themselves.

City of Fresno Emergency Operations Plan, 2015, Updated 2015

The City of Fresno Emergency Operations Plan (EOP) addresses the planned response to extraordinary emergency situations associated with natural disasters, technological incidents, excessive heat/cold, power outages, and national security emergencies in or affecting the City of Fresno. The Plan, which was updated in 2015, does the following:

- Establishes the emergency management organization required to mitigate any significant emergency or disaster affecting the City of Fresno.
- Identifies the policies, responsibilities, and procedures required to protect the health and safety of City communities, public and private property, and the environment from natural or technological disasters.
- Establishes the operational concepts and procedures associated with initial response operations to emergencies, the extended response operations, and the recovery process.

The EOP is designed to establish the framework for implementation of the California Standardized Emergency Management System/National Incident Management System for the City of Fresno, which is located within the California Governor's Office of Emergency Services' Mutual Aid Region V. It is intended to facilitate multi-agency and multi-jurisdictional coordination, particularly between the City of Fresno and the Fresno County Operational Area, including special districts and state agencies, in emergency operations. This plan will be used in conjunction with the Fresno County EOP and the State of California Emergency Plan. The plan is designed to guide the reader or user through each phase of an emergency: preparedness, response, recovery, and mitigation.

Other Plans and Policies

Other hazard mitigation-related policies and plans in place in and observed by the City of Fresno include the following:

- California Code of Regulations Title 23 administrative law for development and use of land in designated floodway areas along the San Joaquin River administered by the Central Valley Flood Protection Board, staffed by the California Department of Water Resources.
- Standards for constructing and maintaining drainage basins and ponds to prevent mosquito breeding and to provide for mosquito control district access for inspection and abatement activities (jointly promulgated by the Planning and Development Department and Public Works Department in fall of 2005).
- Dam failure inundation plans prepared and administered by the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, Fresno Metropolitan Flood Control District, Southern California Edison, and Pacific Gas and Electric Company.
- The California Environmental Quality Act, overseen by the Fresno City Attorney's Office and administered by several City departments, requires consideration of health and safety impacts as they may relate to projects, which are defined as any action that may result in a change in the physical environment and that would include public facilities, and private development, and even adoption/amendment of land use plans and ordinances. An analysis of every project is conducted by the appropriate City department (the Development and Resource Management Department does the bulk of these analyses). Inquiries regarding project sites and features are distributed to departments and outside agencies that may have knowledge of, or which may regulate, aspects of the proposed project. The information obtained from these requests for comment and from other staff research is compiled into an informational document for decision-makers and the public. The information is also used to develop a list of mitigation actions to reduce or abate potential adverse impacts of the project. For those projects which may involve federal funds or require federal approvals, a parallel National Environmental Policy Act assessment is also prepared by the City.
- The Development and Resource Management Department administers regulations in the California Building Code and in Uniform Electrical, Plumbing, and Mechanical Codes as those codes are modified through adoption by the state and City. Plan check and inspection activities of the Department ensure structural soundness and compliance with seismic and other regulations.

E.4.2 Administrative/Technical Mitigation Capabilities

Table E.17 identifies the personnel responsible for activities related to mitigation and loss prevention in Fresno.

Table E.17: City of Fresno’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Planning and Development Department (planners), Department of Public Utilities (engineers), Public Works Department (engineers), Fresno Metropolitan Flood Control District (engineers)
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Planning and Development Department (engineers), Department of Public Utilities (engineers), Public Works Department (engineers), Fresno Metropolitan Flood Control District (engineers)
Planner/engineer/scientist with an understanding of natural hazards	Yes	Planning and Development Department (planners and engineers), Department of Public Utilities (engineers), Public Works Department (engineers), Fresno Metropolitan Flood Control District (engineers)
Personnel skilled in GIS	Yes	Planning and Development Department, Department of Public Utilities, Public Works Department, Information Services Department
Full time building official	Yes	Planning and Development Department
Floodplain administrator	Yes	Planning and Development Department
Emergency manager	Yes	Fresno Fire Department
Grant writer	Yes	Planning and Development Department, Police Department, Public Works Department, Fire Department
Other personnel	Yes	California registered geologist (Department of Public Utilities), California registered environmental health specialist (Planning and Development Department), licensed water and wastewater treatment operators
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	State Emergency Alert System is coordinated by emergency management team through the National Weather Service
Other	Yes	Emergency notification of San Joaquin River bottom residents in conjunction with the U.S. Bureau of Reclamation and Fresno County

E.4.3 Fiscal Mitigation Capabilities

Table E.18 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table E.18: City of Fresno’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	Geographically restricted to designated portions of Fresno based on area income
Capital improvements project funding	Yes	Budgeted out of utility fees and often related to issuance of bonds; City also obtains grants, shares of state gas tax and sales taxes, ballot measure tax revenue, etc.
Authority to levy taxes for specific purposes	Yes	Subject to California Proposition 218 restrictions on new and increased assessments
Authority to levy fees and fines, and to recover costs through lien processes, for nuisance abatement	Yes	Subject to an appeal process that involves administrative law judges retained by the City
Fees for water, sewer, gas, or electric services	Yes	Water, sewer, solid waste, code enforcement (cleanup)

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Impact fees for new development	Yes	Master Fee Schedule as originally chartered under the City's Urban Growth Management Ordinance
Incur debt through general obligation bonds	Yes	Would need vote of the taxpayers to enact.
Incur debt through special tax bonds	Yes	Special Assessment Districts that issue debt and incur the debt but the City only administers
Incur debt through private activities	Yes	The City has the capability of doing them and have in the past
Withhold spending or public infrastructure investment in hazard prone areas	Yes	The Department of Public Utilities retains jurisdiction over water and sewer services and determines its appropriate service areas with risk to facilities being one of the factors leading to a decision not to extend services to River bottom properties

E.4.4 Mitigation Outreach and Partnerships

The Fresno Department of Public Utilities, in conjunction with other agencies, provides water conservation and stormwater quality protection public information programs. The Fire Department provides personal preparedness outreach for heat and freeze emergencies and shelter-in-place information for hazardous materials emergencies. Additionally, the City has developed public service announcements for smoke detector battery life, canal safety, and fireworks safety.

The City's Joint Information System disseminates information in Spanish, and the City can obtain translation services for other languages when necessary. A Joint Information Center plan is an annex to the City of Fresno Emergency Operations Plan and provides comprehensive guidance for early warning notification in all languages and specifically the Americans with Disabilities Act (ADA) community.

Preparedness Exercises afford the opportunity to include the City of Fresno ADA Committee. Members of the committee and volunteers from the ADA community role play for realistic first responder training.

E.4.5 Other Mitigation Efforts

- The City is a certified StormReady community through the National Weather Service.
- The Fire Department, Police Department, and Solid Waste Division are nationally accredited.
- The City has installed security systems for the wastewater treatment facility and for its surface water treatment plant. Generators are installed in critical groundwater pumping stations and these facilities are secured.

E.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the City of Fresno has several existing mechanisms in place that already help to mitigate hazards. In addition to these existing capabilities, there are also opportunities for the City to expand or improve on these policies and programs to further protect

the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Additional training opportunities will help to inform City staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train City staff on mitigation and the hazards that pose a risk to the City of Fresno will lead to more informed staff members who can better communicate this information to the public. In addition, the City could work to improve the CRS rating through additional floodplain management program enhancements. This could further lower the cost of flood insurance for residents.

E.5 Mitigation Strategy

E.5.1 Mitigation Goals and Objectives

The City of Fresno adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Public Works Department may utilize the hazard information when implementing Capital Improvement projects and the Planning and Development Department may utilize the hazard information when reviewing a site plan or other type of development applications. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Fresno will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

In addition to the mitigation actions identified herein the City will continue to comply with the National Flood Insurance Program as specified in General Plan Policy NS-3-j: *“National Flood Insurance Program. Continue to participate in the National Flood Insurance Program (NFIP) by ensuring compliance with applicable requirements.”*

E.5.2 Completed 2009 Mitigation Actions

The City of Fresno did not complete any of the mitigation actions identified in the 2009 plan. However, implementation is in progress for several of these actions and will be continued as part of the mitigation strategy for this plan update.

E.5.3 Mitigation Actions

The planning team for the City of Fresno identified and prioritized the following mitigation actions based on the risk assessment. Background information as well as information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are also included.

In addition to implementing the mitigation actions below the City of Fresno will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in

partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Establish Post-Disaster Action Plan for City Continuity of Operations Plan

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, hazardous materials

Issue/Background: Establish a post-disaster action plan to be part of the City of Fresno Continuity of Operations Plan (COOP) that will include the following elements:

- Procedures for public information
- Post-disaster damage assessment
- Grant writing
- Code enforcement
- Redundant operations

The plan will also include annexes from local businesses and large employers to improve economic and employment recovery. The plan will also identify a mechanism for the City to help businesses without COOPs develop a COOP to be incorporated, as an annex, into the City's Emergency Operations Plan.

Other Alternatives: No action

Responsible Office: City of Fresno Emergency Preparedness Officer

Priority (High, Medium, Low): High

Cost Estimate: \$150,000

Potential Funding: Local funds, grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-planning. A City COOP and local business COOPs will reduce the impact of a disaster to the local economy and employment.

Schedule: Long term

Status: 2009 project, implementation in progress

2. Improve the City's Capabilities for Sheltering Animals in a Disaster

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, hazardous materials

Issue/Background: During a disaster, not only do people need to be rescued, but their pets do also. Hurricane Katrina showed the nation that shelters do not typically allow pets, so pets may be left behind when their owners evacuate. The care of the animals left behind falls to local animal shelters. Currently, the SPCA Animal Shelter does not have the supplies to handle a large scale animal emergency. The City has approximately 18,000 licensed dogs. If a disaster occurred, they would only be able to house a small percentage of them. Overcrowding of animals usually causes diseases and loss of animal life. Purchasing new cages would alleviate some of the overcrowding created by a disaster.

Other Alternatives: Ask other agencies for supplies, if they have them available.

Responsible Office: City of Fresno Emergency Preparedness Officer

Priority (High, Medium, Low): High

Cost Estimate: \$50,000

Potential Funding: General fund

Benefits (Avoided Losses): This will cut down on the spread of disease and animal loss during an emergency or disaster.

Schedule: Short term

Status: 2009 project, implementation in progress

3. Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, hazardous materials

Issue/Background: City inspectors play a vital role in post-disaster building assessment and damage assessment. Pre-training and certification is vital in response and recovery to reduce loss of life, relocate populations, and ensure the rebuilding of local economies.

Other Alternatives: No action

Responsible Office: City of Fresno Emergency Preparedness Officer and Planning and Development Department

Priority (High, Medium, Low): High

Cost Estimate: \$250,000

Potential Funding: Grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-training and certification of individuals responsible for performing assessment of structures and facilities impacted by disasters. Certification will also allow qualified staff to mobilize with the State of California Office of Emergency Services (Region 5) Urban Search and Rescue Task Force.

Schedule: Long term

Status: 2009 project, implementation not yet started

4. Implement a Flood Awareness Program for the Public

Hazard(s) Addressed: Flood

Issue/Background: The City needs a program to educate flood-prone property owners along the San Joaquin River and in frequent annual flooding areas about the flood threat and how best to prepare, mitigate, and insure their properties.

Other Alternatives: No action

Responsible Office: City of Fresno Emergency Preparedness Officer and Planning and Development Department

Priority (High, Medium, Low): Medium

Cost Estimate: \$15,000/year

Potential Funding: General fund, grants

Benefits (Avoided Losses): This will prevent the loss of human life and economic and property losses.

Schedule: Long term

Status: 2009 project, implementation not yet started

5. Southwest Fresno – Recycled Water Distribution System Construction

Hazard(s) Addressed: Drought

Issue/Background: In 2009, the State of California adopted a recycled water policy establishing a mandate to increase the use of recycled water in California by 200,000 acre-feet per year by 2020 and an additional 300,000 acre-feet per year by 2030. The Recycled Water Master Plan prepared by the City of Fresno, Department of Public Utilities (DPU), identifies opportunities to assist with compliance of this law by reducing groundwater pumping and replacing groundwater with recycled water for non-potable purposes (i.e. outdoor irrigation, dust control, fountains, etc.). On April 11, 2013, the Council adopted the Recycled Water Master Plan and associated environmental documents.

In 2017, the DPU commissioned a 5 MGD Tertiary Treatment Facility at the Fresno-Clovis Regional Wastewater Treatment Facility. DPU is currently constructing a Recycled Water Distribution System in Southwest Fresno to deliver recycled water to parks, cemeteries, schools, agricultural uses, etc., to offset potable water irrigation demands. This will help mitigate drought by enabling the use of recycled water for certain uses instead of tapping potable water supplies.

Other Alternatives: DPU has a Water Shortage Contingency Plan (WSCP) which was updated in the City of Fresno's 2015 Urban Water Management Plan to manage water shortages including drought conditions. The WSCP consists of four stages allowing the City to ultimately reduce its water demand to a level commensurate with the water supplies available to a maximum reduction of 50 percent.

Responsible Office: City of Fresno Department of Public Utilities

Priority (High, Medium, Low): High

Cost Estimate: \$75,000,000

Potential Funding: California State Water Resources Control Board – Clean Water State Revolving Fund

Benefits (Avoided Losses): Reduced ground water pumping by using recycled water for non-potable purposes.

Schedule: Ongoing with completion in 2019

Status: New project

6. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Fresno and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Fresno has become a joint power authority of the North Kings Groundwater Sustainability Agency, other members of the Agency include the County of Fresno, City of Kerman, City of Clovis, Biola Community Services District, Garfield Water District and International Water District. As a member of the North Kings GSA, the City of Fresno is required to participate in the development and implementation, no later than January 31, 2020, of a

Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the North Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Fresno.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: City Engineer and North Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

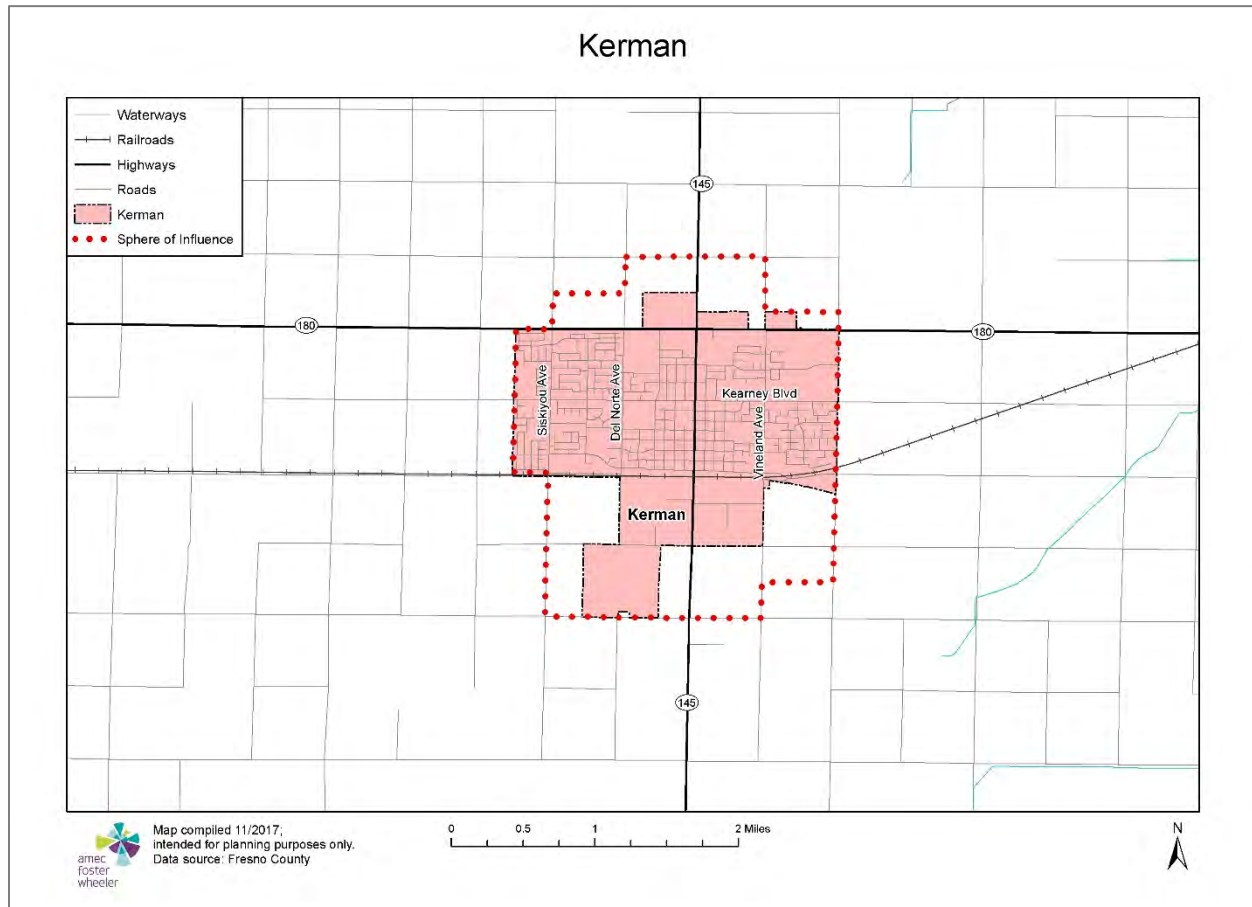


ANNEX F: CITY OF KERMAN

F.1 Community Profile

Figure F.1 displays a map and the location within Fresno County of the City of Kerman and its Sphere of Influence.

Figure F.1: The City of Kerman



F.1.1 Geography and Climate

Kerman is located on the west side of Fresno County in the central portion of the San Joaquin Valley. Over the past decade, the City of Kerman has expanded its boundaries slightly, annexing land along the eastern reach of its Sphere of Influence. The City and its Sphere of Influence cover a 3,091-acre area.

The City is bisected by State Route 145 (Madera Avenue), which runs north/south, and State Route 180 (Whitesbridge Road), which runs east/west. State Highway 99, the major highway through the San Joaquin Valley, is 15 miles east of Kerman. Kerman is 17 miles south of Madera, the county

seat of Madera County, and 15 miles west of Fresno, county seat of Fresno County. The smaller cities of San Joaquin and Mendota are about 13 miles southwest and 18 miles west, respectively.

The mountains of the Coast Range and the Sierra Nevada are roughly equidistant from Kerman, about 35 miles to the southwest and northeast, respectively. The topography in and around Kerman is very level with a gentle, imperceptible slope to the southwest. Elevations in the planning area vary from about 210 feet to 225 feet. There are no natural waterways in the planning area. The largest nearby waterway of consequence is the San Joaquin River, about ten miles north. However, there are several irrigation canals that traverse the planning area.

The climate of the Kerman area is described as Mediterranean, which is typified by hot, dry summers and mild winters. Temperatures recorded at Lemoore Naval Air Station (LNAS), located 41.2 miles south of Kerman, show the mean monthly high temperature for July to be 80.6°F, while the mean temperature for January is 45.1°F. It is not uncommon for maximum temperatures to exceed 100°F during the summer months; nor for temperatures to drop below freezing in the winter. The highest temperature ever recorded at LNAS was 113°F in July of 1975. The lowest temperature of record was 14°F in January of 1962.

Approximately 90 percent of all rainfall in Kerman occurs between November and April. Average rainfall measured in Kerman is 6.08 inches per year compared to 7.83 inches in Coalinga and 9.5 inches in Fresno.

Air movement through the San Joaquin Valley is in a southeasterly direction. Wind enters the valley over the passes east of the San Francisco Bay and exits through mountain passes at the southern end of the San Joaquin Valley. Meteorological data from LNAS indicates that the average wind speed is 4-6 knots with maximum gusts of 40-50 knots recorded from October to May. The prevailing wind direction is from the north and north-northwest, except in December and January, when the winds blow from the southeast or east-southeast.

F.1.2 History

The site of Kerman was first established by the Southern Pacific Railroad Company as a way station with a pump and watering tank in 1891. The site was originally named Collis in honor of the president of the railroad Collis P. Huntington. It was at this site in 1892 that the famous Sontag and Evans gang held up the San Francisco-Los Angeles passenger train, one of the last train robberies in the country and perhaps the most historical event to occur in Kerman.

Settlement and cultivation of the Kerman area began and continued through the turn of the century as irrigation projects brought water to the area, primarily from the Kings River to the south. In 1900, William G. Kerckhoff and Jacob Mansar purchased some 3,027 acres of land from the Bank of California. These men formed the Fresno Irrigated Farms Company. In 1906, Collis was renamed Kerman from the men's names (Kerckhoff and Mansar).

By 1914, Kerman had an estimated population of 400 people surrounded by 29,000 acres of producing crop land. The Kerman Creamery was producing about 1,600 pounds of butter daily. In 1921, Madera Avenue was paved from the Southern Pacific railroad tracks north to the San Joaquin River, and streetlights were installed from the tracks to Whitesbridge Road. By 1936, development of Kerckhoff Park had begun. Oil and gas exploration was being conducted several miles south of town and culminated in 1941 with the development of the largest gas well in the state (at the time).

In 1946, the residents of Kerman voted to incorporate, and the City of Kerman was born. In the 1950s, new subdivisions began to develop, expanding the urban area outward from the original town site. New development and subdivision activity has continued to the present time.

F.1.3 Economy

Despite Kerman's location in the center of a highly productive agricultural area, agriculture is not the dominant industry in the community. This position is occupied by the educational services, and health care and social assistance industry, employing 23.9 percent of the City's work force. Agriculture is the next largest employer, with 18.0 percent of the City's work force. Manufacturing is the third largest industry, but accounts for only 12.0 percent of employment. In contrast to some other cities in the region, Kerman does not have extensive packing houses and agricultural processing facilities in its industrial area.

Select estimates of economic characteristics for the City of Kerman are shown in Table F.1.

Table F.1: City of Kerman's Economic Characteristics, 2015

Characteristic	City of Kerman
Families below Poverty Level	23.5%
All People below Poverty Level	25.6%
Median Family Income	\$45,563
Median Household Income	\$41,820
Per Capita Income	\$14,523
Population in Labor Force	9,677
Population Employed*	5,707
Unemployment	9.9%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables F.2 and F.3 detail how the City of Kerman's labor force breaks down by occupation and industry, respectively, based on estimates from the 2015 American Community Survey.

Table F.2: City of Kerman's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Production, Transportation, and Material Moving Occupations	1,303	22.8
Service Occupations	1,302	22.8
Natural Resources, Construction, and Maintenance Occupations	1,188	20.8
Management, Business, Science, and Arts Occupations	1,007	17.6
Sales and Office Occupations	907	15.9
Total	5,707	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table F.3: City of Kerman's Employment by Industry, 2015

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	1,365	23.9
Agriculture, Forestry, Fishing and Hunting, and Mining	1,028	18.0
Manufacturing	683	12.0
Transportation and Warehousing, and Utilities	475	8.3
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	424	7.4
Retail Trade	405	7.1
Public Administration	323	5.7
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	282	4.9
Construction	267	4.7
Finance and Insurance, and Real Estate and Rental and Leasing	156	2.7
Wholesale Trade	144	2.5
Information	106	1.9
Other Services, Except Public Administration	49	0.9
Total	5,707	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

F.1.4 Population

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the 2015 population for the City of Kerman was estimated at 14,285. Select demographic and social characteristics for the City of Kerman from the 2015 ACS are shown in Table F.4.

Table F.4: City of Kerman's Demographic and Social Characteristics, 2015

Characteristic	City of Kerman
Gender/Age	
Male	48.6%
Female	51.4%
Median age	27.8
Under 5 years	12.0%
Under 18 years	35.2%
65 years and over	7.8%
Race/Ethnicity*	
White	72.0%
Asian	5.7%
Black or African American	0.0%
American Indian/Alaska Native	0.1%
Hispanic or Latino (of any race)	79.1%
Education	
High school graduate or higher	55.6%
Disability Status	
Population 5 years and over with a disability	9.5%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 97.0% reporting one race

F.2 Hazard Identification and Summary

Kerman’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Kerman (see Table F.5). In the context of the plan’s planning area, there are no hazards unique to Kerman.

Table F.5: City of Kerman—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Low
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Limited	Occasional	Significant	Medium
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Extensive	Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Limited	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Limited	Highly Likely	Limited	Low
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

F.3 Vulnerability Assessment

The intent of this section is to assess Kerman's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Kerman's HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Kerman.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table F.5). Identifying these differences helps the reader to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County.

Note: The hazard "Significance" reflects the overall ranking for each hazard, and is based on the City of Kerman's HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table F.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Kerman identified below. The discussion of vulnerability related information for each of the following hazards is located in Section F.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include drought and hazardous materials incidents.

- agricultural hazards
- drought
- earthquake
- epidemic/pandemic
- flood/levee failure
- fog
- hazardous materials incidents
- windstorm
- winter storm

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Kerman, those hazards are as follows:

- dam failure*
- human health hazards: West Nile Virus
- severe weather: extreme cold, extreme heat, heavy rain/thunderstorm/hail/lightning, tornado
- soil hazards
- volcano
- wildfire**

***Note on Dam Failure:** Although the County ranking for dam failure is High, the City ranks it as Low; no dams are identified within Kerman, as indicated in Table 4.9, Fresno County Dam Characteristics.

****Note on Wildfire:** Although the County ranking for wildfire is High, it is ranked Low by the City of Kerman due to a lack of exposure to wildfire risk within the city boundaries.

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. Avalanche and landslide are considered Not Applicable (N/A) to the City of Kerman.

F.3.1 Assets at Risk

This section considers Kerman's assets at risk, including values at risk, critical facilities and infrastructure, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table F.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Kerman.

Table F.6: 2017 Property Exposure for the City of Kerman by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	6	2	\$2,947,885	\$2,947,885	\$5,895,770
Commercial	128	210	\$59,212,673	\$59,212,673	\$118,425,346
Exempt	17	66	\$0	\$0	\$0
Industrial	27	29	\$31,409,557	\$47,114,336	\$78,523,893
Multi-Residential	89	342	\$52,790,242	\$26,395,121	\$79,185,363
Residential	2,900	3,871	\$366,404,305	\$183,202,153	\$549,606,458
Total	3,167	4,520	\$512,764,662	\$318,872,167	\$831,636,829

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Kerman from Fresno County GIS is provided in Table F.7 and mapped in Figure F.2. This is the information that was used for mapping and analysis purposes. It should be noted that the City had different data, which is indicated in parentheses in the table. (City data was not used for analysis since it was not available in GIS format.)

Table F.7: City of Kerman's Critical Facilities

Critical Facilities Type	Number*
CalARP	2
Communications	1
Department of Social Services	1
Fire Station	1
Health Care	1
Nursing Home	1
Police	1
School	8
Total	16

Source: Fresno County, HIFLD 2017

Figure F.2: City of Kerman's Critical Facilities

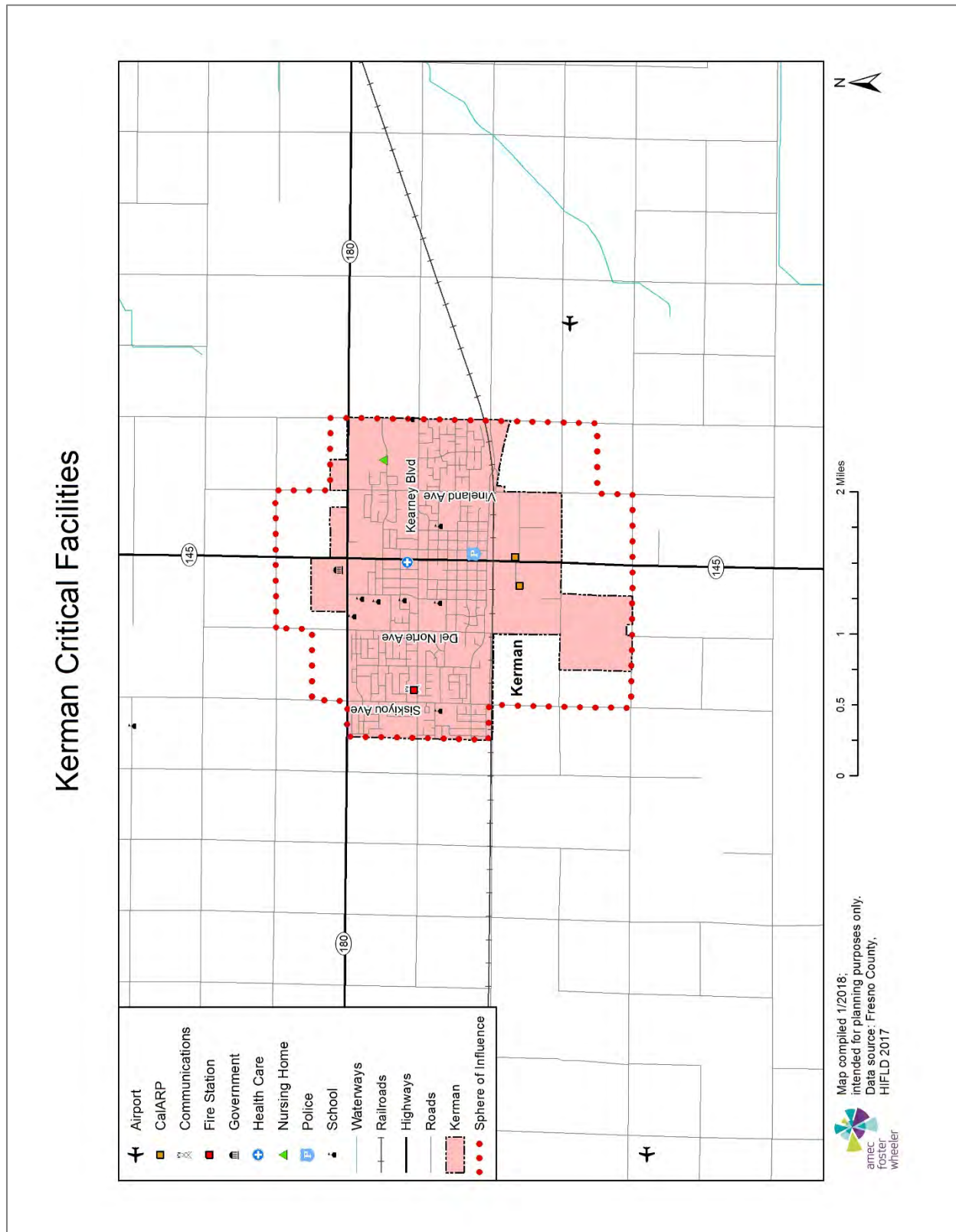


Table F.8 lists specific critical facilities and other community assets identified by Kerman's planning team as important to protect in the event of a disaster.

Table F.8: Specific Critical Facilities and Other Community Assets Identified by the City of Kerman's Planning Team

Name of Asset	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info/ Comments
City Hall	3 million	n/a	
Police Station	1.2 million	n/a	Secondary emergency operations center
United Health Center	3.7 million	n/a	EOP medical center
Fire Station	6.4 million	n/a	Primary emergency operations center
Community Center	3.1 million	400	EOP gathering point

Economic Assets

Table F.9 identifies the City's largest employers, which are led by the Kerman Unified School District.

Table F.9: Major Kerman Employers

Name of Business	Product/Service	# of Employees
Kerman Unified School District	Education	425
Panoche Creek Packaging	Almonds	100
Sebastian	Communications	70
City of Kerman	Municipal Government	60
Helena Chemical	Chemical	50
Baker Commodities	Rendering Plant	35
H & J Chevrolet	Auto Sales	25
Hall Ag. Enterprise	Labor Contractor	40
Perko's Café	Restaurant	23
Kerman Ag. Resources	Agricultural Chemicals	27
Sun Empire Foods	Candy	15

Source: 2007 Kerman General Plan Update

Growth and Development Trends

Table F.10 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2017.

Table F.10: City of Kerman's Change in Population and Housing Units, 2010-2017

2010 Population	2017 Population Estimate	Estimated Percent Change 2010- 2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010- 2015
13,544	14,614	+7.90	3,908	4,144	+6.04

Source: California Department of Finance, www.dof.ca.gov/Forecasting/

For the purposes of the 2007 Kerman General Plan Update, population projections were developed representing low and high estimates. By the year 2027, the estimates forecast a low population estimate of 26,613 and a high population estimate of 40,561 persons.

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

F.3.2 Estimating Potential Losses

Table F.5 above shows Kerman’s exposure to hazards in terms of number and value of structures. Fresno County’s assessor’s data was used to calculate the improved value of parcels. The most vulnerable structures are unreinforced masonry buildings and buildings built prior to the introduction of modern day building codes. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Note: Ranked Medium significance by both Kerman and the County, **epidemic/pandemic, windstorm, and winter storm** potential impacts are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment in the main plan for details on the entire planning area’s risk and vulnerability to these hazards.

Agricultural Hazards

Agriculture is a significant component of the City of Kerman’s economy. Any pests, plant diseases, or weather events negatively affecting crop production could have substantial impacts on employment and the local economy.

Drought

Of High ranking significance to the entire planning area, Kerman’s High ranking is tied to the fact that groundwater is the only source of drinking water in the City. Water moving down gradient from the floodplains of the Sierra Nevada streams and rivers is the major source of groundwater recharge in this area. Over-application of imported irrigation water within the Fresno Irrigation District is another source of groundwater recharge. Rainfall provides only a minor percentage of total groundwater recharge in the area.

Earthquake

The City of Kerman is located in an area that is seismically active; however, the potential for dangerous seismic activity is slight. It is located in a seismic zone that is characterized by a relatively thin section of sedimentary rock overlying a granitic basement. Ground motion that could result from an earthquake would be high, but the distance to the faults that are the expected sources of the shaking is sufficiently great that the effects should be minimal.

Although Fresno County does not have any major faults within its boundaries, Kerman has been affected by earthquakes in the past. The most notable earthquake was the Coalinga earthquake in May 1983, which measured magnitude 6.7 on the Richter scale. Although no damage was reported in Kerman, the quake was strongly felt by local residents.

Flood/Levee Failure

According to FEMA's 2016 Flood Insurance Study, the City of Kerman is not subject to floodwaters from a 100-year storm. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction. However, areas of the 100-year floodplain are found adjacent to the City, particularly along California Avenue east of the City, as shown in Figure F.3. Therefore, although no property is at risk to damage from the 100- or 500-year floods, vehicular and rail transportation to and from the City could be impacted by flooding.

Certain areas within the City are subject to localized flooding and ponding of stormwater. During rain events, flooding occurs in the area between Madera Ave and 9th St and between D St and California Ave within the southern section of the City of Kerman. The city has to sandbag intersections and low areas within this area or buildings will be inundated. The City has sandbagged 5 out of the last 10 years. The sandbagging has saved buildings from being flooded including a local Motel located on California Ave that sustained flood damage before the City started to sandbag the area. A medical center located across from the motel is also potentially affected. In total, 425 homes and businesses and an elementary school are potentially affected by localized flooding within the City. The value of these structures at risk to localized flooding is in excess of \$42,000,000. Furthermore, new development, if not designed properly, can magnify drainage problems. New development must conform to standards and plans contained in the Kerman Stormwater Drainage Master Plan, which directs the location of new stormwater drainage lines, mains, and ponding facilities. Figure F.4 illustrates the areas most vulnerable to localized flooding.

Figure F.3: City of Kerman's 100- and 500-Year Floodplain

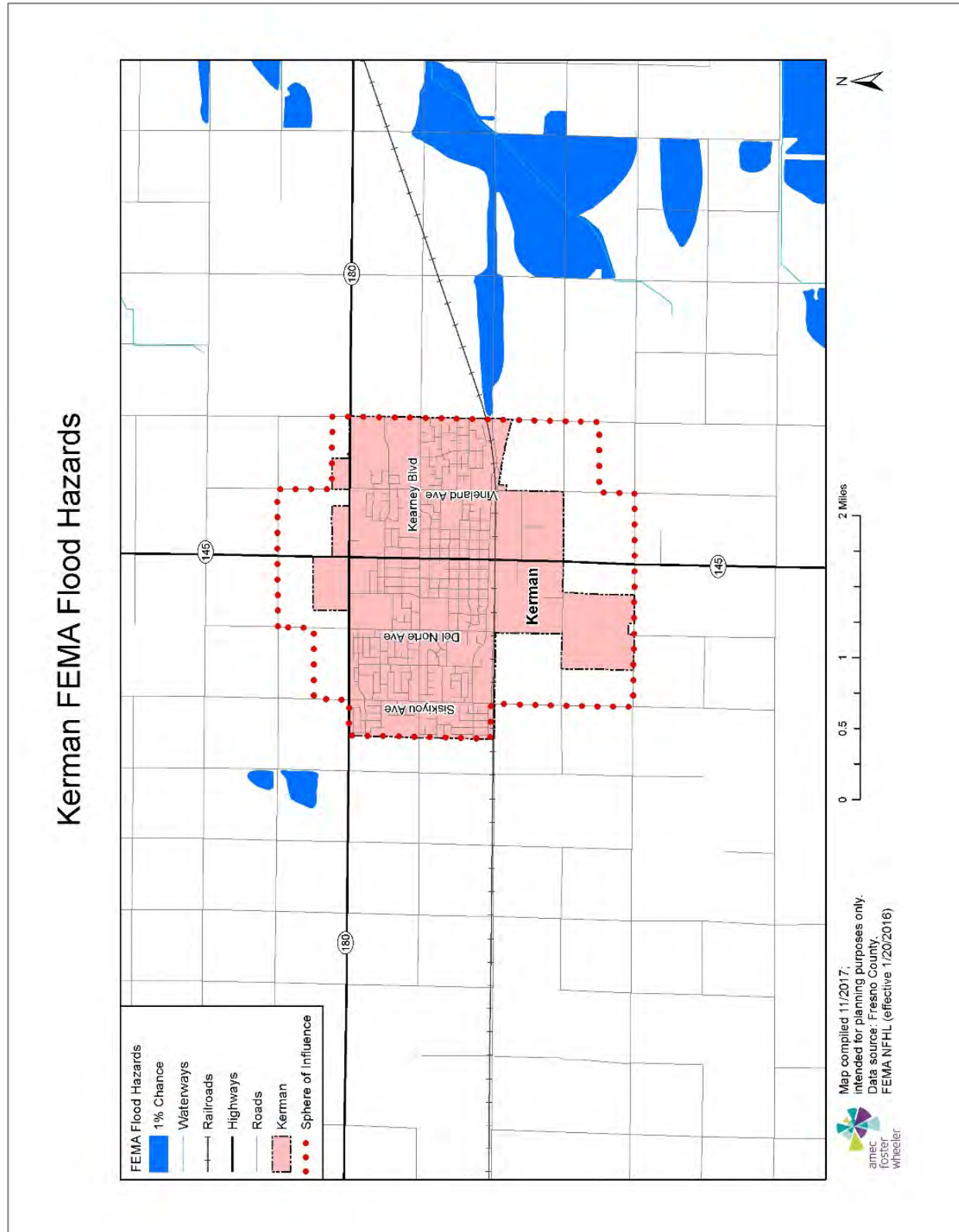
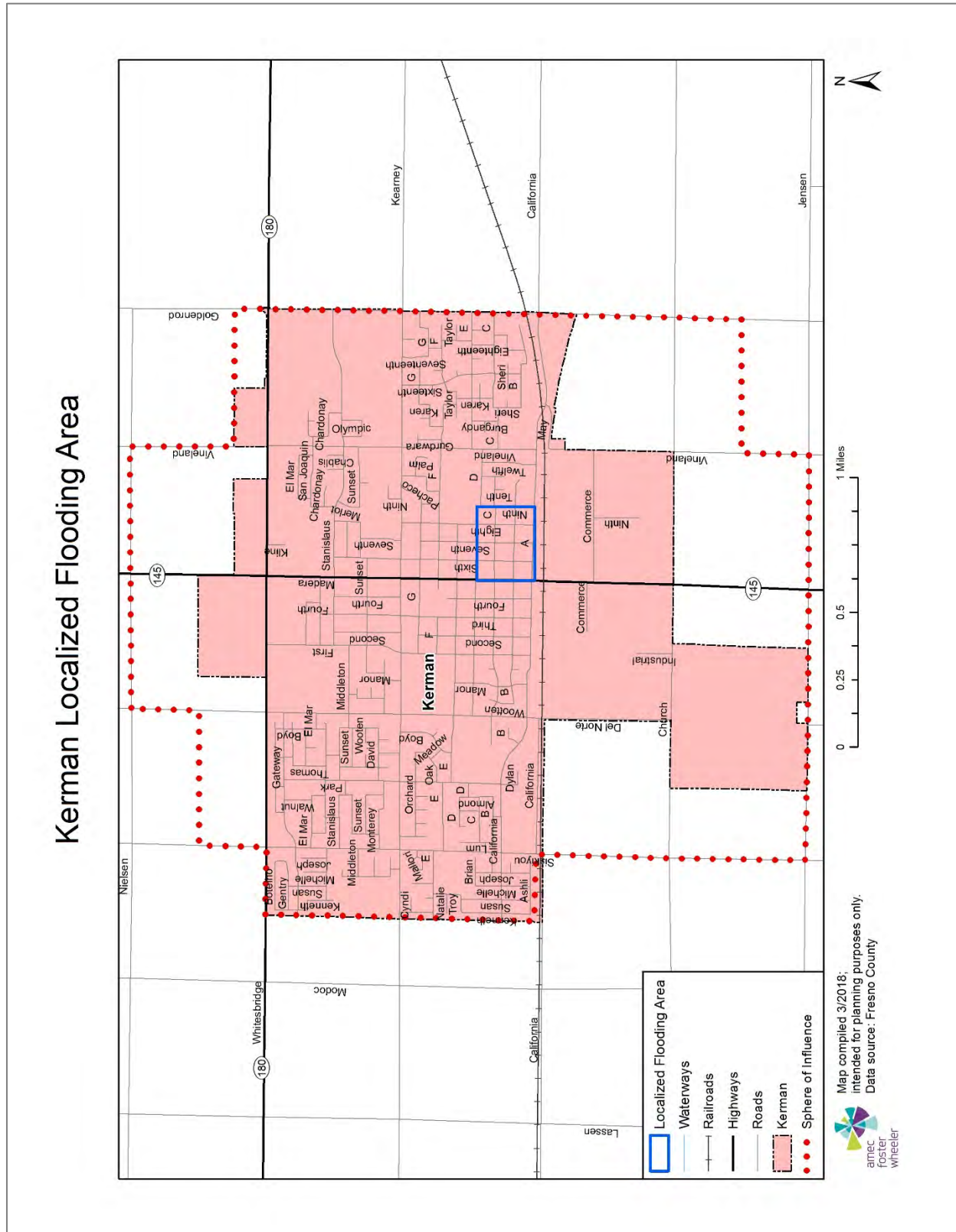


Figure F.4: City of Kerman's Area of Localized Flooding



Hazardous Materials Incident

There are several uses of hazardous materials within the City that pose a threat to its citizens. These uses include industrial operations on the south side of the City, the state highways that carry large volumes of truck traffic, the railroad, and the wastewater treatment plant. Kerman has two state highways (State Routes 145 and 180) that carry a large amount of truck traffic. It is difficult to ascertain the number of trucks carrying hazardous waste. The American Avenue landfill lies about seven miles southwest of Kerman. Chemical Waste, Inc. operates a hazardous waste collection facility at Kettleman City, about 55 miles south of Kerman.

There are 2 CalARP hazardous materials facilities located in the City of Kerman. As detailed in Table F.11, there is one critical facility located within a half mile of a CalARP facility.

Table F.11: Critical Facilities within ½ mile of CalARP Facility: City of Kerman

Critical Facility Type	Count
Police	1
Total	1

Source: Fresno County, HIFLD 2017

F.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into three sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Kerman's updated capabilities are summarized below.

F.4.1 Regulatory Mitigation Capabilities

Table F.12 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Kerman.

Table F.12: City of Kerman's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	2007 Kerman General Plan Update
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (stormwater, water conservation, wildfire)	N/A	
Building code	Yes	2007 California Building Standards Code
Fire department ISO rating	Yes	ISO rating 3
Erosion or sediment control program	No	
Stormwater management program	Yes	Storm Drain Master Plan
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016

2007 Kerman General Plan Update

The 2007 Kerman General Plan Update expresses the City's vision and expectations for the future. It is a development blueprint for the year 2027. The plan serves as a decision-making tool to guide future decisions on the physical development of Kerman to facilitate a well-planned community. Some of the plan elements (e.g., Land Use; Conservation, Open Space, Parks and Recreation; and Safety) have goals and policies that are directly or indirectly related to mitigation. The Safety and Conservation, Open Space, Parks and Recreation elements are the most relevant to hazard mitigation. As such, select goals and policies from these elements are extracted and included below.

Safety Element

The Safety Element is the primary vehicle for relating local safety planning to City land use decisions. Its main purpose is to reduce death, injuries, property damage, and the economic and social dislocation resulting from natural hazards.

Goals

- Prevent the loss of life and personal property due to natural and manmade hazards, including earthquakes, floods, and fires
- Safeguard the economic resources of the City from losses due to natural and manmade hazards, including earthquakes, floods, and fires
- Promote citizen awareness of the implications of natural and manmade hazards that exist in the region

Policies

Seismic and Geologic Safety
1. Policy: The City shall insure that all new and rehabilitated structures are constructed to meet adequate building standards.
2. Policy: The City shall review the State Mining and Geology Board's publications, which define Special Studies Zones for areas along fault lines.
3. Policy: The City of Kerman shall continue the abatement/rehabilitation of dangerous buildings as defined by the Uniform Housing Code.

Fire Safety
1. Policy: The City of Kerman shall coordinate with the North Central Fire District through Kerman's site plan review process and the State's environmental review process to insure that future development does not impose a burden on their services. North Central, with input and review from the City, should establish a 20-year Capital Improvement Plan (CIP) for potential fire station/equipment in the Kerman area. The City should continue to charge Development Impact Fees for new growth to accommodate the CIP.
2. Policy: The City of Kerman shall coordinate with North Central Fire District to provide prevention and public education to the residents to reduce the demand for fire protection services.
3. Policy: The City shall require that yards and lots be maintained free of weeds and debris.

Hazardous Land Use Relationships
1. Policy: Residential development in close proximity to industrial zones and the wastewater treatment plant shall be avoided. Development adjacent to the wastewater treatment plant shall be limited to industrial uses.
2. Policy: Residential land uses shall be limited adjacent to State Highway 145 and State Highway 180.
3. Policy: Businesses that use, produce, or generate any type of hazardous materials shall be conducted in a safe manner.

Conservation, Open Space, Parks and Recreation Element

The conservation portion of this element includes the conservation, development, and utilization of natural resources, including water, forests, soils, rivers and other waters, wildlife, and other natural resources.

Goals

- Conserve, restore, and enhance significant natural, cultural, and historic resources in Kerman
- Create and preserve open space in the Kerman area to meet the needs of the community now and in the future

Policies

Water Quality and Conservation
1. Policy: Promote a community awareness program that will educate the community in water-saving methodologies at the home and the work place.
2. Policy: Require the use of native and drought-tolerant new landscaping in existing and future parks and medians.
3. Policy: Allow for adequate groundwater recharge by developing storm ponding and retention basins where feasible. In some areas these ponds or basins can be incorporated into a recreational area or used as wildlife habitat area.
4. Policy: The City should develop a secondary water source system ("purple pipe system") that can be incorporated into new development in order to use less potable water for the irrigation of parks, schools, and public landscaping.

Kerman Master Storm Drain Plan

In 1982, the City of Kerman developed a master storm drain plan that defined the existing storm drain facilities and provided a plan for the City of Kerman as it grew. Through annual updates, the plan has evolved into today's comprehensive plan of system pipelines, drainage basins, and pump stations. In some locations, the basins are used as parks in the dry season. As new development takes place, the developers are required to construct master drainage facilities defined by the plan that impact their area of construction.

F.4.2 Administrative/Technical Mitigation Capabilities

Table F.13 identifies the personnel responsible for activities related to mitigation and loss prevention in Kerman.

Table F.13: City of Kerman's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Consultant—Yamabe & Horn
Planner/engineer/scientist with an understanding of natural hazards	Yes	
Personnel skilled in GIS	Yes	Consultant—Yamabe & Horn
Full-time building official	Yes	Planning and Development Services
Floodplain manager	No	
Emergency manager	Yes	Police Chief
Grant writer	Yes	California Consulting
Other personnel	N/A	
GIS Data—Land use	No	
GIS Data—Links to Assessor's data	No	
Warning systems/services (Reverse 9-11, outdoor warning signals)	No	

According to FEMA's 2016 Flood Insurance Study, the City of Kerman is not subject to floodwaters from a 100-year storm and thus is not required to participate in the NFIP.

F.4.3 Fiscal Mitigation Capabilities

Table F.14 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table F.14: City of Kerman's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes

Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	No
Incur debt through private activities	No
Withhold spending in hazard prone areas	No

F.4.4 Opportunities for Enhancement

Based on the capabilities assessment, the City of Kerman has existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. The opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Drought Contingency plan that will help to create a framework for drought response and mitigation in Kerman.
- Update the Storm Drain Master Plan
- While the City of Kerman is not subject to floodwaters from a 100-year storm on a creek or river and thus is not required to participate in the NFIP, the City might consider the benefits of joining the program which would allow residents and businesses access to flood insurance, given the flood issues associated with stormwater drainage.

F.5 Mitigation Strategy

F.5.1 Mitigation Goals and Objectives

The City of Kerman adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Planning and Development Services may utilize the hazard information when reviewing site plan and building applications. The City Manager will use hazard information when working economic development specific projects and opportunities to recruit new businesses. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Kerman will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

F.5.2 Completed 2009 Mitigation Actions

The City of Kerman has not completed any of the actions identified in the 2009 plan. However, these actions will be carried forward in the mitigation strategy for this plan update.

F.5.3 Mitigation Actions

The planning team for the City of Kerman identified the following mitigation action based on the risk assessment. Background information and information on how the action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule is included.

In addition to implementing the mitigation actions below the City of Kerman will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Construct California Avenue Parallel Storm Drain Line

Hazard(s) Addressed: Flood

Issue/Background: When the City of Kerman constructed the first storm drain system in the early 1960s, a 20-inch storm drain line was installed in California Avenue to move the water that drained from the central part of Kerman to the main storm drain line that leads south to Church Avenue where the master storm drain basin was constructed. As Kerman grew so did the storm drain runoff and a master storm drain plan was developed in the early 1980s to allow storm drain impact fees to be collected on new growth and provide a plan to install the new infrastructure. The last section of the master planned storm drain system in the south part of Kerman is a parallel 30 inch storm drain line running west from 4th Street to 1st Street. Because this section of master planned SD has not been constructed, there is a potential for flooding in the drainage area feeding this part of the SD system. We have experienced continual problems throughout the area draining to this section of the SD system and we are required to sandbag when significant rain events occur. The map (Attachment A below) delineates the area that drains to this section of the SD system.

Other Alternatives: No Action

Responsible Office: Public Works Director

Priority (High, Medium, Low): High

Cost Estimate: \$140,000

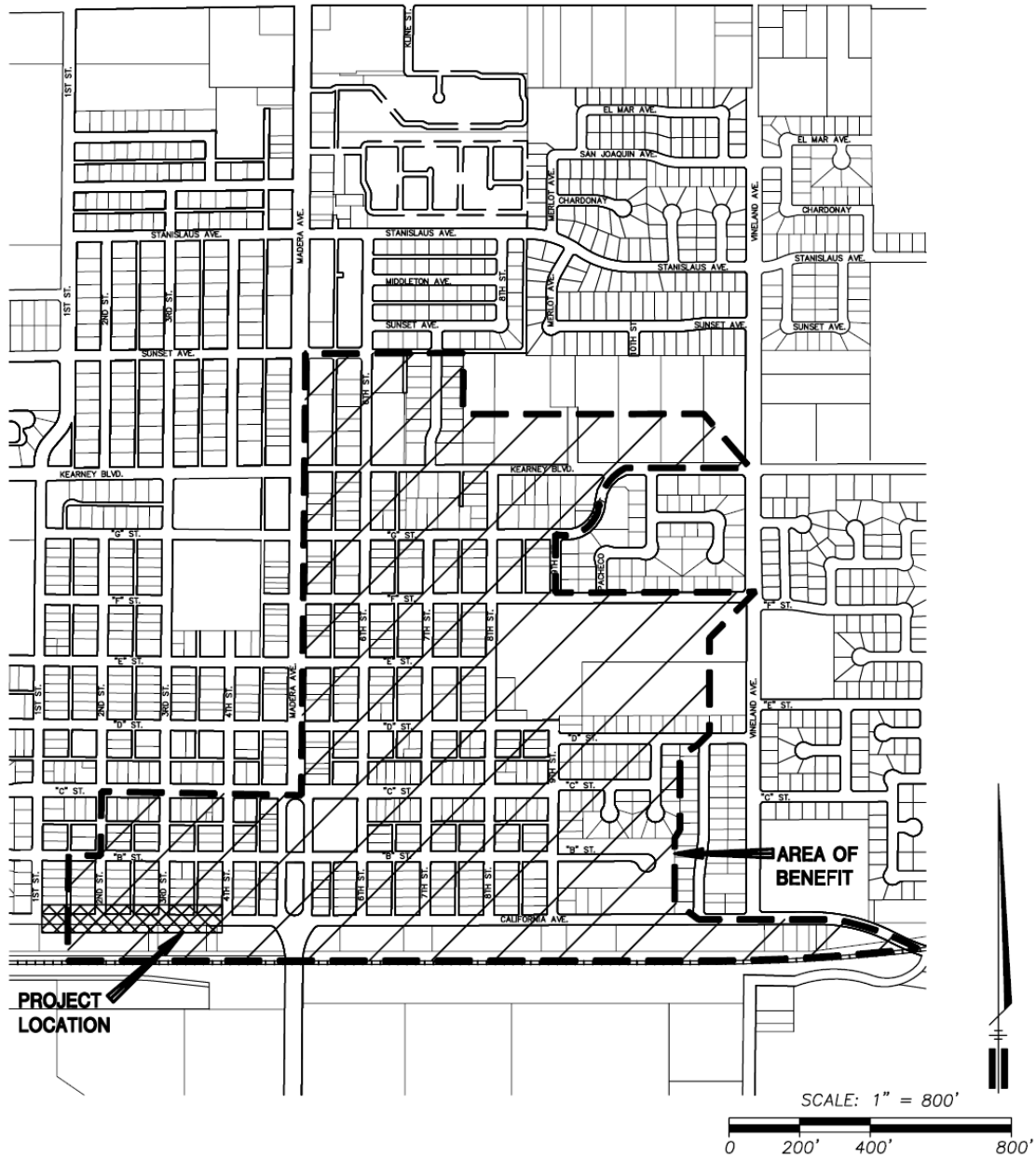
Potential Funding: Not yet identified

Benefits (Avoided Losses): Possible flooding to approximately 425 homes and businesses and one elementary campus valued in excess of \$42,000,000

Schedule: Within 2-5 years, dependent on funding.

Status: 2009 project, not yet started

ATTACHMENT "A"



**YAMABE & HORN
ENGINEERING, INC.**

1300 EAST SHAW AVE.
SUITE 176
FRESNO, CA 93710

TEL (559) 244-3123
FAX (559) 244-3120

Ref. & Rev.

REV
REV
REV
REV
REV

CITY OF KERMAN

**CALIFORNIA AVE. STORM DRAIN
FIRST ST. TO FOURTH ST.
AREA OF BENEFIT**

Dr. By: JJ
Ch. By: GH
Date: 12/09/08
YH Job No. 08-343
Sheet No. 1
of 1 Sheets

F:\2008\08-343\dwg\Exhibits\08-343_AOB.dwg

2. Install Warning Lights for the Intersection of State Route 145 and Highway 180

Hazard(s) Addressed: Severe Weather: Fog

Issue/Background: State Routes 145 and 180 are the two main roads leading into the City of Kerman. These roads are heavily trafficked by personal autos and commercial trucks. Each section of road leading into the City passes through agricultural/rural areas where vehicles often travel at maximum speeds. During winter fog events, the traffic lights become obscured, and the vehicles are not warned of the approaching intersection with enough time to stop. If flashing warning lights were installed on these roadways before the intersection, they would give drivers an opportunity to slow down and stop before they reach the intersection. This would save lives and reduce human injury and property damage. The specific priority location is on the southbound State Route 145 approach to the intersection.

In 2007, there were 22 accidents at this intersection. Nine were injury accidents (seven people required an ambulance response). The nearest hospital is 20 miles away in the City of Fresno.

Other Alternatives: Reduced speeds on state highways and routes leading into the City, speed bumps, traffic control by police during fog events

Responsible Office: City of Kerman and the California Department of Transportation

Priority (High, Medium, Low): Medium

Cost Estimate: \$35,000-50,000

Potential Funding: Possible assistance from the California Department of Transportation since they would maintain the lights

Benefits (Avoided Losses): It is estimated that flashing intersection warning lights would reduce accidents at this intersection by 20 percent. It is estimated that, per year, 0.5 lives would be saved per year (one life @ \$3.1 million=\$1.5 million), seven injuries requiring ambulance dispatch would be avoided (1 hospital visit @ \$15,000=\$105,000), and property damage would be reduced (20 accidents involving 40 vehicles, average \$5,000 per vehicle=\$200,000). The benefits would approximate \$2 million vs. a cost of \$50,000.

Schedule: 1-2 years

Status: 2009 project, not yet started

3. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Kerman and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Kerman has become a joint power authority of the North Kings Groundwater Sustainability Agency, other members of the Agency include the County of Fresno, City of Fresno, City of Clovis, Biola Community Services District, Garfield Water District and International Water District. As a member of the North Kings GSA, the City of Kerman is required to participate in the development and implementation, no later than January 31, 2020, of a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the North Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Kerman.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: City Manager and North Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

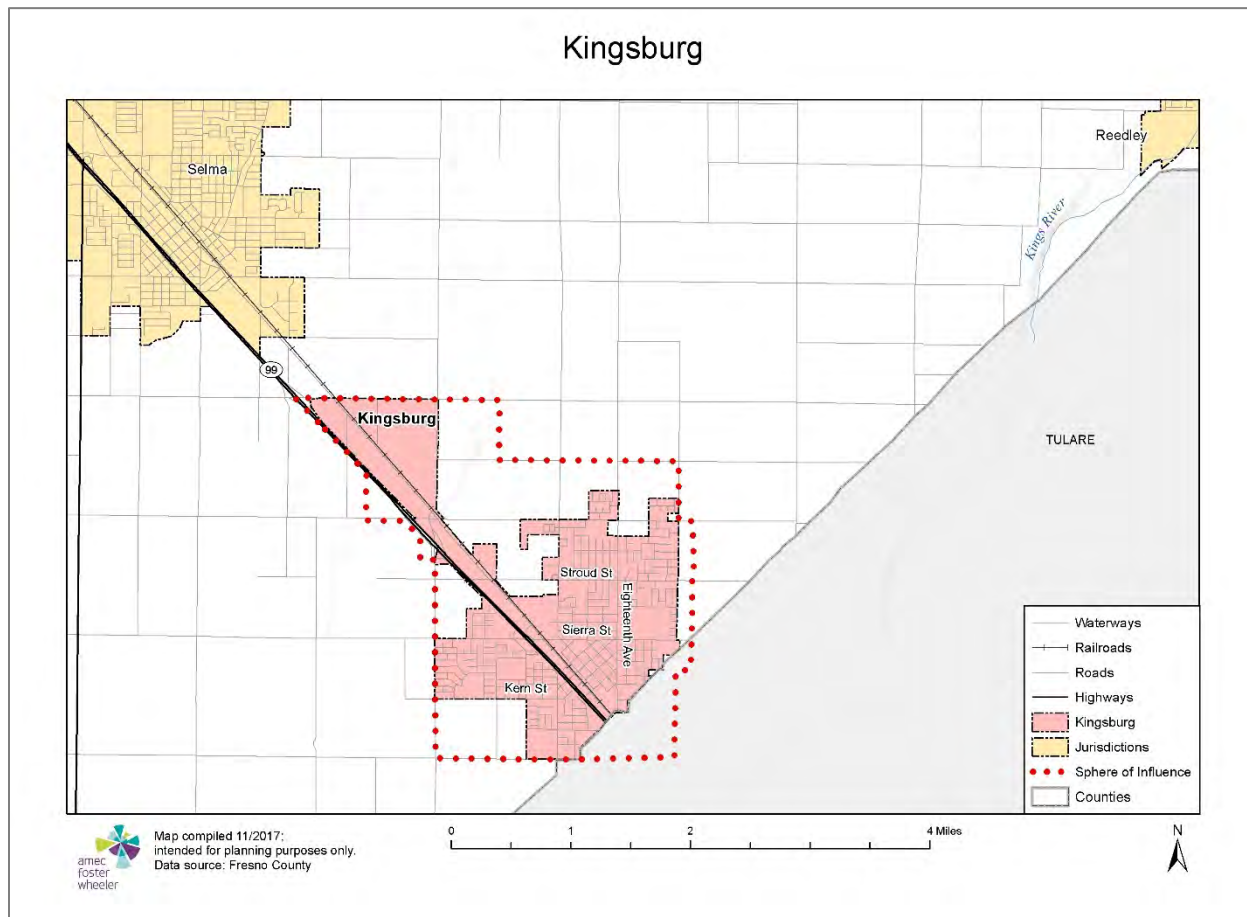


ANNEX G: CITY OF KINGSBURG

G.1 Community Profile

Figure G.1 displays a map and the location within Fresno County of the City of Kingsburg and its Sphere of Influence.

Figure G.1: The City of Kingsburg



G.1.1 Geography and Climate

The City of Kingsburg is a corporate city in Fresno County in the San Joaquin Valley of California. It covers a 4,025-acre area, of which 2,245 acres are within the City limits and the rest comprises the City's Sphere of Influence. Over the past decade, the City has annexed a significant amount of land in the northwestern reaches of its Sphere of Influence toward the City of Selma, along California State Highway 99 and the Union Pacific Railroad.

Kingsburg is directly southeast of the City of Selma and approximately 20 miles south of the County seat, the City Kingsburg. Kingsburg sits directly adjacent to Tulare County on its eastern

and southern boundaries, and Kings County is one mile to the south. The Union Pacific Railroad and California State Highway 99 both run through the middle of the City. The Kings River, a major waterway that starts in the Sierra Nevada Mountains and runs through the lower part of the San Joaquin Valley, is close to the City's southern and eastern boundaries.

Kingsburg's climate can be described as Mediterranean. The summers are hot and dry, and winters are characterized by moderate temperatures and light precipitation. Temperatures and rainfall for Kingsburg are typical of that of the rest of Fresno County.

G.1.2 History

Kingsburg was established in the 1870s, when the now Union Pacific Railroad was laid through the heart of the San Joaquin Valley, and when cattle raising, and wheat production were the principal economic activities. The City was originally established in 1873 as a railroad stop called "Kings River Switch" and was settled primarily by Swedish immigrants. This culture persisted, earning the community the nickname "Little Sweden." The City was later incorporated in 1908. The first highway was built around 1912 and connected Kingsburg to Sanger to the north. By 1925, raisin production and packing had become the City's main industries. To this day, agriculture remains the integral to Kingsburg's economy and Swedish influence can still be seen in the City's architecture.

G.1.3 Economy

Kingsburg is primarily a bedroom community. Development in the City is 72 percent residential, 20 percent commercial, and 8 percent industrial, which limits the sales and property tax base. Kingsburg has diversified its economy over the past decade, though agriculture remains the primary industry around the City, and supports economic development within the City. The largest employers in Kingsburg include Sun-Maid Raisins (700 employees), Guardian Glass (297 employees), Kingsburg Elementary School District (268 employees) and Sacramento Container Company (121 employees).

The City has developed an industrial park on Golden State Boulevard and Stroud Avenue at Highway 99 and a 45-acre commercial park west of Highway 99 and north of Sierra Street. The City's downtown area, known as the "Swedish Village," has specialty shops, restaurants, and businesses.

Select estimates of economic characteristics for the City of Kingsburg are shown in Table G.1.

Table G.1: City of Kingsburg's Economic Characteristics, 2016

Characteristic	City of Kingsburg
Families below Poverty Level	13.5%
All People below Poverty Level	17.8%
Median Family Income	\$77,938

Characteristic	City of Kingsburg
Median Household Income	\$61,925
Per Capita Income	\$24,603
Population in Labor Force	5,448
Population Employed*	4,891
Unemployment	10.1%

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables G.2 and G.3 show how the City of Kingsburg's labor force breaks down by occupation and industry based on estimates from the 2016 American Community Survey.

Table G.2: City of Kingsburg's Employment by Occupation, 2016

Occupation	# Employed	% Employed
Management, Business, Science, and Arts Occupations	1,854	37.9
Sales and Office Occupations	1,101	22.5
Service Occupations	780	15.9
Production, Transportation, and Material Moving Occupations	660	13.5
Natural Resources, Construction, and Maintenance Occupations	496	10.1
Total	4,891	100.0

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

Table G.3: City of Kingsburg's Employment by Industry, 2016

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	1,292	26.4
Retail Trade	520	10.6
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	375	7.7
Agriculture, Forestry, Fishing and Hunting, and Mining	352	7.2
Public Administration	346	7.1
Wholesale Trade	341	7.0
Other Services, Except Public Administration	340	7.0
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	336	6.9
Finance and Insurance, and Real Estate and Rental and Leasing	256	5.2
Transportation and Warehousing, and Utilities	250	5.1
Construction	241	4.9
Manufacturing	225	4.6
Information	17	0.3
Total	4,891	100.0

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

G.1.4 Population

In 2016, according to the U.S. Census Bureau's American Community Survey 5-Year Estimates, the total population for the City of Kingsburg was estimated at 11,716. Select demographic and social characteristics for the City of Kingsburg from the 2016 American Community Survey are shown in Table G.4.

Table G.4: City of Kingsburg's Demographic and Social Characteristics, 2016

Characteristic	City of Kingsburg
Gender/Age	
Male	47.8%
Female	52.2%
Median age	34.2
Under 5 years	6.1%
Under 18 years	28.4%
65 years and over	12.4%
Race/Ethnicity*	
White	83.0%
Asian	2.3%
Black or African American	0.1%
American Indian/Alaska Native	0.8%
Hispanic or Latino (of any race)	39.5%
Education	
High school graduate or higher	89.3%
Disability Status	
Population 5 years and over with a disability	12.2%

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

*Of the 95.3% reporting one race

G.2 Hazard Identification and Summary

Kingsburg’s planning team identified hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Kingsburg (see Table G.5). In the context of the plan’s planning area, there are no hazards unique to Kingsburg.

Table G.5: City of Kingsburg—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Limited	Highly Likely	Limited	Low
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

G.3 Vulnerability Assessment

The intent of this section is to assess Kingsburg’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Kingsburg’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Kingsburg.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table G.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Kingsburg’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table G.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Kingsburg are identified below. The discussion of vulnerability related information for each of the following hazards is located in Section G.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation are drought and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- earthquake
- epidemic/pandemic
- extreme heat
- fog
- hazardous materials incidents
- flood/levee failure

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Kingsburg, those hazards ranked Low are as follows:

- human health hazards: West Nile Virus
- severe weather: extreme cold; heavy rain/thunderstorm/hail/lightning; tornado windstorm; winter storm
- soil hazards
- volcano
- wildfire*

***Note:** Although wildfire is ranked High in the County, Kingsburg ranks wildfire as Low due to a lack of exposure to wildfire risk within the city boundaries. However, some at-risk properties are located within the City's Sphere of Influence (See section G.3.2, Figure G.7).

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. Avalanche and landslide are considered Not Applicable (N/A) to the City of Kingsburg.

G.3.1 Assets at Risk

This section considers Kingsburg's assets at risk, including values at risk, critical facilities and infrastructure, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table G.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Kingsburg.

Table G.6: 2017 Property Exposure for the City of Kingsburg by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Commercial	174	244	\$68,841,479	\$68,841,479	\$137,682,958
Exempt	17	22	\$0	\$0	\$0
Industrial	43	61	\$72,864,393	\$109,296,590	\$182,160,983
Multi-Residential	189	307	\$38,481,741	\$19,240,871	\$57,722,612
Residential	3,202	3,365	\$456,188,691	\$228,094,346	\$684,283,037
Unknown	1	4	\$3,795	\$3,795	\$7,590
Total	3,626	4,003	\$636,380,099	\$425,477,080	\$1,061,857,179

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Kingsburg from Fresno County GIS is provided in Table G.7 and mapped in Figure G.2.

Table G.7: City of Kingsburg's Critical Facilities

Critical Facilities Type	Number
CalARP	5
Fire Station	1
Police	1
School	11
Total	18

Source: Fresno County, HIFLD 2017

Figure G.2: City of Kingsburg's Critical Facilities

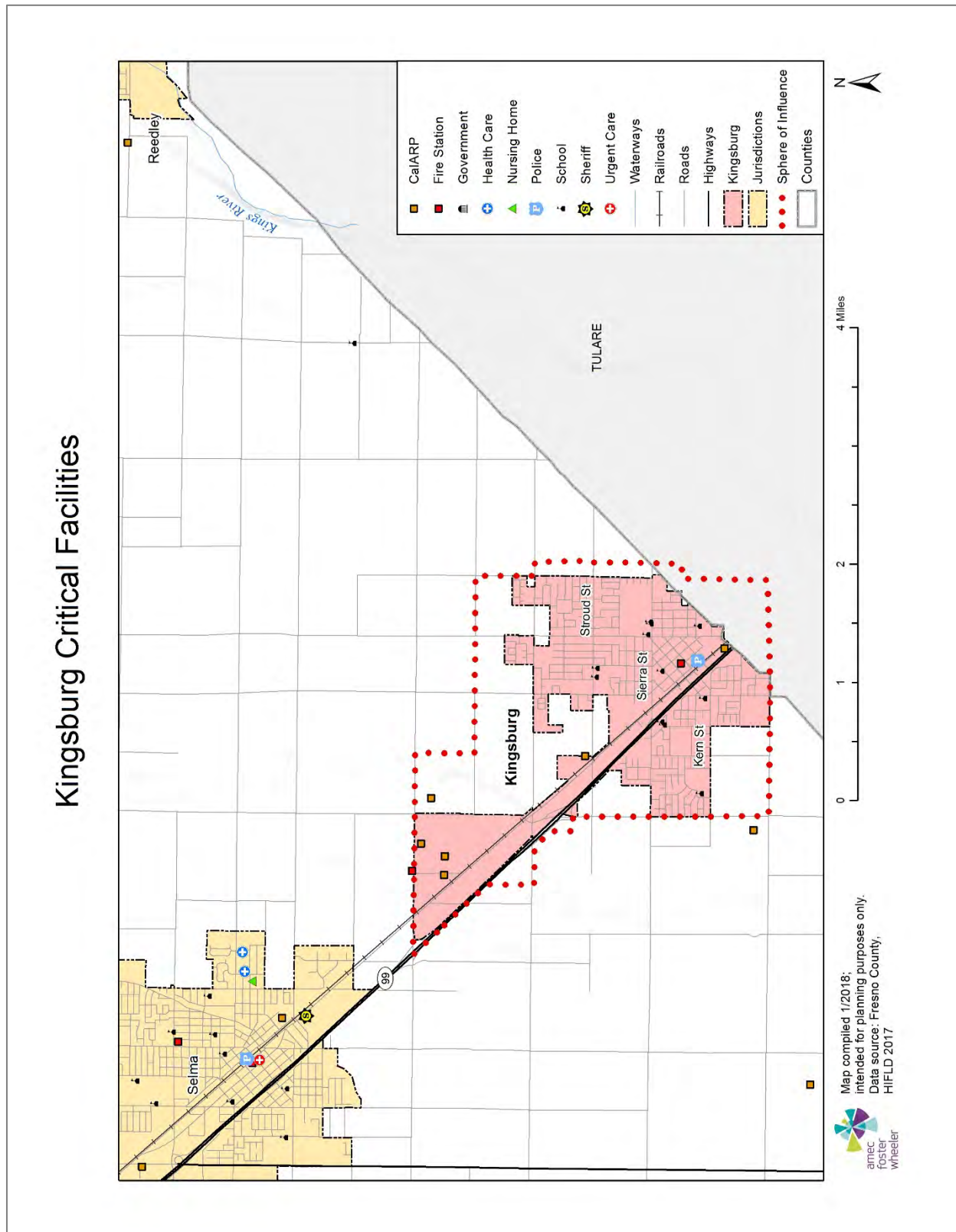


Table G.8 lists particular critical facilities and other community assets identified by Kingsburg’s planning team as important to protect in the event of a disaster.

Table G.8: Specific Critical Facilities and Other Community Assets Identified by the City of Kingsburg’s Planning Team

Name of Asset	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info.
City Hall	376,531	28	Unreinforced masonry
Fire Department—Downtown Station	2,224,747	n/a	Unsecured perimeter
Fire Department—Bethel Avenue Station	1,923,264	n/a	Unsecured perimeter
Police Department	2,285,821	n/a	Close proximity to railroad system
Kingsburg Elementary School District (five schools)	n/a	2,445	Some campuses do not have secured facilities
Kingsburg High School District (one main campus, one alternative education center)	n/a	1,279	Open campus

Growth and Development Trends

Table G.9 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2016.

Table G.9: City of Kingsburg’s Change in Population and Housing Units, 2010-2016

2010 Population	2016 Population Estimate	Estimated Percent Change 2010-2016	2010 # of Housing Units	2016 Estimated # of Housing Units	Estimated Percent Change 2010-2016
11,382	11,716	+2.93	3,817	3,938	+1.03

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates; 2006-2010 5-Year Estimates

Due to County boundaries on the east and south, all growth potential is in the west and north areas of the City. The City has developed a commercial/business park on the north side of Sierra Street in the northwest area of town. Also, there are two new industrial parks on the north area of town on the west side of Simpson Street (Golden State Boulevard).

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

G.3.2 Estimating Potential Losses

Table G.6 above shows Kingsburg’s exposure to hazards in terms of number and value of structures. Fresno County’s assessor’s data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes.

Impacts of past events and vulnerability to specific hazards are further discussed below in accordance with the criteria identified under section G.3 Vulnerability Assessment and Table G.5 Hazard Summaries above. (See Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Agricultural Hazards

The lands surrounding Kingsburg (in Kingsburg, Kings, and Tulare counties) are all in agricultural production (dairy, citrus, grapes/raisins, and nuts). Crop losses in the surrounding area due to hazards have economic impacts in Kingsburg. Some of the primary businesses in Kingsburg are agricultural, including Del Monte and Sun Maid Raisin. Kingsburg's agriculturally based economy is vulnerable to freezes, heat waves, flooding, and insect infestations. A freeze in the winter of 2006 affected the citrus industry and the heat wave in the summer of 2006 affected the dairy and poultry industries.

Any time a hazard-related event results in reduced crop or product production, Kingsburg is negatively impacted by loss of revenue to major businesses. The associated unemployment affects the crime rate, housing market, local businesses, and the City's sales tax revenues.

Dam Failure

Kingsburg is in the mapped inundation area of Pine Flat Dam. Pine Flat Reservoir is located in the foothills of the Sierra Nevada Mountains, approximately 30 miles northeast of Kingsburg. The construction of the 429-foot Pine Flat Dam on the Kings River was completed in 1954. The project's primary purposes are flood control, irrigation, water conservation, and recreation. When completely full, Pine Flat Reservoir is 20 miles long, holds 1 million acre-feet of water, and covers 5,790 acres with 67 miles of shoreline. The upper Kings River is the main tributary that fills the reservoir. According to the Kings River Conservation District, "in the event of a major release from Pine Flat Dam, downstream flooding could occur over agricultural lands near the riverbanks and possibly within the Cities of Reedley and Kingsburg." The Kings River is located approximately one mile, at its closest, from Kingsburg's eastern, southeastern, and southern boundaries.

Drought

Groundwater is the source of domestic water supply for Kingsburg. The groundwater basin is recharged primarily by rainfall and infiltration, stormwater runoff, infiltration from irrigated ditch flows and seepage in the Kings River bottom, and water conservation recharge to natural sloughs in the nearby agricultural area. In October 2007, the City's water utility was operating at maximum peak performance due to drought conditions. Drought may also lead to agricultural losses in the surrounding area, which may impact the City economically.

Earthquake

Kingsburg is located in Seismic Hazard Zone 3. The nearest active earthquake faults are located more than 55 miles to the east in the Sierra Nevada range. Kingsburg has experienced several noticeable ground movement incidents, such as from the 1983 Coalinga earthquake and the 1989 Watsonville earthquake, but no local damage was sustained. The existence and extent of soil liquefaction hazards in the area of Kingsburg are unknown.

The planning team has identified approximately 36 unreinforced masonry buildings in the City. The majority of the unreinforced masonry buildings are downtown, which is very much a community asset. The downtown area, with its Swedish theme, is the community's major attraction. It is referred to as Historic Swedish Village. City Hall is the only critical facility that is an unreinforced masonry building.

Epidemic/Pandemic

The risk and vulnerabilities in the City do not differ from the County at large for this hazard. Please consult the main HIRA in Section 4 in the main plan for more details.

Flood

Heavy rain can lead to problems with storm drainage and create localized flood problems. According to the City of Kingsburg Storm Drain Master Plan, there are several flooding problem areas in the City. These areas are primarily a result of undersized pipes where runoff exceeds pipe capacity even for minor storms, damaged curb and gutters where the flow lines have been disrupted due to raised gutters and other obstructions, or damaged drain pipes. Figure G.3 shows the existing storm drain system deficiencies, Figure G.4 depicts potential stormwater flooding from a 100-year storm, and Figure G.5 depicts potential flooding from a 10-year storm.

Most damaged lines are downtown, where the storm drain pipes are some of the oldest in the system. The undersized lines are located along Kern Street near Roosevelt Elementary School and along Mariposa Street near Lincoln Elementary School.

Areas with curb and gutter flow line damage are generally in the older residential areas, including the areas south and west of Kingsburg High School. The downtown areas along Washington, Lincoln, and Lewis streets also have damaged curbs and gutters.

Prior to the construction of the Pine Flat Dam in the 1920s, flooding occurred in the Kings River area. However, today there is no flood hazard area mapped by FEMA within the City of Kingsburg. The City does participate in the National Flood Insurance Program (NFIP). The City joined the program on November 30, 1983. NFIP insurance data indicates that as of June 6, 2017, there were 10 flood insurance policies in force in the City with \$3,220,000 in coverage. All 10 policies are residential preferred risk policies for properties in a B, C, or X zone. There have been no historical claims for flood losses and according to the FEMA Community Information System accessed

9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Figure G.6 shows the FEMA mapped 100- and 500-year floodplain around the City of Kingsburg.

Figure G.3: Existing Storm Drain System Deficiencies: City of Kingsburg

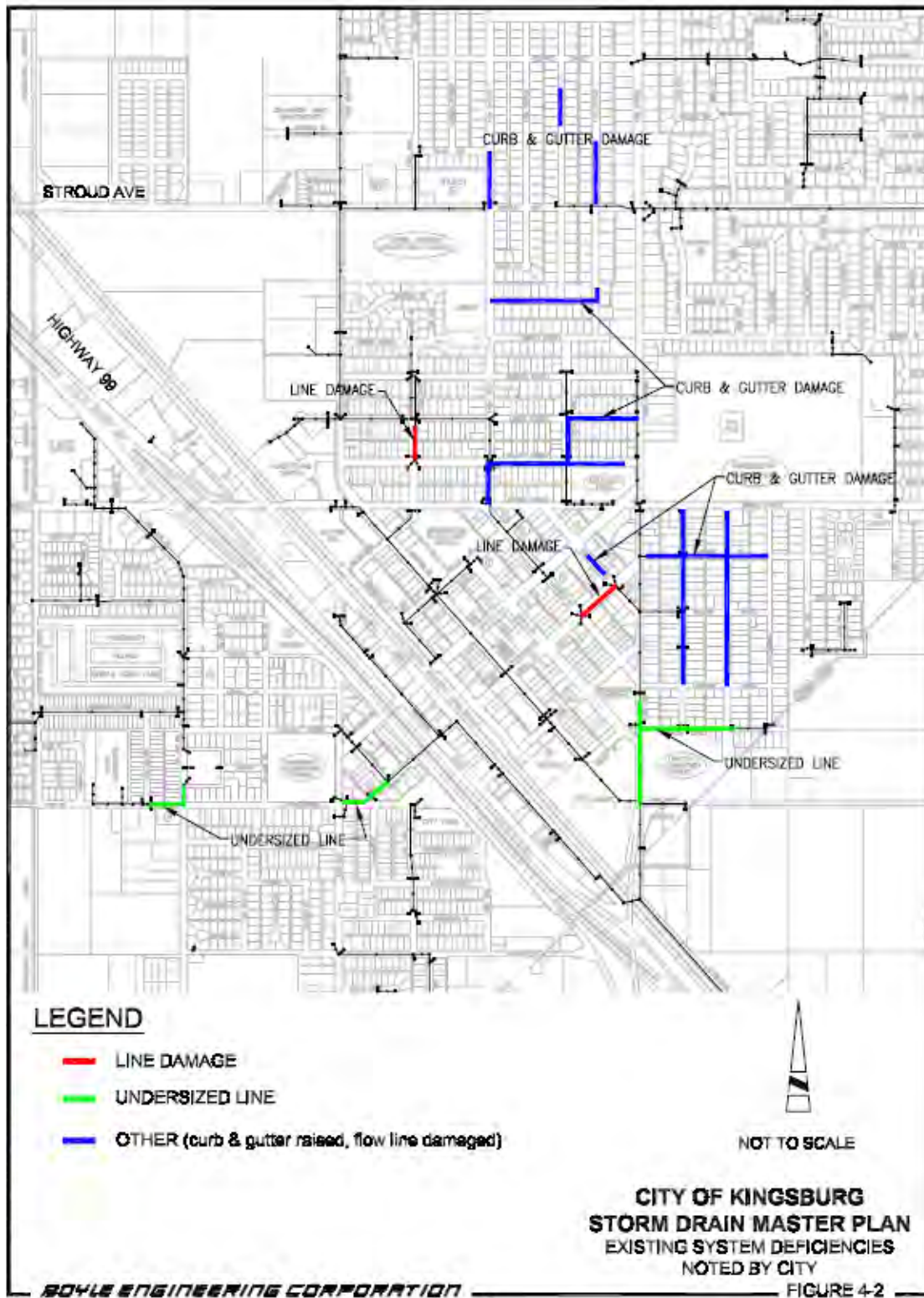


Figure G.4: Flooding in Kingsburg from a 100-Year Storm: City of Kingsburg

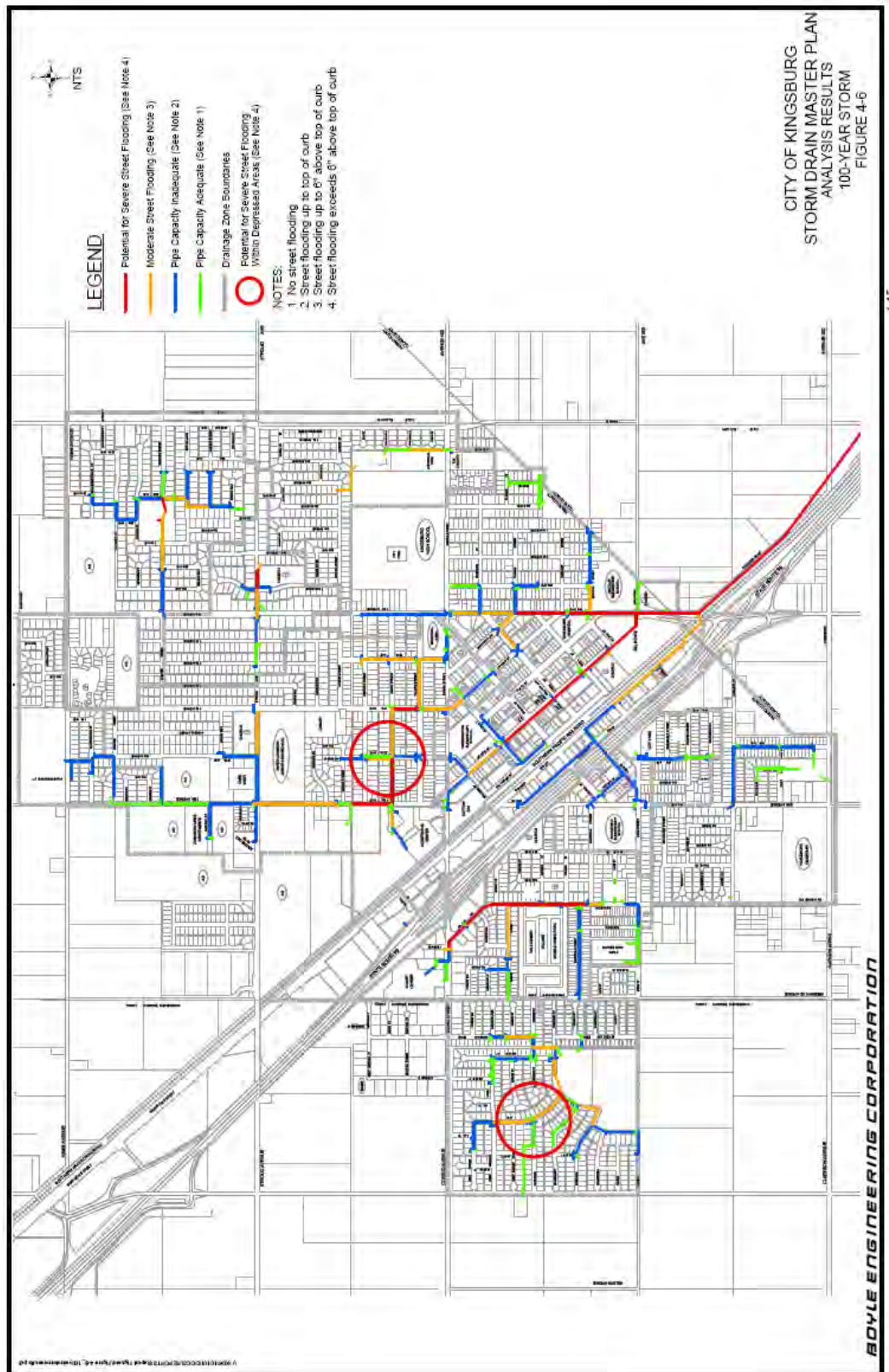


Figure G.5: Flooding in Kingsburg from a 10-Year Storm: City of Kingsburg

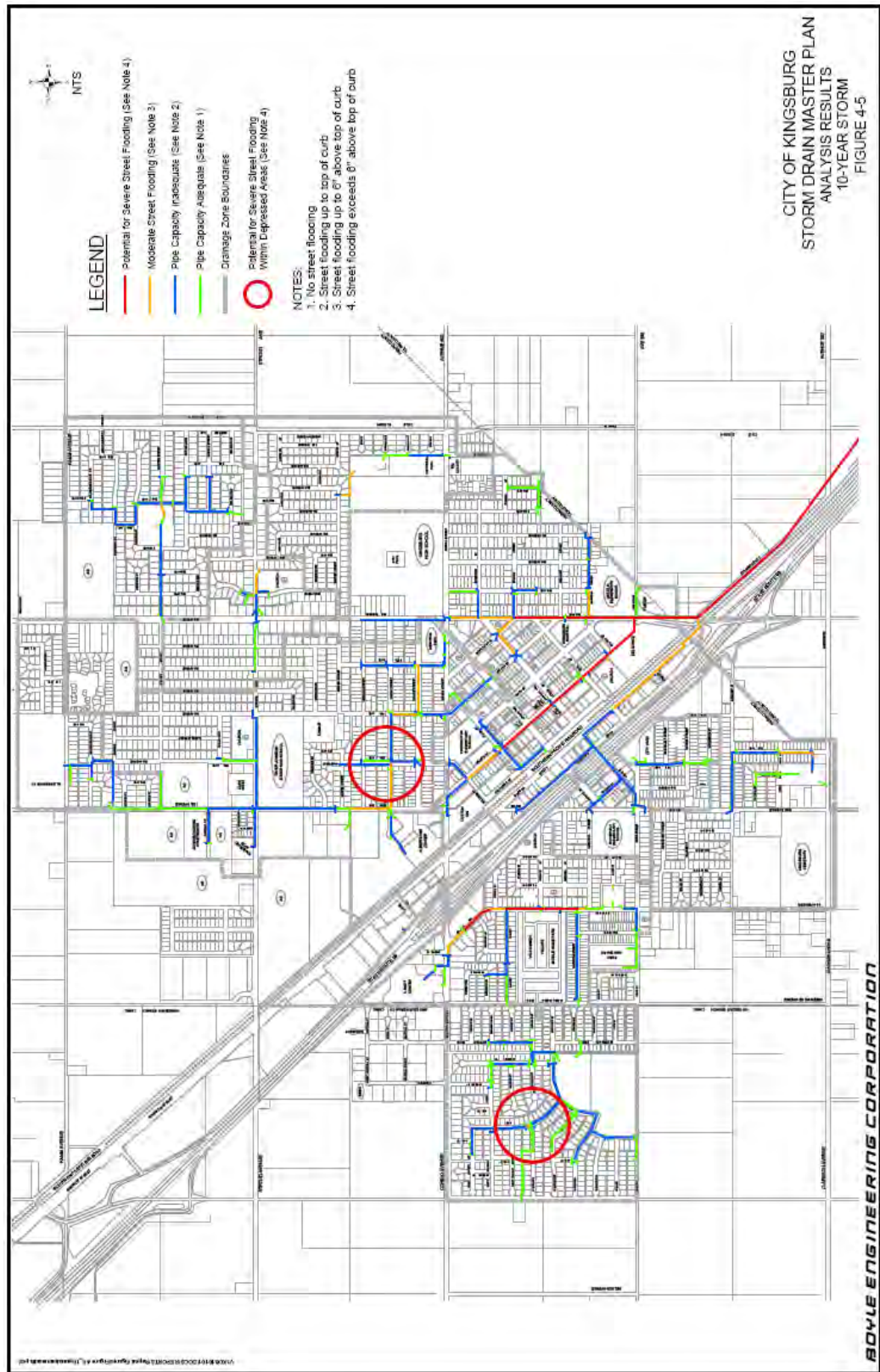
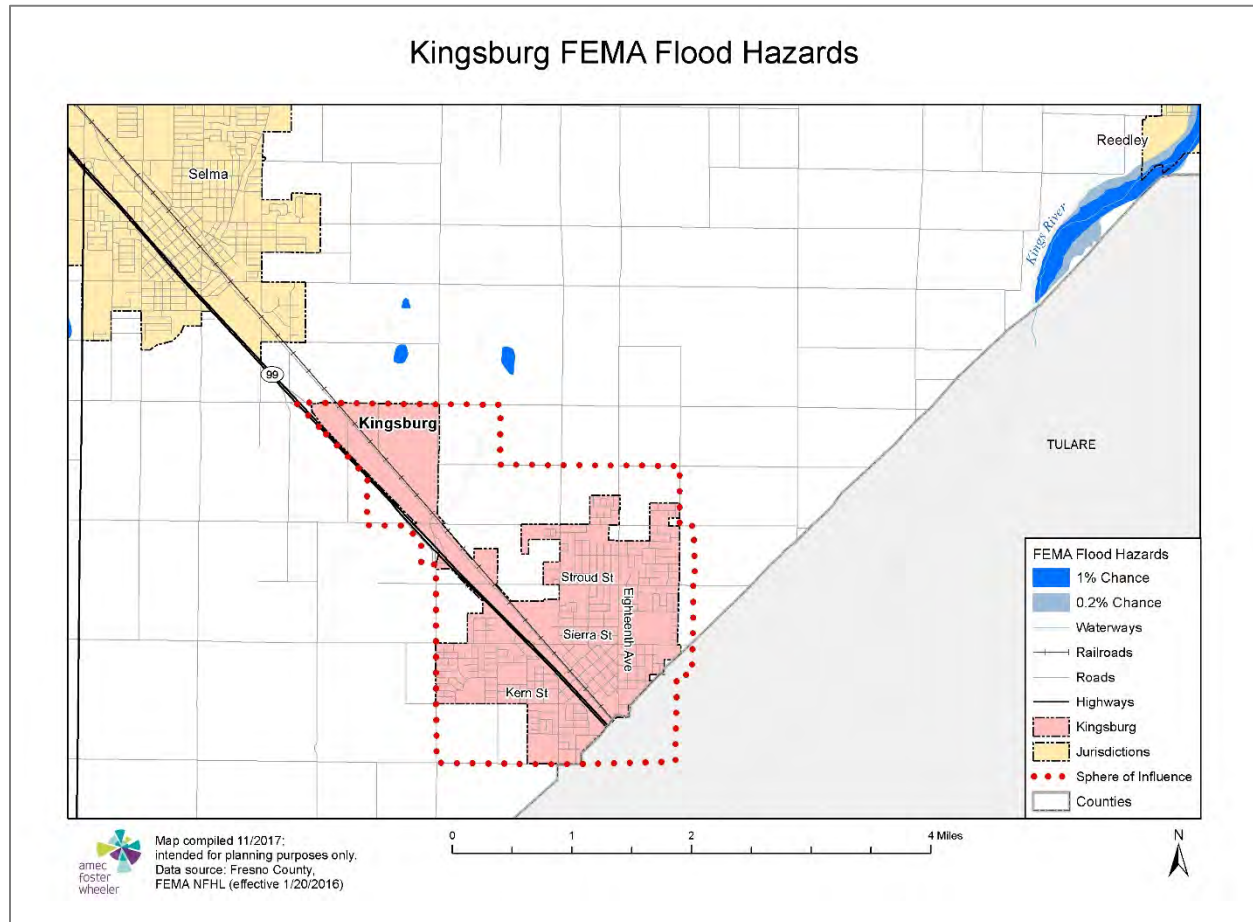


Figure G.6: City of Kingsburg's 100- and 500-Year Floodplains



Hazardous Materials Incident

California State Highway 99 and the Union Pacific Railroad both run through the heart of Kingsburg. With these two main transportation corridors comes the potential and history of major incidents involving loss of life and property.

Incidents such as those mentioned in the fog section above not only affect Highway 99, but also affect local streets and traffic due to detours through the City. Along with the potential for death and injuries from large-scale motor vehicle accidents, there is the potential for hazardous material spills or fires as numerous commercial transportation vehicles travel Highway 99 with various types and quantities of hazardous materials.

The Union Pacific Railroad is a strictly commercial freight transportation system. Large quantities and numerous types of hazardous materials are transported through Kingsburg by rail on a daily basis. In 1947, a collision occurred between a passenger train and a semi-truck hauling gasoline at the Union Pacific railroad crossing and Sierra Street in Kingsburg, killing four people and injuring 129. The rail line was closed for several days, but the specific closures and damage are no longer

known. Warning devices have since been approved. However, due to the increased rail and vehicle traffic in the City, this type of accident may occur again in the future.

Of particular concern is the large number of liquefied petroleum gas vessels that are transported on the system. A derailment and fire, with large exploding liquefied petroleum gas vessels, could cause widespread damage to the City, as has happened in other communities across the country.

Large quantities of hazardous materials are used by the agricultural industry and thus travel through Kingsburg and are stored and used in the surrounding areas. Also, there is the potential for hazardous materials releases from large industrial plants in Kingsburg, such as Guardian Glass and Del Monte.

There are five CalARP hazardous materials facilities located in the City of Kingsburg. As detailed in Table G.10, there are four critical facilities located within a half mile of a CalARP facility.

Table G.10: Critical Facilities within ½ mile of CalARP Facility: City of Kingsburg

Critical Facility Type	Count
Fire Station	1
Police	1
School	2
Total	4

Source: Fresno County, HIFLD 2017

Severe Weather: Extreme Heat

The City does have a cooling station plan administered by the Community Services Department. The fire and police stations, city hall, and the senior center serve as cooling centers. Kingsburg has a high population of elderly residents that are vulnerable during extreme heat events.

Severe Weather: Fog

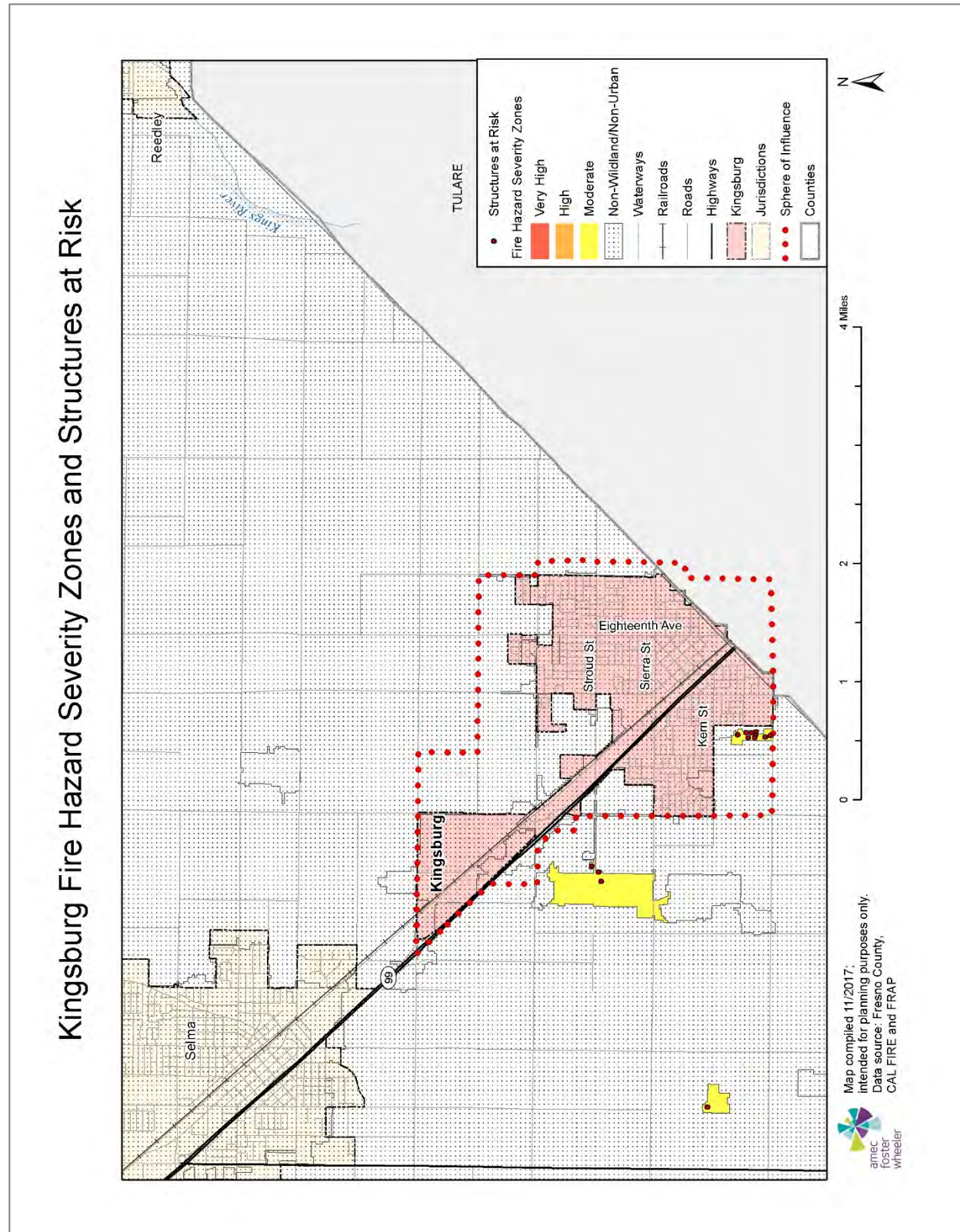
Severe fog events have contributed to multi-vehicle traffic accidents with multiple casualties along Highway 99 in Kingsburg. The most recent large events occurred in 1998 along Highway 99 and Avenue 384 (dense fog caused a chain-reaction accident involving 74 vehicles, killing two and injuring 51) and in 2000 along Highway 99, a major traffic artery in California, between Bethel and Mountain View avenues. The planning team reported that fatal accidents related to severe fog events occur in the area every year. About every five years, there is a major incident involving several vehicles. A similar event is highly likely to occur again in the future, especially with the expansion of Highway 99 from four to six lanes and the increase in highway usage.

These incidents require assistance from the City's emergency responders and also cause traffic to be diverted through the town, increasing the number of accidents there. Kingsburg does have a fog plan that involves constant replacement of signage and street striping to maintain visibility. The school districts implement a foggy day schedule when needed.

Wildfire

Similar to many areas of the County, Kingsburg has high temperatures in the summer with low rainfall creating fire hazard conditions. Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Kingsburg was created (see Figure G.7). An analysis was performed using GIS software to determine where populations, values at risk, and critical facilities are located within wildfire threat zones. According to this assessment, there are no values at risk to wildfire within the city. However, there is some property at risk within the city's Sphere of Influence. (See Figure G.7 below). There are not any critical facilities in wildfire threat zones in the City of Kingsburg.

Figure G.7: City of Kingsburg's Wildfire Risk



G.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Kingsburg's updated capabilities are summarized below.

G.4.1 Regulatory Mitigation Capabilities

Table G.11 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Kingsburg.

Table G.11: City of Kingsburg's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	Comprehensive General Plan for the Swedish Village of Kingsburg, 1992
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	Water Conservation Ordinance, 2003; Kingsburg Municipal Code 13.04.070
Building code	Yes	Version: 2001. Adopt 2007 California Code in January 2008
Fire department ISO rating	Yes	Rating: 5
Erosion or sediment control program	No	
Stormwater management program	Yes	City of Kingsburg Storm Drain Master Plan, 2005
Capital improvements plan	Yes	Five-year plan; updated annually
Economic development plan	Yes	
Local emergency operations plan	Yes	Emergency Operations Plan, May 1992
Other special plans	Yes	Water Master Plan, 2007

Regulatory Tool	Yes/No	Comments
		Urban Water Management Plan (possible adoption summer 2008) North Kingsburg Specific Plan, 2005 (addendum to general plan)
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2005

Comprehensive General Plan for the Swedish Village of Kingsburg, 1992

The Kingsburg General Plan reflects the City's long-range aspirations (15-20 years) of physical form and amenity and provides guidance for developmental regulations, such as zoning and subdivision ordinances. Two of the plans goals, in particular, support hazard mitigation. These goals and their policies are included below.

Goal 8: Seismic Hazards

Goals for achieving and maintaining safety from seismic events, include preventing serious injury, loss of life, serious damage to critical facilities involving large assemblies of people, and loss of continuity in providing services.

- The City will inventory all buildings which are unsound under conditions of "moderate" seismic activity; buildings having questionable structural resistance should be considered for either rehabilitation or demolition. Structures determined by the City's building official to be structurally unsound are to be reported to the owner and recorded with the County recorder to insure that future owners are made aware of hazardous conditions and risks.
- All new building construction shall conform to the latest seismic requirements of the Uniform Building Code as a minimum standard.
- The present building height limit of 50 feet shall be maintained, with a maximum of four stories. This policy should stay in force until such time that high rise construction is desired and capability for evacuation and fire fighting in upper stories is possible through the availability of appropriate equipment.
- Facilities necessary for emergency service should be capable of withstanding a maximum credible earthquake and remain operational to provide emergency response.
- Soil compaction tests, and geotechnical analysis of soil conditions and behavior under seismic conditions shall be required of all subdivisions and of all commercial, industrial and institutional structures over 6,000 square feet in area (or in the case of institutional structures, those which hold 100 or more people).
- The City should adopt an Earthquake Disaster Plan in coordination with Fresno County and local special districts. The plan should identify hazards that may occur as the result of an earthquake of major magnitude. The plan should be sufficiently broad in scope to include the designation of evacuation routes and means to coordinate all local government agencies in assisting local residents in the event of a major earthquake, large-scale fire or explosion, or hazardous chemical spill or release of hazardous airborne gas.

- All lines which are part of the domestic water distribution system should be looped to assure adequate pressure in the event of major fire, earthquake, or explosion. Adequate emergency standby power generation capability should be available at water wells to assure water availability in the event of a major power failure.

Goal 9: Public Safety Hazards

Goals for public safety seek to reduce loss of life or property due to crime, fire, earthquake, or other disasters or hazards, provide adequate medical and emergency services to reduce the effects of natural or manmade disasters, promote citizen awareness and preparedness for emergency/disaster situations or potential for the incidence of crime, and implement adequate interagency disaster planning.

- The City will continue to maintain and update emergency service plans, including plans for managing emergency operations, the handling of hazardous materials, and the rapid cleanup of hazardous materials spills.
- The City will continue to cooperate with the County of Fresno and other agencies in pre-disaster planning activities, such as evacuation required in the event of a serious spill of hazardous chemicals.
- The City will seek to reduce the risks and potential for hazards to the public through planning and zoning practices and regulations which avoid hazardous land use relationships and by the continued and timely adoption of new-edition building and fire codes.

The general plan's Hazard Management Element incorporates the Safety Element of the Fresno County General Plan by reference "to the extent that these original elements apply to the Kingsburg Planning area."

City of Kingsburg Storm Drain Master Plan, 2005

The primary purposes of the City of Kingsburg's Storm Drain Master Plan were to assess the existing storm drain system, determine system deficiencies, recommend cost-effective improvements to correct identified deficiencies, and identify facilities and costs for planned orderly expansion of the system to provide for planned future growth within the planning area (for purposes of flood control and groundwater recharge). The 2005 plan is an update to the 1982 plan. It considers drainage system improvements and development that has occurred since the previous plan and incorporates the latest growth plans envisioned by the City.

The current drainage system collects surface runoff in pipelines that drain to a series of retention basins located through the City. The plan includes recommendations for additional retention basins or improvements to provide the required capacity.

North Kingsburg Specific Plan, 2005

The North Kingsburg Specific Plan serves as the primary instrument of the City of Kingsburg for carrying out urban development proposals of the Comprehensive General Plan for the Swedish Village of Kingsburg as they apply in North Kingsburg, where future development in the City is focused. The plan addresses stormwater drainage as an issue associated with proposed growth and states that all surface water drainage facilities will be designed in conformance with the City of Kingsburg Storm Drain Master Plan.

Water Conservation Ordinance

City of Kingsburg Municipal Code 13.04.070 addresses water conservation (water waste). It specifies when watering is allowed for irrigating lawns, shrubs and trees (i.e., days and times or restrictions).

G.4.2 Administrative/Technical Mitigation Capabilities

Table G.12 identifies the personnel responsible for activities related to mitigation and loss prevention in Kingsburg.

Table G.12: City of Kingsburg's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Planning and Development Director
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	City Engineer and Building Official
Planner/engineer/scientist with an understanding of natural hazards	No	
Personnel skilled in GIS	Yes	Planning Department
Full time building official	Yes	Building Official
Floodplain manager	Yes	
Emergency manager	Yes	Police Chief or Fire Chief
Grant writer	Yes	Contract with outside consultant
Other personnel	No	
GIS Data—Land use		
GIS Data—Links to Assessor's data		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No	
Other		

G.4.3 Fiscal Mitigation Capabilities

Table G.13 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table G.13: City of Kingsburg's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	With voter approval
Fees for water, sewer, gas, or electric services	Yes	Water
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	With voter approval
Incur debt through special tax bonds	Yes	With voter approval
Incur debt through private activities	No	
Withhold spending in hazard prone areas	n/a	
Other	n/a	

G.4.4 Mitigation Outreach and Partnerships

The City of Kingsburg has an existing water responsible program and annual fire safety programs in schools and throughout the year at special community events.

The City of Kingsburg Fire Department recently agreed to an automatic aid agreement for fire and emergency medical services with the Fresno County Fire Protection District. They also have mutual aid agreements with Kings and Tulare county fire departments.

G.4.5 Other Mitigation Efforts

The City has implemented mitigation efforts in the past. Examples that were not covered elsewhere in this section include the following:

- The City has installed auxiliary power sources on three municipal water wells.
- The City's Building Department has standards on building elevations in reference to curbs and gutters based on past practice.
- The City has designated cooling centers and secondary sites if needed during a heat emergency. City Recreation Department staff would assist in staffing these sites, and the City would provide for water and other basic needs.
- The Kingsburg Police Department and the California Department of Transportation have a plan to divert traffic from Highway 99 in the event of fog-related traffic accidents.
- Kingsburg has a fog plan that involves constant replacement of signage and street striping to maintain visibility. The school districts implement a foggy day schedule when needed.
- The City requires, on average, pad elevation of 1 ½ feet above flow line of gutter in residential development, which prevents most flood damage.

G.4.6 Opportunities for Improvement Enhancement

Based on the capabilities assessment, the City of Kingsburg has existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. The opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Drought Contingency Plan that will create a framework for drought response and mitigation.
- Update the 2005 City of Kingsburg Storm Drain Master Plan

G.5 Mitigation Strategy

The City of Kingsburg modified the goals and objectives developed by the Fresno County Hazard Mitigation Planning Committee to better fit the City's needs. The City of Kingsburg's mitigation goals and objectives are the following:

G.5.1 Mitigation Goals and Objectives

Goal 1: Provide Protection for People's Lives from All Hazards

Objective 1.1: Provide timely notification and direction to the public of imminent and potential hazards.

Objective 1.2: Protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters.

Objective 1.3: Improve community transportation corridors to allow for better evacuation routes for public and better access for emergency responders.

1.3.1: Minimize issues associated with California State Highway 99 and the Union Pacific Railroad.

Goal 2: Improve Community and Agency Awareness about Hazards and Associated Vulnerabilities That Threaten Our Communities

Objective: 2.1: Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, what is vulnerable, and recommended responses to identified hazards (i.e. both preparedness and response).

2.1.1: Create/continue an outreach program, provide educational resources, and develop and provide training.

Goal 3: Improve the Community's Capability to Mitigate Hazards and Reduce Exposure to Hazard Related Losses

Objective 3.1: Reduce damage to property from an earthquake event.

3.1.1: Adopt/maintain building codes to meet required earthquake standards.

Objective 3.2: Reduce flood and storm related losses.

3.2.1: Provide for better collection of data related to severe weather events.

3.2.2: Reduce localized flooding within the City's storm drain systems.

3.2.2.1: Implement better drainage to accommodate heavy rains that cause flooding.

Objective 3.3: Reduce hazards that adversely impact the agricultural industry.

3.3.1: Promote and protect the viability of agriculture and further the County's economic development goals.

3.3.1.1: Control invasive species.

3.3.1.2: Identify and lessen freeze impacts.

Objective 3.4: Minimize the impact to the City due to reoccurring drought conditions that impact both ground water supply and agricultural industry.

3.4.1: Develop an integrated City water management plan and groundwater management plan for the City of Kingsburg.

Objective 3.5: Minimize the impact to vulnerable populations within the community that may be affected by severe weather-related events, such as long duration heat waves and hard freezes.

3.5.1: Develop community response plans, such as cooling centers, during heat waves.

3.5.2: Develop community response plans during hard freezes that damage plumbing and cause flooding.

Goal 4: Provide Protection for Critical Facilities, Utilities, and Services from Hazard Impacts

Goal 5: Maintain Coordination of Disaster Planning

Objective 5.1: Coordinate with changing DHS/FEMA needs.

5.1.1: National Incident Management System (NIMS)

5.1.2: Disaster Mitigation Act (DMA) planning

5.1.3: Emergency Operations plans

Objective 5.2: Coordinate with community plans.

5.2.1: General plans

5.2.2: Drought plans

5.2.3: Drainage plans

5.2.4: Intergovernmental agency disaster planning.

Objective 5.3: Maximize the use of shared resources between jurisdictions and special districts for mitigation/communication.

5.3.1: Develop Mutual/Automatic Aid agreements with adjacent jurisdictions and agencies.

Objective 5.4: Standardize systems among agencies to provide for better interoperability.

5.4.1: Standardize communication technology and language.

Goal 6: Maintain/Provide for FEMA Eligibility and Work to Position City Departments and Community Partners for Grant Funding

Objective 6.1: Provide City departments and other agencies with information regarding mitigation opportunities.

Objective 6.2: As part of plan implementation, review projects in this plan on an annual basis to be considered for annual FEMA PDM-C grant allocations or after a presidential disaster declaration in California for HMGP funding as well as for other local, state, and federal funding opportunities.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Economic Development Coordinator may utilize the hazard information when developing business incentives and the Public Works Department may utilize the information when implementing new infrastructure projects. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Kingsburg will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1983. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

G.5.2 Completed 2009 Mitigation Actions

The City of Kingsburg completed two mitigations actions identified in the 2009 plan. These completed actions are as follows:

- Conduct Disaster Response Training
- Replace Storm Drains on Lewis and Washington Streets

These completed actions have reduced vulnerability to hazards and increased local capability through improved hazard event preparation.

G.5.3 Mitigation Actions

The planning team for the City of Kingsburg identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

In addition to implementing the mitigation actions below the City of Kingsburg will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate the information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Enhance Traffic Diversion System

Install permanent illuminating message and directional signs, improve street stripping, and possibly widen the detour route, Simpson Street through the City of Kingsburg.

Hazard(s) Addressed: Multi-Hazard: severe weather

Issue/Background: California State Highway 99 runs through the center of Kingsburg. Historically, when major issues (i.e., major motor vehicle accidents) shut the highway down, traffic is detoured through the City of Kingsburg. The street that traffic is normally diverted onto is Simpson Street (Golden State Boulevard) from Mendocino Avenue at the south to either Bethel or Mt. View avenues on the north. Simpson Street is one of two main north/south arteries that run through Kingsburg.

Several times a year, a significant event occurs on Highway 99, and traffic is diverted onto Simpson Street, especially during the fog season. This diversion typically causes problems for the normal City traffic flow as well as the diverted traffic off of the highway. The City has taken measures to minimize the impact on local traffic by placing traffic signal lights at the two main east/west street arteries, Sierra and Draper streets. Assistance is needed to ensure the diverted traffic has a clear and adequate detour through the City with minimal impact on the community and its public safety entities. With the current road conditions and signage on Simpson Street, detoured traffic often gets off course and confused. There are then thousands of Highway 99 vehicles driving around the City, which causes problems for both the routine traffic patterns and

public safety. Local police must then deal with trying to keep diverted traffic on course and the problems associated with an influx of heavy traffic onto side streets that are not designed for the increased traffic load (i.e., additional motor vehicle accidents). Fire and ambulance services are also affected by slower responses due to the influx of traffic.

Other Alternatives: The City could divert highway traffic through County side streets to minimize the impact on the heavier population of Kingsburg. There are no County streets that are clearly marked or as easily accessible as Simpson Street.

Responsible Office: City of Kingsburg Public Works

Priority (High, Medium, Low): High

Cost Estimate: \$154,780 (stripping cost: \$40,000; four new electronic LED outdoor message signs: \$114,780)

Potential Funding: California Office of Traffic Safety grants; other available grants

Benefits (Avoided Losses): This would greatly reduce the impact to major state corridor Highway 99, motor vehicle accidents, injuries, City of Kingsburg public safety, and traffic flows.

Schedule: Fall 2018

Status: 2009 project, implementation not yet started

2. Create Emergency Evacuation Plan for Large Scale Incident

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, earthquake

Issue/Background: Summer 2017 there was significant flooding around the Kings River area East of Kingsburg. Tulare County and Kingsburg City could have been better prepared to handle the evacuation. Kingsburg would benefit from a plan to evacuate during large scale incidents. Evacuation planning should include the evacuation of the City of Kingsburg as well as receiving evacuees into the City.

Other Alternatives: No action

Responsible Office: Kingsburg Fire Department

Priority (High, Medium, Low): High

Cost Estimate: \$10,000

Potential funding: FEMA Grant

Benefits (Avoided Losses): Having a plan in place will reduce the potential loss of life and property.

Schedule: Plan in place by 2020

Status: New project

3. Identify High Risk and High Value Target Areas*

Hazard(s) Addressed: Multi-Hazard: Human-caused

Issue/Background: Due to the rise in mass shooting incidents, and ongoing terror threats both foreign and domestic, preplanning would be helpful in identifying target areas. Once identified, steps can be taken to minimize losses.

Other Alternatives: No action

Responsible Office: Kingsburg Fire Department

Priority (High, Medium, Low): High

Cost Estimate: \$15,000

Potential funding: Homeland Security Grant

Benefits (Avoided Losses): Once target areas are identified, threat assessments can be done for each site. Preplans can then be updated to reduce loss of life and property. Updates can be added to the city's Emergency Operation Plan.

Schedule: Plan updated by 2020

Status: New project

4. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Kingsburg and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Kingsburg has become a joint power authority of the South Kings

Groundwater Sustainability Agency, other members of the Agency include the City of Fowler, City of Parlier and City of Sanger. As a member of the South Kings GSA, the City of Kingsburg is required to participate in the development and implementation, no later than January 31, 2020, of a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the South Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Kingsburg.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: Public Works and South Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

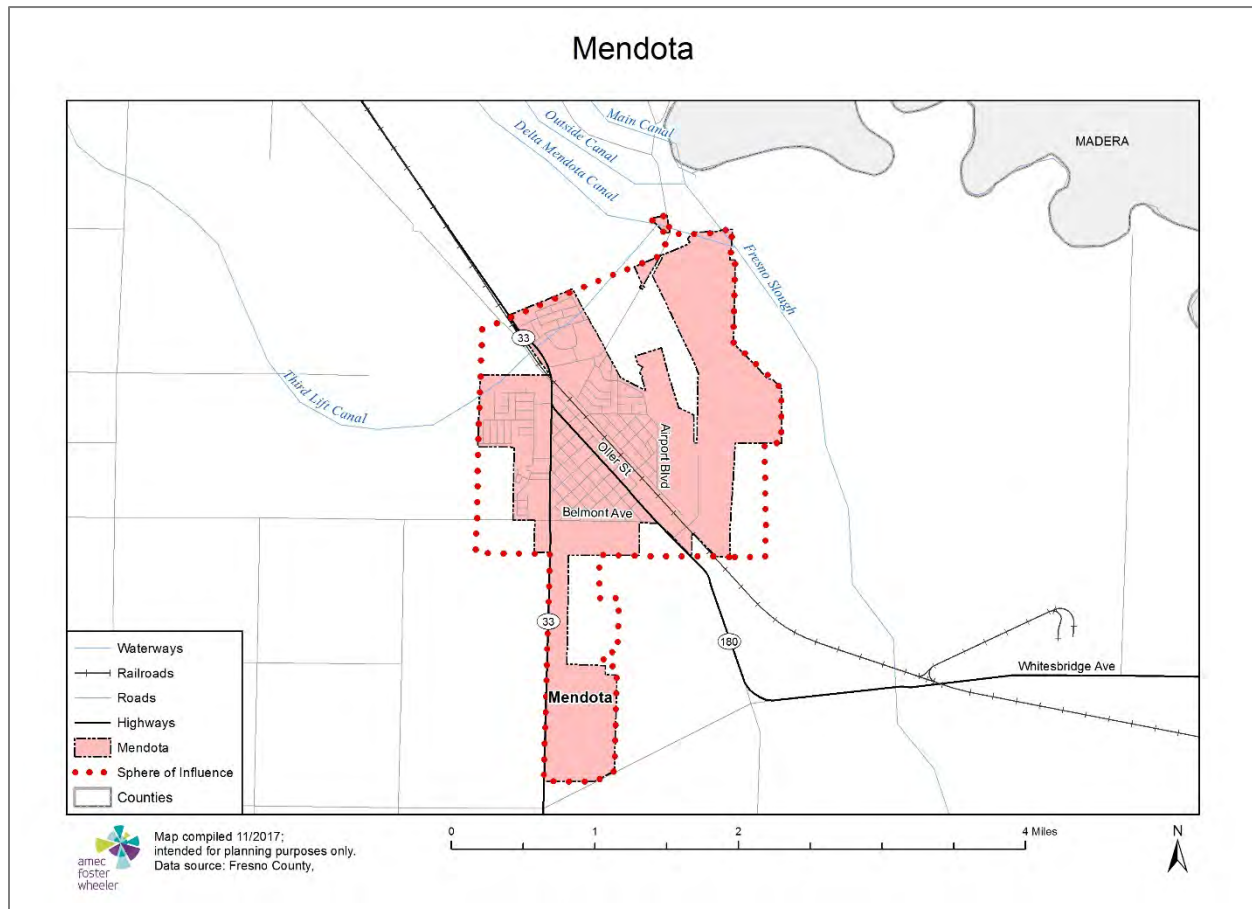


ANNEX H: CITY OF MENDOTA

H.1 Community Profile

Figure H.1 displays a map and the location within Fresno County of the City of Mendota and its Sphere of Influence.

Figure H.1: The City of Mendota



H.1.1 Geography and Climate

The City of Mendota sits in the central part of the San Joaquin Valley. The City is approximately 40.6 miles west of the City of Fresno, where California State Highway 180 and Highway 33 meet. While surrounded by thousands of acres of agricultural lands, the City of Mendota does have some neighbors. The City of Firebaugh lies eight miles to the north, and Kerman and San Joaquin are also nearby to the east and southeast, respectively.

The City of Mendota and its Sphere of Influence cover a 2,902-acre area. The City boundary and the Sphere of Influence have expanded significantly over the past decade, with most growth occurring in the north of the City as well as some annexations in the west.

The City of Mendota has a relatively flat terrain profile. Approximately 25-30 miles to the west is the Coast Range. In all other directions, the terrain is flat agricultural lands. Just north of the City is the conflux of the Delta-Mendota Canal (DMC), the Helm Canal, the San Joaquin River, and the Fresno Slough. These collect into the Mendota Pool, which discharges into the San Joaquin River and then on to the San Francisco Bay Delta. To the east is the 12,000-acre Mendota Wildlife Refuge for Pintail and Snow Geese species.

Mendota has high temperatures that range from 40-50°F in the winter and 100-110°F in the summer. The average rainfall is 11.94 inches per year.

H.1.2 History

In 1891, the Southern Pacific Railroad established a storage and switching facility at the site of present-day Mendota, allegedly to avoid the unruly town of Firebaugh. This service point was unusually large and well-equipped and included a roundhouse and repair facilities. In 1868, under governmental pressure, the Mendota Pool was built to facilitate ship passage on the river, but regulations were eventually changed, and the turntable gate was never used.

By 1900, a good-sized business district had grown around the train station. Development slowed abruptly in 1910 when the railroad discontinued use of the roundhouse. To make matters worse, the largest landowner sold off his holdings at about the same time, ending his support of the local economy.

For a time, a diatomite mine operated in the area. That industry, together with the increasing number of farm workers who resided in the town, brought pressure for municipal services, and Mendota incorporated in 1942.

In the 1950s, the State of California established the Mendota Wildlife Refuge, where, at the time, deer, elk, and migratory birds from Siberian breeding grounds would spend the winter. Although today the deer and elk are gone, the birds still migrate to the refuge for the winter. In 1964, the County established Mendota Pool Park at the site of the turntable gate, which includes an 85-acre park with launch ramp, playgrounds, and picnic areas.

H.1.3 Economy

The most up-to-date economic data available for the City of Mendota comes from the U.S. Census Bureau by way of the American Community Survey (ACS). Select estimates of economic characteristics for the City of Mendota are shown in Table H.1.

Table H.1: City of Mendota's Economic Characteristics, 2015

Characteristic	City of Mendota
Families below Poverty Level	40.9%
All People below Poverty Level	46.5%
Median Family Income	\$25,846
Median Household Income	\$25,862
Per Capita Income	\$8,949
Population in Labor Force	5,252
Population Employed*	3,859
Unemployment	26.5%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Table H.2 and Table H.3 show how the City of Mendota's labor force breaks down by occupation and industry based on 5-year estimates from the 2015 American Community Survey.

Table H.2: City of Mendota's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Natural Resources, Construction, and Maintenance Occupations	2,248	58.3
Production, Transportation, and Material Moving Occupations	769	19.9
Sales and Office Occupations	320	8.3
Management, Business, Science and Arts Occupations	282	7.3
Service Occupations	240	6.2
Total	3,859	100.00

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table H.3: City of Mendota's Employment by Industry, 2015

Industry	# Employed	% Employed
Agriculture, Forestry, Fishing and Hunting, and Mining	2,377	61.6
Educational Services, and Health Care, and Social Assistance	350	9.1
Retail Trade	252	6.5
Wholesale Trade	229	5.9
Manufacturing	188	4.9
Transportation and Warehousing, and Utilities	152	3.9
Public Administration	88	2.3
Construction	82	2.1
Other Services, Except Public Administration	55	1.4
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	53	1.4
Information	17	0.4
Professional, Scientific, and Management, and Administrative and Waste Management Services	16	0.4
Finance and Insurance, and Real Estate and Rental and Leasing	0	0
Total	3,859	100.00

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

The City of Mendota's economy has been largely based on agriculture. Approximately 61 percent of the City's labor force have jobs in agriculture. Despite efforts to diversify the economy, the agriculture industry has grown in dominance as the primary employer in the City over the past 15 years. As a result, the City is particularly vulnerable to any hazards that could affect agricultural production, including agricultural hazards, drought, flood, and severe weather.

Currently, the City of Mendota is suffering from a 26.5 percent unemployment rate. Though Mendota's unemployment rate has dropped over the past decade, it is still roughly twice the unemployment rate of the County as a whole.

H.1.4 Population

According to the California Department of Finance, the Mendota's population was estimated to be 11,828 at the beginning of 2017. Select demographic and social characteristics from the U.S. Census Bureau's 2015 American Community Survey 5-year estimates are shown in Table H.4.

Table H.4: City of Mendota's Demographic and Social Characteristics, 2015*

Characteristic	City of Mendota
Gender/Age	
Male	51.0%
Female	49.0%
Median age	28.0
Under 5 years	10.8%
Under 18 years	33.6%
65 years and over	6.0%
Race/Ethnicity**	
White	84.7%
Asian	0.6%
Black or African American	0.7%
American Indian/Alaska Native	0.1%
Hispanic or Latino (of any race)	98.0%
Education	
High school graduate or higher	30.5%
Disability Status	
Population 5 years and over	6.8%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Based on a 2015 estimated population of 11,402

**Of the 97.6% reporting one race

H.2 Hazard Identification and Summary

Mendota's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Mendota (see Table H.5). In the context of the plan's planning area, there are no hazards that are unique to Mendota.

Table H.5: City of Mendota—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Critical	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Likely	No Data	Medium
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Occasional	Critical	Medium
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

H.3 Vulnerability Assessment

The intent of this section is to assess Mendota's vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Mendota's HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Mendota.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table H.5). Identifying these differences helps the reader to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County.

Note: The hazard "Significance" reflects the overall ranking for each hazard, and is based on the City of Mendota's HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table H.5 reflect the hazards that could potentially affect the City. Those of Medium and High significance for the City of Mendota are identified below. The discussion of vulnerability related information for each of the following hazards is located in Section H.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include drought and flood/levee failure.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incidents
- human health hazards: epidemic/pandemic
- severe weather: extreme heat; windstorm
- soil hazards: expansive soils

- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Mendota, those hazards are as follows:

- human health hazards: West Nile Virus
- landslide
- severe weather: extreme cold/freeze; fog; heavy rain/thunderstorm/hail/lightning; tornado
- soil hazards: erosion, land subsidence
- volcano
- winter storm

Note: For the following three hazards, the risk and vulnerability factors in the City of Mendota are not unique from the planning area at large. Please refer to the main plan, Section 4, for more information on these hazards.

- Human Health Hazards: Epidemic/Pandemic
- Severe Weather: Fog
- Severe Weather: Windstorm

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. Avalanche is considered Not Applicable (N/A) to the City of Mendota.

H.3.1 Assets at Risk

This section discusses Mendota's assets at risk, including values at risk, critical facilities and infrastructure, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster it is generally the value of the infrastructure or improvements to the land that is of concern

or at risk. Generally, the land itself is not a loss. Table H.6 shows the 2017 values at risk broken down by property type for the City of Mendota.

Table H.6: 2017 Property Exposure for the City of Mendota by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	0	\$187,067	\$187,067	\$374,134
Commercial	108	174	\$22,095,970	\$22,095,970	\$44,191,940
Exempt	11	107	\$0	\$0	\$0
Industrial	23	21	\$8,475,093	\$12,712,640	\$21,187,733
Multi-Residential	94	278	\$40,730,574	\$20,365,287	\$61,095,861
Open Space	4	0	\$192,839	\$192,839	\$385,678
Residential	1,523	1,820	\$115,268,169	\$57,634,085	\$172,902,254
Total	1,764	2,400	\$186,949,712	\$113,187,887	\$300,137,599

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Mendota from Fresno County GIS is provided in Table H.7 and illustrated in Figure H.2. The City noted that there is also a police station (near airport) and an American Ambulance station (on 6th, north of Quince).

Table H.7: City of Mendota's Critical Facilities

Critical Facilities Type	Number
Airport	1
CalARP	1
Fire Station	1
School	7
Total	10

Source: Fresno County, HIFLD 2017

Figure H.2: City of Mendota's Critical Facilities

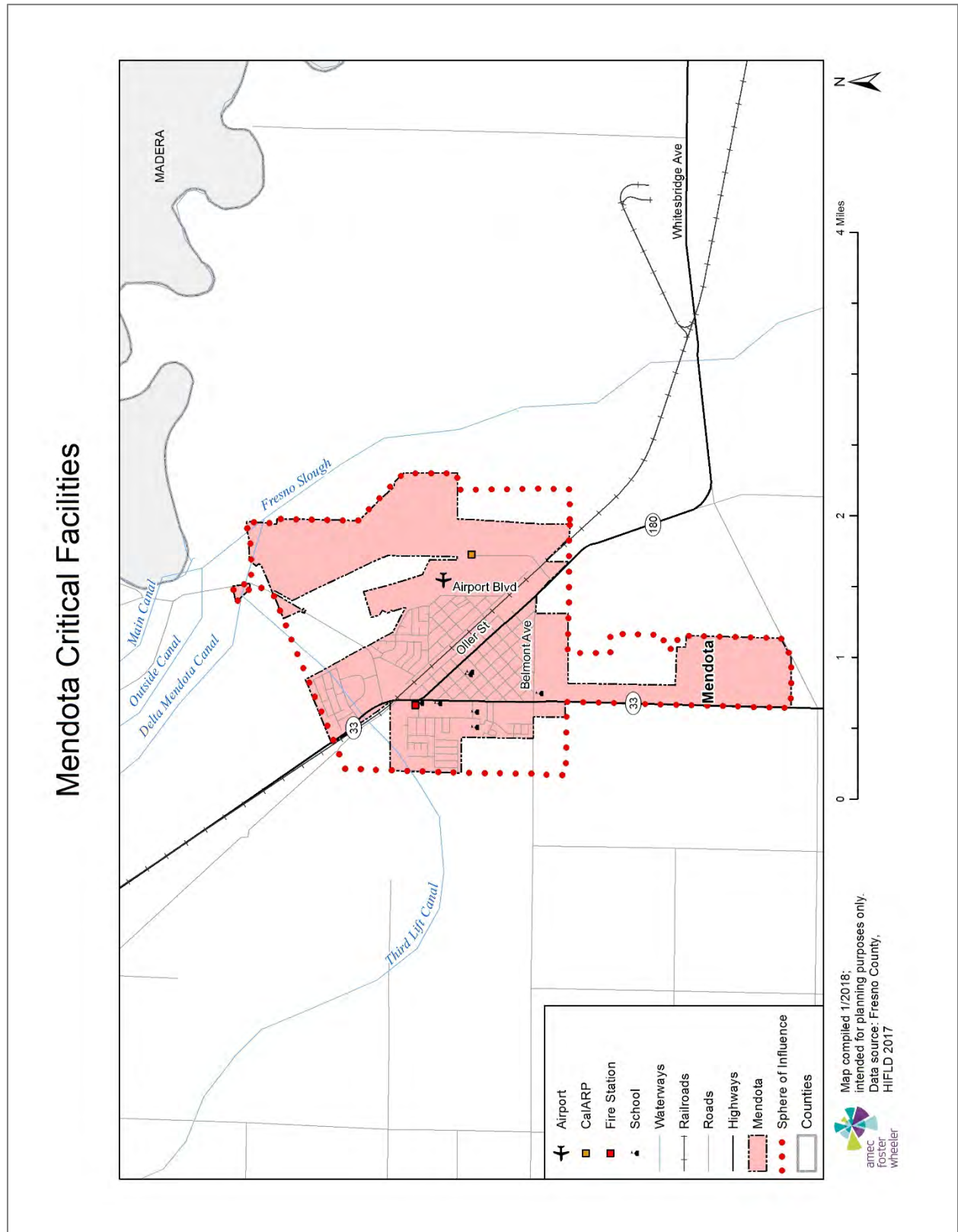


Table H.8 lists particular critical facilities and other community assets identified by Mendota’s planning team as important to protect in the event of a disaster. It should be noted that information from the Fresno County GIS does not match this information provided by the City.

Table H.8: Specific Critical Facilities and Other Community Assets Identified by City of Mendota Planning Team

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info.
Water Treatment Plant	\$8 million	4.5 MGD	Earthquake, manmade
Wastewater Treatment Plant	\$5 million	1.24 MGD	Earthquake, flood, manmade
Sewer and Water System pipes	\$30 million		Earthquake
Mendota Municipal Airport	\$3-5 million		Earthquake, flood, manmade (accidents)
Natural Gas line at Water Treatment Plant	\$50,000		Earthquake, fire
Mendota Wildlife Refuge	N/A		Flood, wildfire, manmade

Growth and Development Trends

Current growth trends are on three borders of the City. A new federal prison and Fresno County Library are to the south of the City in an area that has been annexed into the City limits, and new housing tracts are being built to the west and the north of the City.

Some of the growth has come in the form of infill commercial development as well. The only large and critical infrastructure development being planned for the City is an expansion of the wastewater treatment plant. New housing construction is going in as mid-range homes with on-site construction. Only 2 percent of the buildings constructed in the last year have been pre-manufactured, all belonging to the City.

Table H.9 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2017.

Table H.9: City of Mendota’s Change in Population and Housing Units, 2010-2017

2010 Population	2017 Population Estimate	Estimated Percent Change 2010-2017	2010 # of Housing Units	2017 Estimated # of Housing Units	Estimated Percent Change 2010-2017
11,014	11,828	+7.39	2,556	2,669	+4.42

Source: California Department of Finance, www.dof.ca.gov/Research/

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

H.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table H.6 above shows Mendota's total exposure to hazards in terms of population and the number and values of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures:

Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Agricultural Hazards

Agricultural losses have cascading effects on the City of Mendota. The loss of crops from any hazard event results in loss productivity for farm owners, loss of jobs for farm workers, and loss of expendable income for use in stores. It also limits the City's revenue. In a small city like Mendota, there is even more interdependency than in larger cities, and what affects one sector affects them all. Local crops include cantaloupe, broccoli, lettuce, and alfalfa.

Dam Failure

Mendota is in the mapped inundation areas for the Friant and Pine Flat dams. Containing 1 million acre-feet and 555,500 acre-feet respectively, these are the largest and second largest dams in the County.

Drought

Mendota's water supply comes from groundwater. Extended droughts can cause decline in the local groundwater table, which can have impacts on the ability of current wells and pumps to extract necessary quantities of groundwater for use in the City.

Earthquake

Mendota is located in Seismic Zone 3 but near the boundary of the more hazardous Seismic Zone 4, which covers the foothills to the west. The Ortigalita fault is located approximately 30 miles northwest of Mendota. It is considered active and is designated an Earthquake Hazard Zone under the Alquist-Priolo Earthquake Fault Zoning Act of 1994.

Mendota's planning team identified several important buildings that are vulnerable to seismic events and may be constructed of unreinforced masonry, which are particularly susceptible to earthquake shaking. These included the following:

- Water Treatment Plant
- Wastewater Treatment Plant
- Community Recreation and Public Works departments
- Old Mendota Library

The total number of unreinforced masonry buildings in the City is unknown. There are no hospitals built before 1973.

Flood/Levee Failure

According to the 2016 Flood Insurance Study, there are three basic areas of flooding in Mendota: along Belmont Avenue, the Hacienda Gardens area, and a ponded area west of Highway 33 and the railroad. There are no defined channels within the City limits of Mendota. Thus, the principal type of flooding in the City of Mendota area is sheetflow—broad, shallow, overland flooding, which is generally less than three feet deep and characterized by unpredictable flow paths. In addition, the City suffers flooding in certain residential areas, primarily along Naples Street from Second to Tenth Streets, where runoff from the westerly portion of the City itself is impeded by the elevated railroad and collects into puddles which can be as much as four feet deep. These are relieved only by the City's temporary pumps, and water can persist for 48 to 72 hours after the end of a rain event.

The main source of flooding in Mendota is heavy rains in the Coastal Range west of the City, which run off into Panoche Creek. The City of Mendota lies at an approximate elevation of 175 feet. Terrain in the study area slopes gently from the southwest to the northeast. The drainage basin of Panoche Creek originates in the Diablo Range approximately 30 miles west of the City of Mendota. The creek flows through steep mountain canyons in well-defined channels to the California Aqueduct (around the foothill line). From there to Mendota, the land is relatively flat, and the channel steadily decreases in size and carrying capacity due to siltation and vegetable growth, until it ends at Belmont Avenue. During high creek flows, stormwater floods vast tracks of agricultural land and drains into Belmont Avenue.

Landowners along Belmont Avenue sometimes construct levees parallel to the road, which act as canal banks and channel flow along Belmont Avenue to Highway 33. There, water can continue easterly on Belmont, but can also flow north along Highway 33 to Seventh Street. At that point, it flows northeast through the downtown area and adds to the flooding along Naples Street mentioned above. In 1972, the City won a Superior Court injunction against the landowners which requires them to not build levees but to allow the Panoche Creek water onto their lands in preference to flooding the City. This injunction has been irregularly enforced over the years, though in the past five years the provisions have been vigorously enforced by the City, with a corresponding decrease in the number of Belmont Avenue flood events.

The planning team for Mendota agreed that, on average, flooding occurs on Belmont Avenue twice per year but is relatively minor. Drains along Belmont Avenue become clogged with sedimentation

from flood events. The City pays to remove this build-up annually. Nevertheless, a significant flood occurs every two to three years.

Urban runoff from just under 1,000 acres within the City of Mendota in general is surface flows across city streets in an east-northeasterly direction. The City of Mendota, as with much of the San Joaquin Valley, is relatively flat. Gutters have imperceptibly shallow slopes. Precise topographic surveys of various locations in the city show lengths of gutter with zero slope, others with more commonly shallow slopes of around 0.2% (0.002 feet of fall per foot.) The ground elevations fall towards the Fresno Slough and San Joaquin River to the northeast of the City, but there is currently no discharge of storm water runoff to these bodies of water. There are four storm water basins in newer developments around the perimeter of the city and those areas are not prone to flooding. The older downtown “triangle” – bounded by Derrick Ave (State Route 33) on the west, the Union Pacific Railroad to the northeast, and Belmont Avenue on the south – has very limited storm drain infrastructure.

The infrastructure within the downtown triangle is limited to surface flow conveyances such as curbs and gutters. Runoff passes through street intersections via concrete valley gutters or “bubble-ups,” which are short systems comprised of an inlet, a short length of buried pipe, and an outlet. In these systems, storm water enters the inlet from a gutter on one side of the street, fills the pipe and outlet structure until the water reaches a depth sufficient to flow out of the outlet structure and down the next gutter. Several feet of water is often left standing for months in these systems as the structures of these old systems have solid walls and the heavy clay native soil does not allow percolation.

Because of the high clay content, the City experiences only minimal percolation of standing water within basins, canals and other drainage structures. Removal of collected storm water runoff is by evaporation only. Groundwater levels under the city are 20- to 25-feet below ground surface.

The railroad that trends northwest to southeast through the City is above grade and creates a major impediment to the flow of storm water runoff across the City. Naples Street which parallels the railroad on the southerly side sees extreme flooding centered around its intersections with 2nd Street and 9th Street. Flooding overtops curbs and flood waters have lapped up against the door thresholds of adjacent residential homes. During these events, the street is impassable and there is a threat to public safety due to pedestrian and vehicular mobility risks.

There is a pump station at the intersection of 2nd and Naples that moves water from that intersection under the railroad tracks to a curb outlet structure at the 2nd and Marie Street intersection. The pumps are equipped with variable speed controllers, and when run at full speed their output can exceed the capacity of the 2nd Street gutter flow, but even that is not sufficient to dewater the Naples and 2nd Street intersection during even a moderate storm event. In an effort to mitigate this situation, the City constructed a small basin that, by the use of a diversion valve on the forcemain, can accept some of the water pumped from 2nd & Naples when, during big rain events, they need

to run the pumps at maximum speed. During less-intense rains, when a slower pump operating speed is adequate, they bypass this basin and direct all water down the 2nd Street gutter.

The intersection of Naples and 9th Street is a local low spot. There is no pump station there, which means storm water begins to collect in every storm regardless of the intensity. This problem is exacerbated because when 2nd and Naples floods, water breaks over at 4th Street, and flows southeast along both sides of Naples, eventually reaching and adding to the flooding at 9th Street. At that intersection, there is a system of curb inlets and buried pipe which runs through a private property to the south to discharge into an open channel which runs through a second private property and then discharges on a third private property outside the southeast city limits. This pipe system does not have the capacity to handle even moderate-intensity rain events. When water floods the 9th Street intersection, the only relief currently available is by temporary pump either at the inlet at 9th Street or at the inlet at 10th Street. From 9th Street, water must be pumped over the adjacent railroad tracks to a curb and gutter, when then flows to the storm water retention pond at the Mendota Airport. From 10th Street, water can be pumped onto the private property mentioned above, where it eventually flows to the open channel.

A major storm water management concern is the occasional flood of silty water that comes down Belmont Avenue when a storm in the Coast Range mountains causes Panoche Creek to flood. Flood waters spill over the creek banks 6.75 miles west of the City and flow eastward on Belmont Avenue. A court injunction dating to the 1970s has mandated that the farmers with land adjacent to Belmont must keep their earthen berms below the crown grade of Belmont Avenue, but this is often ignored. The result is causing silt-laden floodwaters to reach the City at the southwest corner of town. During especially high flows, the flood water over tops the intersection of Derrick Ave (State Route 33) and heads northeasterly along Derrick Avenue, across 7th Street, and then easterly through the heart of downtown. This water can easily cross Oller Street, compounding the flooding at 9th Street and Naples. There is a large (48"-72") diameter storm drain in Belmont Avenue, running east from the west end of Derrick Avenue. This pipe largely provides detention of runoff as it discharges into an open channel at the southeast corner of town on the same private property mentioned above. The invert at the end of the pipe is lower than the flowline of the receiving open channel; therefore, water ponds up in the pipe (similar to the bubble-up systems) before it reaches the flowline elevation of the open channel. This causes both standing water in the pipe and a large build-up of sediment and debris from the Panoche Creek flood waters within the pipe. This is a burden to maintain.

Flows from the two open channels at the southeast corner of town historically continued in an open channel about a mile southeast of town where it discharged into the Fresno Slough. Earthmoving operations on the agricultural land (orchard trees) blocked this discharge many years ago.

In 2010, the City entered into an agreement with the San Luis & Delta Mendota Water Authority (SLDMWA) to drop water from this open channel into the San Luis Drain (SLD) via a gate valve where the channel crosses the SLD near Belmont Ave, east of State Route 180. This agreement was a good will gesture by the SLDMWA. The agreement has no specific term, and maybe

cancelled at any time. The City is currently allowed to store water in a 2-mile stretch of the SLD between the Belmont ditch and Bass Avenue to the north until the stored water reaches a depth of 8-feet. This threshold has been met before. When that happens, city staff must bring a temporary pump to relieve the SLD by pumping water into a future wastewater disposal pond at the City's Wastewater Treatment Plant. Without the SLD, the City would not have any means to sufficiently manage their storm water, but this arrangement won't work at such time as the City begins utilizing more of the ponds at the Wastewater Treatment Plant to deal dispose of additional treated effluent from the growing city.

The current system of storm water management does not include a discharge to the Fresno Slough, Mendota Pool, San Joaquin River or other regulated body of water. It relies on the SLD and vacant waste water treatment ponds; neither of which are sustainable.

The planning team identified areas of localized stormwater flood problems. The drainage system for storm- and wastewater is an intricate system that spans across the entire City. There are only three pumps in the system, one that pumps the water from one gutter under the McCabe Elementary school grounds to the gutters on the other side, one to minimize the constant flooding across Highway 33 in town, and one to move water past the railroad tracks. The City often utilizes an additional temporary pump to minimize the flooding along the west side of the railroad tracks. The rest of the system relies on gravity and was not designed to convey typical stormwater flows. There are several points along the system that will pool water, as the slope is so minimal that the water does not move through the system quickly enough.

The Chowchilla Canal Bypass, constructed by the State of California, reduces flood potential in the Mendota-Firebaugh area. The bypass starts approximately five miles east (upstream) of the City of Mendota and can carry approximately 9,000 cfs of San Joaquin River floodwater around the two communities to return it to the river at a point where channel capacity is great enough to carry the flow.

Previous flood events that impacted the City include the following:

- **October 1, 1976**—This flood damaged 15 homes and 12 businesses for an estimated \$44,430 loss. Rains in the hills west of Mendota contributed to runoff in the Panoche-Silver Creek and water flooded into City limits. The flooding occurred along Belmont Avenue. Agricultural and infrastructure damage is unknown. According to a report from the American Red Cross, the organizations provided “canteen service” to about 300 people on the levee and sheltered 75 people at their church shelter.
- **1991**—Rains in the hills west of town caused massive flooding along Belmont Avenue and cut the high school off from the rest of the City. The flooding also limited the ability for Highway 180 traffic to pass through, which decreased potential business traffic in the City. Additional costs to the City were associated with temporary dams constructed by the Public Works Department.

- **1995**—Floodwaters, caused by Panoche Creek runoff channeled along Belmont Avenue, filled streets and caused widespread damage.
- **July 2016** – A summer rain event that occurred in the Coastal Range overflowed Panoche Creek and flooded Belmont Avenue and downtown Mendota. This occurred with no rain falling in the vicinity of Mendota. Estimated cost of damages and clean-up was documented at \$25,000.

According to FEMA’s 2005 Flood Insurance Study, damaging floods also occurred in the area in April 1958 and January-February 1969. Details on these events follow:

- **April 1958**—In this flood, a discharge of 5,090 cfs was recorded on Panoche Creek. Flooding began approximately 10 miles west of the City of Mendota and spread in a fan shape to the northeast for 5 to 10 miles. Approximately 9,700 acres of agricultural land (mostly west of the City of Mendota) and some residential property in the southwest part of the City were flooded. Damage was estimated at \$460,000. Up to five feet of floodwater remained in some areas for as many as 30 days. Crops were destroyed, or production was severely reduced, extensive cleanup and restoration of agricultural land and improvements were required, streets and homes were damaged, and traffic was disrupted. Extensive flood fighting prevented flood damage that otherwise would have occurred.
- **January-February 1969**—The largest known discharge on Panoche Creek (5,400 cfs) was recorded in February 1969, which was during the largest rainfall season on record. Flooding began approximately 10 miles west of the City of Mendota and spread in a fan shape to the northeast for 5 to 10 miles. Approximately 18,400 acres, predominantly agricultural, were flooded. Damage approximated \$1.8 million. Large quantities of silt and debris were deposited on fields and orchards, and oil and gas pipelines were undermined. Residential damage in Mendota was minor due to flood fighting efforts.
- **February 1998**—Runoff from heavy rains in the hills west of Mendota caused a major flood. The drainage system, which was designed to handle 300 cfs, received 7,000 cfs, causing three feet of water to flood and close Belmont Avenue. This event cut off the high school from the rest of City and severely limited the ability for traffic on Highway 180 to pass through. This event also caused business losses due to inability for most vehicles to access the City commercial area. The only recorded costs for the flood are from the Public Works Department: approximately \$32,500 in labor and equipment was spent to fight and clean up the flood.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Mendota was created (see Figure H.3). Table H.10 and Table H.11 summarize the values at risk in the City’s 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Table H.10: City of Mendota's FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	1	1	\$123,574	\$123,574	\$247,148	\$61,787
Multi-Residential	2	1	\$5,835,053	\$2,917,527	\$8,752,580	\$2,188,145
Open Space	1	0	\$156,044	\$156,044	\$312,088	\$78,022
Residential	50	44	\$4,120,393	\$2,060,197	\$6,180,590	\$1,545,147
Total	54	46	\$10,235,064	\$5,257,341	\$15,492,405	\$3,873,101

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table H.11: City of Mendota's FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	1	7	\$311,190	\$311,190	\$622,380	\$155,595
Residential	12	17	\$1,393,231	\$1,393,231	\$2,786,462	\$696,616
Total	13	24	\$1,704,421	\$1,704,421	\$3,408,842	\$852,211

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Mendota has assets at risk to the 100-year and greater floods. There are 54 improved parcels within the 100-year floodplain for a total value of roughly \$15.5 million. There are 13 additional improved parcels valued at \$3.4 million within the 500-year floodplain.

Applying the 20 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly \$3.9 million in damage in the City of Mendota. There is a 0.2 percent chance of a 500-year flood causing roughly \$4.7 million in damage (combined damage from both floods). Properties at risk to flooding are shown in Figure H.4.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Figure H.3: City of Mendota's 100- and 500-Year Floodplains

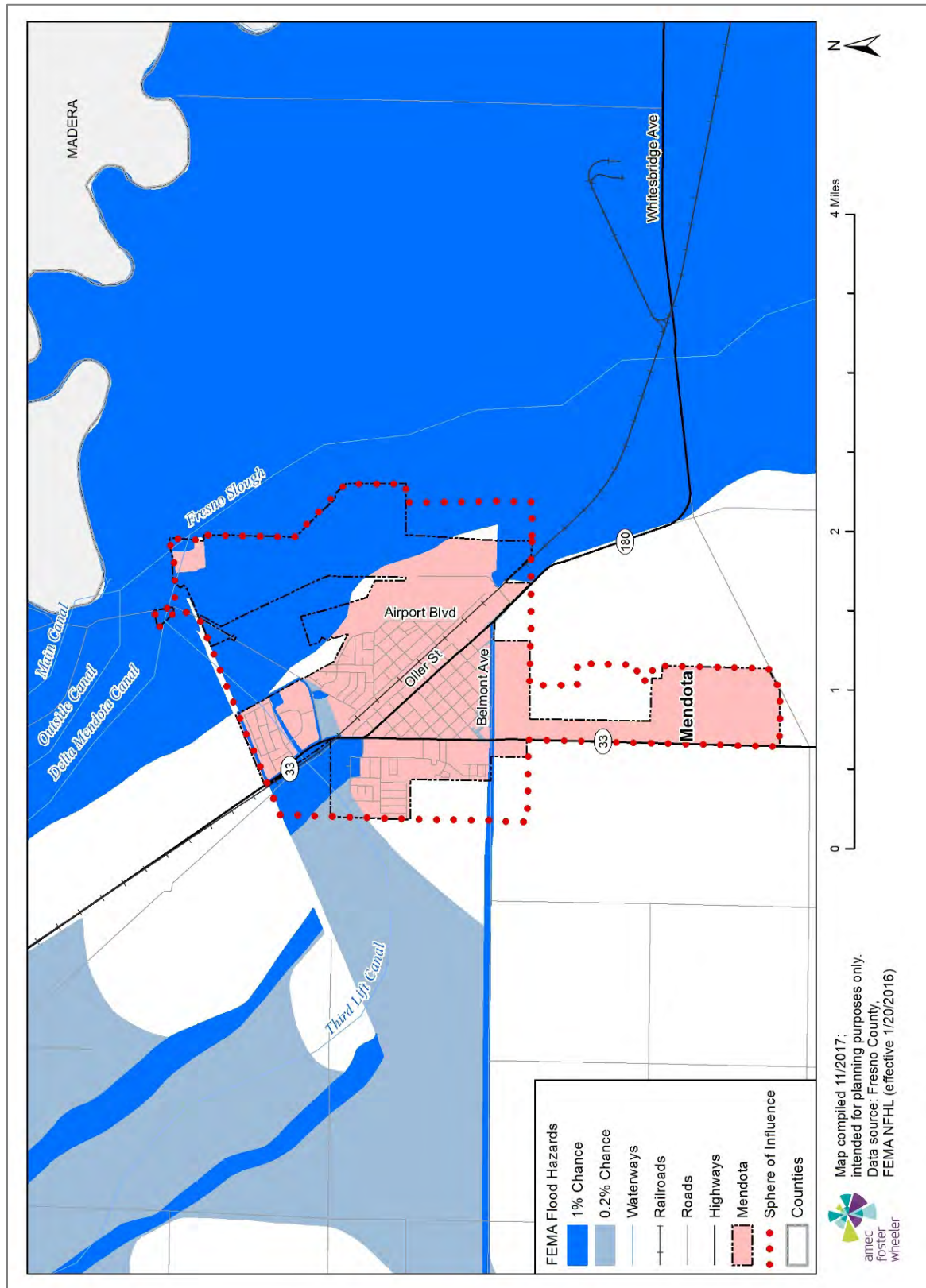
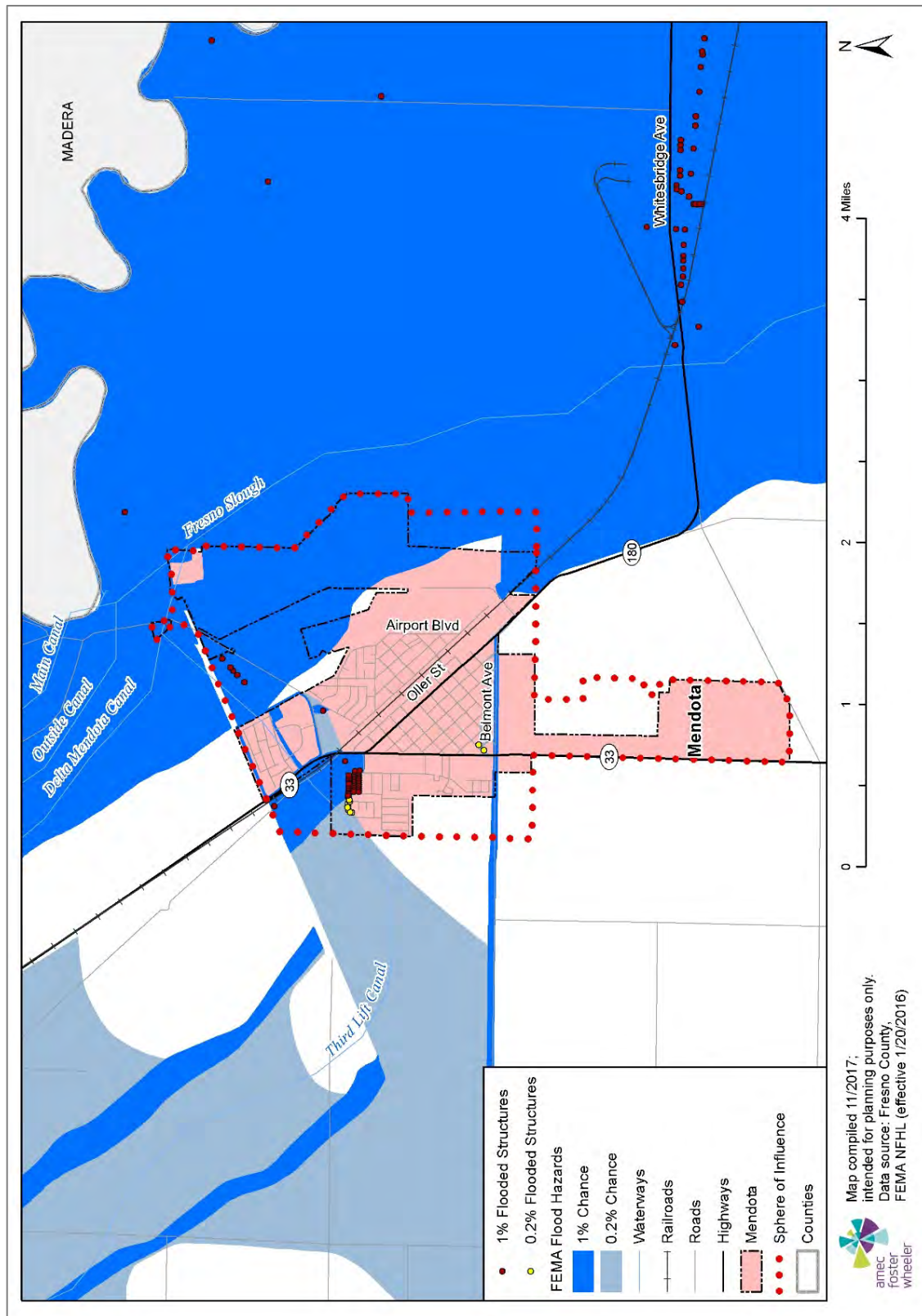


Figure H.4: Properties at Risk in the City of Mendota's 100- and 500-Year Floodplains



Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Mendota joined the National Flood Insurance Program (NFIP) on September 1, 1981. NFIP insurance data indicates that as of June 6, 2017, there were 17 flood insurance policies in force in the City with \$4,630,900 of coverage. All 17 policies were for residential structures, 12 of them single-family homes. There were 9 policies in force in A and AH zones, and the remaining 8 were in B, C, and X zones.

There have been three historical claims for flood losses totaling \$2,572; two were for residential properties, one was nonresidential. Information was not provided on the location (zones) of these claims or their pre- or post-FIRM status. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the average number of persons per household (3.17). The following are at risk to flooding in the City of Mendota:

- 100-year flood—165 people
- 500-year flood—38 people
- **Total flood**—203 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. According to data from Fresno County GIS and the digital flood insurance rate map, there is only one critical facility in Mendota's floodplains, which is a fire station in the 100-year floodplain.

While Mendota High School itself is not in the floodplain, it is on Belmont Avenue, where Panoche Creek runs during big winter storms. The water can get more than one foot deep as it goes past the high school and can cut off the school from the rest of town (as has happened in the past).

The locations of critical facilities were also compared to the USACE mapped 200-year floodplain. An airport and one CalARP hazardous materials facility are located within the 200-year floodplain.

Hazardous Materials Incident

There is one CalARP hazardous materials facility located in the City of Mendota. Based on a buffer analysis of this location, there is one critical facility (airport) located within a half mile of this CalARP facility.

Severe Weather: Extreme Heat

Heat is one of the greatest threats to the migrant farm workers and elderly. The temperatures in the City of Mendota rise to over 100°F, occasionally exceeding 105°F, each summer. During the summer of 2007, the City of Mendota was asked by the Fresno County Office of Emergency Services to make available its City Hall and Senior Center as a cooling shelter for the better part of a week. The City works with the Fresno County Office of Emergency Services during extreme heat events. There are no designated shelters, but the Mendota City Hall often serves as a cooling center. These events can also affect the City economically due to increased water usage.

Severe Weather: Windstorm

The City of Mendota's risk and vulnerability to windstorm is not unique as compared to the planning area at large. Please refer to the main plan's review of this hazard in section 4.

Soil Hazards: Expansive Soils

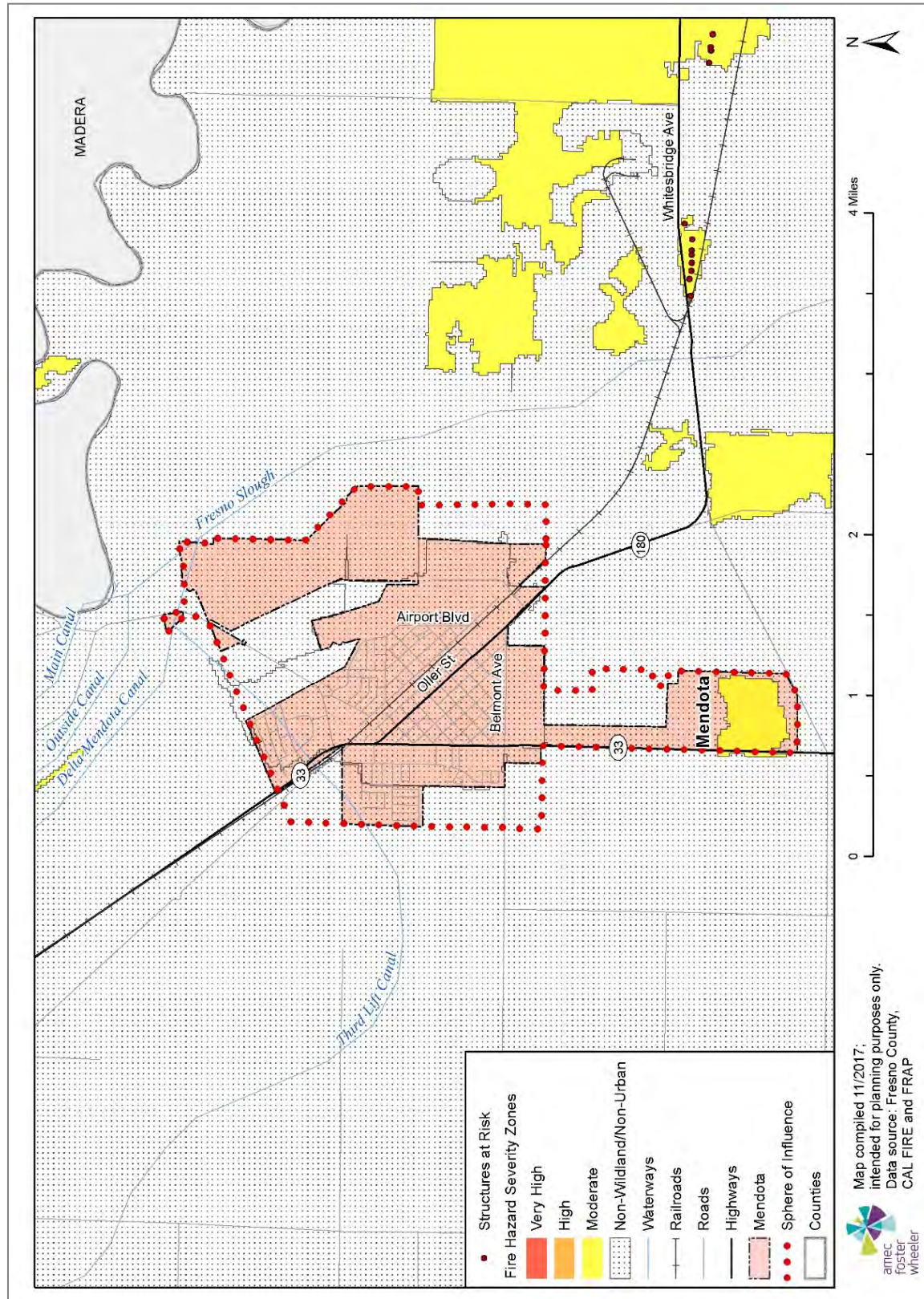
Expansive soils occur throughout the City. In new buildings, a soils report is required prior to building, and appropriate measures are incorporated to address the hazard. In older buildings, these soils cause problems for foundations.

Wildfire

There is some wildfire risk in the Fresno Slough due to weedy vegetation growth. The slough is surrounded by agriculture, and a wildfire could put water wells at risk. There may also be some wildfire risk at the Mendota Wildlife Refuge.

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Mendota was created (see Figure H.5). An analysis was performed using GIS software that determined that there were not any critical facilities in wildfire threat zones in Mendota.

Figure H.5: City of Mendota's Wildfire Threat



H.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Mendota's updated capabilities are summarized below.

H.4.1 Regulatory Mitigation Capabilities

Table H.12 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Mendota.

Table H.12: City of Mendota's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Site plan review requirements	Yes	
Growth management ordinance	No	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	Water Conservation Ordinance
Building code	Yes	
Fire department ISO rating	N/A	No local fire department; County provides fire protection services
Erosion or sediment control program	No	
Stormwater management program	No	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	
Other special plans	No	

Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016
Elevation certificates	No	

City of Mendota General Plan

The City of Mendota General Plan is the official statement of the City regarding future growth and quality of development in the planning area. The current general plan was adopted in August 2009. Policies contained in the plan's Land Use Element are designed to enhance Mendota's existing urban environment. Further, they seek to encourage new urban growth and development, provided that such growth will have minimal adverse impacts upon the environment (which will mitigate hazards), among other things. It is intended to serve as a basis for local decision makers to determine development and land utilization patterns in the City.

Floodplain Management Ordinance

The purpose of the Floodplain Management Ordinance is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas. In order to accomplish this purpose, it includes methods and provisions to:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Control filling, grading, dredging, and other development that may increase flood damage; and
- Prevent or regulate the construction of flood barriers that will unnaturally divert floodwaters or that may increase flood hazards in other areas.

The ordinance applies to all areas of special flood hazards within the jurisdiction of the City of Mendota. Notably, it requires that a permit be obtained before construction or other development begins within any area of special flood hazard. It appoints the City manager as floodplain administrator to administer, implement, and enforce the ordinance by granting or denying development permits in accord with its provisions and describes the accompanying duties and responsibilities.

Water Conservation Ordinance

The Water Conservation Ordinance regulates the use of water supplied by the City of Mendota. It identifies requirements that apply at all times (e.g., limiting wasteful uses and the use of hoses without a positive pressure nozzle on the end) and defines three stages of water conservation and the use restrictions associated with each. During stage 1 water conservation, there is a voluntary conservation to limit water from May through September. Stage 2 involves a mandatory ban on

water usage, such as limited times to wash vehicles, nonoperation of ornamental fountains, and limiting restaurants to only serve water when asked by customers. Stage 3 applies further limitations, including a ban on the times when vegetation may be irrigated and the prohibition of vehicle washings that are not in the immediate interests of public safety, health, and welfare, and the filling, refilling, or adding of water to swimming pools. Citations are used to enforce these regulations.

Emergency Operations Plan

The City of Mendota's Emergency Operations Plan was prepared to ensure the most effective and economic allocation of resources for the maximum benefit and protection of the community in time of emergency. It establishes the emergency organization, assigns tasks, specifies policies and general procedures, and provides for coordination of planning efforts among the City's emergency staff and service elements. The objective of the plan is to incorporate and coordinate City facilities and personnel in an efficient organization capable of responding to, and recovering from, any emergency.

H.4.2 Administrative/Technical Mitigation Capabilities

Table H.13 identifies the personnel responsible for activities related to mitigation and loss prevention in Mendota.

Table H.13: City of Mendota's Administrative and Technical Mitigation Capabilities

Personnel Resources	Department/Position
Planner/engineer with knowledge of land development/land management practices	Contracted City Engineer
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Contracted City Engineer
Planner/engineer/scientist with an understanding of natural hazards	Contracted City Engineer
Full time building official	Director of Public Works
Floodplain manager	City Manager
Emergency manager	City Manager
Grant writer	Multiple people fill this role (no official position, depends on the nature of the grant)
Other personnel	Multiple/varied (various positions constitute the Emergency Management Team in accordance with the Mendota Emergency Plan)
Warning systems/services (Reverse 9-11, outdoor warning signals)	Fresno County Office of Emergency Services (the County can provide assistance in this capacity)

As far as personnel resources, employees of the City of Mendota have diverse expertise, including engineering, risk management, and incident command. The City has an emergency operations plan (see above) that optimizes response to a disaster, and they have secured what technologies they can in regard to limiting the damage and risk from hazards, but they do not have GIS capabilities.

H.4.3 Fiscal Mitigation Capabilities

Table H.14 identifies financial tools or resources that the City could potentially use to help fund mitigation activities. There are currently no specific funding sources for hazard mitigation.

Table H.14: City of Mendota's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Water and sewer
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	Can, but currently do not
Incur debt through special tax bonds	Yes	Can, but currently do not
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

One of the challenges to mitigation in Mendota involves fiscal capabilities. Mendota is a small city with an agriculturally based economy and high unemployment that suffers from one of the lowest revenues in the state. Execution of mitigation actions is limited due to this financial limitation.

H.4.4 Mitigation Outreach and Partnerships

Aside from the partnership to establish this multi-hazard mitigation plan with the County of Fresno, the City of Mendota is not engaged in many partnerships. The City has personnel trained in Incident Command and contracts with the Fresno County Sheriff's Department for public safety services. Additionally, the City conducts limited education on hazards with the exception of the issues of water usage and West Nile virus.

H.4.5 Other Mitigation Efforts

The City of Mendota has undertaken improvements to mitigate damage from flood, one of its most dramatic and regular hazard events. The City has installed a long running underground pipe along Belmont Avenue, one of the major floodways, in conjunction with the California Department of Transportation. The City has also built humps into the streets along this floodway to limit water flows entering residential streets and homes to the north.

H.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the City of Mendota has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. The opportunities for enhancement of the City's mitigation program are listed below.

- Develop a Drought Contingency Plan that will help to create a framework for drought response and mitigation in the City of Mendota.
- Improve stormwater drainage system capability through developing and implementing a Stormwater Management Program.

H.5 Mitigation Strategy

H.5.1 Mitigation Goals and Objectives

The City of Mendota adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Building Department may utilize the hazard information when reviewing building permit applications. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Mendota will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1981. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

H.5.2 Completed 2009 Mitigation Actions

The City of Mendota has not completed any mitigation actions identified in the 2009 plan. However, the City will carry forward, with minor revisions, the stormwater basin project which was in the initial phases of moving forward in 2018.

H.5.3 Mitigation Actions

The planning team for the City of Mendota identified the following mitigation action based on the risk assessment. Background information and information on how the action will be implemented

and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

In addition to implementing the mitigation action below the City of Mendota will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Build a Stormwater Detention/Desilting Basin

Hazard(s) Addressed: Flood

Issue/Background: Mendota has historically experienced flooding during the rainy season, which has resulted in damage of approximately \$75,000 (for those events that documentation is available). A contributing factor is the flood flows from the Panoche-Silver Creek, which runs heavy annually and often spills over and down into the City. Adding to this is the lack of an adequate storm drain system to capture and channel the water.

Ideas for Implementation: The plan is to capture and channel the storm flows into a 40-acre detention basin. The system currently is not designed for the flows that come in from the Panoche-Silver Creek. The basin will allow for the collection of the excess water to keep water off the streets and out of homes and to restrict the flow so that it stays within the capacity of the City's storm drain system.

Other Alternatives: No action

Responsible Office: City of Mendota

Priority: High

Cost Estimate: \$2.25 million for the full 40 acres

Potential Funding: Not yet identified

Benefits (Avoided Losses): Already, there has been approximately \$75,000 in damage. If one looks at the figures, the costs are increasing over time. The last documented event consumed roughly half this amount. Extrapolating from this data, one can assume that within the next 10 years, the project will likely save over \$100,000, and more over time.

Schedule: Approximately 12 months from funding based on environmental work, land acquisition, excavation, etc.

Status: 2009 project; implementation in progress and ongoing into 2020.

2. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Delta-Mendota subbasin underlays the City of Mendota and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Mendota being a local agency (as defined by §10723 of the Water Code) which overlays the Delta-Mendota basin, the City has become a GSA for the portion of the basin which the city boundaries overlays. The Mendota GSA is required to develop and implement, no later than January 31, 2020, a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. The Mendota GSA is part of a multi-agency GSP that is being prepared by the San Joaquin River Exchange Contractors Water Authority. The City of Mendota and Mendota GSA will actively participate in the development and implementation of the planning process. The development of the City of Mendota GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Mendota.

Other Alternatives:

Responsible Office: Public Works Director and Mendota GSA

Priority: High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

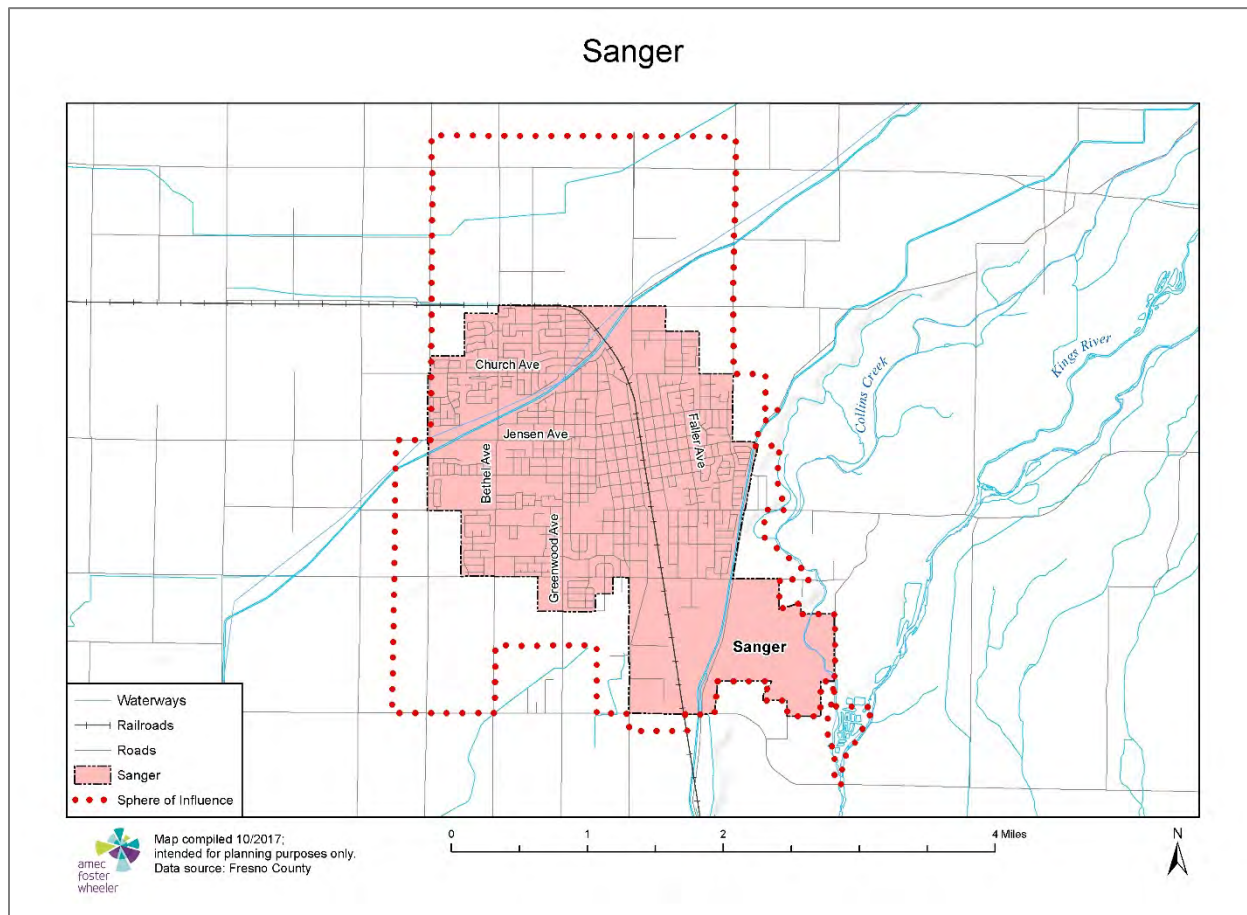


ANNEX I: CITY OF SANGER

I.1 Community Profile

Figure I.1 displays a map and the location within Fresno County of the City of Sanger and its Sphere of Influence.

Figure I.1: The City of Sanger



I.1.1 Geography and Climate

The City of Sanger is located in central Fresno County southeast of the City of Fresno. The City and its Sphere of Influence encompass a 6,871-acre area; the City alone covers 3,688 acres. Over the past decade, the City boundary has remained relatively unchanged with the exception of an area along the western border of the City's Sphere of Influence that was annexed into the City limits.

Sanger has a Central Valley desert climate. The land is generally flat with surface slope of five feet per mile. The City is located on an alluvial plain formed by the Kings River drainage system.

Once largely an agricultural community, Sanger is currently undergoing residential development. Summers are hot and dry, and winters are cold and foggy. The annual average precipitation is 10.4 inches of precipitation.

I.1.2 History

The City of Sanger was founded in 1888 and incorporated in 1911. In 1926, the General Grant Tree was designated the Nation's Christmas Tree by U.S. President Calvin Coolidge and the U.S. Department of the Interior. In 1949, the City of Sanger was designated as the Nation's Christmas Tree City by the U.S. Postal Service, and 10 years later, the General Grant Tree was designated as a National Shrine by the U.S. Congress.

The City was named after Joseph Sanger Jr., who at the time was secretary and treasurer of the Railroad Yardmasters Association. He was never in Sanger but was told at an annual convention in San Francisco that Southern Pacific Railroad officials had named a town in Fresno County for him. At the time, the town was being surveyed.

The history of Sanger is housed in the Sanger Depot Museum, which is actually the Sanger Railroad Depot, once the hub of the town's growth. Built in 1887, the Sanger Railroad Depot sat beside the Southern Pacific Railroad that ran between Fresno and Porterville, California. Among the cargo that passed through this depot was grain, citrus, and lumber brought down from the mountains by Sanger's booming lumber operation. When Sanger's commerce no longer needed the Depot, it was discovered that the building was the oldest in Sanger. It was purchased by a local business family and donated to the Sanger Historical Society. The museum opened in December 1977.

I.1.3 Economy

Sanger offers the conveniences and services of a major city as well as the rural lifestyle prized by so many. Sanger is a full-service city located minutes from California's fifth largest and fastest growing urban center. Its award-winning school district is a magnet for families looking to combine educational excellence with smaller town amenities.

Sanger business development and job growth are robust. Industrial residents come in all sizes, from Fortune 100 companies such as International Paper and Initiative Foods to numerous small and midsize manufacturers and food processors. Sanger is strategically situated to take advantage of the California market and its over 39 million customers.

The five major employers for the City are Sanger Unified (1097 employees), Walmart (339 employees), Pitman Farms (325 employees), ADCO Manufacturing (150 employees and International Paper (125 employees). The City has three high schools, nine elementary schools, three charter schools, and one community day school. Enrollment in 2006 was 9,160.

Sanger's location at the base of the Sierra Nevada mountain range provides limitless recreational opportunities. In less than an hour, residents can view the world's largest trees in Sequoia National Park. A few minutes more will bring you to the bottom of the deepest river gorge in the United States, Kings Canyon National Park, or to the powdery slopes of nearby ski resorts. Numerous foothill parks, campgrounds, lakes, and streams provide families with ample choices for daytrips or extended vacations.

Select estimates of economic characteristics for the City of Sanger are shown in Table I.1.

Table I.1: City of Sanger's Economic Characteristics, 2015

Characteristic	City of Sanger
Families below Poverty Level	19.3%
All People below Poverty Level	23.0%
Median Family Income	\$49,903
Median Household Income	\$43,099
Per Capita Income	\$16,864
Population in Labor Force	11,459
Population Employed*	9,839
Unemployment	13.9%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables I.2 and I.3 detail how the City of Sanger's labor force breaks down by occupation and industry based on estimates from the 2015 American Community Survey.

Table I.2: City of Sanger's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Sales and Office Occupations	2,347	23.9
Management, Business, Science, and Arts Occupations	2,179	22.1
<i>Management, Business, and Financial Occupations</i>	(932)	(9.5)
<i>Computer, Engineering, and Science Occupations</i>	(164)	(1.6)
<i>Education, Legal, Community Service, Arts, and Media Occupations</i>	(858)	(8.7)
<i>Healthcare Practitioner and Technical Occupations</i>	(225)	(2.3)
Service Occupations	2,026	20.6
Production, Transportation, and Material Moving Occupations	1,812	18.4
Natural Resources, Construction, and Maintenance Occupations	1,475	15.0
Total	9,839	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table I.3: City of Sanger's Employment by Industry, 2015

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	2,204	22.4
Agriculture, Forestry, Fishing and Hunting, and Mining	1,214	12.3
Retail Trade	1,040	10.6
Manufacturing	1,002	10.2
Wholesale Trade	752	7.6
Public Administration	735	7.5
Other Services, Except Public Administration	542	5.5
Finance and Insurance, and Real Estate and Rental and Leasing	503	5.1
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	458	4.7
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	442	4.5
Construction	437	4.4
Transportation and Warehousing, and Utilities	386	3.9
Information	124	1.3
Total	9,839	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

I.1.4 Population

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the 2015 population for the City of Sanger was estimated at 24,700. Select demographic and social characteristics for the City of Sanger from the 2015 ACS are shown in Table I.4.

Table I.4: City of Sanger's Demographic and Social Characteristics, 2015

Characteristic	City of Sanger
Gender/Age	
Male	48.5%
Female	51.5%
Median age	31.9
Under 5 years	9.4%
Under 18 years	31.5%
65 years and over	10.4%
Race/Ethnicity*	
White	66.3%
Asian	0.7%
Black or African American	0.6%
American Indian/Alaska Native	0.4%
Hispanic or Latino (of any race)	83.2%
Education	
High school graduate or higher	63.8%
Disability Status	
Population 5 years and over with a disability	11.1%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 96.5% reporting one race

I.2.1 Hazard Identification and Summary

Sanger’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Sanger (see Table I.5). In the context of the plan’s planning area, there are no hazards unique to Sanger.

Table I.5: City of Sanger—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Low
Avalanche	Limited	Likely	Limited	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Limited	Highly Likely	Critical	Low
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

I.3 Vulnerability Assessment

The intent of this section is to assess Sanger’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Sanger’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Sanger.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table I.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Sanger’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table I.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Sanger are identified below. The discussion of vulnerability related information for each of the following hazards is located in Section I.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include drought and flood/levee failure.

- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incident
- human health hazards: epidemic/pandemic

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Sanger, those hazards are as follows:

- agricultural hazards*
- human health hazards: West Nile Virus
- landslide
- severe weather (all)
- soil hazards
- volcano
- wildfire**

***Note on Agricultural Hazards:** Agricultural hazards are ranked Low in the City of Sanger compared to the County overall (ranked High) because very little land in the City is used for agricultural purposes.

****Note on Wildfire:** Wildfire is a High significance hazard for the County overall, but is of Low significance to the City because there are no parcels or structures within the City or its Sphere of Influence that are at risk to any fire severity zones. (See the County's wildfire severity risk map in Chapter 4 for locations of wildfire risk zones in Fresno county and its jurisdictions).

Additionally, the City's Committee members decided to rate avalanche as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence.

I.3.1 Assets at Risk

This section considers Sanger's assets at risk, including values at risk, critical facilities and infrastructure, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table I.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Sanger.

Table I.6: 2017 Property Exposure for the City of Sanger by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	3	2	\$2,381,240	\$2,381,240	\$4,762,480
Commercial	351	590	\$152,581,224	\$152,581,224	\$305,162,448
Exempt	30	89	\$0	\$0	\$0
Industrial	95	134	\$28,998,925	\$43,498,388	\$72,497,313
Multi-Residential	407	838	\$66,139,922	\$33,069,961	\$99,209,883
Residential	4,903	5,796	\$520,672,552	\$260,336,276	\$781,008,828
Total	5,789	7,449	\$770,773,863	\$491,867,089	\$1,262,640,952

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Sanger from Fresno County GIS and the City of Sanger is provided in Table I.7 and mapped in Figure I.2.

Table I.7: City of Sanger's Critical Facilities

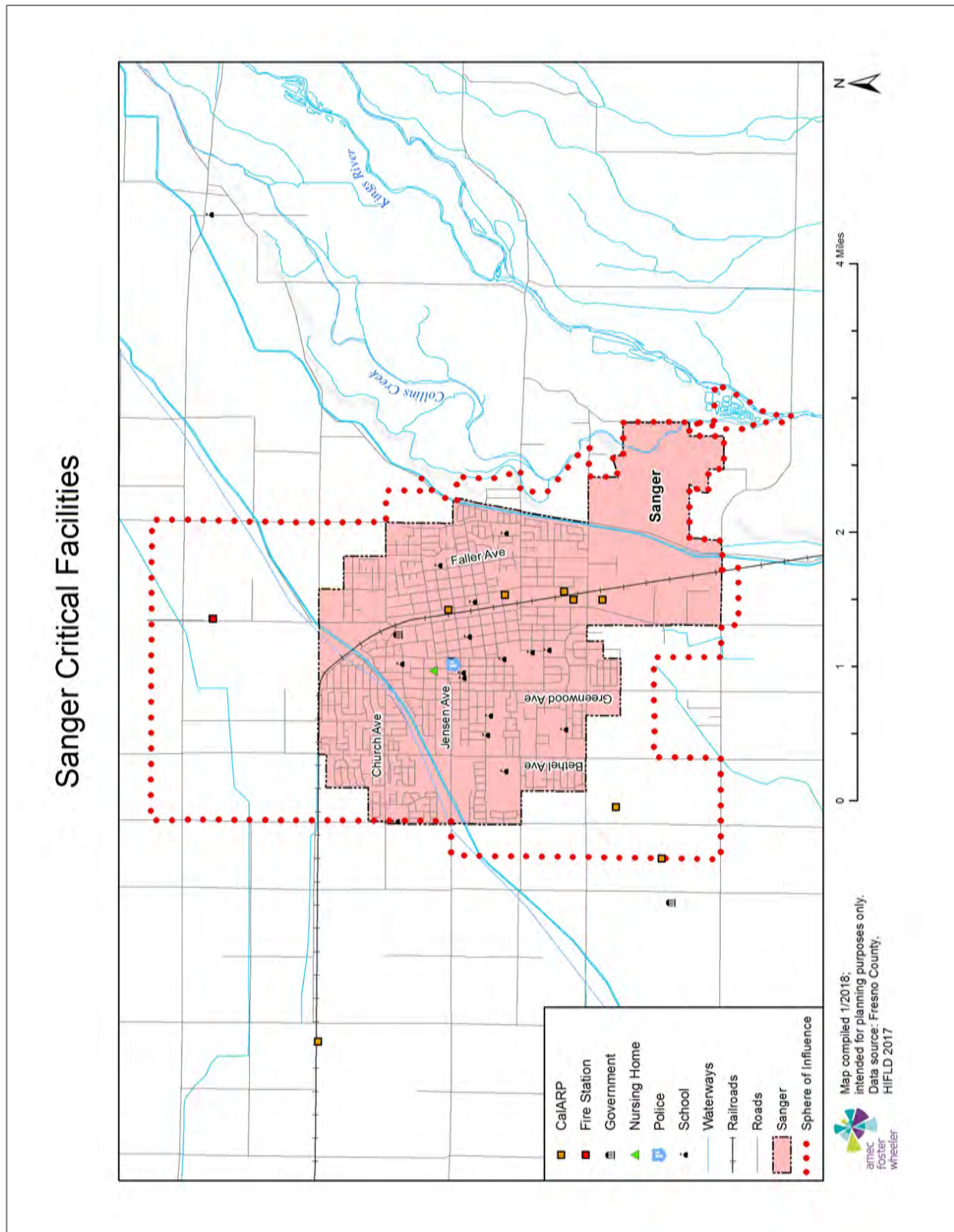
Critical Facilities Type	Number
Behavioral Health	1
CalARP	5
City Hall	1
Department of Agriculture	1
Fire Station	1
Nursing Home	2
Police	1
School	17
Total	27

Source: Fresno County, HIFLD 2017

The Police and Fire departments are not secured and fenced in. The City has sought grant funding in the past to fence these facilities but has not been successful thus far. Additionally, the City Wastewater Treatment Plant has security fencing but upgrades to the security systems in place are needed.

The City operates and maintains the wastewater collection system, a domestic wastewater treatment plant, and an industrial wastewater treatment plant within the City limits. All of the wastewater that flows from the City is collected and treated at the Sanger wastewater treatment plants. Stormwater in Sanger is piped to stormwater percolation basins and is not treated at the Sanger wastewater treatment plant.

Figure I.2: City of Sanger's Critical Facilities



Growth and Development Trends

The City of Sanger, once largely an agricultural community, is currently undergoing significant residential development. All areas of the City are growing. However, growth is anticipated to be focused on the north and northwest sides of town. The State Road 180 project on the north side of town is expected to spur the major building activity over the next 20 years as the City expands up to the northern limits of the existing Sphere of Influence. Paced growth is also expected to the west, with nominal growth in the south and east.

Table I.8 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2015.

Table I.8: City of Sanger's Change in Population and Housing Units, 2010-2015

2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2015
24,270	24,700	+1.77	7,104	7,350	+3.46

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2011-2015 5-Year Estimates

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

I.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table I.6 above shows Sanger's exposure to hazards in terms of number and value of structures. Fresno County's assessor's data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Note: Hazardous materials incidents and epidemic/pandemic are considered medium priority hazards by the City of Sanger but are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to these hazards.

Dam Failure

The City of Sanger is downstream of the largest dam in the planning area, the Pine Flat dam at 1M acres-feet of capacity. The Pine Flat Dam, managed by the U.S. Army Corps of Engineers, is 16

miles northeast (upstream) of Sanger on the Kings River. Should it fail, a flood-tide would engulf the City in approximately one hour according to Corps inundation studies.

Drought

Groundwater is the sole water supply for the City. The Kings River recharges the groundwater, along with runoff from the foothills, which to date has been sufficient to meet the needs of the area. However, the groundwater storage level is decreasing at an alarming rate in the Sanger area and in the San Joaquin Valley.

In an effort to reduce the effects of a drought, the City has constructed wastewater percolation ponds to help recharge the groundwater basin. The City currently percolates approximately 1.7 million gallons per day of final effluent back into the groundwater basin. The City recently spent approximately \$3.6 million to replace a number of old water pipelines that were leaking excessively. The City is an active member of several water conservation groups in the San Joaquin Valley. These groups are reviewing and establishing measures to reduce the declining groundwater basin. According to the Urban Water Management Plan (2005), during a declared water shortage, the City will implement a 25 percent voluntary rationing water conservation program to ensure that the groundwater table does not drop to a dangerous level.

Earthquake

There are unreinforced masonry buildings in the downtown area and east of Academy between 5th and 9th Streets and west of “K” Street. Approximately 24 buildings are located in the downtown area, with other unreinforced masonry buildings located within the City limits. Critical facilities in the downtown include a telecommunications hub and a large natural gas line is located in the south end of the City.

Flood

According to FEMA’s 2016 Flood Insurance Study (FIS), Sanger’s floodplains in general are residential, with some commercial development. Flooding in Sanger, which has flat terrain, is typically the result of local runoff from intense rainfall that exceeds the capacity of storm drainage facilities. There are no well-defined natural drainage channels that carry stormwater away from the City. Hence, the streets fill with water deep enough to impede traffic. Sanger’s only flood control structures are detention basins, several up to 20 feet deep that will fill and flood during a 100-year flood. Overflow from the Kings River has caused extensive damage to agricultural properties east and southeast of the City.

According to the FIS, the flood history of Sanger is not well documented, but flooding reportedly occurred in the area in 1950, 1958, 1967, and 1978. Details on some of these events follow:

- **November 1950**—The Kings River overflowed and drowned cattle and turkeys, damaged farm equipment, eroded agricultural land, and destroyed feed and grain.

- **January 1969**—More than three inches of rain fell in a two-day period and flooded streets and intersections in the City. Overflow was deep enough to stall vehicles and severely disrupt traffic.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Sanger was created (see Figure I.3). Tables I.9 and I.10 summarize the values at risk in the City’s 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Figure I.3: City of Sanger's 100- and 500-Year Floodplains

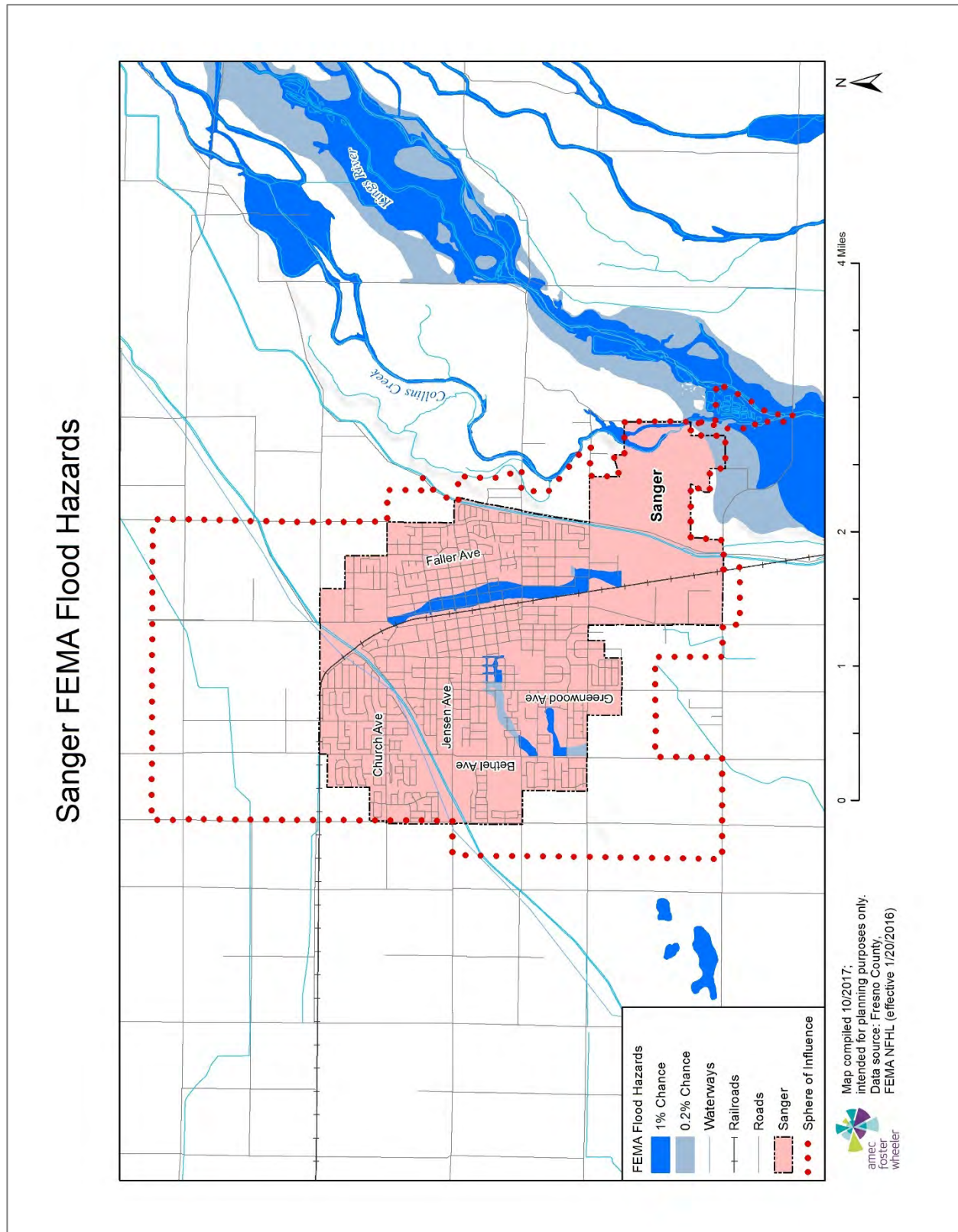


Table I.9: City of Sanger's FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	11	17	\$970,742	\$970,742	\$1,941,484	\$485,371
Exempt	2	2	\$0	\$0	\$0	\$0
Industrial	12	9	\$8,241,782	\$12,362,673	\$20,604,455	\$5,151,114
Multi-Residential	52	262	\$7,450,475	\$3,725,238	\$11,175,713	\$2,793,928
Residential	57	61	\$5,149,439	\$2,574,720	\$7,724,159	\$1,931,040
Total	134	351	\$21,812,438	\$19,633,372	\$41,445,810	\$10,361,453

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Note: The "Exempt" property type includes government, school, and church owned building for which building value is not given.

Table I.10: City of Sanger's FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Residential	49	50	\$7,767,763	\$7,767,763	\$15,535,526	\$3,883,882
Total	49	50	\$7,767,763	\$7,767,763	\$15,535,526	\$3,883,882

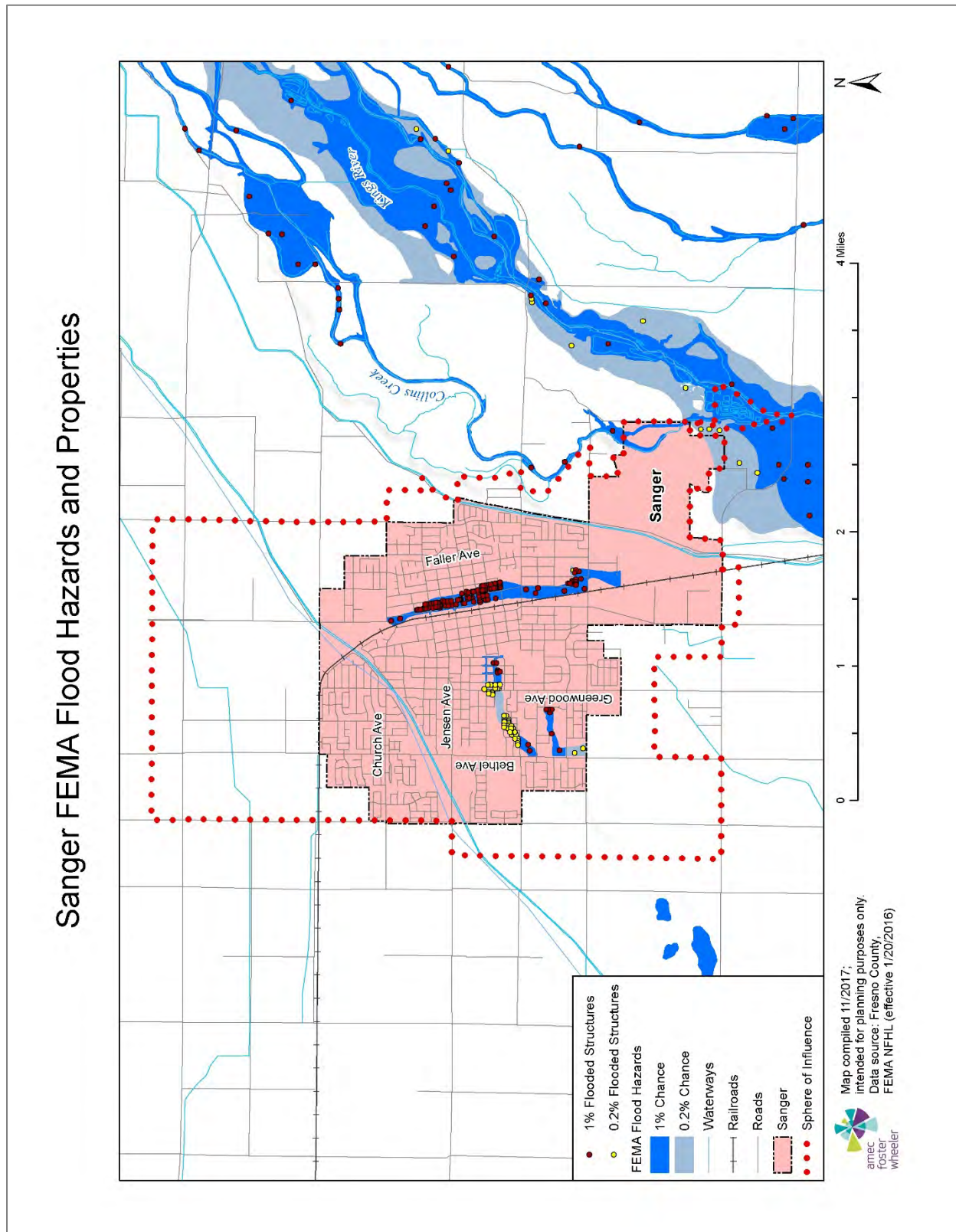
Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Sanger has significant assets at risk to the 100-year and greater floods. There are 134 improved parcels within the 100-year floodplain for a total value of roughly \$41.4 million. An additional 49 improved parcels valued at \$15.5 million fall within the 500-year floodplain.

Applying the 25 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly \$10.4 million in damage in the City of Sanger and a 0.2 percent chance in any given year of a 500-year flood causing roughly \$14.2 million in damage (combined damage from both floods). Properties at risk to flooding are shown in Figure I.4.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Figure I.4: City of Sanger's Properties at Risk to 100- and 500-Year Floods



Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Sanger joined the National Flood Insurance Program (NFIP) on December 1, 1982. NFIP insurance data indicates that as of June 6, 2017, there were 54 flood insurance policies in force in the City with \$10,931,700 of coverage. This represents a decrease in flood insurance policies of more than 50 percent over the past decade, likely due to cost increases. Of the 54 policies, 52 were residential (46 for single-family homes) and 2 were nonresidential. 41 of the policies were in A zones (the remaining 13 were in B, C, and X zones).

There have been four historical claims for flood losses totaling \$16,288.44; all were for residential properties; two were in A zones and two were in B, C, or X zones. Only one was for a post-FIRM structure. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the average number of persons per household (3.17). The following are at risk to flooding in the City of Sanger:

- 100-year flood—346 people
- 500-year flood—155 people
- **Total flood**—501 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. According to data from Fresno County and the digital flood insurance rate map, the following critical facilities, detailed in Table I.11, are located in Sanger's floodplains:

Table I.11: Critical Facilities in 100-/500-year Floodplains: City of Sanger

Critical Facilities Type	100-Year Floodplain	500-Year Floodplain
CalARP	2	-
School	1	-
Total	7	-

Source: Fresno County, HIFLD 2017

Hazardous Materials Incident

There are five CalARP hazardous materials facilities located in the City of Sanger. As identified in Table I.12 (below), there are 15 critical facilities in Sanger located within a half mile of a CalARP facility.

Anhydrous Ammonia

Within the City of Sanger, the use of anhydrous ammonia is necessary for food processing and refrigeration systems. Several facilities such as Del Monte Fresh, CaliFresh, Initiative Foods, Gibson Winery and Pitman Farms utilize anhydrous ammonia in their daily operations. However, the use of this toxic chemical has had a significant increase in accidental releases into the community over the last ten years. Between 2007 and 2010, there were four total responses for anhydrous ammonia leaks within the City. From 2010 to 2016 there were 23 separate incidents due to a release of anhydrous ammonia.

In an effort to reduce the community's risk to these incidents the Fire Department initiated a Community Risk Reduction program and hired a full time Community Risk Reduction Officer to help identify these particular risks and assist industry in abating accidental releases.

Table I.12: Critical Facilities within ½ mile of CalARP Facility: City of Sanger

Critical Facility Type	Count
Behavioral Health	1
City Hall	1
Department of Agriculture	1
Fire Station	1
Nursing Home	1
Police Station	1
School	9
Total	15

Source: Fresno County, HIFLD 2017

I.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Sanger's updated capabilities are summarized below.

I.4.1 Regulatory Mitigation Capabilities

Table I.13 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Sanger.

Table I.13: City of Sanger's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General or Comprehensive plan	Yes	City of Sanger 2005 General Plan, 2003 (update underway)
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	1995
Other special purpose ordinance (stormwater, steep slope, wildfire)	No	
Building code	Yes	Version: 2001
Fire department ISO rating	Yes	Rating: 3
Erosion or sediment control program	Yes	
Stormwater management program	Yes	
Site plan review requirements	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	City of Sanger Emergency Operations Plan, 2000
Other special plans		
Flood insurance study or other engineering study for streams	Yes	
Elevation certificates (for floodplain development)	Yes	

City of Sanger 2005 General Plan, 2003

The purpose of the 2005 City of Sanger General Plan is to guide growth, community change, and environmental conservation. It contains goals and policies that represent the community's vision for how it wants to grow and develop over time. These goals and policies assist City staff, the Planning Commission, and the City Council in making decisions about projects that affect the use of land. Two of the plan's elements that are largely related to hazard mitigation are the Conservation Element and the Safety Element. Mitigation-related goals and policies of these elements are included below.

Conservation Element

Goal 1:	Hydrology and Water Quality: Manage the City's water resources to provide for urban uses while protecting the environment.
Policy 1:	Protect and preserve water resources in order to provide sufficient quantities of water that meet State quality standards to serve the domestic water demand for build-out of the General Plan.
Policy 2:	Protect and preserve watershed and recharge areas, including those critical for the replenishment of domestic water supplies.

Goal 2:	Storm Drainage: Collect and convey storm water in a manner that least inconveniences the public, reduces or prevents potential water-related damage, and protects the environment.
Policy 1:	Maintain a reliable source of revenue to fund citywide storm drainage improvements, including replacement, repair, or relocation of storm drain facilities.
Policy 2:	Encourage the use of natural storm water drainage systems in a manner that preserves and enhances natural features and consider recreational opportunities and aesthetics in the design of storm water detention/retention and conveyance facilities.
Policy 3:	Improve the quality of runoff from urban and suburban development through use of appropriate and feasible mitigation measures or best management practices. Examine the impact of proposed urban developments with regard to water quality and effects on drainage courses.

Goal 3:	Geology and Soils: Preserve and enhance unique geologic features and soils for future generations to use and enjoy.
Policy 1:	Identify and protect geologic resources within the City limits.
Policy 2:	Coordinate the management of mineral resources adjacent to the planning area, working with mining operators, and County and state departments.
Policy 3:	Provide for the preservation of soil resources through the creation of an agricultural greenbelt. Conserve soil resources, particularly to provide a continuing base for agricultural productivity and the City's economy by working with agricultural interests to develop practices that minimize the impacts of tilling and grading on soil erosion.

Safety Element

Policies of this element reduce the risk of death, injuries, property damage, and economic and social dislocation resulting from hazards such as fires, floods, earthquakes, and other hazards. Goals and policies facilitate decision making for minimizing potential safety risks. In 1974, Sanger adopted the *Five County Seismic Safety Element for the General Plans of Fresno, Kings, Madera, Mariposa, and Tulare Counties and their Respective Incorporated Cities*.

Goal 1:	Protect the public health, safety, and welfare and minimize the damage to structures, property, and infrastructure as a result of geologic and flood hazards.
Policy 1:	Evaluate proposed projects and land use policy decisions based on the environmental hazards identified in this element. Low intensity/occupancy uses (such as agricultural production, recreational uses, or wildlife habitat preservation) shall be preferred in hazard areas.
Policy 2:	Utilize FEMA Flood Insurance Rate Maps to determine the general location of flooding hazard areas when reviewing development proposals. The City shall maintain FIRM maps to reflect currently available information on the Planning Area.
Policy 3:	Continue to maintain the City's Emergency Operations Plan to ensure the safety of residents and to prevent damage to the built and natural environment.

Municipal Code Chapter 14 Buildings and Building Services, 2011

This ordinance adopts the building code of the City and lists the building conditions that must be met for the building inspector to authorize final connection of utility services and certificate of occupancy.

Municipal Code Chapter 26 Emergency Services, 1997

This ordinance provides for the preparation and carrying out of plans for the protection of people and property within the City in the event of an emergency, the direction of the emergency organization established by the code, and the coordination of the emergency functions of the City with all other public agencies, corporations, organizations, and affected private people. The ordinance establishes the City's disaster council and designates the membership of the council. Membership includes the mayor (chairperson), the director of emergency services (vice-chairperson), the assistant director of emergency services, and other people as provided for in the City's current emergency plan. The council's powers include the development of emergency and mutual aid plans and agreements and the ordinances and resolutions to implement them.

Municipal Code Chapter 30 Fire Protection and Prevention, 2016

This ordinance provides for fire protection and prevention of fire relative to the adoption of the 2013 California Fire Code. Additionally, there are amendments to the California Fire Code to help mitigate hazards in the City of Sanger that are either reasonably necessary for local climatic, geographical or topographical conditions. These changes include variations on solar photovoltaic panel installations, fire sprinkler system requirements and regulations on woodworking, lumber yard, recycling and waste handling facilities.

Municipal Code Chapter 34 Floods, 2001

The purpose of the flood ordinance is to promote health and safety and prevent public and private losses due to flooding in identified flood hazard areas. It designates the city manager as the floodplain administrator.

Urban Water Management Plan, 2015 (Draft)

The Urban Water Management Plan describes the vulnerability of the City's water supply. It plans for measures taken for four stages of water shortage and includes projected water supply and demand comparisons through 2035. The plan also describes actions for flood, earthquake, and other types of catastrophes.

Emergency Operations Plan, 2000

The City of Sanger prepared the Emergency Operations Plan in an effort to ensure the most effective and efficient use of all resources, material, and staff for the maximum benefit and protection of the Sanger community. The plan is designed to facilitate coordination and management of information and resources amongst City agencies and affected populations to effectively respond to a hazard event. Currently the EOP has been placed into a draft version and will be updated in 2018.

I.4.2 Administrative/Technical Mitigation Capabilities

Table I.14 identifies the personnel responsible for activities related to mitigation and loss prevention in Sanger.

Table I.14: City of Sanger's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Community Development Director, City Engineer, Senior Planner, Public Works Director
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Community Development Director, City Engineer, Senior Planner, Public Works Director
Planner/engineer/scientist with an understanding of natural hazards	Yes	Community Development Director, City Engineer, Senior Planner
Personnel skilled in GIS	Yes	City Engineer
Full-time building official	Yes	Building Official
Floodplain manager	Yes	City Manager
Emergency manager	Yes	City Manager
Grant writer	Yes	City Lobbyist
Other personnel	No	
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints)	Yes	City Engineer
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	No	

I.4.3 Fiscal Mitigation Capabilities

Table I.15 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table I.15: City of Sanger's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Water, wastewater
Impact fees for new development	Yes	
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

I.4.4 Mitigation Outreach and Partnerships

The Sanger Fire Department provides education programs on fire safety, cardiopulmonary resuscitation (CPR) training, and conducts other tours and presentations. The Fire Department has also implemented a Community Emergency Response Team (CERT) with disaster training provided to volunteers free of charge.

The City promotes water conservation by distributing public information through bill inserts, brochures, community speakers, paid advertising, and many special events every year. City water bills show gallons used per billing period for the last billing period compared to the same period the previous year. The City continues to work with the Sanger Unified School District to promote water conservation and to educate students about these issues.

The City has formally joined the Upper Kings Water Forum, a multi-agency effort to integrate the region's water management plans and coordinated the development of the Urban Water Management Plan with the Sanger Chamber of Commerce, County of Fresno, Department of Health Services, Consolidated Irrigation District, and other public agencies.

I.4.5 Other Mitigation Efforts

The City of Sanger has identified areas prone to flooding and made improvements to reduce it.

The City sets up warming centers during extreme cold/freeze events and cooling centers during extreme heat events.

I.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the City of Sanger has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. The opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop landscaping ordinances that incorporate proper species selection that are drought resistant, and planting and maintenance practices that will not exacerbate the effects of drought.
- Implement warning systems and develop an evacuation plan in partnership with the County.

I.5 Mitigation Strategy

I.5.1 Mitigation Goals and Objectives

The City of Sanger adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Building and Permits Department may utilize the hazard information when reviewing a building permit application. While the Community Development and Public Works Departments may utilize the information to review site plan applications or when developing or updating existing planning documents. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Sanger will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1982. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

I.5.2 Completed 2009 Mitigation Actions

The City of Sanger has not completed any of the actions identified in the 2009 plan. However, implementation has been started on five of the 2009 actions and will be continued as part of the mitigation strategy of this plan.

There are three actions from the City of Sanger 2009 mitigation strategy that the City has decided not to carry forward and recommend for implementation in this plan. These deleted actions and the reasons for their deletion are as follows:

- Implement a Flood Awareness Program for the Public – determined to no longer be a priority; the City implemented flood awareness programs targeted toward areas known for small, localized flooding from clogged storm drains instead
- Install Battery Back-Up Systems at Traffic Signals in the City of Sanger on Major Transportation Routes – No longer considered a priority
- Improve City’s Floodplain Management Program and Apply to Community Rating System – Participation in the CRS no longer considered a priority

I.5.3 Mitigation Actions

The planning team for the City of Sanger identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

In addition to implementing the mitigation actions below the City of Sanger will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Establish Post-Disaster Action Plan for City Continuity of Operations Plan

Hazard(s) Addressed: Multi-Hazard: dam failure, drought, earthquake, flood, human health hazards, severe weather, volcano, wildfire

Issue/Background: Establish a post-disaster action plan to be part of the City's Disaster Plan that will include the following elements:

- Procedures for public information
- Post-disaster damage assessment
- Grant writing
- Code enforcement
- Redundant operations

The plan will also include annexes from local businesses and large employers to improve economic and employment recovery. The plan will also identify a mechanism for the City to help businesses not involved with post-disaster planning to be incorporated into the City's plan.

Other Alternatives: No action

Responsible Office: City of Sanger Fire Department, Fire Chief

Priority (High, Medium, Low): High

Cost Estimate: \$125,000

Potential Funding: Grants

Benefits (Avoided Losses): This will improve response/recovery during an event through pre-planning. A City and local business post-disaster plan will reduce the impact of a disaster to the local economy and employment.

Schedule: 1-4 years, dependent on funding

Status: 2009 project, currently seeking grant funding opportunities with contracted grant writers.

2. Add Potable Water Storage Capacity (750,000 Gallon above Ground Tank) to the City of Sanger's Water System

Hazard(s) Addressed: Multi-Hazard: drought, flood, severe weather, earthquake, wildfire

Issue/Background: The City needs a measure of reliability should sources fail or be lacking during drought or when unusual conditions impose higher demands than anticipated. Firefighters need quick access to large volumes of water to control and put out fires. While more water is generally better, the minimum water volumes and flow rates are recommended by the National Fire Protection Association.

The City continues to manage potable water demands through the effective use of conservation programs and reclaimed water. In addition, the City informs the community periodically on the status of the available water supply and the need to conserve.

Minimum volume and flow rates for adequate fire protection are calculated for each community. Local fire companies survey the number, type, construction material, contents, and proximity of structures in a community. The minimum water supply is calculated from the cubic feet of each structure, its occupancy hazard classification, and its construction classification.

Sanger may have enough water to provide fire protection, but the water must be applied quickly to control a fire. The rate at which water flows to a fire is controlled by the capacity of the pipes, hydrants, and water pressure. The flow rate per water “stream” should be at least 500 gallons per minute and sustained for at least 60 minutes to control a fire. Large structures require more than one water stream, requiring more water. If structures are close together, the risk of a fire spreading increases, so higher minimum flow rates are recommended. The values increase by 1.5 times if structures are closer than 50 feet apart.

The City spent approximately \$3.6 million in grants to replace a number of smaller old water pipelines that were leaking excessively. This included upgrades to the distribution system to aid in fire protection requirements. Fire hydrants are generally spaced no more than 300 feet apart.

The City has two aboveground water storage tanks with a total capacity of 140,000 gallons. More are required. One fire line flowing at the minimum flow rate would deplete storage, at maximum capacity, in just over 4.5 hours; two lines—2.3 hours; three lines—1.5 hours. It is typical to have multiple fire lines on a commercial fire, not to mention master stream lines flowing from aerial devices (ladder trucks).

Like many communities, the City of Sanger experienced a rapid rate of growth. The City has increased public safety personnel and equipment and enhanced waste disposal and sewer capabilities. However, due to budget concerns, only one well was developed to manage the increased water demand. In 1979, the average residual water pressure in the City was 50 pounds per square inch (PSI). Today, that average pressure is 45 PSI.

Groundwater storage levels are decreasing at an alarming rate in the Sanger area and in the San Joaquin Valley. In an effort to reduce the effects of a drought, the City has constructed wastewater percolation ponds to help recharge the groundwater basin. The City currently percolates approximately 1.7 million gallons per day of final effluent back into the groundwater basin.

Other Alternatives: Drill more wells

Responsible Office: City of Sanger Public Works Department, Director

Priority (High, Medium, Low): High

Cost Estimate: \$2,500,000 each

Potential Funding: Grants

Benefits (Avoided Losses): This will improve water capacity necessary during large fires, severe drought conditions, and power outages. This will help businesses that use large amounts of water, including the many packing houses within the City limits, stay in production.

Schedule: Within one year or sooner, dependent on funding

Status: Updated 2009 project, implementation in progress

3. Provide Backup Power to City Pumps/Wells

Hazard(s) Addressed: Multi-Hazard: drought, flood, severe weather, earthquake

Issue/Background: The City needs to ensure that its water distribution system can meet minimum fire flow and quality standards during emergency conditions.

Protecting public health is the primary goal when considering the community's drinking water system. The water distribution system must be pressurized to 20 pounds per square inch at all times to minimize cross-connection contamination concerns. The City's total capacity of water storage is 140,000 gallons. In the event of a fire, this storage is quickly depleted as fire flows can reach 6,000 gallons a minute and more. This was the case in July of 2016 during a large commercial fire at the Initiative Foods baby food processing facility in the City of Sanger. Water storage was quickly depleted as fire engines from over 15 different agencies within Fresno County tapped into the water distribution system and deployed their lines pumping an estimated 12,000 gallons per minute. With storage gone, City pumps were pushed to their limits while providing water to

combat the blaze. Citizens throughout the City found it difficult doing the dishes much less taking a shower. Additionally during this fire, the power to the well next to the Initiative Foods plant was disrupted during the fire, forcing fire crews to rely on a nearby canal for a water source.

Other Alternatives: Building multiple elevated potable water storage tanks

Responsible Office: City of Sanger Public Works Department, Director

Priority (High, Medium, Low): High

Cost Estimate: \$200,000 per well, maximum \$1.2 million

Potential Funding: Grants

Benefits (Avoided Losses): Ensures water is available to protect public health and minimize damage to property due to fires; keeps water-dependent businesses operating

Schedule: 1-4 years, dependent on funding

Status: 2009 project, implementation in progress

4. Replace Old Storm Drains in Drainage System to Prevent Flooding

Hazard(s) Addressed: Flood

Issue/Background: During heavy rains, water threatens the homes and the vulnerable facility of Golden Living Center at 9th Street and Rawson Avenue. The proposed project will replace an old drainage system called in and out or siphon drainage. Basically, water is routed under the road at the intersection through a small pipe and then exits from a grated opening and is channeled to a larger drain inlet. Leaves accumulate under the grate, plugging the opening and making it necessary to remove the grate; this creates an unsafe situation and localized flooding. The City places barricades over the openings. However, from time to time, the barricades are removed by unauthorized personnel.

Other Alternatives: No action

Responsible Office: City of Sanger Public Works

Priority (High, Medium, Low): Medium

Cost Estimate: \$220,000

Potential Funding: General fund, street funding

Benefits (Avoided Losses): This project will keep homes from flooding. The new drain inlets are much safer for the public and pets.

Schedule: Funding dependent

Status: Updated 2009 project, implementation in progress

5. Provide Fire Department Office Security

Hazard(s) Addressed: Other

Issue/Background: Each day, the Fire Department is visited by many people for various reasons: ambulance billing, code enforcement issues, report retrieval, fireworks applications, site plan review, etc. For the most part, no conflict takes place. However, from time to time, irate people show up who are upset about imposed fees, citations, or services rendered. Maintaining accurate, effective access control is critical to protecting Fire Department personnel and equipment. This renovation of the Fire Department front office will be folded into a complete fire station remodel project to increase the size for current and future staff members.

Other Alternatives: No action

Responsible Office: City of Sanger, Fire Chief

Priority (High, Medium, Low): High

Cost Estimate: \$3,000,000

Potential Funding: Community Facilities District

Benefits (Avoided Losses): The proposed project will provide Fire Department office security, protecting personnel and equipment from potentially dangerous visitors.

Schedule: 18 months

Status: Updated 2009 project; needs assessment by outside consultant scheduled and to be completed during Spring of 2018, potential construction to begin Fall of 2018.

6. Provide Compound Security for Police and Fire Departments

Hazard(s) Addressed: Other

Issue/Background: The Sanger Police and Fire departments are located in close proximity of each other. Both departments are subject to uncontrolled foot traffic. Maintaining accurate, effective access control is critical to protecting the compound.

Other Alternatives: No action

Responsible Office: City of Sanger, Police Chief and Fire Chief

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Benefits (Avoided Losses): The proposed project will provide a good perimeter security system protecting police vehicles as they are a common target for vandalism and theft of the police radios. In addition, the system will protect fire and EMS equipment from unauthorized personnel, again, from theft and vandalism. Access to the Fire Department is a concern. When firefighters respond to incidents, apparatus doors are slow to close, allowing ample time for a hidden person to make access to the inside of the station.

Potential Funding: Community Facilities District

Schedule: 18 months

Status: Updated 2009 project; construction will commence once needs assessment on fire station redesign is completed, slated for construction Summer of 2018.

7. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Sanger and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Sanger has become a joint power authority of the South Kings Groundwater Sustainability Agency, other members of the Agency include the City of Kingsburg, City of Parlier and City of Fowler. As a member of the South Kings GSA, the City of Sanger is required to participate in the development and implementation, no later than January 31, 2020, of a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the South Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Sanger.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: City Engineer and South Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

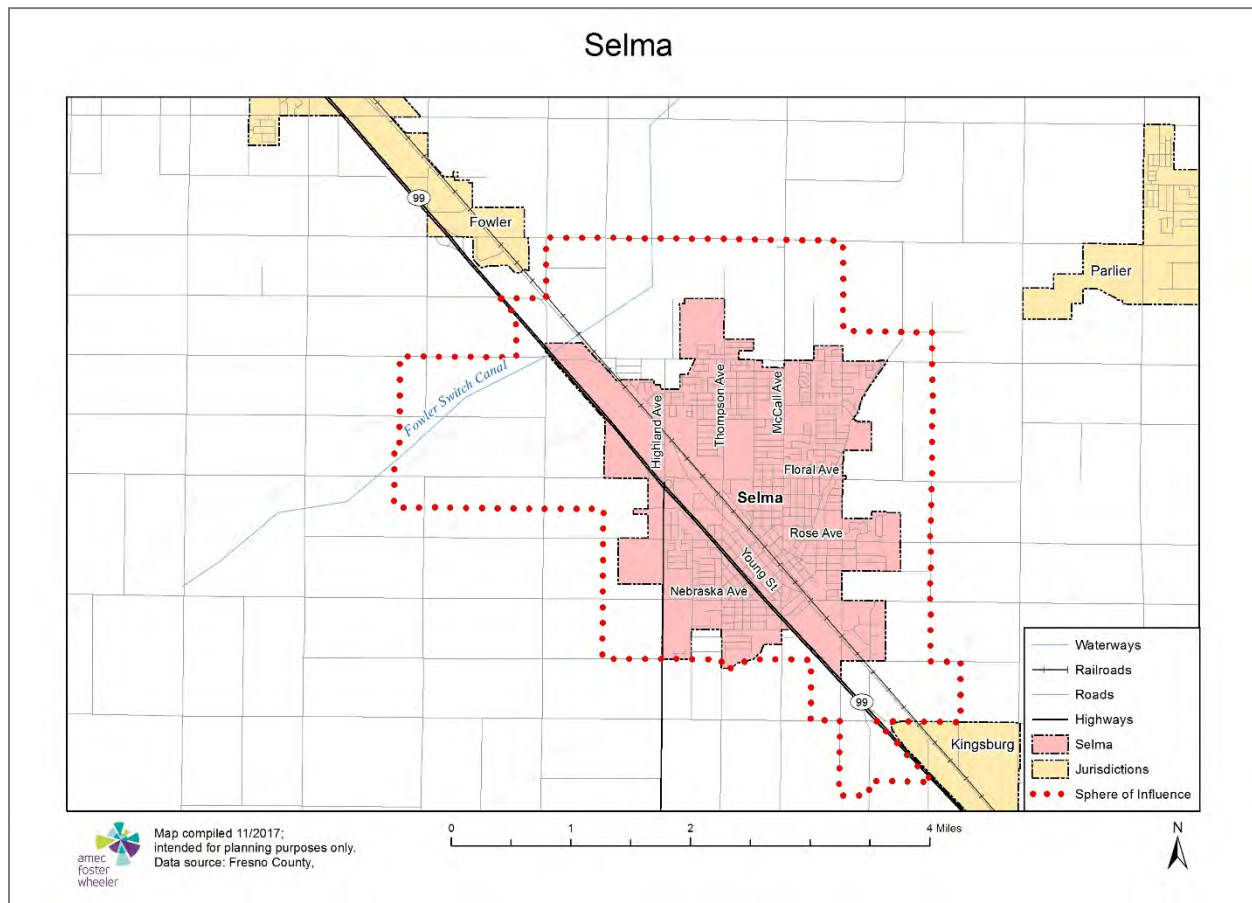


ANNEX J: CITY OF SELMA

J.1 Community Profile

Figure J.1 displays a map and the location within Fresno County of the City of Selma and its Sphere of Influence.

Figure J.1: The City of Selma



J.1.1 Geography and Climate

The City of Selma is located in the central San Joaquin Valley in Fresno County and is about 20 miles west of the Sierra Nevada Mountains. Selma is 19 miles south of the City of Fresno at the crossroads of State Highways 99 and 43. A major, busy railroad line runs diagonally through the City and parallel to State Highway 99. Neighboring communities include Kingsburg (5 miles south), Fowler (8 miles northwest), and Reedley (12 miles northeast). The City and its Sphere of Influence occupy an 8,194-acre area; the City alone comprises 3,316 acres. Over the past decade the City's boundaries have changed minimally, with only a small annexation of land in the southwestern portion of the City's Sphere of Influence. The landscape is generally flat.

The climate is mild year-round with average summer daytime highs in the 90s and winter daytime lows in the 40s. The summer months are very dry, while the winter months get the most rainfall and moisture. Selma's average yearly rainfall is approximately 11.2 inches.

J.1.2 History

Selma was founded in 1893 as an incorporated, agricultural-based city because of the area's mild and temperate climate and the presence of a Southern Pacific Railroad line.

J.1.3 Economy

Much of the area's economy is agriculturally based. The City of Selma is known as the Raisin Capital of the World because the area has numerous vineyards that produce raisins and supporting packing companies. Other local produce includes tree fruits such as peaches. The retail industry in the City of Selma is growing. The leaders in retail sales include large car dealerships, building material and farming implement establishments, and other general retailers. The retail sales increase is due to population growth, Selma's incorporation into the Fresno metropolitan area, and the volume of people that pass through the City on its major highways. Select estimates of economic characteristics for the City of Selma are shown in Table J.1.

Table J.1: City of Selma's Economic Characteristics, 2016

Characteristic	City of Selma
Families below Poverty Level	20.9%
All People below Poverty Level	23.1%
Median Family Income	\$45,303
Median Household Income	\$41,086
Per Capita Income	\$15,686
Population in Labor Force	10,430
Population Employed*	9,195
Unemployment	11.6%
Number of Companies	7,100

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables J.2 and J.3 show how the City of Selma's labor force breaks down by occupation and industry based on estimates from the 2016 American Community Survey.

Table J.2: City of Selma's Employment by Occupation, 2016

Occupation	# Employed	% Employed
Natural Resources, Construction, and Maintenance Occupations	2,203	24.0
Sales and Office Occupations	1,957	21.3
Service Occupations	1,776	19.3
Production, Transportation, and Material Moving Occupations	1,700	18.5
Management, Business, Science, and Arts Occupations	1,559	17.0
Total	9,195	100.0

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

Table J.3: City of Selma's Employment by Industry, 2016

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	1,752	19.1
Agriculture, Forestry, Fishing and Hunting, and Mining	1,392	15.1
Retail Trade	1,024	11.1
Manufacturing	925	10.1
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	723	7.9
Public Administration	649	7.1
Construction	573	6.2
Wholesale Trade	540	5.9
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	497	5.4
Transportation and Warehousing, and Utilities	386	4.2
Finance and Insurance, and Real Estate and Rental and Leasing	322	3.5
Other Services, Except Public Administration	317	3.4
Information	95	1.0
Total	9,195	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

J.1.4 Population

The population was estimated at 24,597 in 2016 with a population density of 4,758 people per square mile. Select demographic and social characteristics for the City of Selma from the 2016 American Community Survey are shown in Table J.4.

Table J.4: City of Selma's Demographic and Social Characteristics, 2016

Characteristic	City of Selma
Gender/Age	
Male	50.0%
Female	50.0%
Median age	30.7
Under 5 years	8.0%
Under 18 years	30.4%
65 years and over	11.4%
Race/Ethnicity*	

Characteristic	City of Selma
White	73.7%
Asian	5.2%
Black or African American	0.4%
American Indian/Alaska Native	0.8%
Hispanic or Latino (of any race)	80.7%
Education	
High school graduate or higher	61.1%
Disability Status	
Population 5 years and over with a disability	9.7%

Source: U.S. Census Bureau American Community Survey 2012-2016 5-Year Estimates, www.census.gov/

*Of the 95.7% reporting one race

J.2 Hazard Identification and Summary

Selma’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Selma (see Table J.5). In the context of the plan’s planning area, there are no hazards that are unique to Selma.

Table J.5: City of Selma—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Unlikely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Medium
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Medium
Tornado	Extensive	Unlikely	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Low
<div> <div> Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area </div> <div> Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years. </div> <div> Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid </div> <div> Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact </div> </div>				

J.3 Vulnerability Assessment

The intent of this section is to assess Selma’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Selma’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Selma.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table J.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Selma’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table J.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Selma are identified below. The discussion of vulnerability related information for each of the following hazards is located in Section J.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include drought and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incidents
- human health hazards: epidemic/pandemic*
- severe weather: extreme cold; extreme heat; fog; heavy rain/thunderstorm/hail/lightning; windstorm*

***Note:** Epidemic/pandemic and windstorm are considered Medium priority hazards by the City of Selma but are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to these hazards.

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Selma, those Low priority hazards are as follows:

- human health hazards: West Nile Virus
- landslide
- severe weather: tornado; winter storm
- soil hazards
- volcano
- wildfire*

Note*: Wildfire is of High significance for the County, but is of Low significance to the City because there are no structures within the City or its Sphere of Influence that are at risk to any fire severity zones. For more information about how wildfire affects the County as a whole, see Chapter 4 Risk Assessment in the main plan.

Additionally, the City's planning team decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and probability of occurrence. **Avalanche** is considered not applicable to the City of Selma.

J.3.1 Assets at Risk

This section considers Selma's assets at risk, including values at risk; critical facilities and infrastructure; historic, cultural, and natural resources; and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City, as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern

or at risk. Generally, the land itself is not a loss. Table J.6 shows the 2017 values at risk broken down by property type for the City of Selma.

Table J.6: 2017 Property Exposure for the City of Selma by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	3	2	\$2,381,240	\$2,381,240	\$4,762,480
Commercial	351	590	\$152,581,224	\$152,581,224	\$305,162,448
Exempt	30	89	\$0	\$0	\$0
Industrial	95	134	\$28,998,925	\$43,498,388	\$72,497,313
Multi-Residential	407	838	\$66,139,922	\$33,069,961	\$99,209,883
Residential	4,903	5,796	\$520,672,552	\$260,336,276	\$781,008,828
Total	5,789	7,449	\$770,773,863	\$491,867,089	\$1,262,640,952

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. An inventory of critical facilities in the City of Selma from Fresno County GIS is provided in Table J.7 and mapped in Figure J.2. This is the information that was used for mapping and analysis purposes.

Table J.7: City of Selma's Critical Facilities

Critical Facilities Type	Number*
CalARP	2
Colleges & Universities	1
Fire Station	2
Health Care	2
Nursing Home	1
Police	1
School	11
Sheriff	1
Urgent Care	1
Total	22

Source: Fresno County, HIFLD 2017

Figure J.2: City of Selma's Critical Facilities

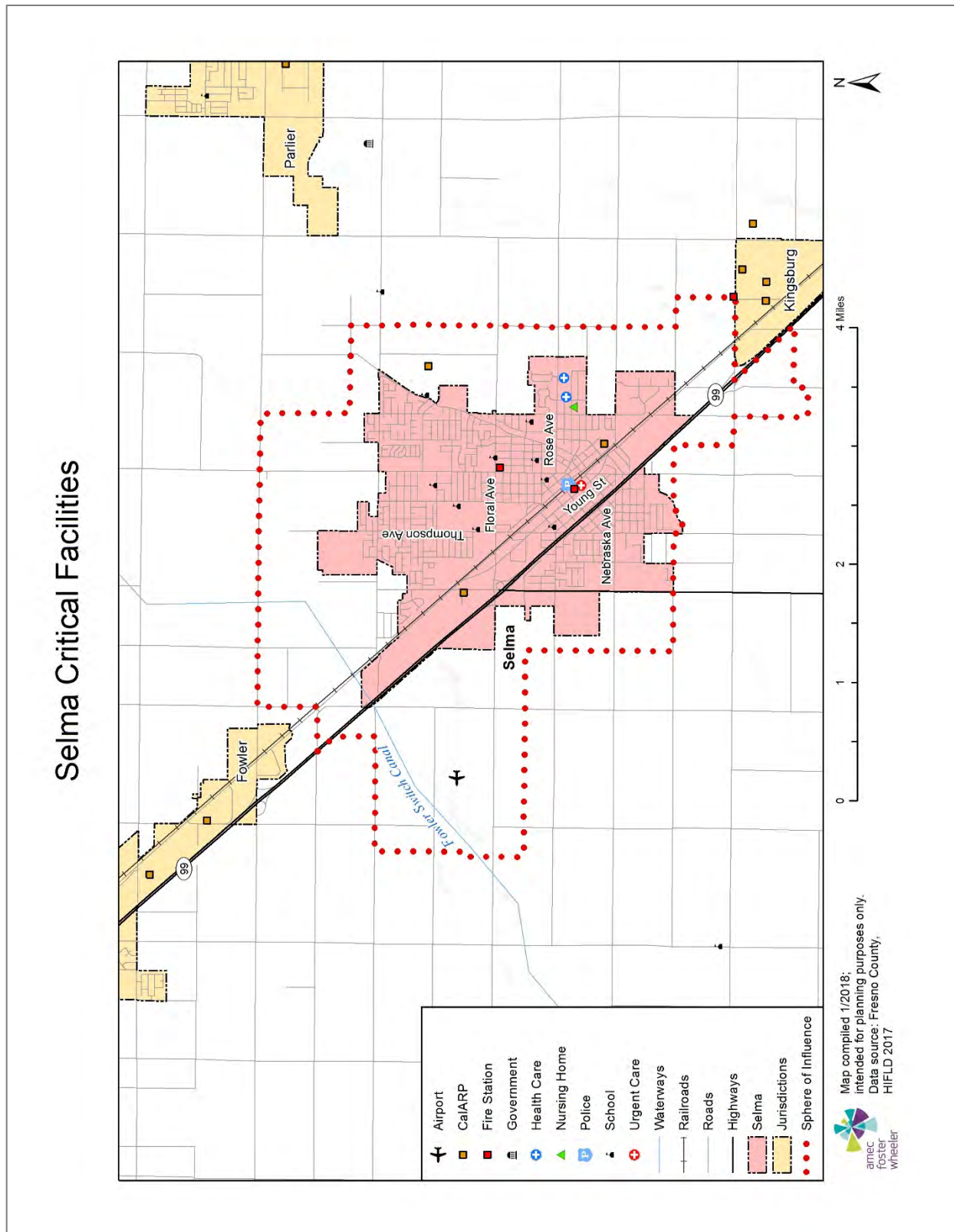


Table J.8 lists particular critical facilities and other community assets identified by Selma's planning team as important to protect in the event of a disaster.

Table J.8: Specific Critical Facilities and Other Community Assets Identified by City of Selma Planning Team

Name of Asset	Replacement Value (\$)	Occupancy/ Capacity #	Hazard Specific Info
Police Department	1,700,000	51	Located next to a railroad track, which is parallel to a gas line also.
Fire Station 2	1,400,000	6 on duty 21 total	
Fire Station 1	1,400,000	4 on duty	Located within half a block of a railroad track and a gas line.
Selma Community Hospital	45,000,000	500	Hazardous materials located within
City Hall	4,500,000	74 seated/ 159 standing	Located within a block of a railroad track and a gas line
Fire Administration Bldg.	584,246	50	
Senior Center	1,200,000	232	
Public Works Yard	1,500,000	16	Hazardous materials located within

The City has four major medical facilities: Selma Community Hospital has 60 beds (including a 15-bed emergency wing), Kaiser Permanente Medical Clinical has an outpatient treatment facility, Bethel Lutheran Home has 87 beds, and Selma Convalescent Home has 34 beds.

The City is planning to build a new police headquarters and will remodel the fire station #2 to accommodate more employees within the next three to five years.

Historic, Cultural, and Natural Resources

There are no registered state or federal historical sites in the City, although Pioneer Village is a historically based village where many community events are held. The City of Selma has some environmentally sensitive areas, which include Rockwell Pond and the Young Pondering area.

Growth and Development Trends

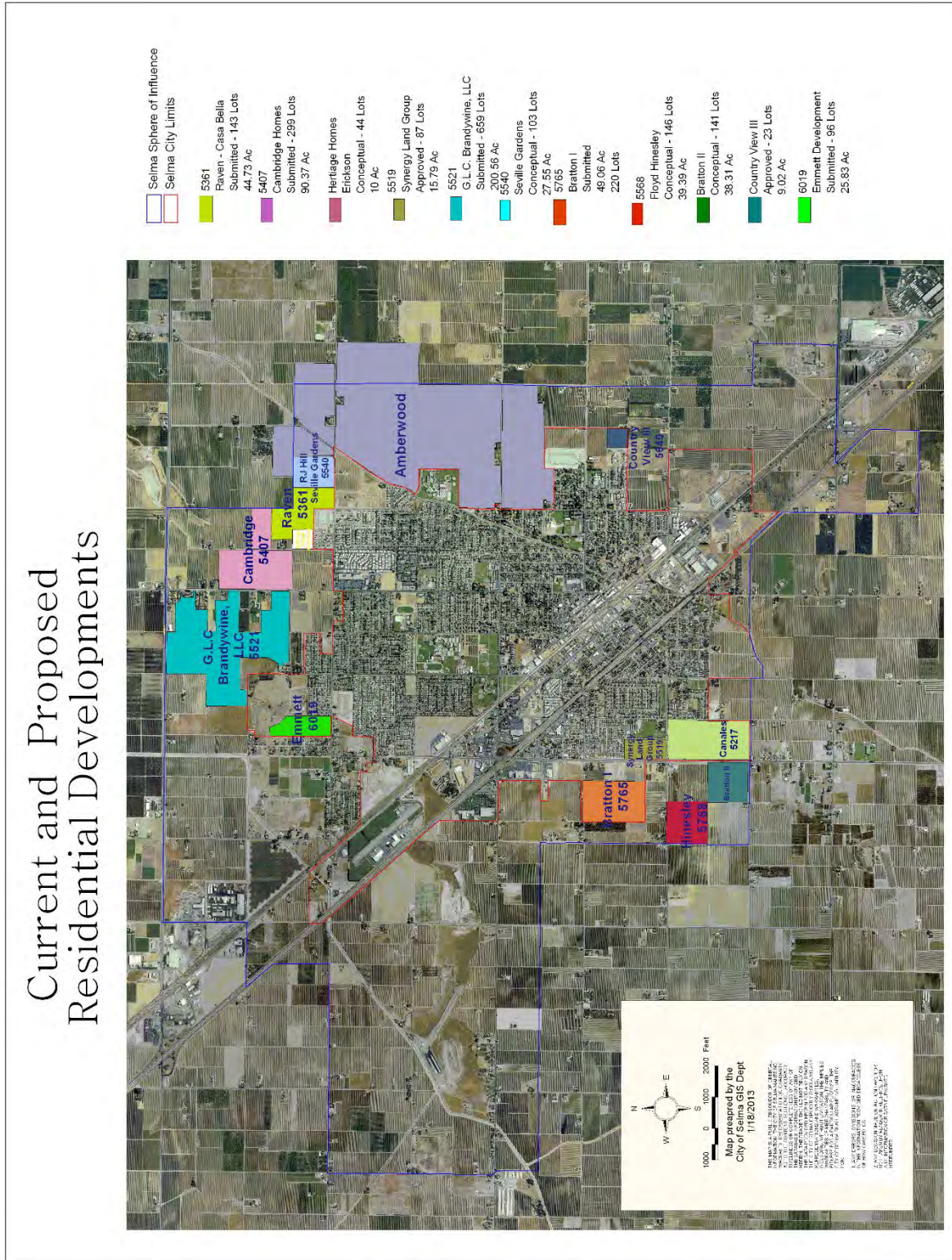
Selma is growing at a rapid pace and is likely to continue this trend for many years. Figure I.3 shows the location of new development in the City. Table J.9 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2015.

Table J.9: City of Selma's Change in Population and Housing Units, 2010-2015

2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2000 # of Housing Units	2007 Estimated # of Housing Units	Estimated Percent Change 2010-2015
23,219	24,017	3.44	6,813	6,984	2.51

Source: American Community Survey 2011-2015 5-Year Estimates, U.S. Census Bureau 2010 Decennial Census

Figure J.3: Proposed Development in the City of Selma



Currently, there are no manufactured housing developments in Selma and there are no planned housing developments that would be located in specified flood hazard areas or in areas with unstable soil. One possible development of concern may be the Tutelian Commercial Project that is located adjacent to the Rockwell Pond, which accepts stormwater runoff from the City. However, the grading and drainage plan will mitigate any localized flooding issues or other issues associated with Rockwell Pond.

More general information on growth and development in Fresno County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

J.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table J.6 above shows Selma’s exposure to hazards in terms of number and value of structures. Fresno County’s assessor’s data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Agricultural Hazards

Although there is not much agriculture in the City limits, the surrounding areas are mostly agricultural land. The City of Selma is greatly affected by any agricultural hazard, because the economy is largely based on this industry. Besides the obvious extreme weather hazards, such as drought, flood and heavy rains, and extreme heat, other agricultural hazards could be a major impact on Selma. Hazards such as pests on certain crops could be a major issue for the economy. Past pests on crops have cost millions of dollars in damage and have included the glassy-winged sharpshooter, olive fruit fly, and red imported fire ant. Other hazards from agriculture itself include air pollution, water shortages, and hazardous materials spills.

Fresno County is one of the top counties in the nation in poor air quality. Often, citizens of the County have a higher chance of having respiratory problems, including asthma in children, than others in the United States. Each year, air quality is also responsible for crop losses. Water shortages are becoming a problem in the area, and crop irrigation, which is necessary to support the industry and thus the economy, adds to the problem. Agricultural sites that store hazardous materials that are close to the City could affect the City directly in the event of a spill or explosion.

Dam Failure

According to the City's 1991 Safety Element, information from the U.S. Army Corps of Engineers, California Office of Emergency Services, and Fresno County indicated that Selma would be in extreme danger in the event of a complete dam failure at Pine Flat Dam at a time that the facility is at full capacity. This would be a worst-case scenario and Selma would be located in the center of a floodway approximately 17 miles wide and 8 to 10 feet deep within three hours of the failure. No projections of a lesser extent have been made for this hazard and there has not been a reported past event of dam failure at Pine Flat Dam.

Drought

Drought would mostly affect the economy of Selma by limiting water resources available for the agricultural sector and human consumption. The agricultural sector would need more irrigated water than normal. During drought periods, surface water allocations are reduced which leads to higher groundwater pumping from an already limited aquifer and thereby lowers the water table. Low water levels and water conservation for the area are already an issue, so a drought could impact Selma and its economy greatly.

Previous droughts happened between 1987 and 1992, which was statewide, and 1998-2004 (more of a dry spell than an actual drought). In 2007, there was an attempt to have a local state of emergency declared because of water supply shortages, especially for local farmers. There was also concern for an increase in West Nile virus because the breeding grounds were moving to urban areas with water due to the dry conditions in the rural areas.

The period between late 2011 and 2014 was the driest in California history since record-keeping began. The drought led to Governor Jerry Brown's instituting mandatory 25 percent water restrictions in June 2015. Subsequently, the winter of 2016–17 turned out to be the wettest on record in Northern California, surpassing the previous record set in 1982–83.

Earthquake

The City of Selma is located in Seismic Zone 3. The planning team identified 15 to 25 unreinforced masonry buildings in town, primarily retail buildings in downtown. Specifically, the team identified City Hall and the Police Department as critical facilities that may be vulnerable to seismic events. Although from a historical perspective, the potential for secondary hazards caused by earthquakes have been considered minimal and rare in the Selma area, the potential for liquefaction and ground settlement instabilities are not well known.

There has been some minimal structural damage in the past from earthquakes, in particular the 1983 Coalinga earthquake, which was felt in Selma. The damage done to an unreinforced masonry building was absorbed by the building's owner.

Flood/Levee Failure

Selma has not historically been subject to significant flooding. The mapped flood hazard area for a 100-year event includes one small area in the northwestern part of the City. The special flood hazard area contains 18 homes.

There is often localized flooding during heavy rain events due to the sheer amount of precipitation and the limited capacity of storm drainage system facilities, capacity issues, or failed operation of storm drain pumps. The City of Selma received American Recovery and Reinvestment Act (ARRA) funding to take a majority of the pumps off line and divert runoff from the Consolidated Irrigation District's (CID) canal system to Rockwell pond. The City is also currently working to divert the remaining pump stations to master planned retention basins. The City has prepared emergency response action plans for the remaining pump stations still active. Areas of localized flooding are illustrated in Figure J.4.

According to FEMA's 2016 Flood Insurance Study (FIS), the flood history of Selma is not well documented, but flooding reportedly occurred in the area in 1950, 1958, 1967, 1969, and 1978. In March 1958, nearly two inches of rain in less than a day clogged storm sewers and caused flooding in the central part of the City. In other floods, water has entered basements, sewer lines have backed up, and water has ponded in commercial and residential areas. Streets, lawns, and basements have been damaged; traffic has been disrupted; businesses have closed temporarily; and flood fighting has been necessary. Flooding has generally been short in duration (ponded areas being exceptions) and most damage has been considered minor.

More recently there has been major damage and some localized flooding from storms:

- **May 2005**—Drainage ditch almost overflowed; localized street flooding occurred.
- **January 2006**—Heavy rain caused much damage to homes and businesses in Selma.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Selma was created (see Figure J.5). Table J.10 summarizes the values at risk in the City's 100-year floodplain as well as loss estimates for the 1 percent annual chance flood event.

Figure J.4: City of Selma Hazard Mitigation Flooding Intersections

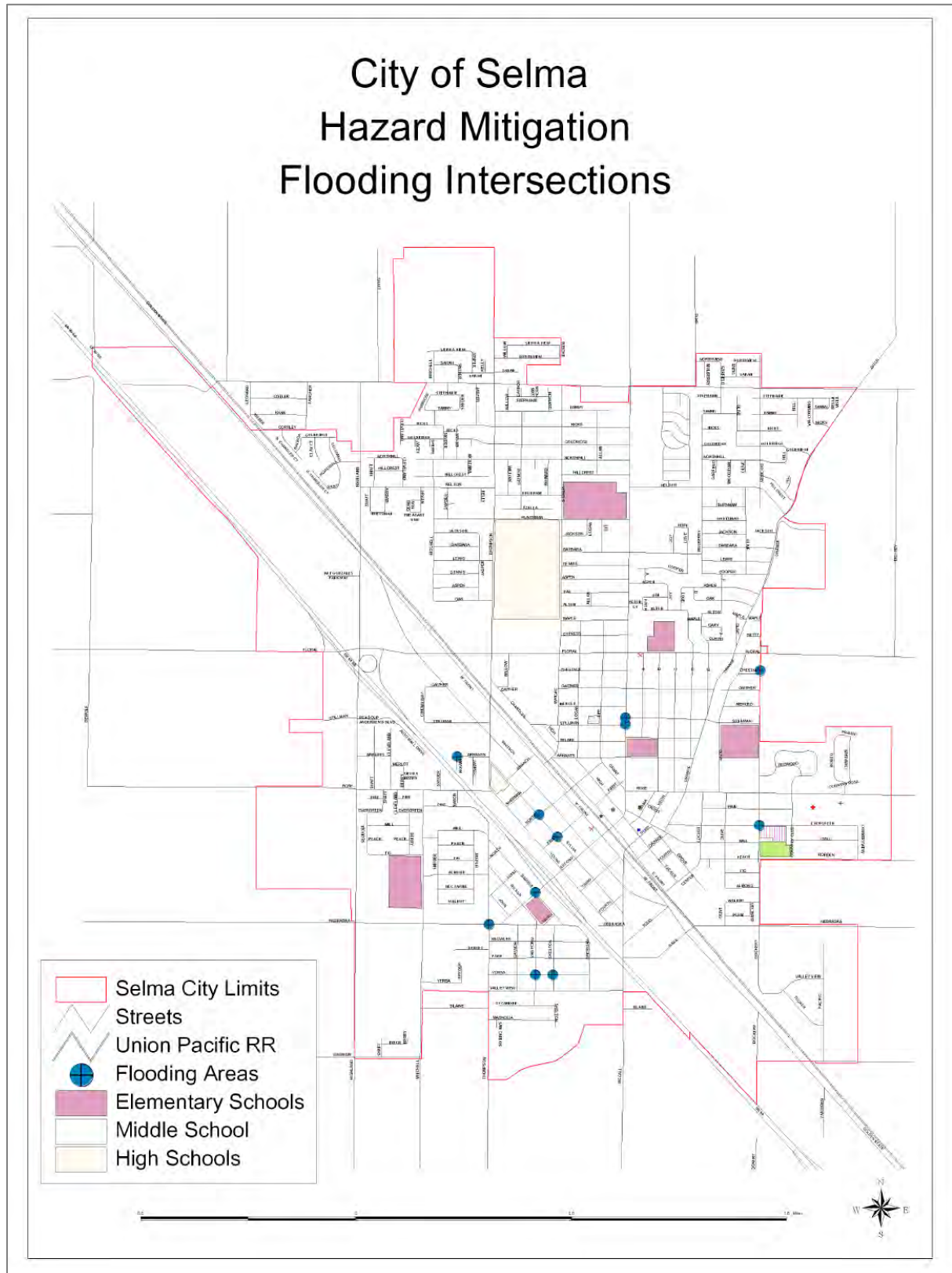


Figure J.5: City of Selma's 100-Year Floodplains

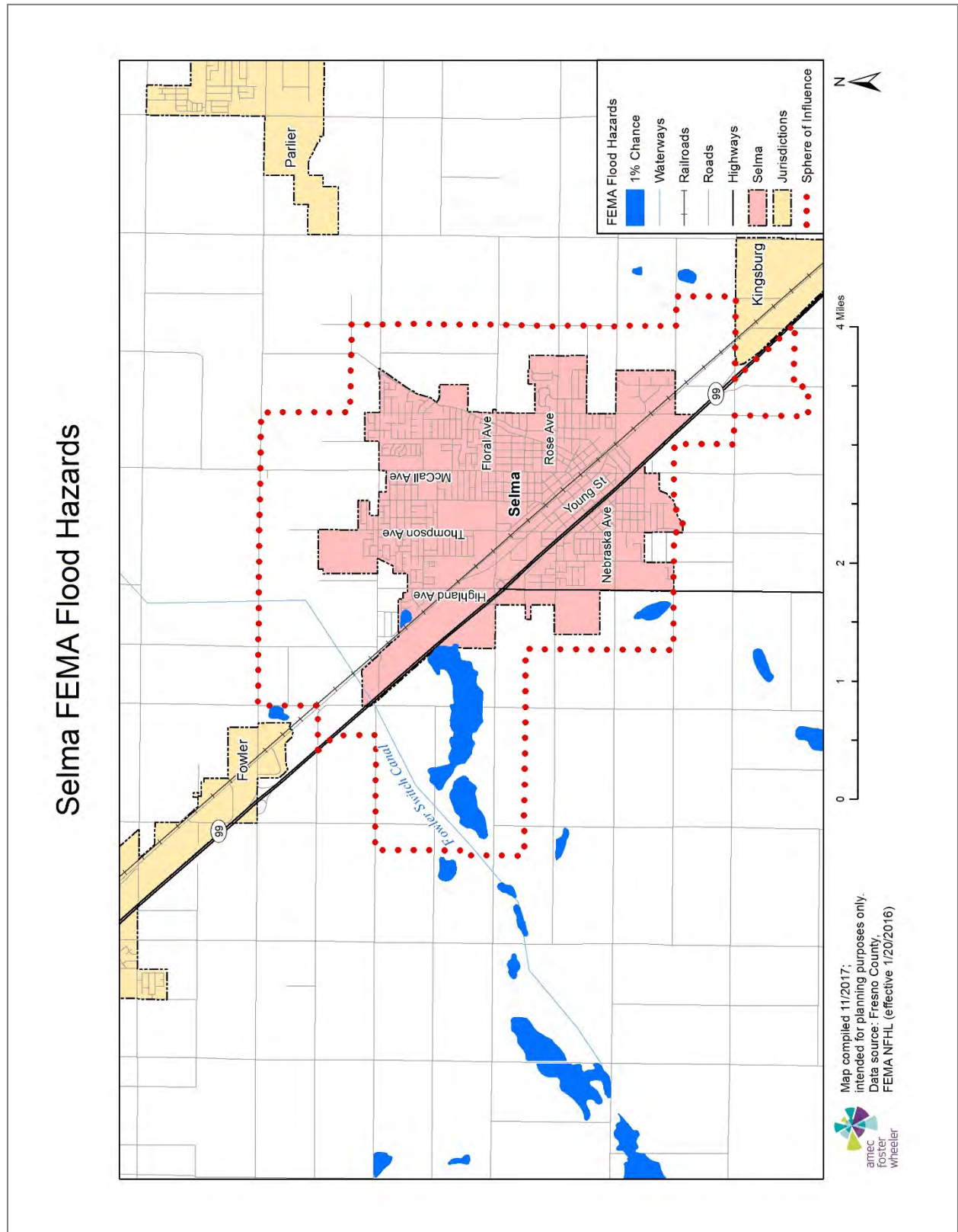


Table J.10: City of Selma's FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Residential	16	18	\$1,953,999	\$977,000	\$2,930,999	\$732,750
Total	16	18	\$1,953,999	\$977,000	\$2,930,999	\$732,750

Sources: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Selma does have assets at risk to the 100-year flood. There are 16 improved parcels located in the 100-year flood hazard area for a total value of roughly \$2.9 million. There are no additional improved parcels in the 500-year floodplain.

Applying the 25 percent damage factor as described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year (or 500-year) flood causing roughly \$732,750 in damage in the City of Selma.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Selma has a flood insurance rate map but is not currently participating in the National Flood Insurance Program. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the average number of persons per household (3.17). The following are at risk to flooding in the City of Selma:

- 100-year flood—51 people
- 500-year flood—0 people
- Total flood—51 people

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. According to data from Fresno County GIS and the digital flood insurance rate map, there are no critical facilities in Selma's flood hazard area.

Hazardous Materials Incident

Two major transportation arteries of statewide significance traverse Selma—a main line of the Southern Pacific Railroad and State Highway 99. These routes are both heavily used and are frequently used to transport hazardous materials that could represent a risk to the community if involved in a transportation accident. Land uses along the transportation routes are diverse. Of specific concern is the Police Department, which is located just a few feet from the railroad line and is the old train depot. One of the two fire stations is located one street way. Other areas of concern related to train derailment include the buried pipes and utilities that run along the tracks, poor crossings, and grade separation. Another transportation hazard is a small, two runway, privately owned airport located two miles northwest of Selma that provides service to private planes.

The planning team identified two plane crashes and two major transportation-related hazardous materials spills in the past:

- **January 1991**—Three big trucks, one loaded with toxic chemicals, collided on Highway 99 in Selma. This collision caused an explosion that closed down the highway and killed two people and injured a third. A nearby elementary school was closed the day after the accident.
- **October 1996**—A freight train carrying household paint, batteries, compressed gas cylinders, and pesticides derailed north of Selma spilling 100 gallons of diesel fuel. There were no injuries; five area residents were evacuated.
- **November 2000**—A plane crash at the Selma Airport resulted in one death and critically injured one person.
- **January 2008**—A single plane crash on the edge of the City limits resulted in one death.

There are two CalARP hazardous materials facilities located in the City of Selma. As identified in Table J.11, there are five critical facilities in Selma located within a half mile of a CalARP facility.

Table J.11: Critical Facilities within ½ mile of CalARP Facility: City of Selma

Critical Facility Type	Count
Fire Station	1
Nursing Home	1
Police	1
Sheriff	1
Urgent Care	1
Total	5

Source: Fresno County, HIFLD 2017

Severe Weather: Extreme Cold/Freeze

The City of Selma experiences freezes that mostly affect the agricultural economy of Selma. Extreme cold also increases the energy demand, poses a threat to human health, and can cause damage to underground water piping throughout the City. Past freezes occurred in, 1990, 1991, 1998, and 2007. Warming centers were opened up for many of these freezes to help the public.

- **1991 and 1990**—These freezes caused catastrophic damage to the crops in the San Joaquin Valley and received presidential disaster declarations.
- **December 1998**—A freeze, accompanied by black ice and snow, caused numerous vehicle accidents in the area and required response from Selma’s public safety services. The freeze was also devastating to the valley’s agricultural sector and resulted in a presidential disaster declaration.
- **January 11-17, 2007**—This freeze, which received a presidential disaster declaration, had a huge economic impact on the City of Selma and many human service resources were used throughout the rest of the year. Impacts included crop damage and unemployment.
- **December 2016**—California growers spent over \$25 million in December to protect their crops from a post-rain cold snap. Though it was cold in the San Joaquin Valley – down to 23 degrees in parts of the of the Valley, according to the National Weather Service – it wasn’t the ice-box along the eastern foothills from Fresno County to Kern County.

Severe Weather: Extreme Heat

Extreme heat events are primarily an issue of human health in Selma, particularly for the homeless, senior citizens, agricultural workers, people with decreased health status, and lower income citizens. Along with the extreme heat comes worsened air quality for the Central Valley region, which increases the chances of respiratory emergencies. Other major impacts of extreme heat events are agricultural losses, which affect the local economy in Selma, and increased water and energy demand, which results in increased operating costs.

The City operates cooling centers and uses the Connect CTY, a computerized telephone and e-mail notification system, to notify people of the issue and locations of the centers. The City also provides a transit system that can take citizens to the cooling centers. Summer temperatures in Selma can exceed 105°F and usually occur for a few days in a row, which is when cooling centers are opened. The Senior Center keeps a list of older adults to check up on, which is very helpful during this type of emergency as well as others.

Cooling centers were opened for extreme heat in Selma in 2007 and 2005. Other extreme heat years include 2016, 2015, 2014, 2003, 2002, and 1999. In mid-July 2006, a stretch of days with 100°F plus temperatures damaged crops, especially tomatoes, tree fruit, and grapes. It also led to a sharp increase in the number of mosquitoes infected with West Nile virus in the valley. The time period of January 2016 through December 2016 was the 3rd warmest year on record for California,

according to NOAA’s National Centers for Environmental Information (NCEI). California saw 2014 as the warmest year on record.

Severe Weather: Fog

Fog is a yearly occurrence around Selma and is a hazard that the City of Selma has learned to respond to. The City itself has fog that reduces visibility and can cause vehicle accidents. In addition, Selma’s public safety personnel often have to respond to major accidents on the highways around Selma. This drains the local resources away from the City.

To try to combat this issue, the Selma Unified School system is on a “foggy day” schedule, which entails starting school later in the morning after a fog has lifted. Also, the California Highway Patrol and California Department of Transportation work together on public education, press releases, pace cars, and signs for safer highway driving.

Some major accidents in the area attributed to fog include the following:

- **November 26, 1989**—21 vehicle pileup on Highway 99 near Selma, 14 people injured
- **January 23, 1990**—60+ vehicle pileup on Highway 99 north of Selma, five deaths
- **February 7, 1991**—Multiple vehicle pileup on Highway 99 between Selma and Fresno, three deaths, 30 people injured
- **January 1994**—56 vehicle pileup on Highway 99 near Selma, two deaths, 42 people injured
- **November 1998**—74 vehicle pileup on Highway 99, two deaths, 51 people injured
- **November 2000**—Small private plane crash, 1 death, 1 critically injured person
- **February 2002**—87 vehicle pileup on Highway 99 near Selma, three deaths, 51 people injured
- **November 2007**—102 vehicle pileup on Northbound Highway 99, two deaths, over 30 people injured
- **January 2017**—At least 40 vehicles were involved in multiple crashes in dense fog on Highway 198 in Kings County

Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning

There has been major damage and some localized flooding from storms during February 1992, February 1998, April 1999, May 2005, January and March of 2006, and January and February of 2017(see also Flood section above).

- **February 1992**—The City of Selma’s ambulance resources were used to respond to four accidents in a chain-reaction on Highway 99 due to heavy rain and hail. There were 12 vehicles involved in these near Fowler with only minor injuries to 12 people and no deaths.
- **February 1998**—A storm downed trees and power lines, damaged cars and homes, and caused power outages.

- **April 1999**—A week of cold, wet, and windy weather with hail caused some crop damage in the area.
- **May 2005**—A ditch almost overflowed, localized street flooding was reported, and houses were struck by lightning.
- **January 2006**—Heavy rains caused much of the damage to homes and businesses.
- **March 2006**—Extreme winds caused much of the damage, especially to a mobile home park.
- **January 2017**—In Fresno County, west of Selma, the intersection of Clovis Avenue and Conejo intersection flooded with several inches of water all across the road.
- **February 2017**—Heavy, persistent rainfall across northern and central California created substantial property and infrastructure damage from flooding, landslides and erosion

J.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Selma's updated capabilities are summarized below.

J.4.1 Regulatory Mitigation Capabilities

Table J.12 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Selma.

Table J.12: City of Selma's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	2010, currently being updated

Regulatory Tool	Yes/No	Comments
Zoning ordinance	Yes	March 2008, currently being updated
Subdivision ordinance	No	
Site plan review requirements	Yes	Title XI, chapter 20.1
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (storm water, water conservation, wildfire)	Yes	Water conservation ordinance adopted but cannot enforce Title VIII, chapter 9
Building code	Yes	2016 California Building Standards Code
Fire department ISO rating	Yes	Rating:3
Erosion or sediment control program	No	
Storm water management program	Yes	Title IX, chapter 9 Sometimes cannot keep up with the large volumes that come with winter storms, especially if electricity is lost.
Capital improvements plan	Yes	Title IX
Economic development plan	Yes	2003
Local emergency management plan	Yes	1989
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016
Elevation certificates	No	

City of Selma General Plan, 2010

The City of Selma's General Plan guides the City's development and growth. The Safety, Conservation and Open Space, and Safety, Public Services, and Facilities elements contain goals and policies related to mitigation. These mitigation-related goals and policies are included below.

Safety Element

The Safety Element was adopted to provide for the protection of residents of the Selma community from natural and manmade hazards. It identifies a range of hazards to life and property to which the City and its residents are subject. The goals for protection of life and property are common to each hazard and are, therefore, presented as the overall goals of the Safety Element.

Goals

- To prevent loss of life and serious injury, resulting from natural or manmade hazards, to the residents of the City of Selma.
- To prevent serious structural damage to critical facilities and structures where large numbers of people are expected to congregate at one time.
- To ensure the continuity of vital services to the Selma area in case of disaster.
- To provide a leadership role in education on public safety.

Hazard Specific Objectives and Policies

Seismic Safety Objectives

- Identify risks to the City of Selma from seismic hazards.

- Establish and maintain a plan to minimize identified risks from seismic hazards.
- Establish and maintain a plan for responding to seismic disaster and for the provision of emergency services.
- To adopt a Seismic Impact Transportation Plan reflecting primary and secondary disaster access routes and designating appropriate evacuation routes.

Seismic Safety Policies

- The Safety Element shall be reviewed and updated periodically. Upon adoption of the Interim Safety Element, the City should review and update the plan within one year and every five years thereafter.
- The City shall develop and adopt an Emergency Operations Plan which shall include action plans in the event of an earthquake disaster. Emergency evacuation routes should be included in the plan.
- The City shall maintain and continue to update, with the County of Fresno and other agencies, an Emergency Services Plan. Included in the plan should be:
 - Provision for control and direction of emergency operations.
 - Provision for continuity of governmental services.
 - Program to coordinate the repair and restoration of essential systems and services.
 - Coordination of emergency operations with other jurisdictions,
- The City should establish an inspection program to identify and inventory all existing unreinforced masonry structures in the City.
- The City should implement a program to abate all identified dangerous buildings.
- Emergency communication centers, fire stations, and other emergency service or critical facilities should be examined to determine earthquake resistance. A program to mitigate deficient facilities should be established.
- Emergency procedures should be identified for public and private utility districts.
- Primary and secondary hazards from seismic activity should be evaluated in all environmental assessment and reporting processes.
- The list of critical facilities for the City of Selma in Appendix D of the Summary and Policy Recommendations of the Five County Seismic Report, shall be reviewed and updated.
- Critical facilities shall be designed to the standards established by the Uniform Building Code for such facilities. Critical facilities means essential facilities as provided in the Uniform Building Code.
- The City shall continue to adopt current issues of the Uniform Building Code and implement the seismic design standards provided by the Code.
- Seismic safety information should be made available to the general public. School districts and agencies related to aged, handicapped, and seismically susceptible industries should be encouraged to develop education programs for seismic awareness.
- The Technical Report of the Five County Seismic Study should be made available to planning projects in the City of Selma.

- The Seismic Impact Transportation Plan designates the following disaster transportation routes.

Geological Safety Objectives

- To provide a safe environment for building construction through knowledge and understanding of soil and land resources.

Geological Safety Policies

- Detailed mapping and analysis of identified areas of geologic hazard shall be provided. Areas identified with a “severe” rating for allowable soil pressures or high corrosivity soil characteristics should be mapped for City staff use in new development project consideration.
- Continue to enforce the Uniform Building Code in all matters related to soil preparation and foundation requirements.

Flood Safety Objectives

- Minimize the hazards of localized sheet flooding resulting from prolonged rainfall and stormwater runoff.
- Promote and become instrumental in coordinating the inclusion of a dam failure component to a regional disaster plan.

Flood Safety Policies

- The City of Selma shall evaluate territories within its sphere of influence to identify areas of potential localized flood hazards.
- In areas identified as being potentially subject to flooding, where the exact area and depth of flooding is uncertain, the applicant or developer of an annexation or development proposal shall be responsible for the preparation of a civil engineering report evaluating the flooding potential.
- The City of Selma shall continue to implement and administer the Master Plan for Storm Drainage as a means of offsetting increased storm water runoff from urbanization.
- The City of Selma shall seek and petition the County of Fresno, Council of Fresno County Governments, and other agencies and cities impacted by potential dam failure to participate in the completion of a disaster plan dealing with dam failure.
- The City shall prepare a local emergency evacuation plan responding to the complete failure of Pine Flat Dam at peak capacity. The evacuation plan shall be coordinated with other responsible and impacted jurisdictions.

Transportation Safety Objectives

- To maintain a responsive City staff trained in hazardous materials incidents.
- To maintain a safe relationship between major transportation routes and urban land uses.
- To provide for land use safety in areas influenced by airports.

Transportation Safety Policies

- The City shall consider the impacts of potential transportation hazards upon adjacent land uses when considering proposals for new or changed urban uses.
- New public use buildings, such as, schools and hospitals, should be located a minimum of 1,000 feet from mainline rail or freeway routes.
- The City shall continue to staff, train, and equip an emergency response team to respond and coordinate public safety activities. The Selma Fire Department is designated as the City's emergency response team for hazardous materials incidents.
- The City shall continue to implement the airport land use plan for the Selma Aerodome.
- New public use buildings should not be located within the flight path or approach zone of airports.
- Adopted new speed survey

Hazardous Materials Safety Objectives

- To reduce and control the effects of hazardous wastes so as to promote the public health and welfare of the Selma community.

Hazardous Materials Safety Policies

- To coordinate and cooperate with other local, state, and federal agencies with expertise and responsibility for all aspects of hazardous wastes.
- To educate the public on the subject of hazardous wastes.
- To ensure that disaster planning for the City of Selma includes policies appropriate to problems associated with hazardous wastes.

Conservation and Open Space Element

This element provides guidance through policies, plans, and programs on the location and design of open space in the community and in the conservation and usage of natural resources.

Goals

- Protect the environment.
- Provide for the usage of natural resources without causing their premature depletion.
- Preserve prime agricultural land.
- Preserve groundwater quality and reduce overdraft conditions.
- Eliminate potential for soil erosion or degradation of its agricultural productivity.
- Limit potential threats to human health and property, which may result from natural environmental hazards.

Policies

- Areas with high erosion potential or soil instability which cannot be mitigated shall be designated for open space land uses.
- Channel and slope modification shall be discouraged where they increase the rate of surface runoff and increase the potential for erosion.
- The City shall endeavor to mitigate, to the fullest extent possible, activities which will exacerbate groundwater overdraft.
- To the fullest degree possible, prime agricultural land shall be preserved for agricultural uses only.
- Maintain Rockwell Pond as both a resource management area (water recharge) and community open space.
- Require correction of local stormwater ponding conditions prior to development in such areas, either through off-site improvements provided by land developers, or through community storm drain facility capital improvement projects.
- Require soil studies in localized areas known to have expansive or unstable soils.

Safety, Public Services, and Facilities Element

Goals

- Reduce the threat to persons and property resulting from natural and manmade hazards including fire, crime, and flooding.
- Provide a safe and sanitary physical environment.
- Undertake required improvements of the sewer and storm drainage systems.

Policies

- Capital improvements shall be undertaken to eliminate existing flooding problems.
- The adopted Urbanizing Area Master Plan for Storm Drainage shall be utilized to determine adequate facilities for new development.
- All new developments shall be required to have community sewer, water, and stormwater systems.

Water Conservation Ordinance

The purpose of the Water Conservation Ordinance of the City of Selma is to minimize outdoor water use, control unnecessary water consumption, and to conserve water in landscaping to preserve the available potable water supply of the City. It prohibits waste of water as defined in the ordinance, sets water conservation stages for outdoor water use, and establishes design criteria for water conservation in landscaping.

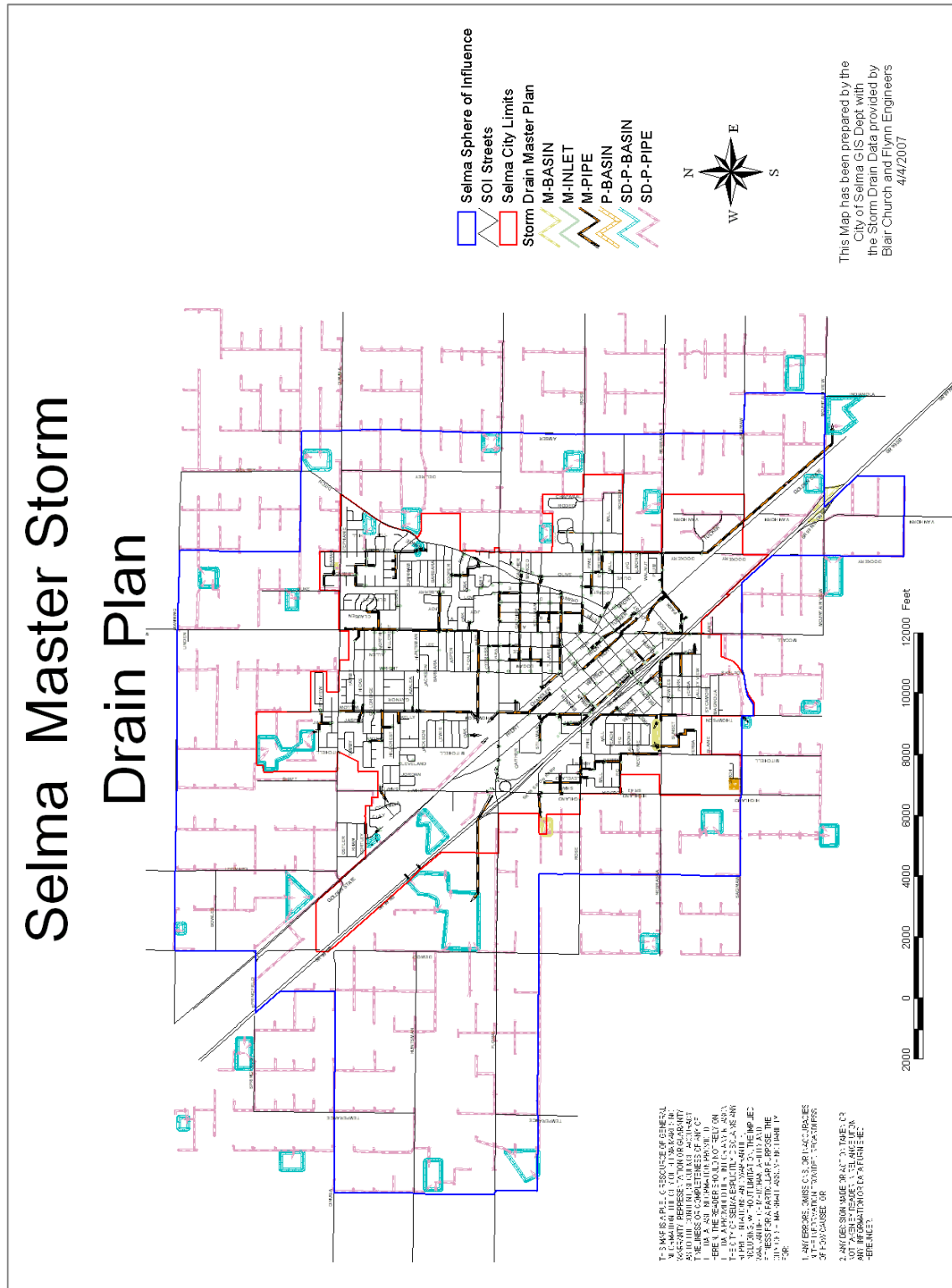
City of Selma Emergency Operations Plan, 1989

The City of Selma Emergency Operations Plan Emergency provides guidance for City response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations. The Basic Plan provides an overview of operational concepts, identifies components of the City Emergency Management Organization, and describes the overall responsibilities of federal, state, County, and City entities. Response and recovery functions, as well as specific guidelines for accomplishing these functions, are contained in the Functional Annexes.

City of Selma Storm Drain Master Plan

The City of Selma has as storm drain master plan to address localized flooding issues. The plan is illustrated in Figure J.6.

Figure J.6: City of Selma Storm Drain Master Plan



J.4.2 Administrative/Technical Mitigation Capabilities

Table J.13 identifies the personnel responsible for activities related to mitigation and loss prevention in Selma.

Table J.13: City of Selma’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Yes	Community Development Department	Currently hiring senior and principle planners
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Yes	Public Works Department/Engineer	
Planner/Engineer/Scientist with an understanding of natural hazards	Yes	Public Works Department/Engineer	
Personnel skilled in GIS	Yes	GIS Coordinator	
Full time building official	No	Community Development Department; City Manager	
Floodplain Manager	No		
Emergency Manager	Yes	Fire and Police Departments	Low staffing
Grant writer	Yes	Administrative Analyst	
Other personnel	Yes		Multiple roles are covered by city staff
Warning Systems/Services (Reverse 9-11, outdoor warning signals)	Yes	Everbridge	

In Selma, the public is served by a seven department City government, which includes full-time Fire and Police departments. The City is also served by supporting groups of reserve firefighters and “volunteers in policing” that can be used in emergencies or major events. The Selma Fire Department provides ambulance services for the City and outside the City limits, encompassing a total of 150 square miles.

The City of Selma has a mapped Special Flood Hazard Area but does not participate in the NFIP and has been sanctioned since 1975. After weighing the limited number of homes subject to the 1-percent-annual-chance flood hazard against the high cost of being a member of the National Flood Insurance Program (NFIP), City Council determined that it is not in the City’s best interest to participate in the NFIP.

J.4.3 Fiscal Mitigation Capabilities

Table J.14 identifies financial tools or resources that the City could potentially use to help fund mitigation activities. There are currently no specific funding sources for hazard mitigation.

Table J.14: City of Selma’s Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	No	Private or other agencies/governments
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

J.4.4 Mitigation Outreach and Partnerships

The Selma Fire Department provides fire safety education and overall fire prevention. The City of Selma is also developing a public disaster preparedness program that should be functional within the next three to four years.

Existing strengths in the City of Selma are that community and local businesses are very generous in meeting the needs and/or volunteering themselves for community outreach programs and events.

J.4.5 Other Mitigation Efforts

The City of Selma is involved in some targeted mitigation efforts, these include the following:

- The City is currently working on its Disaster Management Plan, education and implementation of the plan throughout City government, and an educational outreach program for the citizens of Selma. This is estimated to take three to four years.
- The City is working on getting a new police headquarters building, which will move the police leadership team away from the railroad tracks, which will hopefully mitigate the impacts that some of the manmade hazards could have on police response resources. Construction is expected to begin within the next three to five years.
- The City has placed secondary points of connection and pads for emergency generators at strategic locations to pump stormwater during a citywide power failure.
- The City is requiring new housing developments to put in better stormwater systems than what was previously required to minimize localized street flooding in those areas.

J.4.6 Opportunities for Improvement Enhancement

Based on the capabilities assessment, the City of Selma has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. The opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Drought Contingency Plan that will help to create a framework for drought response and mitigation in the City of Selma.

J.5 Mitigation Strategy

J.5.1 Mitigation Goals and Objectives

The City of Selma adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. All divisions within the Community Development Department, (Building, Planning and Housing) may utilize the hazard information when reviewing site plans or building permit applications. The Parks Division may utilize the hazard information to better understand the City's vulnerability to drought and how to better maintain the City's parks and landscaped medians in a way that will not exacerbate the effects of drought on the community. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Selma will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

J.5.2 Completed 2009 Mitigation Actions

The City of Selma has not completed any mitigation actions identified in the 2009 plan. However, the City will carry forward, with some revisions, several actions that were deferred due to funding constraints and incorporate them into the mitigation strategy of this plan.

There is one action from the City of Selma's 2009 mitigation strategy that the City has decided not to carry forward and recommend for implementation in this plan. This deleted action and the reason for its deletion is as follows:

- Construct a Railroad Crossing Underpass – project no longer planned by City

J.5.3 Mitigation Actions

The planning team for the City of Selma identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

In addition to implementing the mitigation actions below the City of Selma will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard

seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Institute a Disaster Preparedness Education Program for the Public

Hazard(s) Addressed: Multi-Hazard: dam failure, drought, earthquake, human health hazards, flood, severe weather, wildfire, hazardous materials

Issue/Background: The public of Selma does not have any City-issued disaster preparedness education. Any knowledge they possess is from other sources, such as federal and state government agencies. Special populations targeted for this education are non-English speaking residents, senior citizens, and citizens living at or below the poverty level.

Other Alternatives: Adding a smaller disaster preparedness education program onto the already strong fire prevention program; participation in Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program

Responsible Office: City of Selma Fire and Police departments

Priority (High, Medium, Low): High

Cost Estimate: \$6,500 per year

Potential Funding: The program will be kicked off by an AmeriCorps volunteer (which will not cost the City, monetarily), and the actual program will be funded by donations and some budgeted money from the City of Selma.

Benefits (Avoided Losses): By educating the public in disaster preparedness, the citizens will be better prepared during an actual disaster. This individual preparedness will help save lives and property. This also removes some of the constraints on the City's emergency services, enabling them to do more for residents in the event of a disaster.

Schedule: Within two years (2018-2020)

Status: 2009 project, implementation not yet started

2. Install Back-up Power for Storm Drain Pumps

Hazard(s) Addressed: Multi-Hazard: drought, flood, severe weather, earthquake

Issue/Background: Most of the City of Selma's storm drain pumps do not have back-up power sources. This causes localized flooding when there is heavy rain and power outages, which tend to

go hand and hand during major storms. To alleviate this problem, the City can make use of portable generators for the pumping stations.

Other Alternatives: No action

Responsible Office: City of Selma Public Works Department

Priority (High, Medium, Low): High

Cost Estimate: \$27,540 per generator; the cost of three generators would be \$82,620 (not including fees and taxes)

Potential Funding: City budget, grants

Benefits (Avoided Losses): By having back-up power sources, the storm drain pumps will be able to operate, to avoid localized flooding, in the event of a power failure. This could prevent property damage, including damage to cars parked on the streets. Damage costs could range greatly, but an estimate is \$2,000-\$3,000 per storm without power.

Schedule: Within 3-4 years

Status: 2009 project, implementation not yet started

3. Sheridan Street Pump Station Bypass and Retention Basin

Hazard(s) Addressed: Flood

Issue/Background: There is often localized flooding throughout the City of Selma during large storms. The area that is particularly affected is downtown from Young St. to Highway 99, which starts at Rose Ave. and continues to Second St. (please refer to the localized flooding map in Figure J.4.). There are major intersections and areas that flood during storms with intense rains. This occurs because during rain events when storm water in this area flows into an underground storm drain system that ends up at a pumping station on Sheridan Street. The tributary area also contains a large section of State Highway 99 runoff. This drainage system does not currently have sufficient capacity to handle maximum storm flows. By not having enough capacity, this creates clogging and backflow in the area which causes major localized flooding, including surrounding citizens' properties. This project will bypass the existing pump station and gravity feed runoff into a new master planned retention basin south of Valley View Avenue.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which project will be implemented: The City of Selma Stormwater Master Plan

Responsible Office: Public Works & Caltrans

Priority (High, Medium, Low): High

Cost Estimate: \$4,200,000 total possible, which is comprised of land acquisition, excavation of the retention basin and piping.

Potential funding: City Budget, Storm drain impact fees, Caltrans,

Benefits (avoided Losses): The city can decrease damage caused by localized flooding during every single heavy rain storm. The average potential monetary loss could reach \$9,000 per heavy rain storm which could equal out to more than \$45,000 per year in damages. If an extremely heavy rain were to occur more than the average amount of rain, the extent and cost of damages would be much greater and could reach an upwards to \$700,000 because 35 buildings (mostly homes) have flooding potential damage (up to \$20,000 per building) and another possible \$75,000 in other property damages. Examples of possible yearly damages include citizens' vehicles parked in the streets and on properties, vehicles trying to get through the flooded areas, and other private property. These estimates also do not take into account the large amount of resources used in attempting to stop this localized flooding that could be used in other problems during these storms.

Schedule: Within 3-5 years

Status: 2009 project, implementation not yet started

4. Construct New Police and Fire Department Headquarters

Hazard(s) Addressed: Hazardous Materials

Issue/Background: Besides needing to update space and facilities for both departments, the police station is located directly next to the railroad line that runs through the City (it is actually the old train depot). There is also a pressurized natural gas line that runs along the tracks by the police station that is considered a hazard.

Other Alternatives: No action

Responsible Office: City of Selma Police department

Priority (High, Medium, Low): High

Cost Estimate: \$8 million

Potential Funding: 50% funded via State Funding Allocation and 50% funded via voter approved G.O. Bond

Benefits (Avoided Losses): Moving the police station away from the railroad line will reduce the impacts of a disaster, which could partially or completely destroy 50 percent of the City's

emergency services response capabilities. It would also reduce the threat posed to the City's dispatch communications, which dispatches both police and fire services.

Schedule: Within the next 3 years (2018-2021)

Status: 2009 project, revised, implementation not yet started

5. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Selma and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Selma is within the boundaries of the Central Kings Groundwater Sustainability Agency (GSA). The Central Kings GSA is comprised of local agencies including County of Kings, County of Fresno and County of Tulare, as well as a memorandum of understanding (MOU) with Consolidate Irrigation District. As a community that is within the boundaries of the Central Kings GSA, the City of Selma will participate as a stakeholder in the planning process by attending meetings during the development of the Central Kings Groundwater Sustainability Plan (GSP) which must be completed no later than January 31, 2020, to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Active participation in the development and implementation of the Central Kings GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought, a high significance hazard for the City of Selma.

Other Alternatives: None. Not participating in the development and implementation of the GSP that is within the boundaries of the City will put the community at risk of not having sustainable groundwater supplies during periods of long-term drought.

Responsible Office: City Engineer and Central Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: None

Potential Funding: N/A

Benefits (Avoided Losses): Active participation in the implementation of the GSP by the Central Kings GSA will result in the management of groundwater in a manner that is sustainable and avoids undesirable results, as defined by the California State Department of Water Resources, for the City of Selma.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

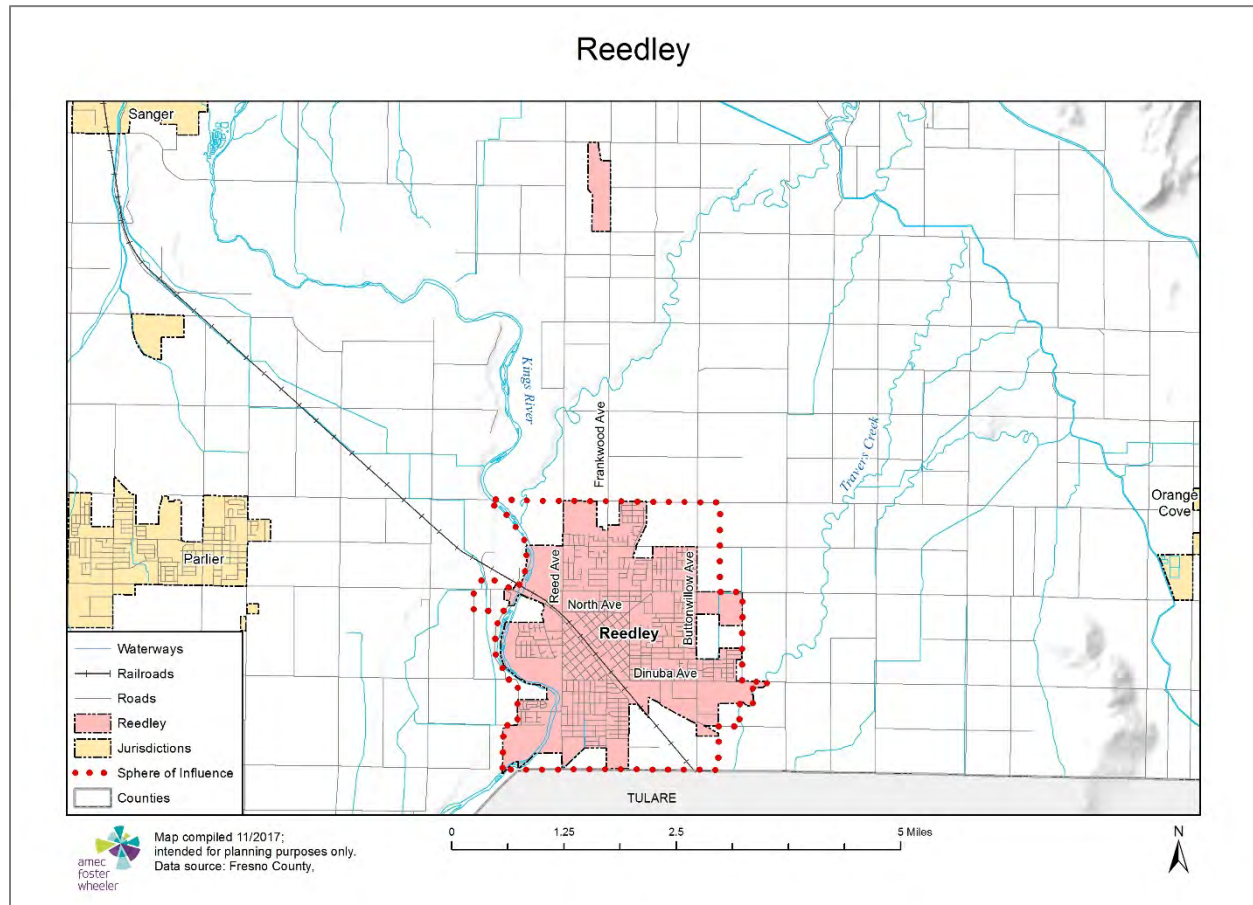


ANNEX K: CITY OF REEDLEY

K.1 Community Profile

Figure K.1 displays a map and the location within Fresno County of the City of Reedley and its Sphere of Influence.

Figure K.1: The City of Reedley



K.1.1 Geography and Climate

Reedley is situated approximately 25 miles southeast of the City of Fresno and equidistant from the City of Visalia, which is southeast of Reedley. Reedley and its Sphere of Influence cover a 4,817-acre area, 3,476 of which is within the Reedley city limits. Manning Avenue, a four-lane divided major arterial street, connects the City with State Highway 99 which is 12 miles to the west. State Highway 180 is located eight miles north of the City, and both highways are heavily used by local, regional, and national residents, travelers, and motor carriers. In addition to its location near these major highways, the community lies adjacent to the Tulare Valley Railroad and the Southern Pacific Railroad lines.

Reedley is located in the central San Joaquin Valley portion of California, lying inland between the State's coastal mountain ranges and the Sierra Nevada Mountains. Reedley's economy continues as predominantly based upon agricultural production and agriculturally oriented industry. The valley floor is the richest intensive agricultural production area in the world. Although there has been economic diversification in recent years, local economy continues to be significantly dependent upon the underlying agricultural character of the region.

K.1.2 History

The lands within the Planning Area have a long history of human habitation, including habitation by the Southern Valley Yokut Indians. The Reedley area was the territory of the Wechikit or Wechikit Yokuts.

As was the case all over California, the arrival of the railroad, even miles away, stimulated commercial agricultural development. In 1884, Civil War veteran Thomas Law Reed moved to what is now Reedley and began farming more than 2,000 acres. Reed settled in the area to provide wheat for Gold Rush miners. Reed's land included what was to become the entire Reedley town site of 360 acres. His donation of land for a railroad station site established the town as the center of the Valley's booming wheat business. Railroad officials commemorated his vision by naming the fledgling City in his honor. When wheat demand slackened, Kings River water was diverted for crop irrigation, and the region began its over 100-year tradition of bountiful field, tree, and vine fruit harvests. With water and railroad services in place, farming families of European immigrants were recruited, and the settlement was incorporated in 1913, with Ordinance No. 1 adopting and prescribing the style of a Common Seal on February 25, 1913. An important element in the early town was a colony of German Mennonites, whose strong traditions and values still shape Reedley's culture.

K.1.3 Economy

Reedley contributes a wide variety of agricultural products to the County's economy. The area's rich, fertile soil produces the finest fruit, nut, vegetable, grain and cotton varieties. Since 1946, Reedley has been known as the Fruit Basket of the World because it leads the nation in the shipping of fresh fruit. Thirty fruit and vegetable packing and cold storage facilities, including the world's largest plant, along with nearby wineries, supply tree and vine fruit products. Related manufacturing industries in Reedley include boxes and packing machinery, and automatic packing equipment.

The Council-Manager form of government administers a general fund operating budget of over \$4,700,000 with a total budget in excess of \$15,000,000. The City has had a Planning Commission since the 1940s and provides full City services, including a municipal airport, water system, sewer plant, and trash collection. A modern, acute-care hospital with a new birthing center provides comprehensive medical coverage. The active Chamber of Commerce & Visitor's Bureau and

Reedley Downtown Association are responsible for significant on-going revitalization and beautification.

Select estimates of economic characteristics for the City of Reedley are shown in Table K.1.

Table K.1: City of Reedley's Economic Characteristics, 2015

Characteristic	City of Reedley
Families below Poverty Level	22.6%
All People below Poverty Level	26.7%
Median Family Income	\$43,818
Median Household Income	\$44,228
Per Capita Income	\$16,313
Population in Labor Force	11,999
Population Employed*	10,269
Unemployment	14.4%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables K.2 and K.3 detail how the City of Reedley's labor force breaks down by industry and occupation based on estimates from the 2015 American Community Survey.

Table K.2: City of Reedley's Employment by Industry, 2015

Industry	# Employed	% Employed
Agriculture, Forestry, Fishing and Hunting, and Mining	2,986	29.1
Educational Services, and Health Care and Social Assistance	2,376	23.1
Retail Trade	825	8.0
Manufacturing	766	7.5
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	593	5.8
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	570	5.6
Other Services, Except Public Administration	434	4.2
Transportation and Warehousing, and Utilities	424	4.1
Public Administration	358	3.5
Construction	357	3.5
Wholesale Trade	356	3.5
Finance and Insurance, and Real Estate and Rental and Leasing	139	1.4
Information	85	0.8
Total	10,269	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table K.3: City of Reedley's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Natural Resources, Construction, and Maintenance Occupations	3,305	32.2
Management, Business, Science, and Arts Occupations	2,160	21.0
<i>Management, Business, and Financial Occupations</i>	<i>(715)</i>	<i>(7.0)</i>
<i>Computer, Engineering, and Science Occupations</i>	<i>(148)</i>	<i>(1.4)</i>

Occupation	# Employed	% Employed
<i>Education, Legal, Community Service, Arts, and Media Occupations</i>	<i>(987)</i>	<i>(9.6)</i>
<i>Healthcare Practitioner and Technical Occupations</i>	<i>(310)</i>	<i>(3.0)</i>
Service Occupations	1,806	17.6
Sales and Office Occupations	1,515	14.8
Production, Transportation, and Material Moving Occupations	1,483	14.4
Total	10,269	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

K.1.4 Population

Reedley is a community of many converging cultures and peoples, from Asian, African, Central American, European, Mexican, Native American and South American. This diverse community provides exposure to a mix of social and cultural influences.

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the 2015 population for the City of Reedley was estimated at 25,092. Select demographic and social characteristics for the City of Reedley from the 2015 ACS are shown in Table K.4.

Table K.4: City of Reedley's Demographic and Social Characteristics, 2015

Characteristic	City of Reedley
Gender/Age	
Male	49.6%
Female	50.4%
Median age	30.7
Under 5 years	9.2%
Under 18 years	29.7%
65 years and over	11.1%
Race/Ethnicity*	
White	58.2%
Asian	2.7%
Black or African American	0.7%
American Indian/Alaska Native	0.3%
Hispanic or Latino (of any race)	76.4%
Education	
High school graduate or higher	60.9%
Disability Status	
Population 5 years and over with a disability	10.6%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 97.0% reporting one race

K.2 Hazard Identification and Summary

Reedley's planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Reedley (see Table K.5). In the context of the planning area, there are no hazards unique to Reedley.

Table K.5: City of Reedley—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	High
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Medium
Expansive Soils	No Data	Occasional	No Data	Medium
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Low
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

Transportation and Rail Incidents were not assessed as a hazard to the planning area, thus they are not included in the table above. Nonetheless, it is important to note that transportation hazards are a concern for the City of Reedley.

K.3 Vulnerability Assessment

The intent of this section is to assess Reedley’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the outreach process in 2017-2018. Reedley is a new jurisdiction that participated in the 2017-2018 Fresno County Multi-Hazard Mitigation Plan Update. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table K.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the City of Reedley’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table K.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of Reedley are identified below. The discussion of vulnerability for each of the following hazards is located in Section K.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include agricultural hazards, drought, and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incidents
- human health hazards: epidemic/pandemic*
- severe weather*: extreme heat; fog
- soil hazards: erosion; expansive soils

***Note: epidemic/pandemic, extreme heat, and fog** are considered Medium priority hazards by the City of Reedley but are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to these hazards.

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Reedley, those hazards are as follows:

- human health hazards: West Nile Virus
- severe weather: extreme cold/freeze, heavy rain/thunderstorm/hail/lightning, tornado, windstorm, winter storm
- soil hazards: land subsidence
- volcano
- wildfire*

***Note:** Wildfire is of High significance for the County overall, but is of Low significance to the City because no parcels or structures within the City or its Sphere of Influence are at risk to any fire severity zones. (For more information on the wildfire hazard, see the County's wildfire severity risk map in Chapter 4 of the main plan).

Additionally, the City's planning team decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and probability of occurrence. **Landslide** and **Avalanche** are considered not applicable to the City of Reedley.

K.3.1 Assets at Risk

This section considers Reedley's assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table K.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Reedley.

Table K.6: 2017 Property Exposure for the City of Reedley by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	7	5	\$2,298,731	\$2,298,731	\$4,597,462
Commercial	306	528	\$117,042,641	\$117,042,641	\$234,085,282
Exempt	47	67	\$0	\$0	\$0
Industrial	89	100	\$58,427,197	\$87,640,796	\$146,067,993
Multi-Residential	556	3,656	\$127,816,315	\$63,908,158	\$191,724,473
Residential	4,673	5,538	\$559,681,385	\$279,840,693	\$839,522,078
Total	5,678	9,894	\$865,266,269	\$550,731,018	\$1,415,997,287

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation.

An inventory of critical facilities in the City of Reedley is provided in Table K.7 and shown in Figure K.2 with greater detail in Figure K.3. Specific facilities and their hazard specific issues as identified by the city's hazard mitigation planning team are listed in Table K.8.

Table K.7: City of Reedley's Critical Facilities

Critical Facility Type	Number
Airport	1
Behavioral Health	1
CalARP	8
Colleges & Universities	1
Communications	1
Courthouse	1
Department of Social Services	1
Fire Station	1
Health Care	1
Nursing Home	2
Police	1
School	13
Total	32

Source: Fresno County, HIFLD 2017

Table K.8: City of Reedley's Hazard Specific Issues for Critical Facilities

Name of Asset	Type*	Hazard Specific issues
Reedley City Hall / Police Dept.	EI	Security / Proximity to Rail
Reedley Fire Department	EI	Security
Reedley Municipal Airport	VF	Security
Kings Canyon Unified School District (X Schools)	VF	Security
Immanuel Schools	VF	Security
Reedley College	VF	Security / Proximity to Rail
Manning Avenue Bridge	VF	Major Transportation Route
Olson Avenue Bridge	VF	Major Transportation Route
Burlington Northern/ Santa Fe Railroad	VF	Vulnerability / Commerce
Reedley Community Center	VF	Security
Reedley Wastewater Treatment Facility	EI	Security
Reedley Sports Park Hydropillar	EI	Security
Reedley Municipal Well Sites (7)	EI	Security
Central Valley Transportation Center	VF	Security
Fueling Stations (8)	VF	Security
Hamilton Packing / Cold Storage	VF	Food Processing (Economic)
Aslan Packing / Cold Storage	VF	Food Processing (Economic)
Thiele Manufacturing	VF	Manufacturing (Economic)
Moonlite Packing / Cold Storage	VF	Food Processing (Economic)
Gerawan Farming / Cold Storage	VF	Food Processing (Economic)
Reedley Lumber Company	VF	Security
City of Reedley Public Works Maintenance Yard	VF	Security / Proximity to Rail
Adventist Hospital, Reedley	EI	Security
Sequoia Safety Council (Ambulance Provider)	VF	Security
Reedley Opera House	VF	Earthquake Collapse (Historic)
Palm Village Retirement Center	VF	Security
Golden Living Center	VF	Security
Sierra View Homes	VF	Security
Reedley City Museum	VF	Security / Proximity to Rail (Cultural)

*EI: Essential Infrastructure; VF: Vulnerable Facilities

Figure K.2: City of Reedley Critical Facilities

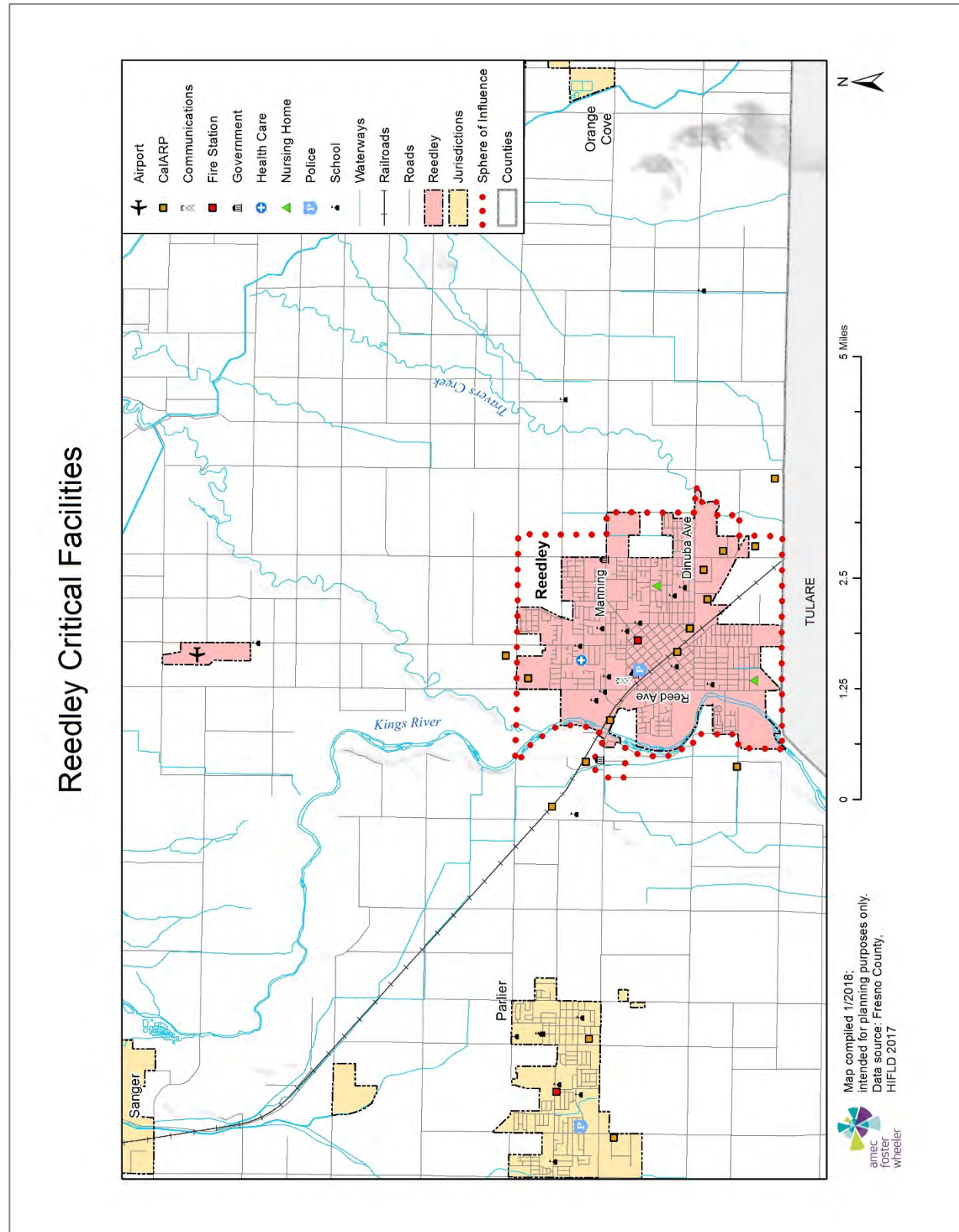
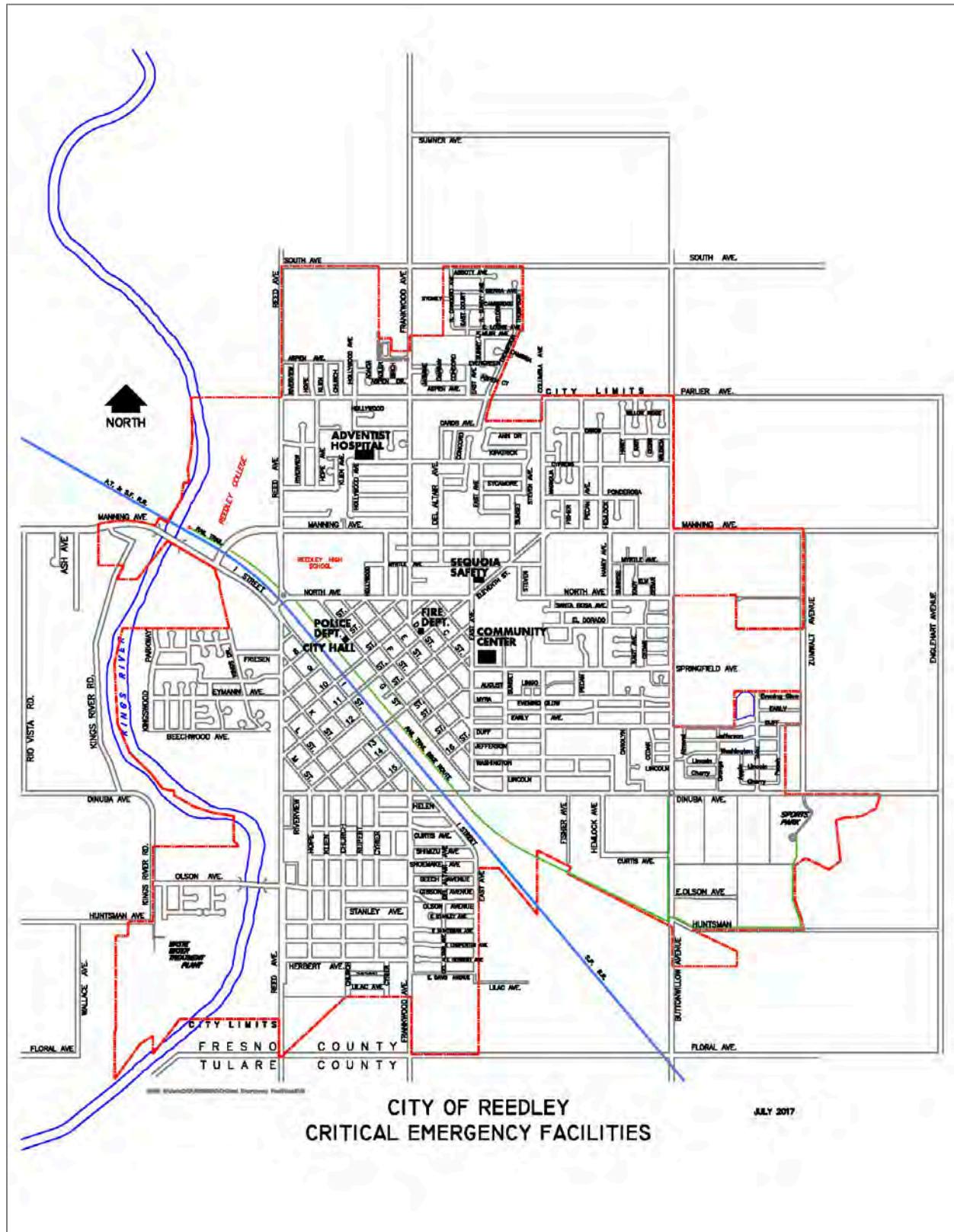


Figure K.3: City of Reedley Critical Facilities



Historic Resources

According to the Southern San Joaquin Valley Archaeological Information Center at California State University Bakersfield, 30 recorded cultural resources are found in and within a 1-mile radius of the project area. Four of these sites are Native American archaeological sites or isolates, while the remainders are historic buildings and sites. Two sites are listed on the National Register of Historic Places and on the California Register of Historic Resources, the Reedley Opera House and the Old Bank of America Building.

Economic Assets

In 2016, Fresno County produced agricultural goods eclipsing \$6.18 Billion in value. Thousands of local jobs – ranging from manufacturing, warehousing, transportation, technical services and beyond – are supported by this industry within the City of Reedley. The Fresno County Department of Agriculture, under the direction of the California Department of Food and Agriculture, is responsible for conducting regulatory and service functions pertaining to the multi-billion-dollar agricultural industry in Fresno County. These functions are mandated by state and federal laws and regulations and by local measures and ordinances by the Fresno County Board of Supervisors. The City works closely with Fresno County, the Fresno Council of Governments, the Fresno County Farm Bureau, and other local and regional agencies in the region to address legislation, regulations, and policies that address preparations and response for public health emergencies, which includes the potential for agro-terrorism, in an effort to protect the area's most significant economic asset.

Growth and Development Trends

Between 1990 and 2010, Reedley experienced an average annual growth rate of 2.73% per year. Since 2010, that number has ranged annually between 2.35% & 3.59% per year – with numbers trending consistently up in the most recent years. This trend is one of the major indicators of the City's potential growth over the life of the Agency's General Plan (2030). By analyzing past growth trends, in comparison to the State Department of Finance projections for growth in the San Joaquin Valley, an average annual growth rate of 3% was utilized in the Reedley General Plan. While the vast majority of housing structures in the community are traditional or "site-built", the City permits manufactured housing on a permanent foundation in all zones allowing single family residential uses.

Bounded by the Fresno County/Tulare County line along the southern portion of the City; as well as the Kings River to the West, paced and contiguous growth will take place to the north and east. These areas do not contain any known hazard-related concerns, such as soil hazards, excessive flooding or wildfire. Capacity for critical infrastructure is either in place or appropriately planned for. Design, placement and protection of these items will be a most crucial concern. Additionally, the protection and conservation of water resources will continue to be a major priority, as the area is prone to drought conditions.

The City's General Plan Land Use Map, adopted in February 2014 and last updated in January 2016, is shown in Figure K.4. The General Plan projects that Reedley's population will reach 47,369 by year 2030.

Table K.9 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2015. As of 2015, the population of Reedley was 25,092 with an average growth rate of 3.71 percent.

Table K.9: City of Reedley's Change in Population and Housing Units, 2010-2015

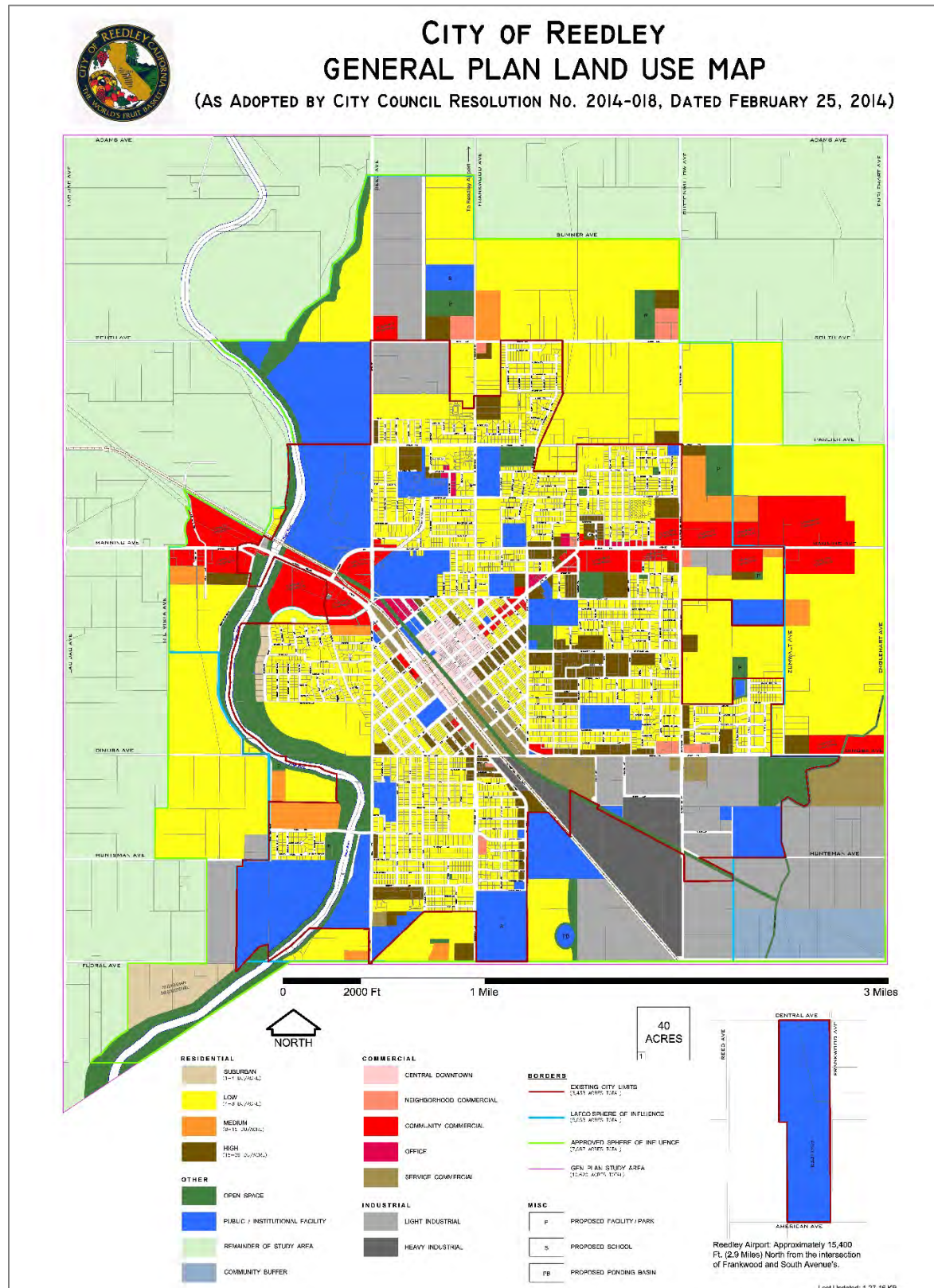
2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2015
24,194	25,092	+3.71	6,867	7,240	+5.43

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2011-2015 5-Year Estimates

Of the 7,240 housing units in Reedley, 95.2 percent are occupied. Owner-occupied units account for 59.5 percent of all occupied housing. Single family detached homes comprise 74.9 percent of the housing stock in the City.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

Figure K.4: City of Reedley's Land Use Designations



K.3.2 Estimating Potential Losses

Table K.6 above shows Reedley's exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are currently 140 parcels in the 100- and 500-year floodplains in the City of Reedley. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County as a whole).

Agricultural Hazards

Among the largest impacts to agricultural production is the changing weather patterns seen within the Valley over the past decade. More extreme weather threatens the proper growth and maintenance of crops, and harbors the introduction of pest infestation, various plant diseases, and increased fire hazards.

Drought

Groundwater is the source of domestic water supply for Reedley. The groundwater basin is recharged primarily by rainfall and infiltration, storm water runoff, infiltration from irrigated ditch flows and seepage in the Kings River bottom, and water conservation recharge to natural sloughs in the nearby agricultural area. Agriculture on the west side of the San Joaquin Valley relies largely on water transferred through the Sacramento-San Joaquin Delta from Northern California. The effects of a four-year drought have severely narrowed the periods in which massive pumps can be used to move water from north to south. Less water means less acreage planted, creating a spike in unemployment and economic hardship for farm laborers and their communities. The geologic drought has shown how agriculture affects many lives, impacting communities well beyond the farm sector. For the past several years, the City's water utility has been operating at maximum peak performance due to the drought conditions.

Dam Failure

Reedley is in the mapped inundation area of Pine Flat Dam. Pine Flat Reservoir is located in the foothills of the Sierra Nevada Mountains, approximately 20 miles northeast of Reedley. The construction of the 440-foot Pine Flat Dam on the Kings River was completed in 1954. The project's primary purposes are flood control, irrigation, water conservation, and recreation. When completely full, Pine Flat Reservoir is 20 miles long, holds 1 million acre-feet of water, and covers 5,790 acres with 67 miles of shoreline. The upper Kings River is the main tributary that fills the reservoir. According to the Kings River Conservation District, the water management agency encompassing Fresno, Kings and Tulare counties, "In the event of a major release from Pine Flat Dam, downstream flooding could occur over agricultural lands near the riverbanks and possibly

within the Cities of Reedley and Kingsburg.” The Kings River runs through the western section of the City of Reedley limits.

Dam failures can result from earthquakes, erosion of the face or foundation, improper sitting, rapidly rising floodwaters, structural/design flaws or acts of terrorism. The Pine Flat Dam is a concrete gravity designed dam. The Jeff L. Taylor Pine Flat Power Plant is a hydroelectric generation station operated by Kings River Conservation District and is located at the base of the dam.

A dam failure will cause loss of life, damage to property, and other ensuing hazards, as well as the displacement of persons residing in the inundation path. Damage to electric transmission lines could impact life support systems in communities outside the immediate hazard areas. A catastrophic dam failure, depending on size of dam and population downstream, could exceed the response capability of local communities. Damage control and disaster relief support would be required from other local governmental and private organizations, and from the state and federal governments. Mass evacuation of the inundation areas would be essential to save lives, if warning time should permit. Extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food, and temporary shelter would be required for injured or displaced persons. Identification and burial of many dead persons would pose difficult problems; public health would be a major concern. Many families would be separated, particularly if the failure should occur during working hours.

These and other emergency/disaster operations could be seriously hampered by the loss of communications, damage to transportation routes, and the disruption of public utilities and other essential services. Governmental assistance could be required and may continue for an extended period. Actions would be required to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and welfare for the affected population including, as required, temporary housing for displaced persons.

Earthquake

A major earthquake and ground shaking can cause significant social disruption and damage to buildings and infrastructure in the City of Reedley due to the close proximity of earthquake faults. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. A significant earthquake could occur and exceed the response capabilities of the City of Reedley. Response and disaster relief support would be required from other cities, private organizations, and from the state and federal governments.

Reedley has experienced several noticeable ground movement incidents, such as the 1983 Coalinga earthquake and the 1989 Watsonville earthquake, but no local damage was sustained.

Flood/Levee Failure

The Kings River begins on the western slope of the Sierra Nevada and flows westerly to Pine Flat Reservoir. Twenty-five miles downstream of this reservoir, the river passes along the west side of Reedley as it flows to the Valley floor. The supply of surface water for the Kings River Basin area comes primarily from two sources, the Kings River and the San Joaquin River. The Kings River flows are regulated by Pine Flat Dam, with a storage capacity of 1,000,000-acre feet. Flows in the river at Reedley come from releases from Pine Flat Dam and tributary inflow. The dam, completed in 1954, was constructed for flood control, irrigation, recreation and water conservation.

The annual flow in the Kings River, as measured at the Reedley Narrows gaging station located three miles upstream of Reedley for the period 1963 to 1987, averages approximately 1,000,000 acre-feet per year. The highest average monthly flows occur in late spring with a maximum flow of approximately 3,000 cubic feet per second (cuffs), while the lowest flows generally occur in late fall with a minimum flow of approximately 290 cfs. Flooding in the Reedley area can occur due to high flows in the Kings River or as a result of local runoff from intense rainfall.

The most recent FEMA Flood Insurance Rate Map (FIRM) affecting the City of Reedley was updated in February 2009. According to the FIRM, portions of the Planning Area west of Reed Avenue are subject to 100-year (or 1-percent-annual-chance) flooding by the Kings River, areas in the northern plan area are subject to a 100-year flooding by the Wahtoke Creek and areas in the eastern plan area are subject to 100-year flooding by the Travers Creek.

According to FEMA's 2016 Flood Insurance Study (FIS), damaging floods occurred in Reedley and the surrounding area in 1867, 1914, 1950, 1958, 1967, 1969, and 1978. Details on some of these events follow:

- **January 1914**—Kings River overtopped and damaged the Manning Avenue bridge. The river reached almost a half mile wide, and the river banks and surrounding agricultural land were scoured and eroded.
- **November 1950**—High flows on the Kings River washed out the Olsen Avenue bridge and threatened the Manning Avenue bridge.
- **January-February 1969**—A discharge of 17,100 cfs at the community of Piedra resulted in the City's most costly flood.

The City of Reedley's objectives and policies for managing flood risk are based on the Fresno County Safety Element and on Federal Insurance Administration regulations. The similarity between the City and County Safety Elements should ensure that the City of Reedley and Fresno County follow a uniform approach toward the management of the Kings River flood-prone areas.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Reedley was created (see Figure K.5). Tables K.10 and K.11

summarize the values at risk in the City’s 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Table K.10: City of Reedley’s FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Exempt	3	3	\$0	\$0	\$0	\$0
Total	3	3	\$0	\$0	\$0	\$0

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Note: The “Exempt” property type includes government, school, and church owned building for which building value is not given.

Table K.11: City of Reedley’s FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	2	\$8,928	\$8,928	\$17,856	\$4,464
Commercial	1	183	\$260,000	\$260,000	\$520,000	\$130,000
Residential	135	1	\$29,437,171	\$29,437,171	\$58,874,342	\$14,718,586
Total	137	186	\$29,706,099	\$29,706,099	\$59,412,198	\$14,853,050

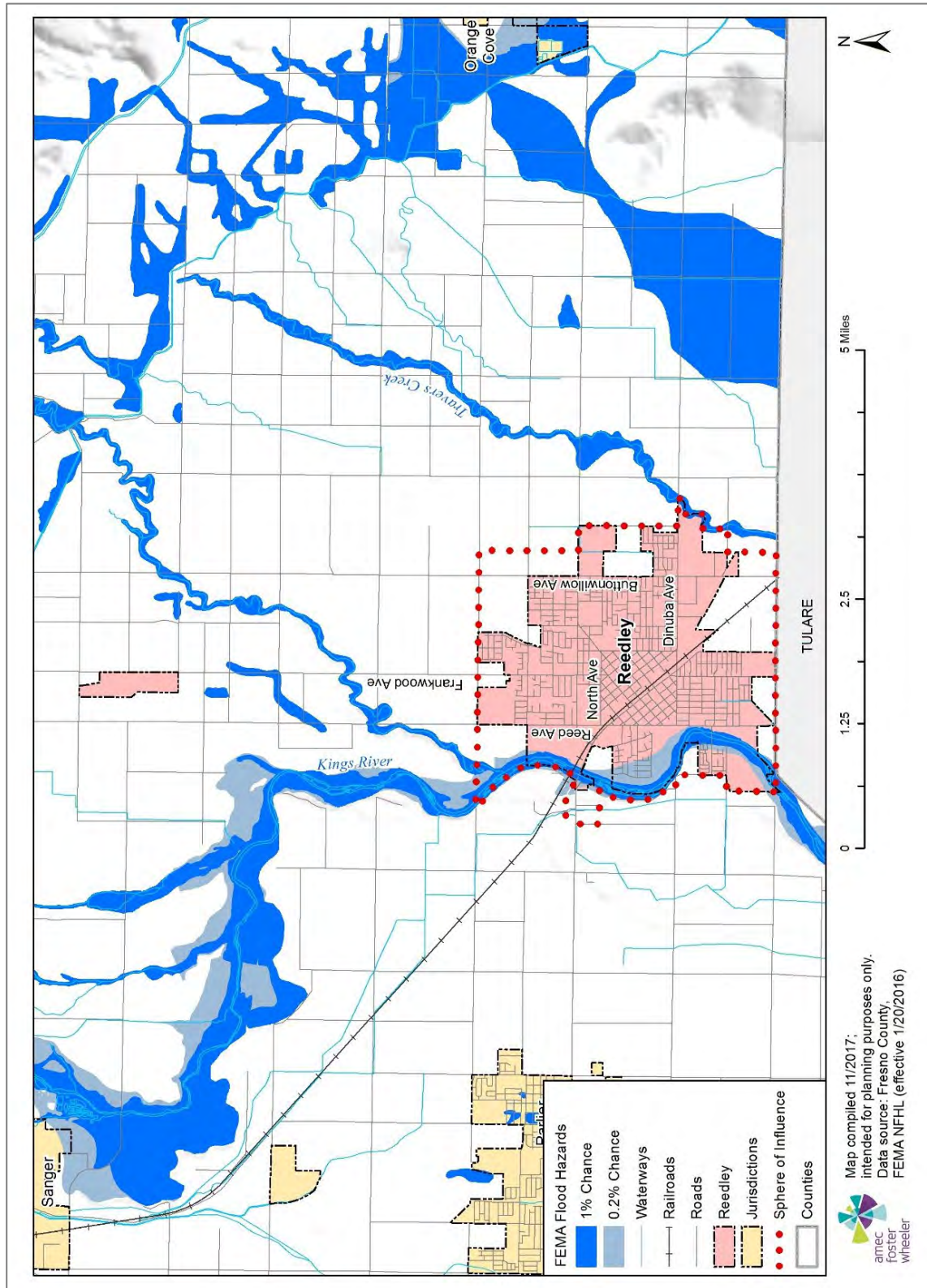
Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Reedley has limited assets at risk to the 100-year and 500-year floods. Only three improved parcels are located within the 100-year floodplain, and due to their “exempt” property type, no building value is known, which means a loss estimate could not be calculated. An additional 137 improved parcels valued at over \$59.4 million fall within the 500-year floodplain.

Applying the 25 percent damage factor as previously described in Section 4.3.2, there is a 1 percent chance in any given year of a 500-year flood causing roughly \$14.9 million in damage. Actual loss would likely be higher due to the inclusion of the three additional “exempt” properties for which building value is unknown.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are likely below the actual market values. Thus, the actual value of assets at risk may be higher than those included herein.

Figure K.5: City of Reedley's 100- and 500-Year Floodplains



Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the average number of persons per household (3.17). This analysis found that approximately 428 people in the City of Reedley are at risk of having their homes flooded.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Reedley joined the National Flood Insurance Program (NFIP) on September 30, 1982. NFIP Insurance data indicates that as of June 6, 2017, there were eight flood insurance policies in force in the City with \$2,345,000 of coverage. All eight policies were residential (for single-family homes), and all eight policies were Preferred Risk policies in B, C, and X zones. One policy is for a pre-FIRM structure and seven are for post-FIRM structures.

There have not been any historical claims for flood losses in the City of Reedley and according to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. In the City of Reedley there are no critical facilities located in the 100- or 500-year floodplain.

Hazardous Materials Incident

The City of Reedley is susceptible to a hazardous materials release from the result of transportation accidents or spills of stored materials used at an industrial business. The significance of the problems to the environment, property, or human health is dependent on the type, location and quantity of the material released.

Manning Avenue and the San Joaquin Valley Railroad both run through the heart of Reedley. There is the potential for hazardous material spills on these transportation routes. Numerous commercial transportation vehicles travel Manning Avenue with various types and quantities of hazardous materials. The San Joaquin Valley Railroad is strictly a commercial freight transportation system. Large quantities and numerous types of hazardous materials are transported through Reedley by rail on a daily basis. Of particular concern is the large number of liquefied petroleum gas vessels that are transported on the system. A derailment and fire, with large exploding liquefied petroleum gas vessels, could cause widespread damage to the City. Although warning devices have been installed to decrease the potential for a rail incident, increased rail and vehicle traffic in the City allow for the occurrence in the future.

There are also stationary quantities of hazardous materials used by the agricultural industry that are stored and used within Reedley and in the surrounding areas. There is the potential for hazardous materials releases from large industrial plants in Reedley. Facilities such as these

throughout the City are less of a threat due to current laws and regulations requiring them to have contingency and evacuation plans. The Reedley Fire Department is responsible to check compliance of these facilities and maintain records of stored quantities of hazardous materials.

Additional causes of hazardous materials spills could be clandestine dumping of toxic or hazardous waste on public or private property. As the costs and restrictions increase for legitimate hazardous waste disposal sites, illegal dumping of hazardous materials may also increase proportionately. Besides the immediate effect of hazardous materials incidents on scene, there are also ancillary effects such as the impact on waterways and drainage systems, and the evacuation of schools, business districts, and residential areas.

There are eight CalARP hazardous materials facilities located in the City of Reedley. As identified in Table K.12, there are 12 critical facilities in Reedley located within a half mile of a CalARP facility.

Table K.12: Critical Facilities within ½ mile of CalARP Facility: City of Reedley

Critical Facility Type	Count
Colleges & Universities	1
Communications	1
Fire Station	1
Police	1
School	8
Total	12

Source: Fresno County, HIFLD 2017

Soil Hazards: Erosion

Because the topography of the Reedley area is relatively flat, erosion does not have a significant impact in the area. Moderate-to-severe water erosion potential does exist, however, along the bluffs of the Kings River as a result of the steep slope conditions found in that area. Gullies can be started at the onset of the rainy season; and, once started, they can cut back into the adjacent level soils. It is generally more difficult to control such gullies than to prevent them. In areas of the bluff where there are gopher or squirrel burrows, tunnel erosion may result since such burrows can collapse. As a result, water and rodent management may be needed on the bluffs.

A band of Atwater (AoA) soil is found in the northeastern portion of the Planning Area. This soil consists of stabilized old dunes of wind-sorted materials which are susceptible to moderate-to-severe wind erosion during infrequent periods of high wind.

Soil Hazards: Expansive Soils

Severe expansive soil conditions which could cause heavy damage to buildings, roads, and other structures are rare within the Planning Area. They are limited to the Cometa (CzaD) soil, with its dense clay subsoil, which is found in the far northwestern portion of the Planning Area. Although,

according to the Soils Conservation Service, this soil has a severe limitation rating for most urban type land uses, its relatively isolated location will insure that it will not adversely impact Reedley's future development.

Moderately expansive soils – including soils in the Ramona (Rb; Rc) and San Joaquin (ScA; SeA) Series – are found in a relatively large area within the northeastern and eastern portions of the Planning Area. Although these areas are generally planned for urban uses, moderately expansive soils will usually cause damage only to substandard structures and to flatwork such as streets and patios. In addition, foundations can usually be especially engineered to minimize damage due to these moderately expansive soils. The Ramona and San Joaquin soils, however, also have a severe limitation rating for use as septic tank absorption fields and storm drainage basin sites because of their slow permeability.

K.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Reedley's updated capabilities are summarized below.

K.4.1 Regulatory Mitigation Capabilities

Table K.13 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Reedley.

Table K.13: City of Reedley's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General or Comprehensive plan	Yes	Adopted by Resolution 2014-08 (Feb. 18, 2014)
Zoning ordinance	Yes	Title 10, Chapter 1 Adopted Sept. 2, 1980
Subdivision ordinance	Yes	Title 11, Chapter 1 Adopted April 25, 2000

Regulatory Tool	Yes/No	Comments
Growth management ordinance	No	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Water Conservation Ordinance 2015-002 Adopted May 26, 2015
Building code	Yes	2016 California Building Code Adopted Dec. 13, 2016
Fire department ISO rating		
Erosion or sediment control program	No	
Stormwater management program		
Site plan review requirements	Yes	Title 10, Chapter 19 Adopted Sept. 2, 1980
Capital improvements plan	Yes	Details in Annual City Budget Document
Economic development plan	No	
Local emergency operations plan	Yes	
Other special plans	No	
Flood insurance study or other engineering study for streams	No	
Elevation certificates (for floodplain development)	Yes	

K.4.2 Administrative/Technical Mitigation Capabilities

Table K.14 identifies the personnel responsible for activities related to mitigation and loss prevention in Reedley.

Table K.14: City of Reedley's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Community Development Director
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	City Engineer
Planner/engineer/scientist with an understanding of natural hazards	Yes	City Engineer
Personnel skilled in GIS	Yes	Engineering Dept., Senior Engineering Assistant
Full time building official	Yes	Building Official
Floodplain manager	Yes	
Emergency manager	Yes	Police Chief or Fire Chief
Grant writer	Yes	Outside Agency
Other personnel		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	Community Development and Engineering Dept's.
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	All City Dept's.

K.4.3 Fiscal Mitigation Capabilities

Table K.15 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table K.15: City of Reedley's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	No

K.4.4 Mitigation Outreach and Partnerships

The City of Reedley administers a variety of outreach efforts to support mitigation. The City's website offers ongoing and seasonal information pertaining to water conservation and general public safety and maintenance issues. The Reedley Fire and Police Departments provide year-round safety education at schools, downtown public events, service clubs and the annual open house. The Reedley Fire Department also administers the HomeSAFE program which provides smoke alarms for qualifying households. The "Reedley Communicator" is a quarterly publication by the City of Reedley issued to its residents with various helpful tips and safety information.

K.4.5 Opportunities for Enhancement

Based on the capabilities assessment, the City of Reedley has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. Some of the possible opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Drought Contingency Plan that will help to create a framework for drought response and mitigation in the City of Reedley.
- Develop a stormwater management program
- Develop an Evacuation Plan in partnership with the County and specific to hazardous materials incidents.

K.5 Mitigation Strategy

K.5.1 Mitigation Goals and Objectives

The City of Reedley adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Community Development Department, specifically the Planning and Building Divisions may utilize the hazard information when reviewing site plan application or when reviewing a building permit application. The Engineering Department may use this information while managing the City's Capital Improvement Program and help to focus future Capital Improvement Projects. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from Reedley will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1982. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

K.5.2 Mitigation Actions

The planning team for the City of Reedley identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

In addition to implementing the mitigation action below the City of Reedley will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on drought. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action

can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Develop Stormwater Detention Basin

Hazard(s) Addressed: Multi-hazard: drought, flood

Issue/Background: The City has identified the need to improve the ground water table by redirecting storm water currently draining directly to the Kings River to detention ponds that will assist the City in replenishing the groundwater. Groundwater is the source of domestic water supply for Reedley. For the past several years (2013-2018), the City's water utility has been operating at maximum peak performance due to the drought conditions. The City has identified approximately two acres to develop a storm water detention basin. The required property is owned by the City. The project has been designed and construction plans are 60% complete. As of 2018 the City is actively seeking to secure funding sources to use with development impact fees and complete the project.

Other Alternatives: No action

Responsible Office: City of Reedley, Engineering Department

Priority (High, Medium, Low): High

Cost Estimate: \$2,820,000

Potential Funding: City Development Impact Fees, Cal OES 404 Hazard Mitigation Grant, Prop 18

Benefits (Avoided Losses): The project will increase the amount of available groundwater by mitigation for the City's withdrawal of groundwater and will also mitigate flood impacts.

Schedule: 1 to 2 years

Status: New project

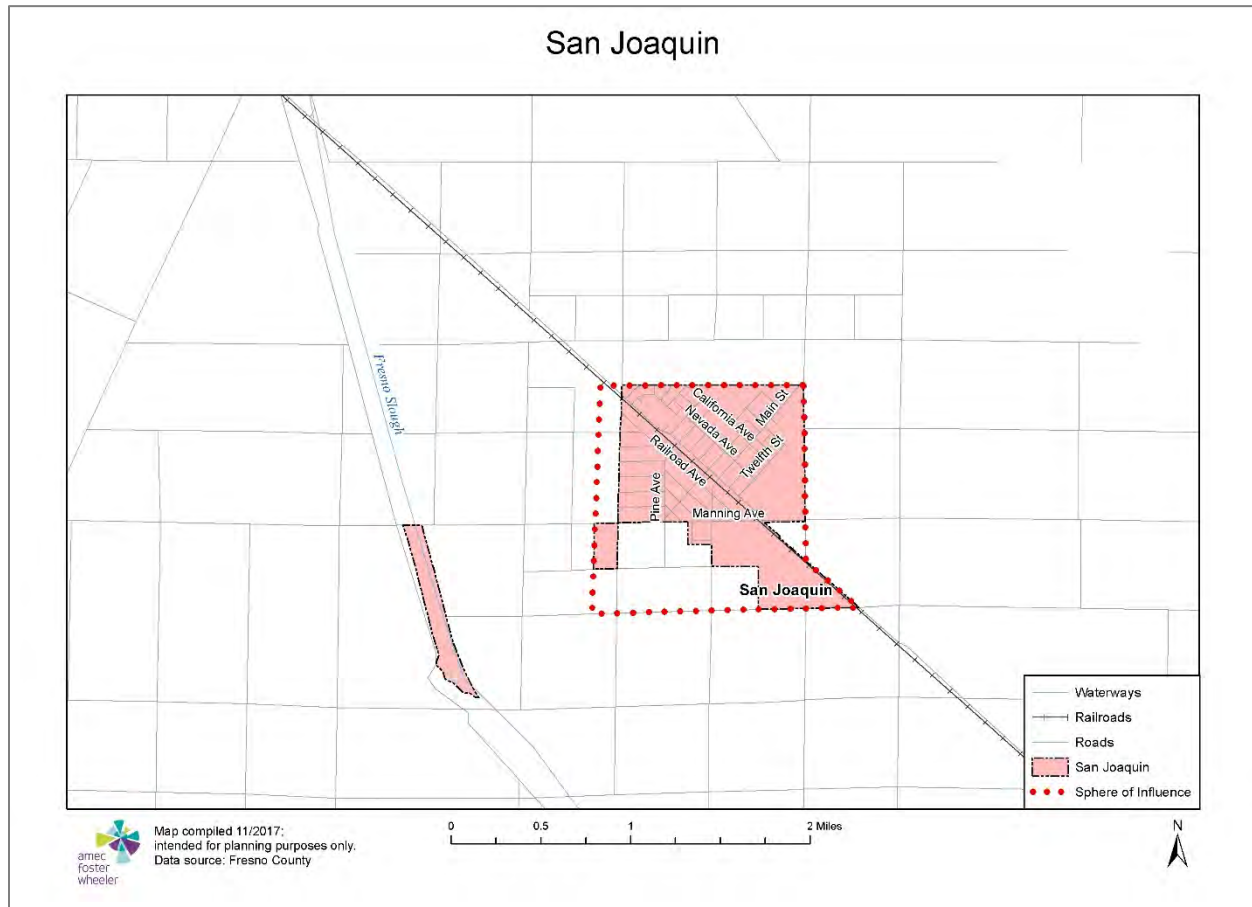


ANNEX L: CITY OF SAN JOAQUIN

L.1 Community Profile

Figure L.1 displays a map and the location within Fresno County of the City of San Joaquin and its Sphere of Influence.

Figure L.1: The City of San Joaquin



L.1.1 Geography and Climate

The City of San Joaquin is situated in western Fresno County, approximately 11 miles southwest of the City of Kerman. San Joaquin is the smallest incorporated city in the County; the City and its Sphere of Influence cover a 962-acre area, 731 acres of which is within the City limits.

L.1.2 History

The following is given in the City's 2013 General Plan: San Joaquin was founded in the early 1900s and incorporated in 1920 as a general law city. The City developed with a traditional grid layout, oriented around the railway and served as a center for services in an agricultural area. Throughout its history, the city has been a small community with a strong agricultural presence.

L.1.3 Economy

According to the 2013 General Plan, San Joaquin faces difficulty covering the costs of public services due to lower than average per capita sales tax income, low wages among residents and poor proximity to major trade routes. The major industry in San Joaquin is agriculture; however, the local economy has suffered following a federal program to retire arid farmland around the City, which has greatly reduced employment opportunities.

Select estimates of economic characteristics for the City of San Joaquin are shown in Table L.1.

Table L.1: City of San Joaquin's Economic Characteristics, 2015

Characteristic	City of San Joaquin
Families below Poverty Level	55.8%
All People below Poverty Level	54.2%
Median Family Income	\$22,540
Median Household Income	\$24,437
Per Capita Income	\$7,692
Population in Labor Force	1,275
Population Employed*	1,165
Unemployment	8.6%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Tables L.2 and L.3 detail how the City of San Joaquin's labor force breaks down by occupation and industry based on estimates from the 2015 American Community Survey.

Table L.2: City of San Joaquin's Employment by Occupation, 2015

Occupation	# Employed	% Employed
Natural Resources, Construction, and Maintenance Occupations	751	64.5
Management, Business, Science, and Arts Occupations	108	9.3
Service Occupations	79	6.8
Sales and Office Occupations	90	7.7
Production, Transportation, and Material Moving Occupations	137	11.8
Total	1,165	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table L.3: City of San Joaquin's Employment by Industry, 2015

Industry	# Employed	% Employed
Agriculture, Forestry, Fishing and Hunting, and Mining	760	65.2
Educational Services, and Health Care and Social Assistance	88	7.6
Transportation and Warehousing, and Utilities	52	4.5
Manufacturing	51	4.4
Wholesale Trade	47	4.0
Retail Trade	34	2.9
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	33	2.8
Other Services, Except Public Administration	32	2.7
Construction	24	2.1
Finance and Insurance, and Real Estate and Rental and Leasing	22	1.9
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	22	1.9
Public Administration	0	0
Information	0	0
Total	1,165	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

L.1.4 Population

According to the U.S. Census Bureau's American Community Survey (ACS) 5-Year Estimates, the 2015 population for the City of San Joaquin was estimated at 4,008. Select demographic and social characteristics for the City of San Joaquin from the 2015 ACS are shown in Table L.4.

Table L.4: City of San Joaquin's Demographic and Social Characteristics, 2015

Characteristic	City of San Joaquin
Gender/Age	
Male	49.4%
Female	50.6%
Median age	22.7
Under 5 years	10.5%
Under 18 years	41.5%
65 years and over	4.5%
Race/Ethnicity*	
White	93.5%
Asian	0.0%
Black or African American	0.0%
American Indian/Alaska Native	0.0%
Hispanic or Latino (of any race)	96.0%
Education	
High school graduate or higher	28.1%
Disability Status	
Population 5 years and over with a disability	4.5%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 99.5% reporting one race

L.2 Hazard Identification and Summary

San Joaquin’s planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the City (see Table L.5). In the context of the plan’s planning area, no hazards are unique to San Joaquin.

Table L.5: City of San Joaquin—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	High
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Low
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Limited	Likely	Negligible	Low
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Limited	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Limited	Highly Likely	Limited	Low
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

L.3 Vulnerability Assessment

The intent of this section is to assess San Joaquin’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the outreach process in 2017-2018. San Joaquin is a new jurisdiction that participated in the 2017-2018 Fresno County Multi-Hazard Mitigation Plan Update. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table L.5). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects overall ranking for each hazard, and is based on the City of San Joaquin’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table L.5 reflect the hazards that could potentially affect the City. Those of Medium or High significance for the City of San Joaquin are identified below. The discussion of vulnerability for each of the following hazards is located in Section L.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include agricultural hazards and drought.

- agricultural hazards
- drought
- earthquake
- flood/levee failure
- hazardous materials incident
- human health hazards: epidemic/pandemic*
- severe weather*: windstorm, winter storm

***Note:** epidemic/pandemic, windstorm, and winter storm are considered Medium priority hazards by the City of San Joaquin but are not unique to the City in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to these hazards.

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of San Joaquin, those low significance hazards are as follows:

- dam failure*
- human health hazards: West Nile Virus
- severe weather: extreme cold/freeze, extreme heat, fog, heavy rain/thunderstorm/hail/lightning, tornado
- soil hazards
- volcano
- wildfire**

***Note on Dam Failure:** Although the County ranks dam failure as High in significance, the City determined the hazard to be of Low significance because there is only one dam located in the City, the Mud dam owned by the James Irrigation District, and it is not a significant hazard dam according to the National Dam Inventory.

****Note on Wildfire:** Although the County ranks wildfire as High in significance, the City determined the hazard to be of Low significance because there are no structures exposed to wildfire risk within the city boundaries or Sphere of Influence.

Additionally, the City's Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. Avalanche and landslide are considered Not Applicable (N/A) to the City of San Joaquin.

L.3.1 Assets at Risk

This section considers San Joaquin's assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market

value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table L.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of San Joaquin.

Table L.6: 2017 Property Exposure for the City of San Joaquin by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	1	0	\$12,673	\$12,673	\$25,346
Commercial	37	70	\$6,658,928	\$6,658,928	\$13,317,856
Exempt	11	110	\$0	\$0	\$0
Industrial	15	16	\$6,573,243	\$9,859,865	\$16,433,108
Multi-Residential	10	105	\$7,049,843	\$3,524,922	\$10,574,765
Residential	613	945	\$40,052,026	\$20,026,013	\$60,078,039
Total	687	1,246	\$60,346,713	\$40,082,400	\$100,429,113

Source: Fresno County 2017 Parcel and Assessor data

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation.

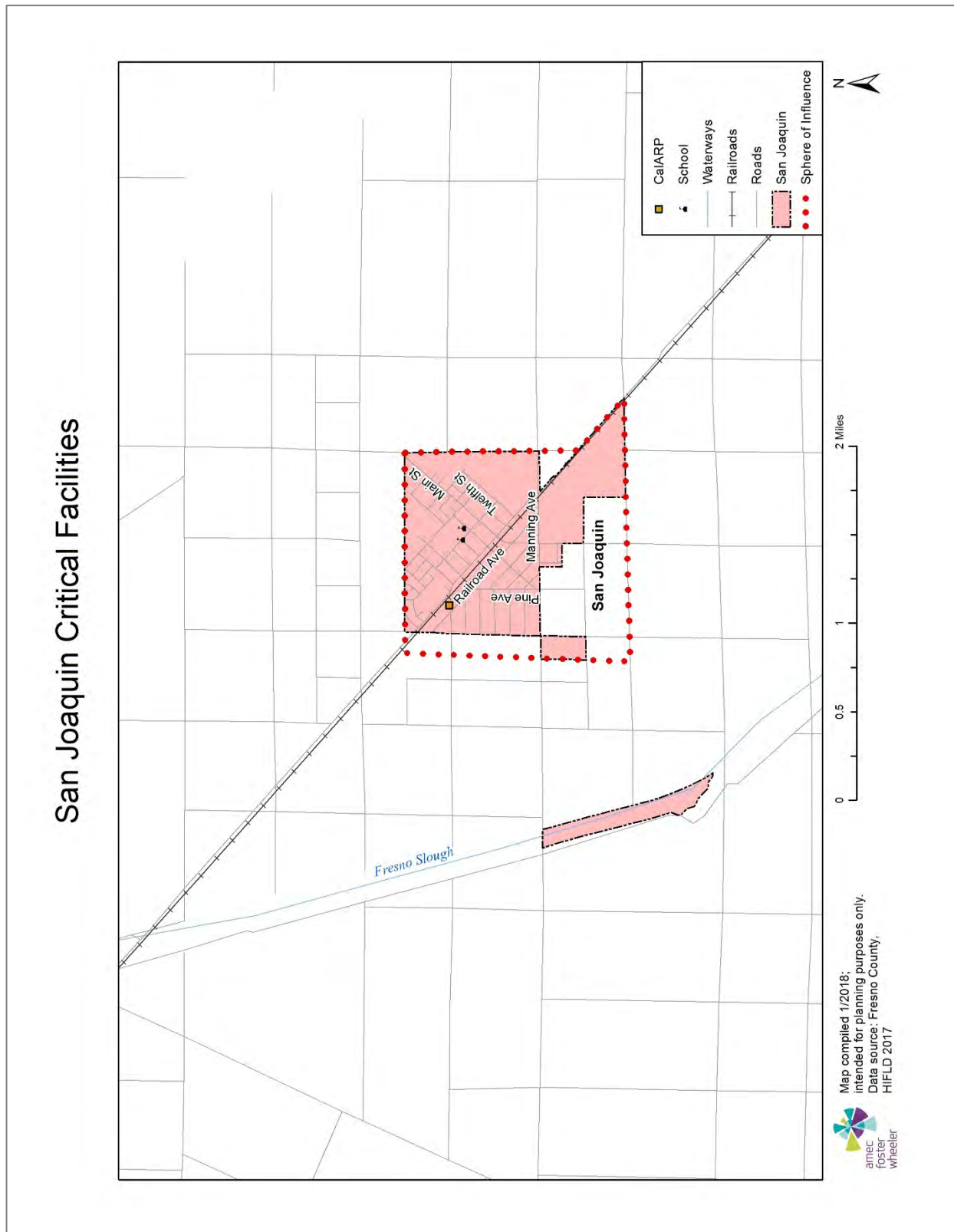
An inventory of critical facilities in the City of San Joaquin identified by Fresno County GIS is provided in Table L.7 and mapped in Figure L.2. In addition to these facilities, the City also considers City Hall (21900 W. Colorado Avenue) and Veteran Memorial Hall (22001 W. Manning Avenue) to be critical facilities.

Table L.7: City of San Joaquin's Critical Facilities

Critical Facility Type	Number
CalARP	1
School	2
Sheriff	1
Total	4

Source: Fresno County, HIFLD 2017

Figure L.2: City of San Joaquin's Critical Facilities



Historic Resources

The National Register of Historic Places does not list any sites within the City of San Joaquin.

Economic Assets

The City of San Joaquin has a base of ready to go industrial locations including undeveloped parcels that have easy to access infrastructure. The existing buildings in the industrial park have modern amenities and are amendable to easy conversion into a variety of different industrial uses. In addition to space, San Joaquin's other site location strengths include its transportation infrastructure with direct railroad access and connections to I-5, State Highway 41 and U.S. Highway 99. The community's location is in reasonable proximity to agricultural production and processing facilities and is well situated to serve agribusiness. Other community assets in San Joaquin include affordable housing, a rural quality of life and a business-friendly city staff ready to assist new businesses.

Growth and Development Trends

The average population increase for the past ten years has been 2.76% and the average increase for the most recent five years has been 3%. The need for construction of major facilities (i.e. water wells, sewage treatment plant expansion, and parks) will be directly proportional to growth.

The City's General Plan Land Use Map, revised in September 2013, is shown in Figure L.3.

Table L.8 illustrates how San Joaquin has grown in terms of population and number of housing units between 2010 and 2015. As of 2015, the population of San Joaquin was 4,008 with an average growth rate of only 0.17 percent. However, despite minimal population change, the city experienced substantial development of housing units.

Table L.8: City of San Joaquin Change in Population and Housing Units, 2010-2015

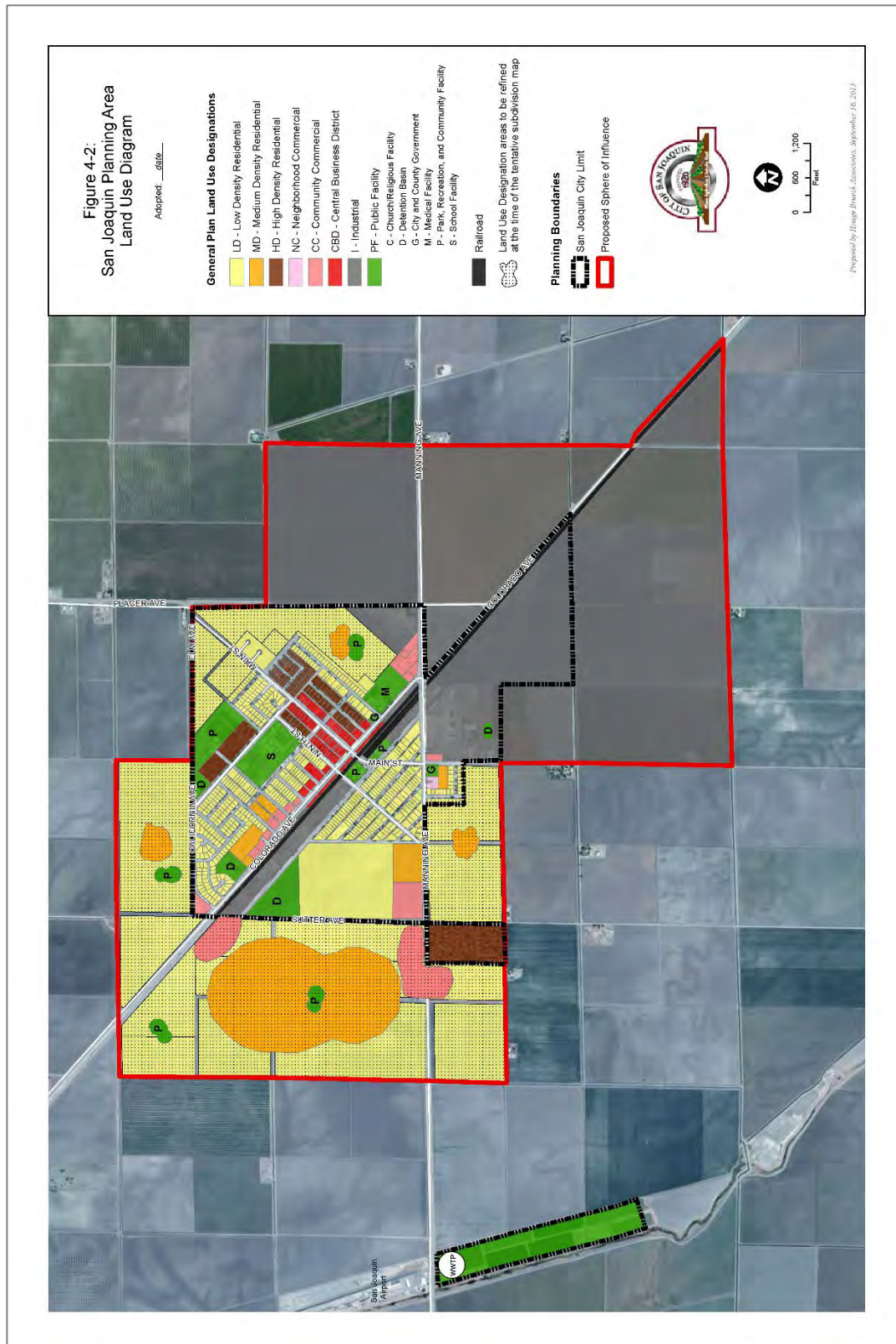
2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2015
4,001	4,008	+0.17	934	1,044	+11.8

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2011-2015 5-Year Estimates

Of the 1,044 housing units in San Joaquin, 91.2 percent are occupied. Renter-occupied units account for 62.0 percent of all occupied housing. Single family detached homes comprise 51.1 percent of the housing stock in the City, followed by 2-unit and 3- or 4- unit structures, which together account for 40.2 percent of all housing units.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

Figure L.3: City of San Joaquin's Land Use Designations



L.3.2 Estimating Potential Losses

Table L.6 above shows San Joaquin's exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. In regard to these types of structures, there are no parcels in the 100- or 500-year floodplains in the City of San Joaquin. No further information on vulnerable structures is available. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County as a whole).

Agricultural Hazards

Agricultural hazards are of high significance for the City of San Joaquin due to the large proportion of the City's economy devoted to agriculture. Agricultural pests or diseases that harm crop yields are likely to cause significant economic distress in the City. A threat to San Joaquin is the ongoing agricultural land retirements that would potentially reduce the commodity output and limit the growth in food processing or packing facilities.

Drought

The HMPC determined that while drought is a significant hazard to the City of San Joaquin, this risk and vulnerability does not differ substantially from the overall risk faced by the County. Details on risk and vulnerability to drought can be found in Chapter 4 Risk Assessment.

Earthquake

There are no known active faults that run through the City. The nearest active fault, the Coalinga Fault, is approximately 40 miles west of the City. The San Andreas Fault is located 50 miles to the west, and the Owens Valley Fault is located approximately 100 miles to the east. The Clovis Fault is northwest-trending and about five miles east of the City of Clovis. It has been determined that the greatest potential for a significant earthquake would be from the San Andreas Fault. The 2007 Uniform Building Code (UBC) indicates that the City is located within Seismic Risk Zone 3, although it is relatively close to Zone 4 located to the west. UBC states that buildings constructed in Zone 4 are subject to higher standards than other zone designation buildings. Places located on alluvial deposits, like the City, tend to experience more intense ground shaking than those located on solid rock. However, because the City is far from any active faults, it is relatively unlikely that ground shaking in the City would be more than minimal (San Joaquin General Plan, 1995). According to the Fresno County Multi-Hazard Mitigation Plan, the City has a 20 to 30 percent chance of shaking 10 percent in the next 50 years.

Flood/Levee Failure

According to FEMA's 2016 Flood Insurance Study (FIS), San Joaquin faces minimal flood risk. The significance of flood is low compared to the planning area as a whole due to protection provided by a system of levees. According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction. However, the City of San Joaquin does face risk of flooding from levee failure. See Chapter 4 Risk Assessment for a map of leveed areas in Fresno County.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of San Joaquin was created (see Figure L.4). None of the City falls within the 100- or 500-year floodplain and no values are at risk from a 100- or 500-year flood event. However, all of the City falls within a leveed area. Properties at risk and loss estimates due to flooding are detailed in Table L.9.

Figure L.4: City of San Joaquin's 100- and 500-Year Floodplains

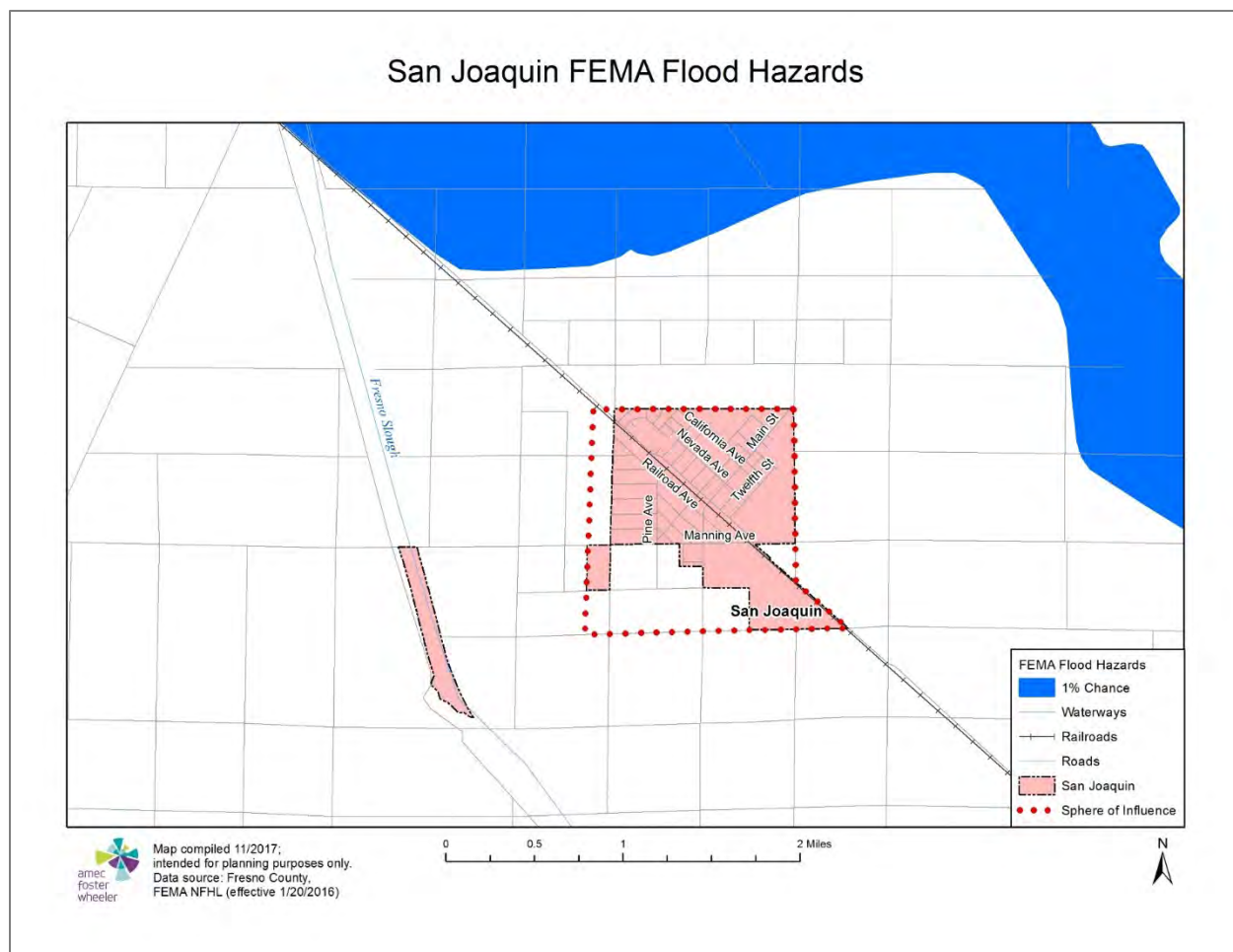


Table L.9: City of San Joaquin's Levee Failure Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	0	\$12,673	\$12,673	\$25,346	\$6,337
Commercial	37	70	\$6,658,928	\$6,658,928	\$13,317,856	\$3,329,464
Exempt	11	110	\$0	\$0	\$0	\$0
Industrial	15	16	\$6,573,243	\$9,859,865	\$16,433,108	\$4,108,277
Multi-Residential	10	105	\$7,049,843	\$3,524,922	\$10,574,765	\$2,643,691
Residential	613	945	\$40,052,026	\$20,026,013	\$60,078,039	\$15,019,510
Total	687	1,246	\$60,346,713	\$40,082,400	\$100,429,113	\$25,107,278

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Population at Risk

Using parcel data from the County, population at risk was calculated for the National Levee Inventory leveed area based on the number of residential properties at risk and the U.S. Census Bureau 2016 estimate for the average number of persons per household (3.17). Based on this assessment, 1,975 people are at risk to flooding from levee failure in the City of San Joaquin.

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of San Joaquin joined the National Flood Insurance Program (NFIP) on April 30, 1982. NFIP Insurance data indicates that as of June 6, 2017, there were no flood insurance policies in force in the City. However, there have been three historic losses paid in the City, including two claims for residential structures and one claim for a commercial structure, with paid losses totaling \$10,720.

There are no repetitive loss structures in the City of San Joaquin.

Hazardous Material Incident

There is one CalARP hazardous materials facility located in the City of San Joaquin. As identified in Table L.10, there is one critical facility in San Joaquin located within a half mile of this CalARP facility.

Table L.10: Critical Facilities within ½ mile of CalARP Facility: City of San Joaquin

Critical Facility Type	Count
School	1
Total	1

Source: Fresno County, HIFLD 2017

L.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of San Joaquin's updated capabilities are summarized below.

L.4.1 Regulatory Mitigation Capabilities

Table L.11 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in San Joaquin.

Table L.11: City of San Joaquin's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General or Comprehensive plan	Yes	
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, steep slope, wildfire)	No	
Building code	Yes	
Fire department ISO rating	No	
Erosion or sediment control program	No	
Stormwater management program	Yes	
Site plan review requirements	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	
Other special plans	No	
Flood insurance study or other engineering study for streams	No	
Elevation certificates (for floodplain development)	No	

L.4.2 Administrative/Technical Mitigation Capabilities

Table L.12 identifies the personnel responsible for activities related to mitigation and loss prevention in San Joaquin.

Table L.12: City of San Joaquin's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	Consultant
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Consultant
Planner/engineer/scientist with an understanding of natural hazards	No	
Personnel skilled in GIS	Yes	Consultant
Full time building official	Yes	
Floodplain manager	Yes	
Emergency manager	No	
Grant writer	Yes	Consultant
Other personnel		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	No	
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	

L.4.3 Fiscal Mitigation Capabilities

Table L.13 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table L.13: City of San Joaquin's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	Yes
Withhold spending in hazard prone areas	Yes

L.4.4 Other Mitigation Efforts

As the City nears buildout (24,330 persons), the demand for an additional fire station may be warranted. Property maintenance is enforced through General Plan policies that will reduce the potential and severity of fires.

L.4.5 Opportunities for Enhancement

Based on the capabilities assessment, the City of San Joaquin has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the community. Some of the possible opportunities for enhancement of the City's existing mitigation program are listed below.

- Develop a Drought Contingency Plan that will help to create a framework for drought response and mitigation in the City.
- Develop landscaping ordinances that incorporate proper species selection that are drought resistant, and planting and maintenance practices that will not exacerbate the effects of drought.
- Provide training opportunities for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Additional training opportunities will help to inform City staff members on how best to integrate hazard information and mitigation projects into their departments.

L.5 Mitigation Strategy

L.5.1 Mitigation Goals and Objectives

The City of San Joaquin adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Public Works Department may utilize the hazard information when implementing new projects as well as when maintain city infrastructure. The Department of Parks and Recreation may utilize the hazard information to better understand the community's vulnerability to drought and maintain the City's park and community centers in a manner to that will not exacerbate the effects of drought. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from San Joaquin will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1982. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

L.5.2 Mitigation Actions

The planning team for the City of San Joaquin identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included.

In addition to implementing the mitigation action below the City of San Joaquin will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Construct A Water Storage Tank and Booster Pump Station; Including Emergency Generators to Be Installed at Water Storage Tank, Booster Pump and All Water Well Sites

Hazard(s) Addressed: Multi-Hazard: drought, flood, severe weather, earthquake

Issue/Background: The City currently does not have any water storage capacity, which makes us vulnerable to water shortages and system demands during drought and also susceptible to shortfalls related to fire flows. Additionally, in the event of an emergency and power goes out the City does not have any backup power sources to ensure the wells remain in operation. A number of hazards in the planning area could result in extended power outages.

Other Alternatives: None

Responsible Office: City of San Joaquin

Priority (High, Medium, Low): High

Cost Estimate: \$3 million

Potential Funding: State Revolving Fund, Community Development Block Grant

Benefits (Avoided Losses): Storage tank will help the City maintain its ability to meet system demands including fire flows and drought reserves. A dedicated emergency generator will ensure the tank and booster station will remain operational during power outages.

Schedule: Construction to begin Fall 2018

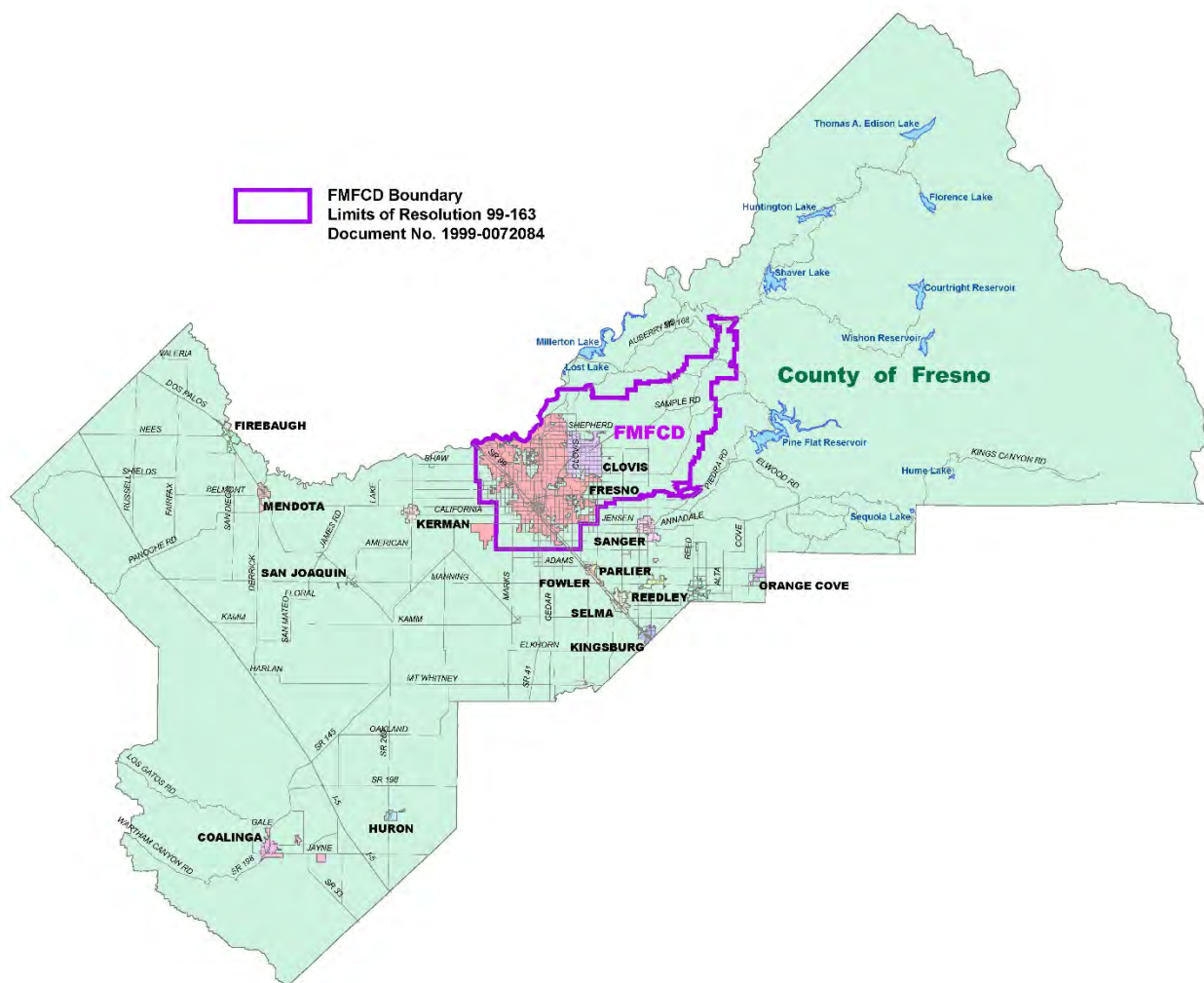
Status: New project

ANNEX M: FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

M.1 District Profile

The Fresno County Metropolitan Flood Control District service area is illustrated in Figure M.1.

Figure M.1: Fresno County Metropolitan Flood Control District's Service Area



Source: Fresno County Metropolitan Flood Control District, www.fresnofloodcontrol.org/

Until June 5, 1956, the responsibility for stormwater management and related functions was vested individually in the Cities of Fresno and Clovis and the County of Fresno. Fresno Metropolitan Flood Control District (District) is a “special act” district, created by the electorate to provide fully coordinated and comprehensive stormwater management and related services on a regional basis

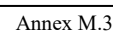
through a quasi-joint powers relationship among the Cities of Fresno and Clovis and the County of Fresno.

The District is located in the fertile San Joaquin Valley in the central part of California, about halfway between San Francisco and Los Angeles. The terrain in the Fresno area is relatively flat, with a sharp rise to the foothills of the Sierra Nevada Mountains about 15 miles eastward.

The climate in the Fresno area is sunny and dry in the summer and cool and wet in the winter months. Midsummer temperatures can occasionally top 100°F, but low humidity and gentle breezes help to make the high temperature more bearable. The mean July temperature is 82°F (mean high 99°F). Although temperatures drop below 32°F at times, the mean low temperature in the winter is 37°F degrees. Precipitation usually begins in October and ends in April, averaging 10.6 inches.

The District is authorized to control stormwater within an urban and rural foothill watershed of approximately 400 square miles known as the Fresno County Stream Group. The watershed extends eastward into the Sierra Nevada to an elevation of approximately 4,500 feet above sea level. The District service area includes most of the Fresno-Clovis metropolitan area (excluding the community of Easton) and unincorporated lands to the east and northeast. Figure M.1 displays the District's service area and Figure M.2 displays the District's Master Plan Map.

Fresno County (Fresno Metropolitan Flood Control District)
Multi-Jurisdictional Hazard Mitigation Plan



Before 1956, stormwater management generally consisted of independent, site-specific actions intended only to alleviate individual problem locations, failing to create comprehensive solutions. In response to the rapidly increasing number of stormwater management problems and the inability of the three independent jurisdictions to provide an effective, coordinated solution, a citizens' committee formed to explore alternatives.

The result of the citizens' efforts was draft legislation creating a "special act" district designed to mandate a quasi-joint powers relationship among the Cities and County, which would provide the desired stormwater management service. The act is known as the Fresno Metropolitan Flood Control District Act of 1955 and was signed into law on May 13, 1955. The District Act became law on September 17, 1955, subject to voter approval. On June 5, 1956, the District Act was ratified by a five-to-one majority vote (32,030 voting in favor, 5,974 voting in opposition) and was established as Chapter 73 of the California Water Code appendix.

The mission of the District is to provide the approximately 700,000 citizens living within its boundaries the ability to control and manage the water resources of the area; to prevent damage, injury, and inconvenience; to conserve such waters for local, domestic, and agricultural use; and to maximize the public use and benefit of the District's programs and infrastructure.

The District works to address stormwater and related water resource problems and needs, while seeking to prevent the creation of new problems. The District strives to achieve these goals within the reasonable time and economic parameters established through collective community discussion and decision making as entrusted to the District's seven-member Board of Directors. As a service agency, it is the District's responsibility to respond to the community's needs for technical information, resource conservation, and facility construction, operation, and maintenance.

M.2 Hazard Identification and Summary

The District’s planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table M.1).

Table M.1: Fresno Metropolitan Flood Control District—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Unlikely	Limited	Limited	Low
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Unlikely	Critical	High
Drought	Extensive	Likely	Critical	Medium
Earthquake	Extensive	Occasional	Critical	Medium
Flood/Levee Failure	Significant	Occasional	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Low
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Negligible	Low
Severe Weather				
Extreme Cold/Freeze	Extensive	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Highly Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Medium
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Limited	Occasional	Limited	Low
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

M.3 Vulnerability Assessment

The intent of this section is to assess the District’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the FMFCD’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the District.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table M.1). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the District’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table M.1 reflect the hazards that could potentially affect the District. Those of Medium or High significance for the District are identified below. The discussion of vulnerability for each of the following hazards is located in Section M.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include dam failure and flood/levee failure.

- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incidents
- severe weather: heavy rain/thunderstorm/hail/lightning

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the District, those hazards of low significance are as follows:

- agricultural hazards
- human health hazards: epidemic/pandemic; West Nile Virus
- landslide
- severe weather: extreme cold/freezing; extreme heat; fog; tornado; windstorm; winter storm
- soil hazards
- volcano
- wildfire*

***Note:** Wildfire is considered a High significance hazard for the County, but is of Low significance to the District because wildfire risk within the District is addressed by the County and the Cities of Fresno and Clovis. Please refer to the wildfire risk maps for the cities of Fresno and Clovis for justification of the Low rating in the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

Additionally, the District's planning team decided to rate certain hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and probability of occurrence. Avalanche is considered not applicable to the District.

For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

M.3.1 Assets at Risk

This section considers the District's assets at risk, specifically critical facilities and infrastructure, natural resources, and growth and development trends.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Table M.2 lists particular critical facilities and other community assets identified by the District's planning team as important to protect in the event of a disaster. The District's physical assets consist of the flood control and local drainage structures and real property, the operations center, and equipment.

Table M.2: Specific Critical Facilities and Other Community Assets Identified by the Fresno Metropolitan Flood Control District's Planning Team

Name of Asset	Replacement Value (\$)	Occupancy/ Capacity #	Comments
Redbank-Fancher Creek Flood Control Project	\$125,000,000	n/a	Provides protection from 200-year, 30-day rainfall event
Local Stormwater Drainage System (153 basins in various stages of completion, 84 pump stations, 670 miles of pipeline)	\$320,000,000	n/a	2-year pipeline collection system and 6-inch, 10-day basin capacity
Fresno Metropolitan Flood Control District Operations Center	\$12,000,000	84 employees	

The Fresno Metropolitan Flood Control District has undertaken several mitigation actions to reduce vulnerability within the District. Fancher Creek Detention Basin (FCB) is an important component of the District's Flood Control Master Plan. Not only does FCB provide flood control on a large channel, it also removed several floodplains from a flood insurance requirement for many Fresno residents. The major structures in FCB were constructed in 2006. However, the need for additional excavation of the basin and future improvements remains.

The District recently acquired a Proposition 1 Grant that will fund the construction of a pipeline from the Gould Canal to FCB as well as a large capacity pump station in FCB. The pipeline will allow uncontrolled flows from Mud Creek and the Vernon Drain to be diverted from the Gould Canal to FCB. The pump station will provide rapid dewatering of FCB. These projects are scheduled to be constructed in 2018-2019.

Natural Resources

Several state or federally listed species may be found within the District boundary. These are identified, along with other species of concern found in the District, in Table M.3.

Table M.3: Species of Concern in the Fresno Metropolitan Flood Control District

Common Name	Scientific Name	Federal Status	State Status
American Badger	<i>Taxidea taxus</i>		
American (=pine) marten	<i>Martes Americana</i>		
Bald eagle	<i>Haliaeetus leucocephalus</i>		Endangered
Beaked clarkia	<i>Clarkia rostrata</i>		
Black-crowned heron	<i>Nycticorax nycticorax</i>		
Boggs Lake hedge-hyssop	<i>Gratiola heterosepala</i>		Endangered
Burrowing owl	<i>Athene cunicularia</i>		
California horned lark	<i>Eremophila alpestris actia</i>		
California linderiella	<i>Linderiella occidentalis</i>		
California tiger salamander	<i>Ambystoma californiense</i>	Threatened	Threatened
Colusa grass	<i>Neostapfia colusana</i>	Threatened	Endangered
Dry Creek cliff strider bug	<i>Orvalia pege</i>		
Elongate copper-moss	<i>Mielichhoferia elongate</i>		

Common Name	Scientific Name	Federal Status	State Status
Foothill yellow- legged frog	<i>Rana boylei</i>		Candidate- Threatened
Fresno kangaroo rat	<i>Dipodomys nitratoide exilis</i>	Endangered	Endangered
Golden eagle	<i>Aquila chrysaetos</i>		
Great gray owl	<i>Strix nebulosa</i>		Endangered
Greene's tuctoria	<i>Tuctoria greenei</i>	Endangered	Rare
Hairy orcutt grass	<i>Orcuttia pilosa</i>	Endangered	Endangered
Hardhead	<i>Mylopharodon conocephalus</i>		
Hartweg's golden sunburst	<i>Pseudobahia behiifolia</i>	Endangered	Endangered
Hoary bat	<i>Lasiurus cinereus</i>		
Hoover's calycaderia	<i>Calycadenia hoover</i>		
Keck's checkerbloom	<i>Sidalcea keckii</i>	Endangered	
Kings River buckwheat	<i>Eriogonum nudum var. regirivum</i>		
Madera linanthus	<i>Linanthus serrulatus</i>		
Mariposa cryptantha	<i>Crypantha mariposae</i>		
Mariposa pussypaws	<i>Calyptidium pulchellum</i>	Threatened	
Midvalley fairy shrimp	<i>Branchinecta mesovallensis</i>		
Molestan blister beetle	<i>Lytta molesta</i>		
Orange lupine	<i>Lupinus citrinus var. citrinus</i>		
Osprey	<i>Pandion haliaetus</i>		
Oval-leaved viburnum	<i>Viburnum ellipticum</i>		
Pallid bat	<i>Antrozous pallidus</i>		
Prairie falcon	<i>Falco mexicanus</i>		
San Joaquin adobe sunburst	<i>Pseudobahia peirsonii</i>	Threatened	Endangered
San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	Endangered	Threatened
San Joaquin pocket mouse	<i>Perognathus inornatus inornatus</i>		
San Joaquin Valley orcutt grass	<i>Orcuttia inaequalis</i>	Threatened	Endangered
Sanford's arrowhead	<i>Sagittaria sanfordii</i>		
Sierra Nevada red fox	<i>Vulpes vulpes necator</i>	Candidate	Threatened
Spiny-sepaled button-celery	<i>Eryugium spinosepalum</i>		
Spotted bat	<i>Euderma maculatum</i>		
Succulent owl's-clover	<i>Castilleja campestris ssp. Succulenta</i>	Threatened	Endangered
Swainson's Hawk	<i>Buteo swainson</i>		Threatened
Tree-anemone	<i>Carpenteria californica</i>		Threatened
Tricolored blackbird	<i>Agelaius tricolor</i>		Candidate- Endangered
Valley elderberry longhorned beetle	<i>Desmocerus californicus dimorphus</i>	Threatened	
Vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	Threatened	
Vernal pool tadpole shrimp	<i>Lepidurus packardii</i>	Endangered	
Western mastiff bat	<i>Eumops perotis californicus</i>		
Western pond turtle	<i>Emys (=Clemmys) marmorata</i>		
Western spadefoot	<i>Spea (=Scaphiopus) hammondi</i>		
Western yellow- billed cuckoo	<i>Coccyzus americanus occidentalis</i>	Threatened	Endangered
White-tailed Kite	<i>Elanus leucurus</i>		
Willow flycatcher	<i>Empidonax traillii</i>		Endangered
Yosemite lewisia	<i>Lewisia disepala</i>		

Source: Fresno Metropolitan Flood Control District Services Plan, 2004

Sensitive habitats in the District include the following:

- Central Valley drainage hardhead/squawfish stream
- Great Valley mixed riparian forest
- Northern basalt flow vernal pool
- Northern claypan vernal pool
- Northern hardpan vernal pool
- Sycamore alluvial woodland

Growth and Development Trends

The Fresno Metropolitan Flood Control District completes technical studies and updates its master plan in conjunction with the growth patterns within its 400-square-mile service area. The District meets with the local Building Industry Association and planning departments to ensure knowledge of growth and development trends.

Development requires the urban storm drain system to be expanded. As the urban sphere expands, the District's storm drainage master plan expands as well. The District utilizes canals that are operated and maintained by the Fresno Irrigation District (FID) to pump stormwater when urban basins require additional stormwater management capacity. These canals have a fixed capacity. An expanded urban area also increases the total amount of runoff generated within the District boundaries; this runoff may also need to be managed by pumping to the FID system.

M.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table M.2 above shows the Fresno Metropolitan Flood Control District's critical facilities and assets that could be exposed to hazards. Specific losses for the Cities of Fresno and Clovis and the portion of the County of Fresno within the District's boundaries are discussed elsewhere in this hazard mitigation plan.

Note: Hazardous Materials Incidents are considered Medium priority hazards by the District but are addressed by the City of Fresno and the City of Clovis. See Chapter 4 Risk Assessment, Annex B, and Annex C for details on vulnerability to this hazard.

Dam Failure

The Fresno Metropolitan Flood Control District has three earthen dams (Big Dry Creek, Fancher Creek, and Redbank Creek) that are identified in the Fresno County Operational Area Dam Failure Evacuation Plan. The dams are maintained regularly for rodent and vegetation control and inspected regularly for operational integrity and security. They are also inspected annually by the

U.S. Army Corp of Engineers and the California Department of Water Resources Division of Safety of Dams.

Drought

The Fresno Metropolitan Flood Control District has nearly 420 acres of irrigated and landscaped basins that could be impacted in a prolonged drought.

Earthquake

The seismic hazard within the Fresno Metropolitan Flood Control District's service area is relatively low compared to many other parts of California. However, the area is considered to have a moderate risk of earthquake damage due to the presence of major fault systems to the west, south, and east and due to the large population and number of buildings, critical facilities, and infrastructure and other development that could be vulnerable to more severe ground shaking.

Flood

The Fresno Metropolitan Flood Control District's operation center is located outside of the 100-year floodplain and therefore should not be susceptible to damage in a large flood event. The Redbank-Fancher Creeks Flood Control Project and local stormwater drainage system could sustain damage during a large flood event due to debris accumulation and high stormwater flows.

Since it is a special district, participation in the National Flood Insurance Program (NFIP) does not apply to the Fresno Metropolitan Flood Control District, thus NFIP Repetitive Loss and Severe Repetitive Loss properties are not tracked for the jurisdiction; therefore, the District does not have this data available. Within the District's boundaries the City of Fresno has one Repetitive Loss property but no Severe Repetitive Loss properties; Clovis has none of either type. Refer to those annexes for additional information. There are two Repetitive Loss properties in the unincorporated County, but further details to determine if these are within the District's boundary are not available. There are no Severe Repetitive Loss properties in the County as detailed in Chapter 4 Section 4.3.2 of the base plan.

Severe Weather: Heavy Rain/Thunderstorm/Hail/Lightning

Heavy rain, thunderstorm activity, and hail are usually of such duration that they have no adverse impact on the District's Redbank-Fancher Creeks Flood Control Project. However, the local stormwater drainage system, which is designed to accept the peak flow rate of runoff from a two-year intensity storm event (a storm which has a 50 percent probability of occurring in any given year) could be impacted. When storm events occur that exceed the two-year intensity, ponding occurs in the streets until the pipeline system can remove the water. If the storm is sufficiently intense to generate more water than the street can store, the water will continue to rise until it reaches a topographic outlet where it can escape down gradient. This escape route is a feature of the major storm routing system. There are multiple areas within the District's service area that

were developed before the District was formed and therefore lack the major storm routing system. These areas could be susceptible to damage from heavy rain, thunderstorm, and hail.

M.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into four sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation outreach and partnerships.

To develop this capability assessment, the District's planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the District's planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The Fresno Metropolitan Flood Control District's updated capabilities are summarized below.

M.4.1 Regulatory Mitigation Capabilities

Table M.4 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table M.4: Fresno Metropolitan Flood Control District's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	District Services Plan, 2004 (also, see general plans for Cities of Clovis and Fresno and Fresno County)
Zoning ordinance	Yes	Cities of Clovis and Fresno, Fresno County
Subdivision ordinance	Yes	Cities of Clovis and Fresno, Fresno County
Site plan review requirements	Yes	Cities of Clovis and Fresno, Fresno County
Growth management ordinance	No	
Floodplain ordinance	Yes	Cities of Clovis and Fresno, Fresno County
Other special purpose ordinance (storm water, water conservation, wildfire)	Yes	Cities of Clovis and Fresno, Fresno County
Building code	Yes	2001 California Building Code
Erosion or sediment control program	Yes	Cities of Clovis and Fresno, Fresno County
Storm water management program	Yes	Storm Drainage and Flood Control Master Plan

Capital improvements plan	Yes	Cities of Clovis and Fresno, Fresno County
Economic development plan	Yes	Cities of Clovis and Fresno, Fresno County
Local emergency operations plan	Yes	Cities of Clovis and Fresno, Fresno County
Other special plans	Yes	Strategic Plan
Flood Insurance Study or other engineering study for streams	Yes	2016

As indicated above, the District has several plans and programs that guide hazard mitigation. Some of these are described in more detail below.

District Services Plan, 2004

The District Services Plan presents District goals, program objectives, current program descriptions, and implementation strategies. Comprehensive program descriptions provide reference and orientation information for District staff, Board members, and the public.

Fresno County Flood Control District Strategic Plan

The Fresno County Flood Control District Strategic Plan is a brief document that includes the District's mission and vision statements and other guiding principles. The following goals are outlined in the plan:

- Timely provision of needed services through fair and equitable financing
- Prevention of future drainage/flooding problems
- Operations and maintenance programs that ensure public safety and community aesthetics
- Conservation of storm and other surface water to preserve groundwater and environmental resources
- Augmentation of public open space and recreation resources through joint use of District facilities
- Support of economic development within the Fresno/Clovis area
- Achievement of program goals through close coordination with the County and the Cities of Fresno and Clovis

District Programs

Flood Control Program

The flood control program relates to the control, containment, and safe disposal of stormwater that flows onto the valley floor from the eastern streams. It consists of a system of facilities and operations that is currently composed of eight major flood control facilities and many related streams and channels. The District is the local sponsor of the U.S. Army Corps of Engineers' Redbank-Fancher Creeks Flood Control Project, which consists of five of the flood control system's major facilities. The District is responsible for construction cost sharing, land acquisition, operation, and maintenance related to the project. It is also responsible for construction, operation, and maintenance of additional, nonfederal flood control facilities required to control the stream

group, and for floodplain management. The eight major structural elements of the flood control system are Big Dry Creek Dam and Reservoir, Fancher Creek Dam and Reservoir, Redbank Creek Dam and Reservoir, Pup Creek Detention Basin, Alluvial Drain Detention Basin, Redbank Creek Detention Basin, Fancher Creek Detention Basin, and Big Dry Creek Detention Basin.

Rural Streams Program

The District has implemented a rural streams program to preserve, restore, and maintain rural stream channels and to complete any additional facilities necessary to safely convey storm flows through the rural area and the downstream urban area. It includes activities to secure and maintain drainage amenities necessary for rural lands within the watershed.

Local Stormwater Drainage Program

The District's local drainage program relates to the collection and safe disposal of stormwater runoff generated within the urban and rural watersheds or "drainage areas." The District's local stormwater drainage system consists of storm drains, detention and retention basins, and pump stations. The system is designed to retain and infiltrate as much stormwater and urban runoff as possible.

Other Programs

Other District programs include a stormwater quality program, water conservation program, recreation program, and wildlife management program.

M.4.2 Administrative/Technical Mitigation Capabilities

Table M.5 identifies the personnel responsible for activities related to mitigation and loss prevention in the District.

Table M.5: Fresno Metropolitan Flood Control District's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/ No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Engineering Department	Various positions
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Engineering, Operations, and Environmental Departments	Various positions
Planner/engineer/scientist with an understanding of natural hazards	Yes	Engineering and Operations Departments	Various positions
Personnel skilled in GIS	Yes	GIS Technician	Two positions
Full-time building official	No		
Floodplain manager	No		Advisory agency
Emergency manager	Yes	Operations Department	Various positions
Grant writer	Yes	Administration/Staff Analyst	Three staff members can work as grant writers

Other personnel	Yes	Administration, Engineering, Facilities Departments	Various support and maintenance positions
GIS Data—Land use	Yes		
GIS Data—Links to Assessor's data	Yes		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No		

In addition to the above capabilities, the Fresno Metropolitan Flood Control District also has several programs and projects designed to reduce vulnerability. The District runs ongoing public outreach via a clean stormwater education program. The District also has several structural flood control projects ongoing, including significant completion of Fancher Creek Detention Basin (FCB), construction of flood control facilities at Pup Creek-Enterprise Basin (PEB), construction of the Big Dry Creek Detention Basin Pump Station (BDB), construction of the Dry Creek Extension Basin Pump Station (DCE), and ongoing excavation of FCB, BDB, PEB, and DCE. The District is also planning for upcoming construction of pump stations at urban stormwater basins in various locations.

Board of Directors

A seven-member Board of Directors governs the District. The Fresno City Council appoints four members, the Fresno County Board of Supervisors appoints two members, and the Clovis City Council appoints one member. Each director serves a four-year term and may be reappointed for consecutive terms. The Board must approve the District budget, fees, and assessments; direct matters of policy and enact ordinances; and perform other responsibilities authorized and required by the Fresno Metropolitan Flood Control District Act of 1955.

M.4.3 Fiscal Mitigation Capabilities

Table M.6 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table M.6: Fresno Metropolitan Flood Control District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Yes	Included in our yearly budget
Authority to levy taxes for specific purposes	Yes	We have voter approved authority to tax properties within our boundaries that receive benefits from our services up to \$.20/\$100 assessed valuation
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	Yes	New development pays their proportional share of the storm drain system
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	Yes	

Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	
Other	Yes	Grants, contributions, rents, service fees, and donations

The financing program of the District includes five major categories of revenues. These include general property tax, assessments, bonds, fees and service charges, and grants and contributions. In addition to these, the District receives minor miscellaneous revenues such as rents and leases, interest, and gifts. The general authority to receive or collect such revenues is set forth in the District's enabling legislation, other state legislation under which the District is an eligible participant, and through joint powers relationships in which the District participates.

Economic Development Reserve

In October of 1999, the Board of Directors established an annual economic development reserve for the purpose of accelerating funding of storm drainage infrastructure to support job-creating developments in the community. This policy allows up to 50 percent of the District's annual budget reserve to be allocated as an economic development reserve.

These funds may be used at the direction of the Board to support construction of master plan storm drainage facilities to service high priority economic development projects. Projects are considered on a first come, first served basis, and each project must:

- Create additional leverage toward construction of master plan facilities by drawing additional public or private monies,
- Effect construction of critical elements of the drainage system, and
- Serve an economically targeted industry or area.

M.4.4 Mitigation Outreach and Partnerships

As part of the rural streams program, the District has developed and distributed public information materials to increase public awareness and understanding of various issues related to clean stormwater, including stream and habitat values, flood water conveyance, water quality, and the adverse effects of human activities.

The District partners with the Fresno Irrigation District and the Cities of Fresno and Clovis, which provide for dry season delivery of imported surface water into many of the District's local stormwater drainage retention basins.

M.4.5 Opportunities for Enhancement

Based on the capabilities assessment, the Fresno Metropolitan Flood Control District has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to

further protect the communities the District serves. Some of the opportunities for enhancement of the District's existing mitigation program are listed below.

- Enhance existing public outreach strategy. As mentioned above the District has an outreach strategy that includes disseminating information to the public through their clean stormwater education program. The District may work to enhance their public outreach strategy to include information on flood/levee failure and dam failure and through existing partnerships with the County, City of Fresno, and City of Clovis.
- Future improvements may include participation in training for staff related to hazard mitigation grant funding in partnership with the County and Cal OES.

M.5 Mitigation Strategy

M.5.1 Mitigation Goals and Objectives

The Fresno Metropolitan Flood Control District adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the District to help inform updates and the development of plans, programs and policies for the jurisdictions within the District. Hazard information will be incorporated in future updates to the District's Service Plan and Strategic Plan. The information within this LHMP as well as the annexes of the jurisdictions the District serves, will help the District to better understand the vulnerabilities of each jurisdictions and better tailor projects within the District's existing programs.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from the Fresno Metropolitan Flood Control District will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

M.5.2 Completed 2009 Mitigation Actions

The District has not completed any mitigation actions identified in the 2009 plan. However, implementation has been started for several of these actions and will be continued as part of the mitigation strategy for this plan update.

There are two actions from the 2009 plan that the District is not carrying forward, because they have been replaced with new projects detailed in actions 1 and 2, below. The deleted actions are:

- Construct Control Structures and Flood Channel for Mud Creek Flows between Gould and Fresno Canals
- Construct Improvements to the Vernon Drain between the Gould and Fresno Canals

M.5.3 Mitigation Actions

The planning team for the Fresno Metropolitan Flood Control District identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included. Actions with an ‘*’ are those that mitigate losses to future development.

In addition to implementing the mitigation actions below the Fresno Metropolitan Flood Control District will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The District agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Construct the Gould Canal to Fancher Creek Detention Basin Pipeline.

Hazard(s) Addressed: Flood

Issue/Background: The Gould Canal is an FID facility that conveys rural stormwater and irrigation water through the Fresno/Clovis area. There are multiple uncontrolled rural streams that discharge into the Gould Canal upstream of this project component's location. Along with the uncontrolled rural stream discharges, FMFCD has multiple urban basins, located downstream of Fancher Creek Detention Basin, that rely on discharging to the Gould Canal to prevent localized flooding. During major storm events, the uncontrolled flows in the Gould Canal can limit the ability to pump urban basins to the Gould Canal. FMFCD and FID monitor the Gould Canal closely to ensure the canal does not overtop. At times, the inability to discharge stormwater out of the urban basins creates a localized flooding issue. The stormwater that is conveyed in the canal, whether it is from the rural streams or urban basins, is routed out of the local region. The Gould Canal to Fancher Creek Detention Basin Pipeline will construct the facilities necessary to establish a connection between the Gould Canal and Fancher Creek Detention Basin, including roughly 2,900 lineal feet of 72" pipeline. The connection will allow FMFCD to divert the uncontrolled rural stream flows out of the Gould Canal and into Fancher Creek Detention Basin. These proposed improvements will reduce the risk of flooding along the canal downstream and will maintain capacity within the canal for urban basin discharges. This project component will also allow FMFCD to capture, retain and recharge stormwater in Fancher Creek Detention Basin that would typically be routed out of the local region.

Other Alternatives: No action

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$1,562,000

Potential Funding: This project is being funded by a 2017 Proposition 1 Grant.

Benefits (Avoided Losses): The project would provide reduction of flooding that currently occurs in the rural and urban areas.

Schedule: Three years

Status: New project

2. Construct the Fancher Creek Detention Basin Pump Station and Telemetry System

Hazard(s) Addressed: Flood

Issue/Background: Fancher Creek Detention Basin's primary use is for flood control. This site is also used for groundwater recharge. However, recharge operations are very conservative (i.e.

smaller volumes for a limited time span) as the basin's gravity relief system does not provide rapid dewatering of the basin. A necessity to better utilizing the basin for groundwater recharge is the ability to dewater the basin quickly, should a major storm event be forecasted. This project will include constructing a high discharge pump station and telemetry system, enabling expanded recharge operations. Once the pump station is constructed, FMFCD and FID will be able to divert and retain stormwater that would otherwise be routed out of the local region into the basin to retain for groundwater recharge purposes. Not only will local water conservation and water supply self-reliance be increased, but the ability to divert stormwater into this basin more frequently will decrease flood risk along the adjacent canals downstream.

Other Alternatives: No action

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$1,094,000

Potential Funding: This project is being funded by a 2017 Proposition 1 Grant

Benefits (Avoided Losses): The project would provide reduction of flooding that currently occurs in the rural and urban areas.

Schedule: Three years

Status: New project

3. Provide for Local Stormwater Drainage System Infrastructure*

Hazard(s) Addressed: Flood

Issue/Background: Drainage service for new development is funded through development fees paid upon approval of the development. Ideally, drainage services are provided concurrent with construction of the development project. However, system construction may occasionally be delayed due to insufficient fee revenue to fund all facilities required by a development project. The provision of service can also be delayed by the lack of street improvements necessary to convey runoff from the development to the collection points. Unless the developer or the District can advance funds to cover the necessary facilities or street improvements, the developer must provide temporary on-site storage of the project's runoff until permanent service is available.

There are also areas within the District that were developed before the District was established in 1956. Some of these areas are still without permanent drainage service due to the lack of development fee revenue.

Other Alternatives: No action

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$100,000-\$2,000,000 per project

Potential Funding: Pre-Paid Drainage Assessment Funds and Fresno Metropolitan Flood Control District General Fund

Benefits (Avoided Losses): Ensures roads are passable for emergency vehicles and prevents repetitive structural damage.

Schedule: Ongoing

Status: 2009 project, implementation in progress

4. Retain 200-Year Flood Control Protection*

Hazard(s) Addressed: Flood

Issue/Background: There are currently 200-year flood control facilities (dams, detention basins, and bypass structures) east of the metropolitan area. As development occurs upstream of those facilities, the level of protection will diminish. The study and subsequent construction of additional flood control facilities (detention basins and bypass structures) upstream of new development will continue the 200-year protection level.

Other Alternatives: Compromise 200-year protection level

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: \$50,000,000

Potential Funding: Fresno Metropolitan Flood Control District Assessment Tax Fund, mitigation grants

Benefits (Avoided Losses): Retain current 200-year flood protection level

Schedule: 5-10 years

Status: 2009 project, implementation in progress

5. Retrofit Areas with Surface Outlets to Protect Existing Structures

Hazard(s) Addressed: Flood

Issue/Background: The District was not formed until 1956, and portions of the community were not annexed to the District immediately. There are a number of areas that were developed in low lying areas that are prone to flooding when large storms occur. Current standards establish the finished floors of structures be elevated above the surface outlet of an area. This project would retrofit areas with surface outlets to protect existing structures.

Other Alternatives: Purchase repetitively flooded structures

Responsible Office: City of Fresno and Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: \$10,000-\$250,000 each

Potential Funding: City of Fresno, Fresno Metropolitan Flood Control District General Fund, mitigation grants

Benefits (Avoided Losses): Ensures roads are passable for emergency vehicles and prevents repetitive structural damage

Schedule: Five years

Status: 2009 project, implementation in progress

6. Install Back-up Generators for Pump Only Facilities

Hazard(s) Addressed: Flood

Issue/Background: The Fresno Metropolitan Flood Control District was not formed until 1956, and portions of the community relied on pump only stations for protection from floods. If there was a power outage in these areas during a storm event, the streets would become impassable and potential structure damage would occur.

Other Alternatives: Purchase repetitively flooded structures

Responsible Office: City of Fresno and Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Low

Cost Estimate: \$50,000-\$100,000 per site; there are four such sites (WW, VV, MM, and AB2)

Potential Funding: Fresno Metropolitan Flood Control District General Fund, mitigation grants

Benefits (Avoided Losses): Ensures roads are passable for emergency vehicles and prevents repetitive structural damage

Schedule: Ten years

Status: 2009 project, implementation not yet started

7. Big Dry Creek Diversion Additional Drop Structure

Hazard(s) Addressed: Flood

Issue/Background: Big Dry Creek Diversion routes flows out of the base of Big Dry Creek Reservoir, the District's largest flood control structure. The Diversion Channel helps de-water stormwater captured in Big Dry Creek Reservoir and is operated within the framework of the U.S. Army Corps Water Control Manual for the Redbank and Fancher Creek Project. The construction of an additional drop structure within the channel will decrease velocity in the Diversion Channel, reducing erosion and improving the safety of the Project.

Other Alternatives: None.

Responsible Office: Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): Medium

Cost Estimate: \$700,000

Potential Funding: Fresno Metropolitan Flood Control District General Fund, mitigation grants

Benefits (Avoided Losses): Reduces channel erosion, improves operational safety and reduces maintenance.

Schedule: Five years

Status: New project

ANNEX N: LOWER SAN JOAQUIN LEVEE DISTRICT

N.1 District Profile

The Lower San Joaquin Levee District (the District) was created by the state legislature in 1955. The purpose of the District is to operate and maintain levees, bypasses, channels, control structures, and other facilities in connection with the Lower San Joaquin River Flood Control Project and provide protection to the people and the property of the District.

A brief history of the San Joaquin River helps clarify the District's purpose: The San Joaquin River and its tributaries have historically caused flood problems that have been a threat to life and property. Flooding problems have been lessened, but not eliminated, through activities of federal, state, and local governments and the sacrifices and efforts of affected landowners.

Completion and operation of the Friant Dam in 1947 reduced flow volumes, but contributed to a major sedimentation problem in the river. Sedimentation has reduced the river's flow capacity and increased the potential for flooding and erosion problems as well as vegetation encroachment, which further accelerates channel constriction. Years of planning, engineering, and public hearings resulted in the approval of the Lower San Joaquin River Flood Control Project plan.

The project was designed and constructed by the California Department of Water Resources between 1959 and 1967. The project's purpose is to provide flood protection along the San Joaquin River and tributaries in Merced, Madera, and Fresno counties. The plan covers 108 river miles, contains 191.4 miles of levees, and protects over 300,000 acres. The project is a series of bypasses built to collect San Joaquin flood flows, as well as floodwater from the Kings River System. The bypasses divert flows around stretches of the San Joaquin where constrictions impair its capacity. The District, in accordance with its agreement with the State Reclamation Board, is obligated to maintain not only the bypasses, but the channel of the San Joaquin River within the project, in a condition where the channel will carry flood flows in accordance with the maximum benefits for flood protection.

The District boundaries were based on historical data as to areas subject to actual flooding and/or receiving benefit from the project related to the designed capacity of the bypass system. The boundaries were established along existing section lines, roads, canals, drains or other permanent lines that were reasonably close to the probable floodplain.

Figure N.1 depicts the San Joaquin River System and the waterway channels that make up the natural and manmade system. Channel topography relates the manner in which flows are directed. Reservoir capacities are important in that flood releases are made when those capacities are at risk, affecting the channels' rated capacities; Figure N.2 depicts the reservoirs and water courses that contribute flows into the flood project; Figures N.3 through N.5 display the levee units that make up the flood project (each unit is depicted by a number and its length (levee mile)); and Figure N.6

shows the project levees, channels, structures, and appurtenances that make up the flood project (channel rated capacities are also shown).

Figure N.1: San Joaquin River System

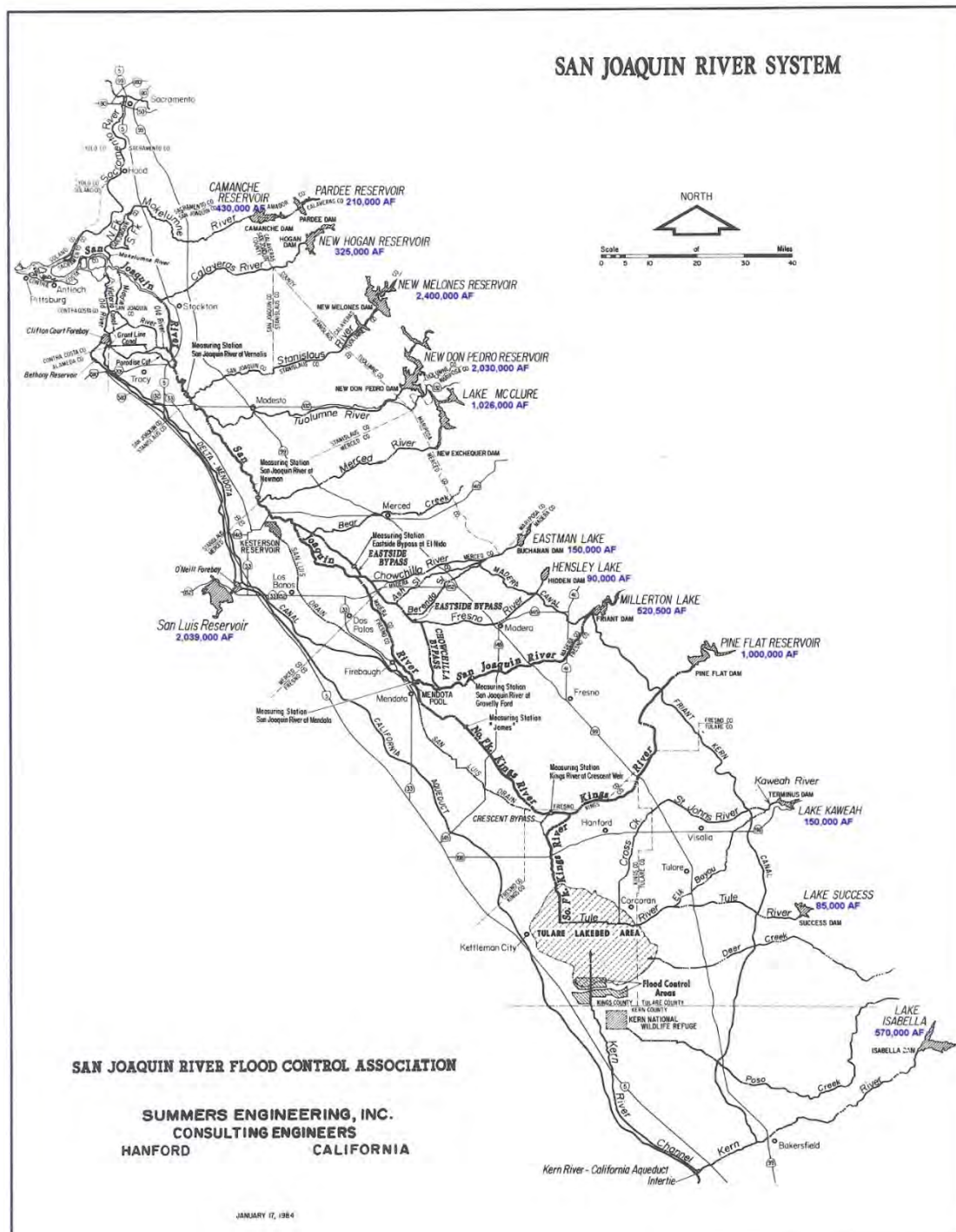


Figure N.2: Project Contributory Streams

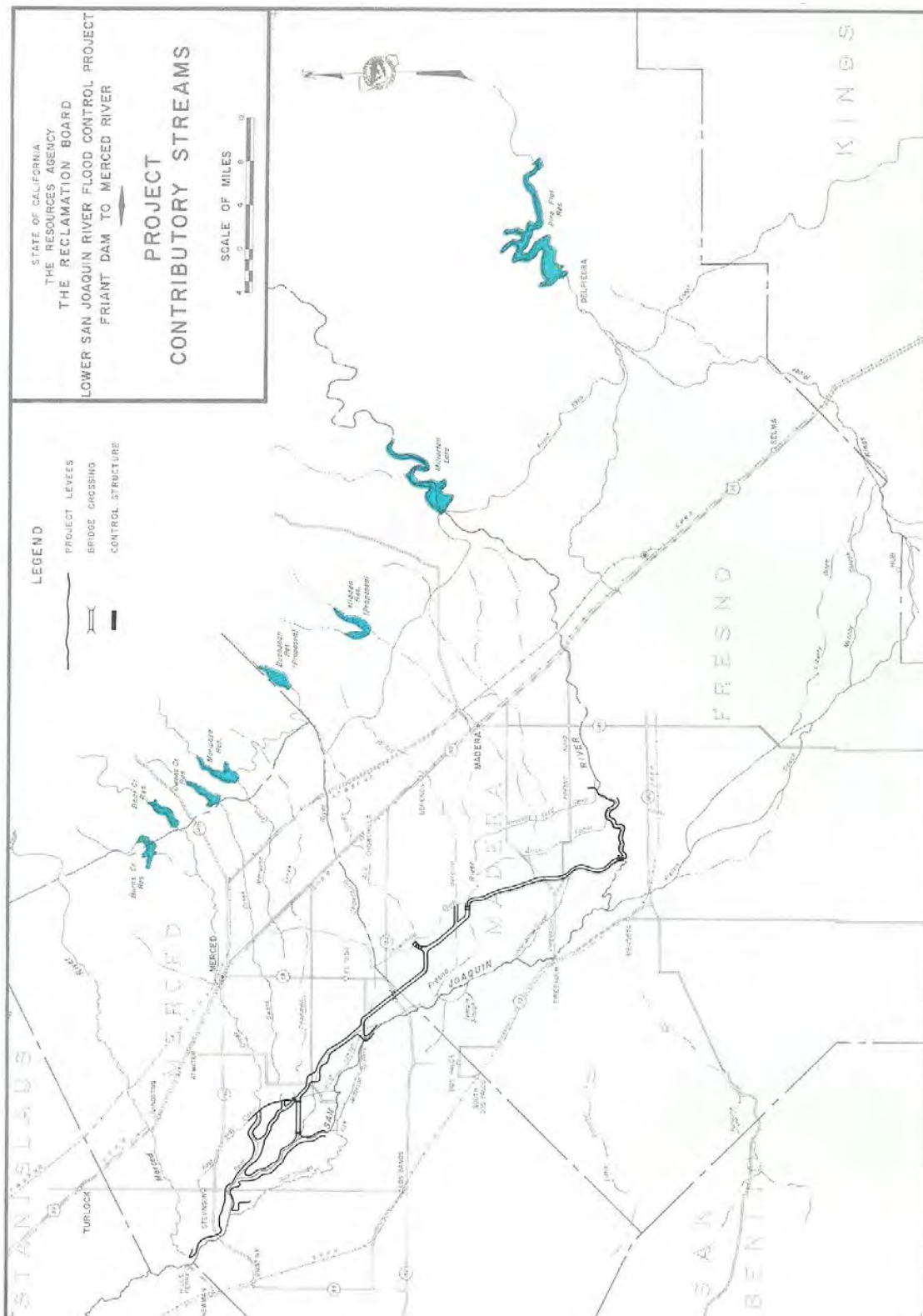


Figure N.3: Project Map—Northern Portion

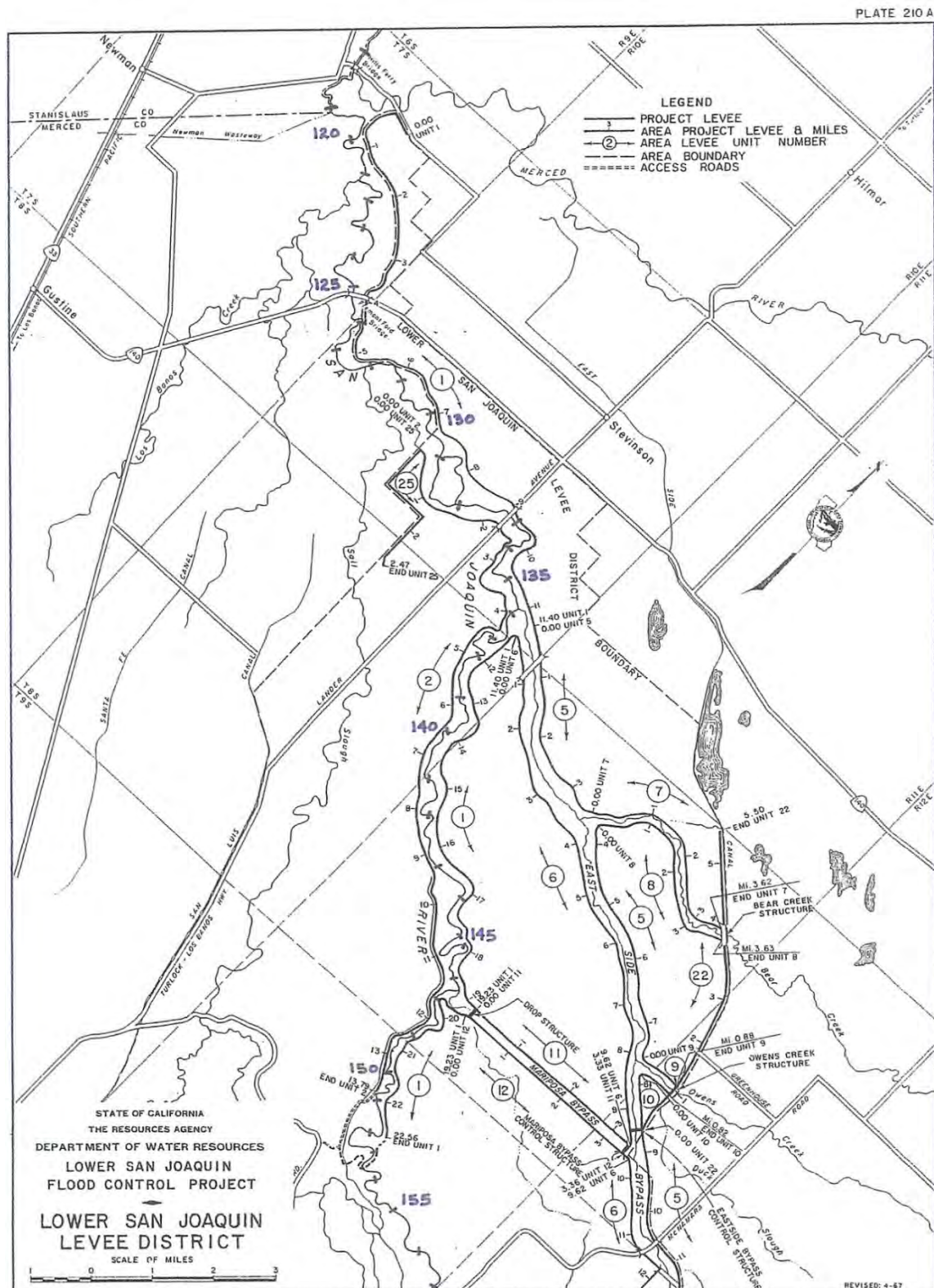


Figure N.4: Project Map B—Central Portion

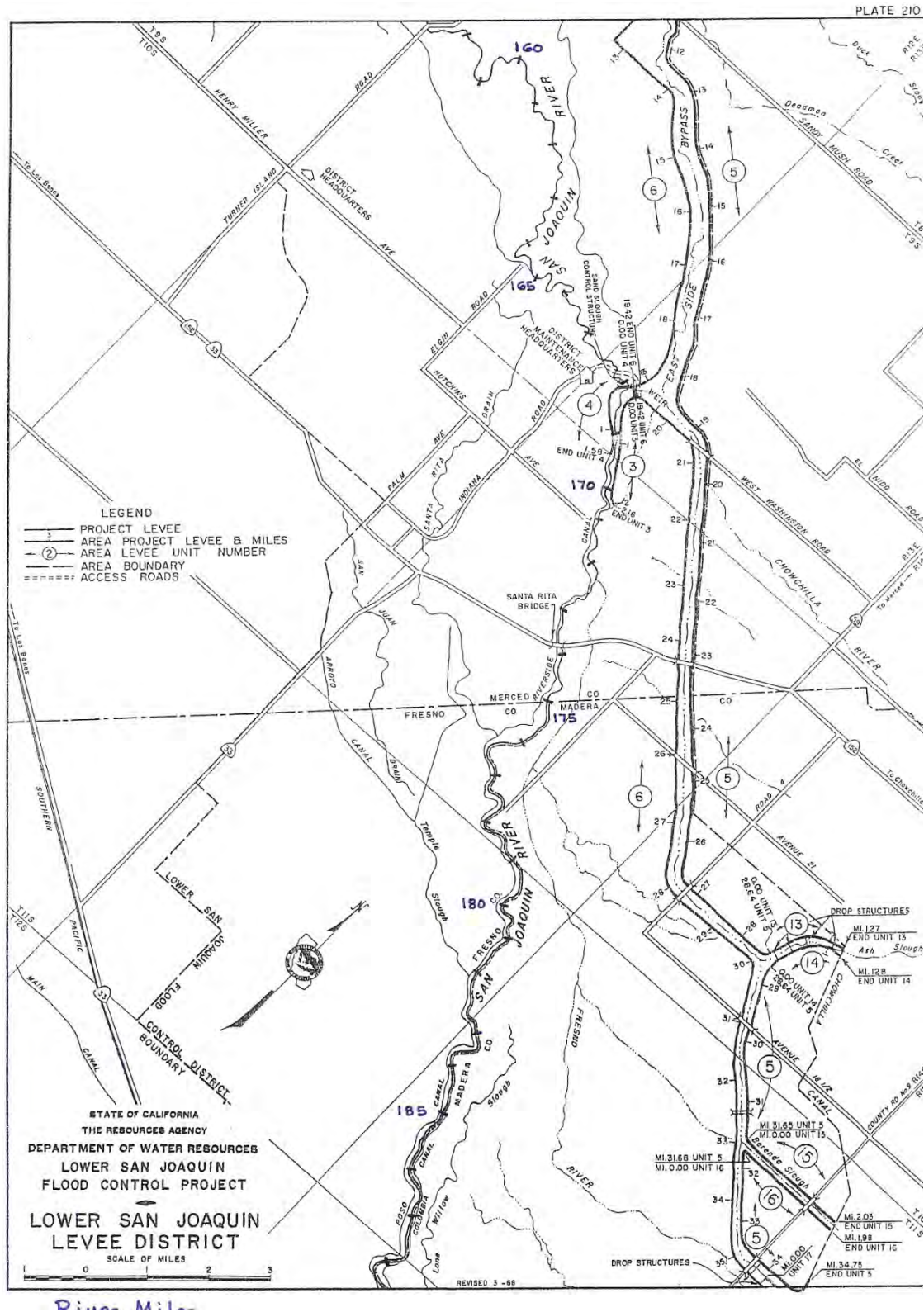


Figure N.5: Project Map—Southern Portion

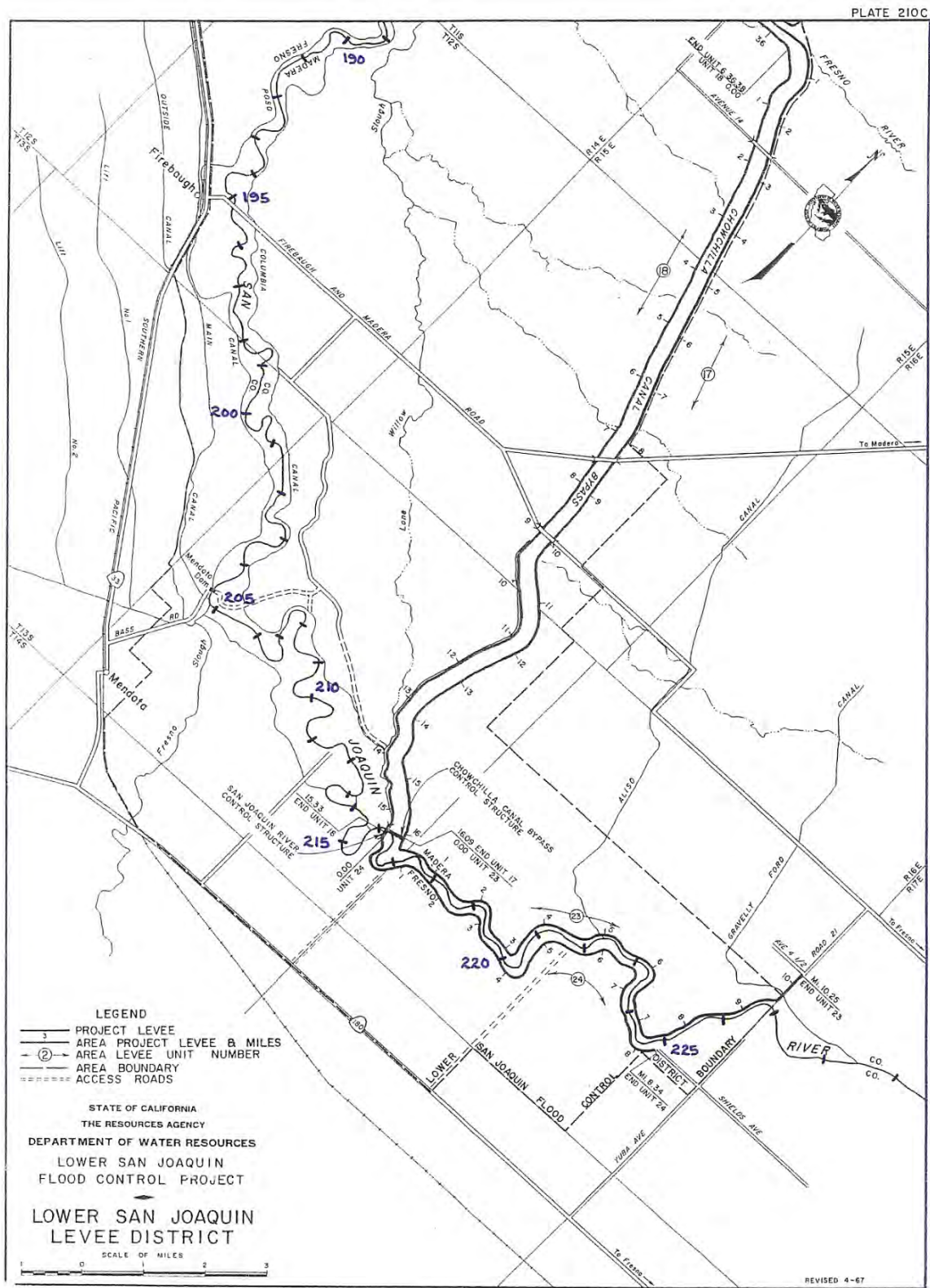
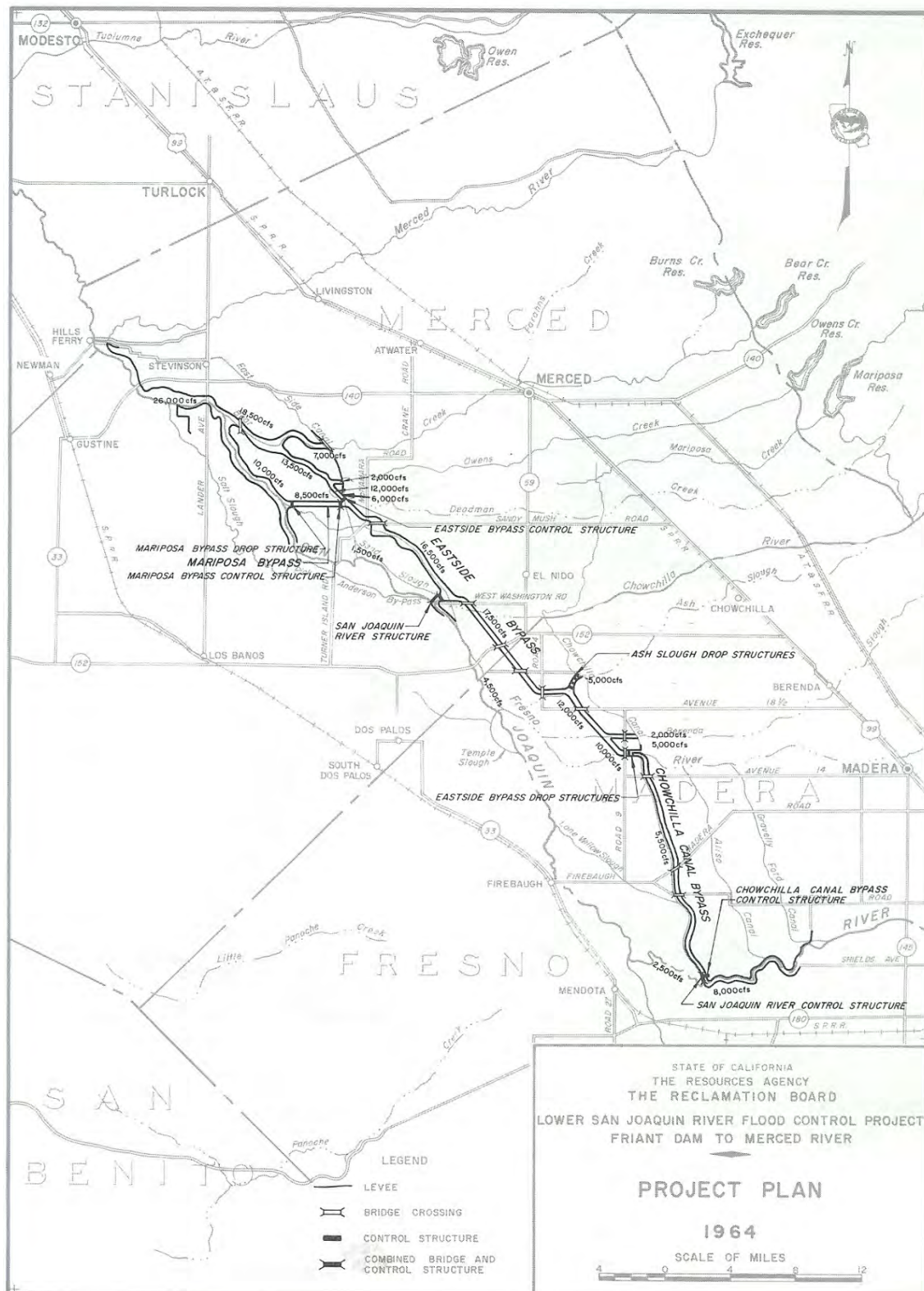


Figure N.6: Project Plan



N.2 Hazard Identification and Summary

The District’s planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table N.1).

Table N.1: Lower San Joaquin Levee District—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	N/A	N/A	N/A	N/A
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	High
Drought	Significant	Likely	Critical	Medium
Earthquake	Significant	Occasional	Catastrophic	Low
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Limited	Low
Human Health Hazards:				
Epidemic/Pandemic	N/A	N/A	N/A	N/A
West Nile Virus	N/A	N/A	N/A	N/A
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	N/A	N/A	N/A	N/A
Extreme Heat	N/A	N/A	N/A	N/A
Fog	N/A	N/A	N/A	N/A
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Medium
Tornado	N/A	N/A	N/A	N/A
Windstorm	N/A	N/A	N/A	N/A
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Medium
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

N.3 Vulnerability Assessment

The intent of this section is to assess the District’s vulnerability separate from that of the whole planning area, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the FMFCD’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the District.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table N.1). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects overall ranking for each hazard, and is based on the District’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table N.1 reflect the hazards that could potentially affect the District. Those of Medium or High significance for the District are identified below. The discussion of vulnerability for each of the following hazards is located in Section N.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include dam failure and flood/levee failure.

- dam failure
- drought
- flood/levee failure
- severe weather: heavy rain/thunderstorm/hail/lightning
- soil hazards: erosion

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the District, those hazards are as follows:

- earthquake
- hazardous materials incidents
- landslide
- winter storm
- soil hazards: expansive soils and subsidence

Additionally, the District's planning team decided to rate certain hazards as **Not Applicable (N/A)** to the planning area due to either a lack of exposure, vulnerability, and probability of occurrence, or may occur within the geographic limits of the District but are addressed under the jurisdiction of the County and its incorporated municipalities. **Agricultural hazards, avalanche, human health hazards, extreme cold/freeze, extreme heat, fog, tornado, windstorm, volcano, and wildfire** are considered not applicable to the District.

N.3.1 Assets at Risk

This section considers the District's assets at risk, which include real property; levees, structures, and appurtenances that make up the flood project; and other equipment and automobiles used in District operations (see Table N.2). It should be noted that the real property and flood project are owned entirely by the State of California. The District has ownership of a 3.5-acre parcel and various equipment and automobiles that are used for operation and maintenance of the flood project.

Table N.2: Specific Critical Facilities and Other Community Assets Identified by the Lower San Joaquin Levee District's Planning Team

Name of Asset	Replacement Value (\$)	Hazard Specific Info.
Property: Flood Project	3,721,080	Flood, Erosion, Drought
Equipment	492,345	Flood
Automobiles	342,800	Flood

N.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table N.2 above shows the San Joaquin Levee District's critical facilities and assets that could be exposed to hazards. Specific losses for the City of Firebaugh and the portion of the County of Fresno within the District's boundaries are discussed elsewhere in this hazard mitigation plan.

Note: severe weather: heavy rain/ thunderstorm/hail/lightning is considered a Medium priority hazard by the District but is not unique to the District in the context of the full planning area. See Chapter 4 Risk Assessment for details on vulnerability to this hazard.

Dam Failure

Dam failure is a significant hazard in the District, as it may result in increased strain on remaining flood control facilities, including the levee system.

Drought

Drought conditions can also cause problems in the District, as dry, cracking soil can compromise the integrity of the levee system. The cracking of the levee material (clay soil) is regularly observed during dry times when no water is present in the channels. Water in the channels allows the clay in the levee soil material to absorb the water and close the cracking.

Flood/Levee Failure

Flood is clearly the hazard of greatest concern to the District. The California Department of Water Resources defines the flood season as November 15 to June 15. In the early part of the season, the San Joaquin Valley is in danger of flood from rain-flood runoff. In the latter part of the season, there is danger of flooding from snowmelt runoff. Heavy rains and thunderstorms occur annually and increase the risk of damaging floods occurring within District boundaries.

Every three to four years, on average, flood flows in the District (along San Joaquin, Kings, Fresno, Chowchilla rivers and numerous streams) exceed the design level of protection of the levees. These events result in infrastructure damage (e.g., to the levees themselves); property damage throughout the district in agricultural, rural, and urban areas; and crop damage. For more information about flooding in the District, see Section N.1 District Profile.

While there is no history of past occurrences, a failure of one or more upstream dams could cause significant flooding and be catastrophic in nature to the District and surrounding areas.

Since it is a special district, participation in the National Flood Insurance Program (NFIP) does not apply to the Lower San Joaquin Levee District, thus NFIP Repetitive Loss and Severe Repetitive Loss properties are not tracked for in the jurisdiction; therefore, the District does not have this data available. There are two Repetitive Loss properties in the unincorporated County, but further details to determine if these are within the District's boundary are not available. There are no Severe Repetitive Loss properties in the County as detailed in Chapter 4 Section 4.3.2 of the base plan.

Soil Hazards: Erosion

Related to flooding, erosion along the banks of the channels is also a concern of the District. Ongoing maintenance is required to mitigate the effects of erosion caused by high waters.

N.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the District's planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the District's planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The San Joaquin Levee District's updated capabilities are summarized below.

N.4.1 Regulatory Mitigation Capabilities

Table N.3 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table N.3: Lower San Joaquin Levee District's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	No	
Zoning ordinance	No	
Subdivision ordinance	No	
Site plan review requirements	No	
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (storm water, water conservation, wildfire)	No	
Building code	No	
Fire department ISO rating	No	
Erosion or sediment control program	Yes	Operation and maintenance manual
Storm water management program	No	

Regulatory Tool	Yes/No	Comments
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	Yes	Operation and maintenance manual
Other special plans	No	
Flood Insurance Study or other engineering study for streams	No	
Elevation certificates	No	

The District's primary capability is the Lower San Joaquin River Flood Control Project, which is described in more detail in Section N.1 District Profile. The District's operations and maintenance rules are as follows:

- No encroachment or trespass, which will adversely affect the efficient operation or maintenance of the project works, shall be permitted upon the rights of way for the protective facilities.
- No improvement, excavation or construction shall be permitted within the limits of the project right of way, nor shall any change be made in any features of the works without prior determination by the State Reclamation Board that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice and to the design criteria of the project.
- The California Department of Water Resources (DWR) makes semiannual inspections of all features of the project and reports its findings to the District and the State Reclamation Board. The inspection objectives are to determine if proper maintenance items are being adhered to (i.e., that all brush, trees, and wild growth, other than sod, are removed from the levee crown and slopes; that all burrowing animals have been exterminated; that an active channel maintenance program is being carried out; that all bridges and control structures of the project are in good conditions and working order). Following the inspection findings a joint field inspection is made with the District and the DWR to review and discuss the report.
- The channel as defined for this project is that area lying along the waterway between the waterward toe of one levee and the waterward toe of the opposite levee. In cross sections this includes the drainage channel and banks, and the area from the top of the bank to the toe of the levee which is called the berm or floodway.
- The channels consist of natural drainage channels and bypass channels constructed as part of this project. These channels extend along and adjacent to the San Joaquin River from the Merced River to Mendota Dam, and from the junction of the Chowchilla Canal Bypass to Gravelly Ford. The river reach from Mendota Dam to the Chowchilla Canal Bypass is not part of the project facilities.
- Inspections by the District shall be made to be certain that the channel floodway is clear of debris, weeds, and wild growth; the capacity of the channel or floodway is not being reduced by the formation of shoals.

- The channels of-the project shall be maintained and kept clear of regrowth of vegetation. This is necessary as regrowth of vegetation will change the flood flow characteristics of the project channels. The purpose of channel maintenance is to ensure that the channel is kept in as good a condition as when the project was constructed. A regular program of channel maintenance shall be instituted by the District. Tree and brush growth in the channel shall be cleared and removed along with any debris that may be present. A strip of brush and small trees may be retained, through application to the State Reclamation Board, on the floodplain within 10 feet of the levee on the waterward side where necessary to prevent erosion and wavewash. Suitable riprap material shall be placed to repair existing slope protection or in other locations found to be critical trouble points to stabilize the channel alignment and preserve the general uniformity of the bank lines.

Additionally, federal and state regulations require that all flood projects undergo an inspection of facilities every 90 days. Two of these inspections are done by the DWR (in the fall and spring), and two are done by the District (in the winter and summer). All inspections are done to specific standards developed by the U.S. Army Corps of Engineers and the DWR. Inspections result in ratings of either “compliant” or “noncompliant.” Records by DWR that show the District has maintained their flood facility to “compliant” standards. DWR publishes an annual report on such inspections.

N.4.2 Administrative/Technical Mitigation Capabilities

Table N.4 identifies the personnel responsible for activities related to mitigation and loss prevention in the District.

Table N.4: Lower San Joaquin Levee District’s Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	No		
Engineer/professional trained in construction practices related to buildings and/or infrastructure	No		
Planner/engineer/scientist with an understanding of natural hazards	Yes	Summers Engineers	Consultant
Personnel skilled in GIS	Yes		
Full time building official	No		
Floodplain manager	No		
Emergency manager	Yes	Manager	Personnel
Grant writer	No		
Other personnel	Yes	Supt, Foreman	Personnel
GIS Data—Land use	No		
GIS Data—Links to Assessor’s data	No		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No		

The District is governed by a seven-member Board of Directors and appointments are by the Board of Supervisors of the appropriate counties. The District operates with an unpaid Board, minimal staff, no investment in real property, and only the absolute necessities in equipment. The philosophy of the District Board is to provide the best flood protection with minimal funds. District personnel are given flood-fight methods training, per the DWR/U.S. Army Corps of Engineers standards, every three years (length of time is determined by employee turnover).

N.4.3 Fiscal Mitigation Capabilities

Table N.5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table N.5: Lower San Joaquin Levee District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	No	
Authority to levy taxes for specific purposes	Yes	Annual operations and maintenance budget assessments
Fees for water, sewer, gas, or electric services	No	
Impact fees for new development	No	
Incur debt through general obligation bonds	No	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

From 1963 to 1978, all lands within the District were assessed a tax for maintenance. This was through the assessor offices of the three counties. The tax was a flat rate based on assessed valuation, land only. After the voter approval of Proposition 13 in 1978, all tax assessments were eliminated. This resulted in substantial decreases in District income to funds amounting to half the District's average annual budget for routine maintenance. To continue financing the maintenance and operation costs of this service, a benefit assessment was implemented. The assessment is in proportion to the benefit received as it relates to each parcel's ability to be put into use and its size. (Use refers to the use of the land, e.g., swamp and overflow, pasture, row crops and permanent crops, residential, commercial, or industrial. Each land use is given a weighted factor for determining the assessment charged to that parcel.)

N.4.4 Mitigation Outreach and Partnerships

Cooperation from local agencies (districts, counties), landowners, the DWR, and the U.S. Army Corps of Engineers is essential in the flood-fight activities needed to operate and maintain the flood facilities during an event. Needed manpower for patrolling and/or flood fighting is a cooperative effort from stakeholders (those who have a vested interest in maintaining levee stability for flood protection).

N.4.5 Other Mitigation Efforts

Annual maintenance activity includes vegetation control (herbicide, handwork), rodent control, fence/gate repairs, erosion repairs, levee roadway graveling, levee slope repairs, channel repairs, livestock grazing monitoring, and structure inspections (operation-electronic). During high water periods, the District patrols the levees.

N.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the Lower San Joaquin District has existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the communities the District serves. Some of the possible opportunities for enhancement of the District's existing mitigation program are listed below.

- Develop an Evacuation Plan in case of dam or levee failure in partnership with the County and jurisdictions within the District.
- Develop and implement warning systems. To further enhance mitigation efforts the District may partner with the jurisdictions in the District to develop and implement warning systems for existing levees and dams that may impact these communities in an event of a failure.

N.5 Mitigation Strategy

N.5.1 Mitigation Goals and Objectives

The Lower San Joaquin Levee District adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the District to help inform updates and the development of plans, programs and policies for the jurisdictions within the District. The hazard information will be used to inform the District's Lower San Joaquin River Flood Control Project including reviewing and if necessary revising the project's operations and maintenance rules. The information contained with this annex as well as the hazard information within the jurisdictional annexes that are served by the District, will help the District to better understand the vulnerabilities of the communities they serve and help to mitigate those risks where possible.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from the Lower San Joaquin Levee District will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

N.5.2 Completed 2009 Mitigation Actions

The Lower San Joaquin Levee District has not completed any of the mitigation action identified in the 2009 plan. However, implementation of these actions is underway and will continue as part of the mitigation strategy of this plan update.

N.5.3 Mitigation Actions

The planning team for the Lower San Joaquin Levee District identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

In addition to implementing the mitigation actions below the Lower San Joaquin Levee District will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The District agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Institute a Dredging Management Program for the Purpose of Flood Damage Reduction

Hazard(s) Addressed: Flood

Issue/Background: At any given point, channel flood stage is determined, in part, by the size and shape of the cross-sectional area of the floodway channel. Impediments that can affect the floodway cross-sectional area create undesirable conditions. Typically, in the San Joaquin River, in-channel shoaling results when the channel flow is unable to transport the amount of material being carried by the current (capacity), or the size of the transported material exceeds the ability of the current to move it (competency). When either of these conditions exists, transported sediment is deposited by the river and accumulation begins to occur. This will eventually build-up to the point that it diminishes the channel depth and restricts the passage and/or reduces flow capacity of the river. This accumulation slows flow velocity, contributing to longer durations of exposure of levees to erosion and saturation, affecting levee foundation issues. These in-channel sediment deposits can also cause overbank flooding to occur more frequently.

Dredging to remove sediment deposits can reduce the frequency of overbank topping and shorten flow durations, which will minimize levee foundation integrity issues. It should be noted that while dredging can temporarily restore channel capacity, it does not change the pre-existing conditions that caused the sediment to be deposited in the first place. In fact, dredging re-creates those original

conditions, resulting in continued sediment deposition at that location. This will continue to occur as long as an upstream sediment source exists (particularly erosion-prone banks and lands). Consequently, dredging must be repeated regularly to maintain the effectiveness of reducing flood stages.

Regulatory agencies with responsibilities to maintain ecosystem values in river environments can prevent and/or hinder program attempts to manage this sediment accumulation. The environmental effects of removing this sediment may require more mitigation for habitat losses than the District can provide. There are land and water rights that will need to be addressed before a viable program can be implemented, which will take time. These time constraints result in increased risk of loss of life and property in a future disaster.

A comprehensive approach to all the issues pertaining to river sediment accumulation that incorporates habitat and flood values needs to be developed, with a focus on protecting life and property. This can be accomplished through committed efforts of responsible agencies along with adequate funding. This would have to be an ongoing process as the river system will continue to deposit sediment.

Other Alternatives: Constructing a new setback levee would allow the river sediment processes to remain in the main channel. This would address channel capacity requirements by increasing the cross-sectional area of the channel for flood flows. The associated costs (land acquisitions, water rights, levee construction, levee removal, etc.) would be higher than a suitable dredging management program.

Responsible Office: Lower San Joaquin Levee District

Priority (High, Medium, Low): High

Cost Estimate: \$2.5 million/mile (106 miles of river)

Potential Funding: CA DWR grants

Benefits (Avoided Losses): Flood damage in Mendota and Firebaugh will be avoided. Damage to viable agricultural crops that will affect economies in surrounding communities and statewide markets will also be avoided.

Schedule: Annually, when river channel is seasonally dry (June-October), depending on river reach

Status: 2009 project, implementation in progress

2. Institute an Invasive Vegetation Management Program for the Purpose of Flood Damage Reduction

Hazard(s) Addressed: Flood

Issue/Background: At any given point, channel flood stage is determined, in part, by the size and shape of the cross-sectional area of the floodway channel. Impediments that can affect the floodway cross-sectional area create undesirable conditions. Unmanaged invasive vegetation is an impediment within the San Joaquin River that can reduce the ability of the channel to pass the designed flood flows, thus reducing flow velocity and increasing the water stage elevation. Proper management of vegetative growth is essential in lessening flood damage.

The impact of vegetation on the flow carrying capacity of the San Joaquin River depends on the location, density, height, and vegetation type as well as the depth, velocity, and timing of the flood flows. Unmanaged vegetation within the river's main channel causes drag, or a resistance to flow. Dense vegetation located throughout the river channel is likely to cause significant resistance and increase flow stage, whereas a narrow band of trees and shrubs parallel to the channel may have little impact on the channel's ability to carry flood flows. However, even acceptable woody trees and shrubs that have rigid stems will attempt to resist flows and may become uprooted and add to the debris carried by the flood flows.

Vegetation along levees needs to be removed or otherwise managed as part of routine flood management system maintenance. This practice can prevent trees from becoming established that may harm the integrity of the levee and facilitates visual inspection of the levee. Managing vegetation requires knowledge of the river system relative to acceptable retention of certain vegetation. A vegetated buffer zone between the main channel and the levee can benefit the reliability of the flood management system by protecting the levee without significantly impacting stage or flow capacity.

Unfortunately, regulatory agencies with responsibilities to maintain ecosystem values in river environments can prevent and/or hinder program attempts to manage this vegetation. Unmanaged vegetation can become habitat for species listed under the endangered species acts. The environmental effects of removing this vegetation may require more mitigation than the District can provide. The result is increased risk of loss of life and property in a future disaster.

A comprehensive approach to all the issues pertaining to habitat and flood values needs to be developed, with a focus on protecting life and property. This can be accomplished through committed efforts of responsible agencies along with adequate funding. This would have to be an ongoing process, as the river system will continue to develop vegetative growth.

Other Alternatives: Constructing a new setback levee would allow vegetation to remain in the main channel by increasing the cross-sectional area of the channel for flood flows. The associated costs (land acquisitions, water rights, levee construction, levee removal, etc.) would be higher than a suitable vegetative management program.

Responsible Office: Lower San Joaquin Levee District

Priority (High, Medium, Low): High

Cost Estimate: \$500,000–10 million

Benefits (Avoided Losses): Flood damage in Mendota and Firebaugh will be avoided. Damage to viable agricultural crops that will affect economies in surrounding communities and statewide markets will also be avoided. It would also create a balanced aquatic habitat ecosystem that can support environmental values along with flood management.

Potential Funding: CA DWR grants

Schedule: Annually, November to April (conditions permitting)

Status: 2009 project, implementation in progress.



ANNEX O: KINGS RIVER CONSERVATION DISTRICT

O.1 District Profile

In 1951, the Kings River Conservation District (KRCD) was formed through special legislation by the State of California in order to manage and protect the resources of the San Joaquin Valley. Today, KRCD is a leading resource management agency for the Kings River region serving agriculture, business, and residential communities within 1.2 million acres spanning portions of Fresno, Kings, and Tulare counties.

The mission of KRCD is to provide flood protection, cooperate with other agencies to achieve a balanced and high quality water supply, provide on-farm support in efficient water conservation practices, and develop power resources for the public good. Additionally, KRCD has partnered with the Kings River Water Association and the California Department of Fish and Wildlife to implement the Kings River Fisheries Management Program. The Kings River Fisheries Management Program is dedicated to improving and enhancing the lower Kings River watershed and fishery habitat through habitat enhancements, scientific studies, monitoring, and public outreach and education.

The KRCD consists of seven divisions, each represented by an elected director who together comprise the KRCD's governing body.

The KRCD's area and its seven divisions are shown in Figure O.1. The District is a new jurisdiction that participated in the 2017-2018 Fresno County Multi-Hazard Mitigation Plan Update.

The Fresno County communities participating in this plan update that fall within the KRCD boundaries are the cities of Clovis, Fowler, Fresno, Kerman, Kingsburg, Reedley, San Joaquin, and Sanger.

Fresno County (Kings River Conservation District)
Multi-Jurisdictional Hazard Mitigation Plan



O.2 Hazard Identification and Summary

The Kings River Conservation District’s planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the Fresno County area (see Table O.1).

Table O.1: Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	High
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	High
Drought	Significant	Likely	Limited	High
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	Medium
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Low
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Medium
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Medium
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Medium
<div> <div> Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area </div> <div> Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years. </div> <div> Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid </div> <div> Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact </div> </div>				

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

O.3 Vulnerability Assessment

The intent of this section is to assess the District’s vulnerability separate from that of the whole planning area, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the outreach process in 2017-2018. The district is a new jurisdiction that participated in the 2017-2018 Fresno County Multi-Hazard Mitigation Plan Update. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction. Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table O.1). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects overall ranking for each hazard, and is based on the District’s HMPC member input and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table O.1 reflect the hazards that could potentially affect the District are identified below. The discussion of vulnerability for each of the following hazards is located in Section O.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include agricultural hazards, dam failure, drought, and flood/levee failure.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incidents
- soil hazards: erosion, land subsidence
- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the District, those hazards considered of low significance are as follows:

- avalanche
- human health hazards
- landslide
- severe weather
- soil hazards: expansive soils
- volcano

O.3.1 Assets at Risk

This section considers the District's assets at risk, which include critical facilities and infrastructure, natural resources, and potential future growth and development throughout the District's Boundary.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Table O.2 lists particular critical facilities and other community assets identified by the District's planning team as important to protect in the event of a disaster.

Table O.2: Critical Facilities and Other Assets Identified by District's Planning Team

Name of Asset	Replacement Value (\$)	Hazard Specific Info.
Jeff L. Taylor Pine Flat Power Plant	\$142,337,545	Flood, Dam Failure
Kings River Channel Improvement Levees	\$3,100,00	Flood, Erosion, Drought, Land Subsidence
Riverdale District Office	\$300,000	Flood, Earthquake
Equipment	\$700,000	Flood
Automobiles	\$400,000	Flood

Natural Resources

In partnership with the Kings River Water Association (KRWA) and the California Department of Fish and Wildlife (CDFW), the KRCD runs the Kings River Fisheries Management Program, which is intended to protect and enhance fishery habitat within the lower Kings River.

Growth and Development Trends

KRCD does not monitor for potential growth of urban and rural communities nor does KRCD participate in planned development of communities and infrastructure. Growth and development trends can be referred to in each city and county's General Plan.

O.3.2 Estimating Potential Losses and Risk

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table O.2 above shows the Kings River Conservation District's critical facilities and assets that could be exposed to hazards. Specific losses for the incorporated communities and the portion of the County of Fresno within the District's boundaries are discussed elsewhere in this hazard mitigation plan.

Note: both earthquake and hazardous materials incidents are considered Medium priority hazards by the District but are addressed by the affected cities and unincorporated Fresno County in the respective jurisdictional annexes and main plan risk assessment. See Chapter 4 Risk Assessment for details on vulnerability to this hazard.

Agricultural Hazards

The KRCD works with growers in the district to improve water management. Agricultural hazards that require an increase in irrigation could strain groundwater supplies in the region, which would be of concern to the District. Additionally, the KRCD is concerned with water quality. Any pests, crop diseases, or noxious weeds that could result in a widespread increased application of fertilizers, pesticides, or other chemicals could negatively impact water quality in the watershed.

Dam Failure

The KRCD operates the Pine Flat Power Plant, which generates electricity through irrigation and flood control releases from the Pine Flat Dam. Failure of the dam would halt power generation and put this asset at risk.

Additionally, failure of the dam would result in uncontrolled flows from the reservoir and would have a potential to overtop the levee and canal systems below the dam. At risk would be the inundation of agricultural lands and urban and rural communities located in close proximity to the Kings River.

Drought

Drought vulnerability within the KRCD is related to land subsidence and the structural integrity of the District's flood control structures. The recent drought from 2012 to 2017 resulted in an increase in groundwater pumping, which accelerated land subsidence in several locations

throughout the District. Subsidence, discussed below, threatens the structural integrity of the District's levees.

Flood/Levee Failure

Flood is the primary hazard of concern for KRCD. Before Pine Flat Dam was developed, Kings River flooding was always a threat. The Kings River is prone to two types of flooding, stormwater and snowmelt. Downpours of rain over the foothills and mountains can create extremely high peak flows, though generally of brief duration. The maximum natural flow ever measured or calculated on the Kings River occurred on January 3, 1997 and amounted to 112,000 cubic feet per second. Snowmelt runoff flows in the April through July period do not reach such extreme peaks, but yield a much greater total volume of water over a longer period. Pine Flat Dam has largely controlled flood flows originating above the reservoir; however, during heavy storm events, uncontrolled flows from eastern small streams like Mill Creek and Hughes Creek (located between one to three miles below Pine Flat Dam) are capable of generating substantial peak flows which would then be pushed through the network of canals and levees in the Kings and Tulare Subbasins.

The 2017 deluge of floodwater releases from Pine Flat Dam caused flooding to communities and businesses along parts of the Kings River. On June 22, 2017, KRCD responded to a levee breach on the South Fork of the Kings River between Grangeville Blvd. and Highway 198. The breach was a 40-foot wide break that flooded 400 acres of alfalfa.

The KRCD works to protect the flood carrying capacity of Kings River channels and levees through maintenance of approximately 140 miles of levee systems along the river from below Kingsburg near 8½ Avenue in Kings County to Highway 41 near Stratford on the South Fork, and to McMullin Grade (Highway 145) on the North Fork. The KRCD's flood control systems are shown in Figure O.2.

KRCD staff conduct year-round maintenance to eliminate the danger of flood and erosion hazards, including controlling weeds and brush along the levee banks, and clearing downed trees from the channels. During flood releases, the flood control maintenance crew maintains 24-hour patrols monitoring the levee banks for sloughing, erosion and boils. Also, during high water, the staff assists other irrigation districts in removing debris from the various weirs and structures along the river.

Since it is a special district, participation in the National Flood Insurance Program (NFIP) does not apply to the Kings River Conservation District, thus NFIP Repetitive Loss and Severe Repetitive Loss properties are not tracked for the jurisdiction; therefore, the District does not have this data available. Within the District's boundaries the City of Fresno is the only jurisdiction that has a Repetitive Loss property (one property) but no Severe Repetitive Loss properties; The Cities of Clovis, Fowler, Kerman, Kingsburg, Reedley, San Joaquin or Sanger do not have either type; Refer to those annexes for additional information. There are two Repetitive Loss properties in the unincorporated County, but further details to determine if these are within the District's boundary

are not available. There are no Severe Repetitive Loss properties in the County as detailed in Chapter 4 Section 4.3.2 of the base plan.

Figure O.2: KRCD Flood Control System



Soil Hazards: Erosion

KRCD staff regularly conduct maintenance on the levee systems to minimize erosion. Erosion of levees and river banks can compromise the structural integrity of the flood control systems and clog the river channels, exacerbating flood impacts.

Soil Hazards: Land Subsidence

During the 2012 to 2017 drought, farmers relied heavily on groundwater pumping, which caused acceleration in land subsidence in several locations throughout the Kings River service area. Subsidence threatens the structural integrity of the KRCD Channel Improvement Levees.

Wildfire

Wildfire is not of high significance to KRCD. On occasion, KRCD would prescribe controlled burns to the interior of the levees to rid the channel of dead and overgrown brush as a way to

maintain a clear channel for effective conveyance of flood flows and to mitigate for potential wildfires.

O.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the District's planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the District's planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The Kings River Conservation District's updated capabilities are summarized below.

O.4.1 Regulatory Mitigation Capabilities

Table O.3 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table O.3: Kings River Conservation District's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	No	
Zoning ordinance	No	
Land Use	No	
Site plan review requirements	No	
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (storm water, water conservation, wildlife)	No	
Building code	No	
Fire department ISO rating	No	
Erosion or sediment control program	No	
Storm water management program	No	
Capital improvements plan	No	

Regulatory Tool	Yes/No	Comments
Economic development plan	No	
Local emergency operations plan	Yes	KRCD Emergency Action Plan
Other special plans	Yes	Operations & Maintenance Manual for Kings River Channel Improvement Project
Flood Insurance Study or other engineering study for streams	No	
Elevation certificates	NO	

O.4.2 Administrative/Technical Mitigation Capabilities

Table O.4 identifies the personnel responsible for activities related to mitigation and loss prevention in the District.

Table O.4: District's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices			
Engineer/professional trained in construction practices related to infrastructure			
Planner/engineer/scientist with an understanding of natural hazards			
Personnel skilled in GIS	Yes	Varies	Personnel
Licensed UAV Pilot	Yes	Water Resources	Personnel
Floodplain manager	No		
Emergency manager	Yes	Manager of Flood Operations & Maintenance	Personnel
Grant writer	No		
Other personnel	Yes	Flood Maintenance Crew	Personnel
GIS Data—Land use	Yes	Varies	Personnel
GIS Data—Links to Assessor's data	No		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No		

O.4.3 Fiscal Mitigation Capabilities

Table O.5 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table O.5: District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Yes	
Authority to levy costs for specific purposes	Yes	
Fees for water	No	

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Impact fees for new development	No	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	Yes	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

O.4.4 Mitigation Outreach and Partnerships

KRCD has a partnership with the Kings River Water Association (KRWA) and the California Department of Fish and Wildlife (CDFW) to implement the Kings River Fisheries Management Program in order to protect and enhance fishery habitat.

The KRCD also works through the Southern San Joaquin Valley Water Quality Coalition with the Central Valley Regional Water Quality Control Board to address water quality issues in the Tulare Lake Basin watershed.

O.4.5 Other Mitigation Efforts

KRCD has conducted studies and preliminary assessments for several water supply enhancement projects, including Rodgers Crossing, Mill Creek, groundwater banking, and Raised Pine Flat Dam.

O.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the Kings River Conservation District has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the communities the District serves. Some of the opportunities for enhancement of the District's existing mitigation program are listed below.

- Develop and implement warning systems. To further enhance mitigation efforts the District may partner with the jurisdictions in the District to develop and implement warning systems for existing levees and dams that may impact these communities in an event of a failure.
- Partner with jurisdictions within the District including the County to develop a Drought Contingency plan that will help to create a framework for drought response and mitigation in the District.
- Provide training opportunities for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Additional training opportunities will help to inform staff members on how best to integrate hazard information and mitigation projects into their daily duties.

O.5 Mitigation Strategy

O.5.1 Mitigation Goals and Objectives

The Kings River Conservation District adopts the hazard mitigation goals and objectives developed by the Fresno County Hazard Mitigation Planning Committee.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the District to help inform updates and the development of plans, programs and policies for the jurisdictions within the District. The hazard information may be incorporated into updated to the District's Emergency Action Plan and well as inform existing projects such as the Kings River Fisheries Management Program. The information contained with this annex as well as the hazard information within the jurisdictional annexes that are served by the District, will help the District to better understand the vulnerabilities of the communities they serve and help to mitigate those risks where possible.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from the Kings River Conservation District will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

O.5.2 Mitigation Actions

The planning team for the KRCD identified and prioritized the following mitigation action based on the risk assessment. Background information and information on how the action will be implemented and administered, including the responsible office, potential funding, estimated cost and schedule are included.

In addition to implementing the mitigation action below the Kings River Conservation District will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The District agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Analysis of Levee Integrity and Improvement Project

Hazard(s) Addressed: Multi-hazard: flood, drought, soil hazards – land subsidence

Issue/Background: KRCD has the responsibility to operate and maintain the Kings River Channel Improvement Levees - 140 miles of flood protection levees in Fresno and Kings Counties.

Recent consecutive years of drought moved farmers to heavily rely on groundwater pumping, causing acceleration in land subsidence in several locations throughout the Kings River service area. Subsidence threatens the structural integrity of the KRCD Channel Improvement Levees. Additionally, the 2011 and 2017 flood event on the Kings River added stress to the levees and tested its ability to efficiently convey excess flood waters away from the Kings subbasin.

This project contains a LiDAR survey for the Kings River from Pine Flat Dam out to Mendota Pool and south to Empire Weir No.2 on the South Fork. The LiDAR data would be utilized with the GEI Consultant's hydrologic model to generate surface water elevation profiles. Not only will this project enable better understanding of flooding in the District and better planning for flood emergency response, but also collecting LiDAR data will enable KRCD to identify structural projects to address findings related to targeted areas in the levees that need improvement. This could include identification of areas affected by land subsidence. KRCD anticipates that this LiDAR data collection will enable follow-up structural projects to strengthen and improve the effectiveness of the Kings River Channel Improvement Levees. Additionally, a Flood Safety Plan would be developed for the Channel Improvement Levees.

Other Alternatives: None

Responsible Office: Kings River Conservation District

Priority (High, Medium, Low): High

Cost Estimate: \$463,000

Potential Funding: DWR Statewide Flood Emergency Response Program; KRCD local fund

Benefits (Avoided Losses): Benefits of this project include accurate modeling of the physical conditions of the Kings River Channel Improvement Levees. KRCD would be able to identify sections of the Channel Levees that need improvement. Furthermore, a complete LiDAR set for the entire Kings River system is critical to understanding how physical changes and various flood flows upstream affect the downstream river system. Additionally, the Flood Safety Plan would clearly outline the responsible agencies and actions necessary to respond to a flood incident in a timely and effective manner.

KRCD is taking a preventive approach to flood planning by making the necessary improvement to our levee systems before the start of the wet season. We hope by being proactive in levee management and hydrologic modeling, we will be able to decrease the likelihood of a levee failure, thus avoiding the loss of crops, livestock, homes, and lives.

Schedule: Anticipated start date is June 2018. Project completion estimated to take 14 months.

Status: New project

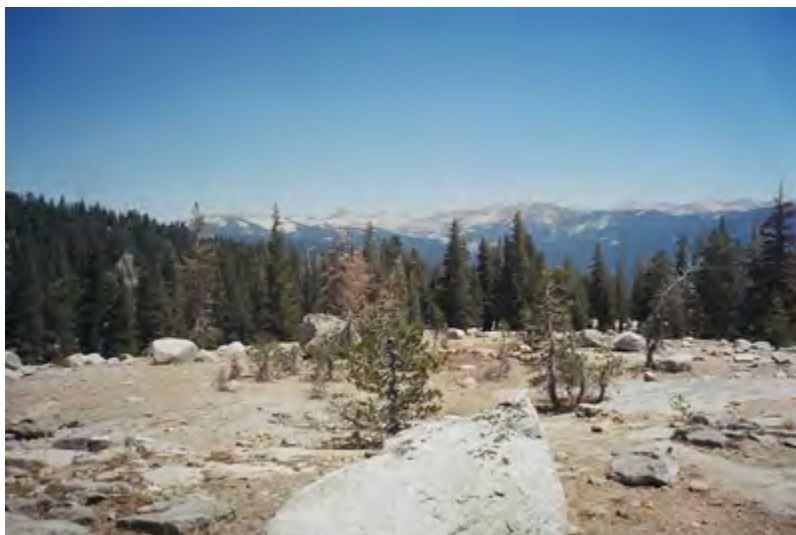
ANNEX P: SIERRA RESOURCE CONSERVATION DISTRICT

P.1 District Profile

The Sierra Resource Conservation District (SRCD or the District) has partnered under separate Memorandums of Understanding (MOUs) with the Highway 168 Fire Safe Council and the Oak to Timberline Fire Safe Council in the further development and update of this annex. For more information about the Councils, please see Section P.4.4 Mitigation Outreach and Partnerships.

According to the Sierra Resource Conservation District Long Range Plan 2015-2020, the primary purposes of the SRCD (as legislated by the state) are to secure the adoption of conservation practices including but not limited to farm, range, open space, urban development, wildlife, recreation, watershed, water quality, and woodland and to save the basic resources, soil, water, and air of the state from unreasonable and economically preventable waste and destruction. Its mission is to take available technical, financial, and educational resources, whatever their source and focus, or coordinate them at the local level, to meet the present and future natural resource needs of the local land user.

Formed in 1957, the SRCD originally encompassed 1,179,173 acres and over 1,843 square miles in eastern Fresno County (almost one-third of the total acreage of Fresno County). In 2009, the District successfully incorporated the consolidation the Navelencia Resource Conservation District through the Fresno County LAFCo (Local Agency Formation Commission). The District now encompasses 1,847,537 acres equivalent to 2,887 square miles. This is nearly 50 percent of Fresno

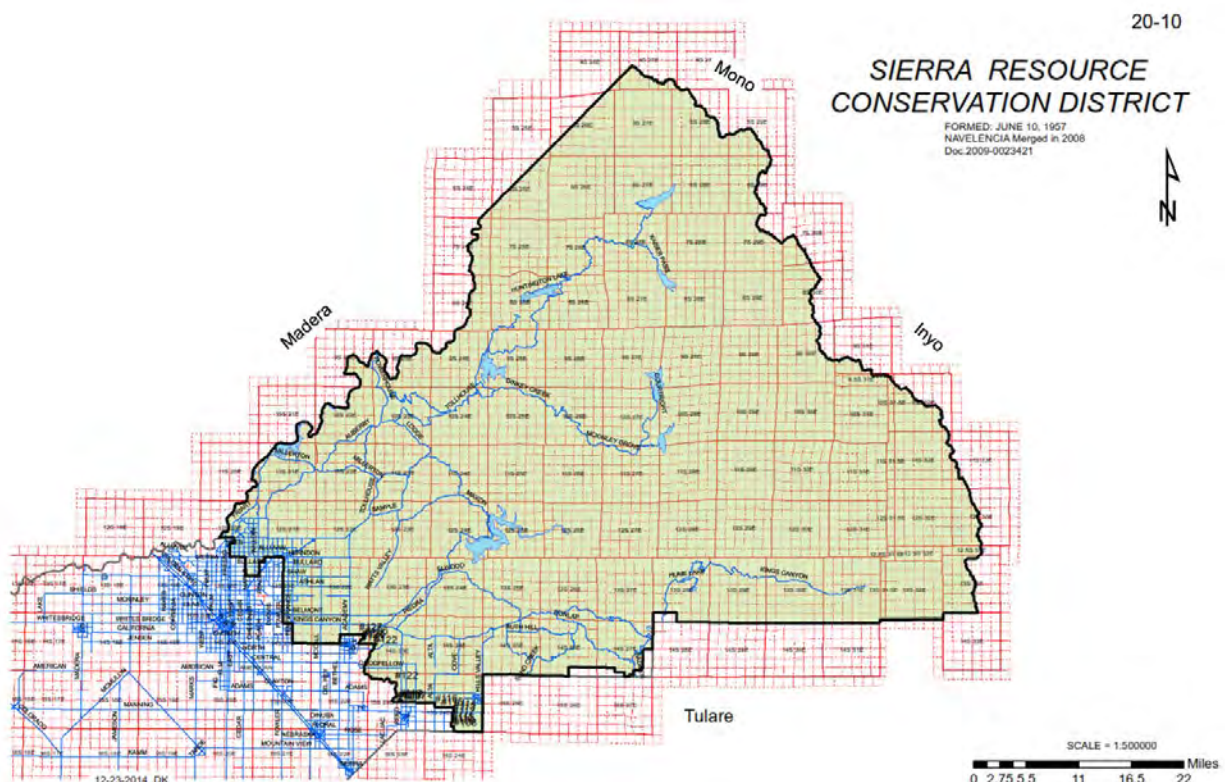


County's 6,000 square miles. In 2016, again through Fresno County LAFCo, the District detached 130,000 +/- acres that were within Tulare County to the Tulare County Resource Conservation District. The District is now bounded on the north by the San Joaquin River with Madera County, on the east the crest of the Sierra Nevada with Inyo and Mono County, on the south by the Tulare County line, and extends west into the fertile valley areas near Orange Cove, Reedley, Sanger, and then Clovis and the northern part of the City of Fresno. More than 1,000 square miles of the District are public lands, which include portions of several wilderness areas, McKinley Grove, and portions of the Sierra National Forest, Sequoia National Forest and Giant Sequoia National Monument,

Sequoia Kings Canyon National Park, Squaw Leap Recreational Area, Millerton Lake State Park, and Pine Flat Reservoir. There are three Indian rancherias within the district: Big Sandy Mono Rancheria, Cold Springs Mono Rancheria which are federally recognized – and the Dunlap Band of Mono Indians which is a non-federally recognized tribe.

The boundaries of the Sierra Resource Conservation District are shown in Figure P.1.

Figure P.1: Sierra Resource Conservation District



Approximately 15 percent of the District is on the valley floor with heavy urbanization, production agriculture, and a few public lands. The terrain here is predominately flat. As one heads east, the terrain changes to rolling foothills that cover 20 percent of the District, and the land is predominately eastside rangeland and oak woodlands, then oak/conifer intermix with low-density residential to the 4,000-foot elevation. Continuing east, the remaining 65 percent of the District extends to the 14,000-foot elevation Sierra Nevada crest and is timberland intermixed with lower density rural residential with additional Wildland Urban Interface (WUI).

The rapid rise in elevation from 2,000 feet to 5,000 feet creates steep valleys, rapid runoffs, and associated soil movements. Rapid water runoff from the upper watershed portions of the District

has under certain conditions caused downstream flooding on both the San Joaquin and Kings rivers. It can be sunny on the valley floor on the west side of the District and snowing on the east side.

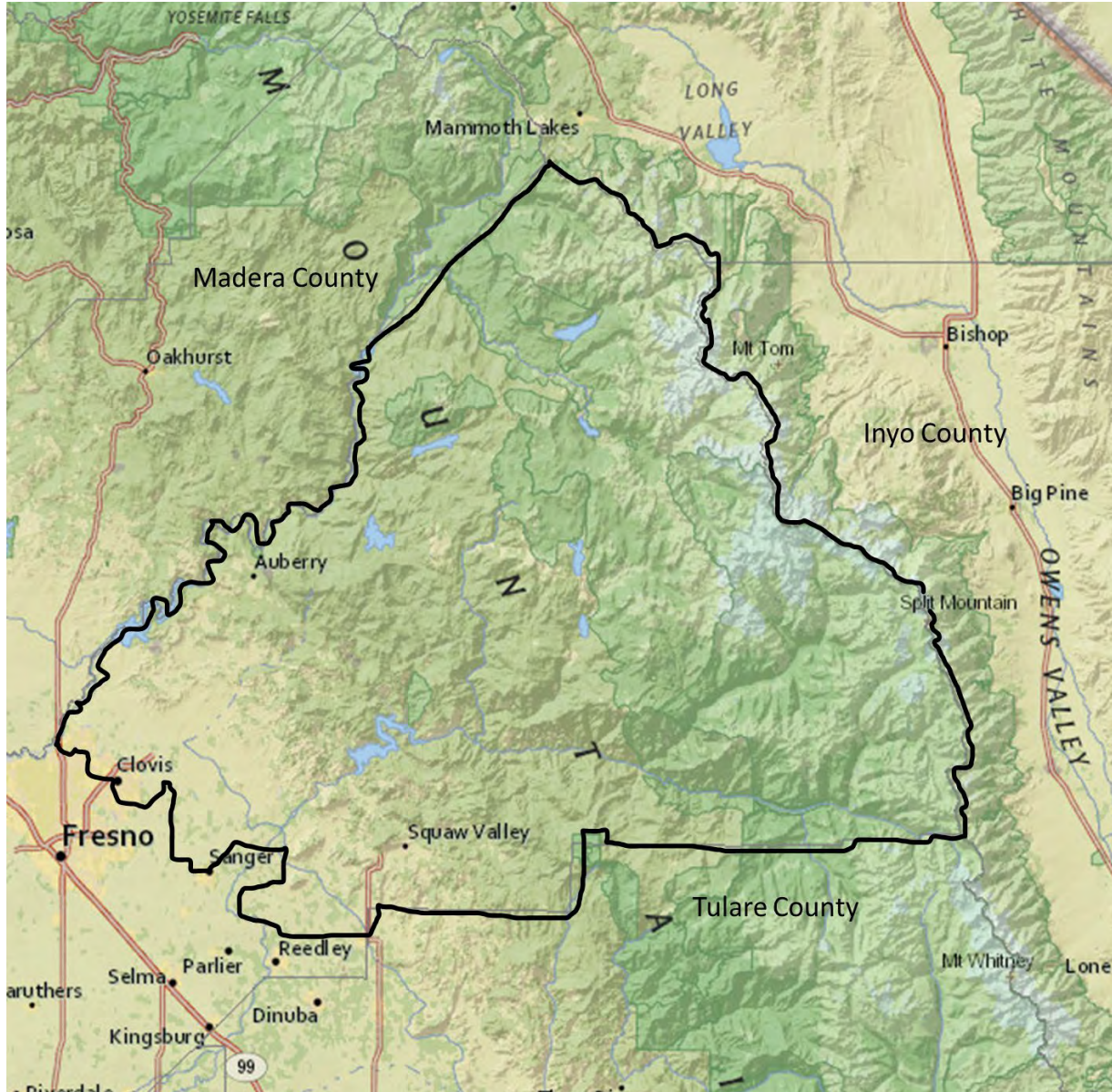
Vegetation types run full spectrum from sensitive citrus fruit and nut orchards, specialty crops on the valley floor, open eastside rangeland, extensive oak woodlands and brush in the foothills, and heavily forested mountains and alpine areas above timberline. The forested lands are abundant with wildlife. Summer range for some wildlife species like deer is on public lands, but the winter range is on predominately private lands in the foothill zone.

Fresno County is the largest agricultural production County in California and the nation. There are about 2,272 farms in the District. Primary agricultural products include oranges, strawberries, nuts, grapes, olives, Asian market crops, truck garden crops, cattle, dairy products, and honey. Timber and rangeland also contribute to the District's economy.

Valuable recreation areas in the District include the Sierra Heritage Scenic Byway and the China Peak Ski Area. High country packing, camping, hiking, water sports, boating, horseback riding, skiing, and bicycling are a few of the activities enjoyed in the District. The Highway 180 corridor is heavily used to bring tourists from around the world to the world-famous Sequoia and Kings Canyon National Parks and Sequoia National Forest.

Figure P.2 shows the area's topography.

Figure P.2: Sierra Resource Conservation District



P.2 Hazard Identification and Summary

The SRCD’s planning team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the District (see Table P.1).

Table P.1: SRCD—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	Limited	Likely	Limited	Low
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	Medium
Earthquake	Significant	Occasional	Catastrophic	Low
Flood/Levee Failure	Extensive	Likely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Medium
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Medium
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	High
<p>Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area</p> <p>Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.</p> <p>Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid</p> <p>Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact</p>				

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

P.3 Vulnerability Assessment

The intent of this section is to assess the District’s vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, and used to rank the hazards and to identify the related vulnerabilities unique to each jurisdiction. In addition, the SRCD’s HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the District.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table P.1). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects the overall ranking for each hazard, and is based on the District’s HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table P.1 reflect the hazards that could potentially affect the District. Those of Medium or High Significance for the District are identified below. The discussion of vulnerability for each of the following hazards is located in Section P.3.2 Estimating Potential Losses. Based on this analysis the priority hazards (High Significance) for mitigation include wildfire and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- flood/levee failure
- hazardous materials incidents
- severe weather: extreme cold; winter storm

- soil hazards: erosion
- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the Sierra Resource Conservation District, those hazards are as follows:

- avalanche
- earthquake
- human health hazards
- landslide
- severe weather: extreme heat, fog, heavy rain/thunderstorm/hail/lightning, tornado, windstorm
- soil hazards: expansive soils, land subsidence
- volcano

For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the main plan.

P.3.1 Assets at Risk

This section considers the District's assets at risk. Table P.2 lists District assets, including natural resources, identified by representatives from the SRCD as important to protect in the event of a disaster.

Table P.2: SRCD—Critical Facilities and Other District Assets

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info
Forest timber	Billions	n/a	Timber belt subject to devastating wildfires; stand replacing fires destroy this critical resource and jobs
Wildland ecosystems	Billions or priceless	n/a	Loss of critical ecosystems destroyed by unnatural wildfire events
Endangered and threatened species	Priceless	n/a	Wildfire threatens 172 listed threatened and endangered species in eastern Fresno County
Powerhouses and associated facilities, including Big Creek community	100 million to billions	16 power facilities, 120 employees, 260 residents	Wildfire or floods could destroy one or more facilities during a major event
Watershed and water quality of upper San Joaquin and Kings Rivers	Hundreds of millions	n/a	Wildfire and to a lesser extent flooding threaten water quality and availability along with other watershed values
Wish-I-Ah Care Center (live-in nursing home for mentally challenged)	5 million	100+	This facility is only hospital like facility within District boundaries

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info
Sierra High School	70 million	800 students 50 staff	School is also primary emergency operations center for District surrounded by wildland susceptible to fire
Auberry Elementary	20 million	300 students	Surrounded by wildland susceptible to fire
Sierra Elementary	20 million	300 students	Surrounded by wildland susceptible to fire
Big Creek Elementary	12 million	150 students	Surrounded by wildland susceptible to fire
21 dams (large and small)	100 million to 1 billion	n/a	Subject to damage or failure during flood events
Foothill Middle School	30 million	300 students	Surrounded by wildland susceptible to fire, alternate operations evacuation center
Highway 168 in eastern Fresno County	1-200 million depending on damage	Primary and in some cases only route for over 15,000 residents and up to 25,000 summer visitors	Subject to frequent (multiple times yearly) closers due to primarily wildfire and semiannually due to slides and rock fall during major storm events.
Shaver Lake sewage treatment plant	50 million	5 employees	At risk for both wildfire and flood
18 fire stations	3 million each	4 employees each	Most at risk of wildfire damage or loss
Auberry sheriff's substation	\$500,000	10 deputies	At risk of wildfire loss
8 U.S. Forest Service offices/facilities	\$400,000 to 15 million	12 to 40 employees per facility	All at risk from wildfire; some at risk from flood
Kaweah Watershed			
Dunlap and Miramonte Elementary Schools			
Dunlap Leadership Academy			
State Highways 180 & 245			
Squaw Valley Sheriff's Substation			
Fresno County Library – Bear Mountain Branch			
Hume Lake Ranger District Office and Work Center			
SEKI Park Service Facilities			
Hume Lake Christian Camp			
Hume Lake Dam			
Wonder Valley Resort			
Project Survival's Cat Haven			
CAL FIRE Stations in Piedra, Squaw Valley and Sand Creek			
Fresno County Wonder Valley Fire Station			
Hume Lake Fire Department			
Mountain Valley Volunteer Fire Department			
Caltrans Yard			
Fresno County Public Works Yard			
Unknown # of wooden bridges (~200)	\$500,000-?		All at risk of wildfire damage and loss
Communications towers			

Growth and Development Trends

Population growth within the SRCD is widespread but not uniform. The areas closest to the largest cities and communities are growing fastest and have higher housing densities. The foothill areas are growing the next fastest, with most of the growth in widely scattered single family homes within a very high fire hazard environment. An exception to this is the area near Millerton Lake, outside the Town of Friant, known as Millerton New Town. This high-density development when built out will have thousands of homes with a large exposure to the WUI. The mountainous region is the third fastest growing area in the District. Only the limited availability of private land and some issues with water availability are limiting growth in the mountain areas. Many new homes and cabins are built each year, especially along the mountainous portion of the Highway 168 corridor and near the community of Shaver Lake. Approximately 70 percent of new construction in the mountain area is second homes.

Growth within the SRCD on the valley floor is primarily in the form of subdivisions along primary transport corridors. The City of Fresno is the hub of jobs and retail. Growth is spreading outward from that hub. In general, new growth is not being permitted in flood zones, so most flooding in these areas has been minor and primarily due to rain events exceeding the capacities of the flood control drainage infrastructure. There are levees and irrigation canals within the lower elevation portions of the District. Historically, there have not been flooding problems related to these structures, but they are aging (some are over 100 years old). A flood event from the failure of one of these structures could cause widespread damage depending on the location of the break.

The foothill and mountain areas continue to grow and add complexity to the wildland fire issues within the District. Currently, there is no serious effort to control growth in these areas. Projections are for population within these areas to more than double in the next 10 years. Due to the widely scattered housing in this part of the District, the wildfire problem is more one of wildland-urban intermix rather than the more easily defined wildland-urban interface, as is the case with Millerton New Town. This greatly increases the probability of wildland fire starts, and the complexity of protecting homes is multiplied many times over that of protecting more concentrated populations. The probability of major losses of homes and property in these areas is very high.

The SRCD completed its consolidation with the Navelencia Resource Conservation District (Navelencia RCD). The Navelencia RCD in 2009 encompassed 781,075 acres (1,222 square miles), approximately one fifth of Fresno County's total acreage. The Navelencia RCD is bounded on the north and west by the Kings River, on the south by the Fresno-Tulare county line and the Sequoia National Park boundary, and on the east by the Fresno-Inyo and Fresno-Mono county lines. The former District is fairly indicative of the boundaries for the Oak to Timberline FireSafe Council (See Figure P.4). This largely agricultural area is rural with an estimated population between 30,000 and 50,000 people. Together, the combined RCDs cover 2,887 square miles.

P.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table P.2 above shows the sierra Resource Conservation District's critical facilities and assets that could be exposed to hazards. Specific losses for the Cities of Fresno and Clovis and the portion of the County of Fresno within the District's boundaries are discussed elsewhere in this hazard mitigation plan.

Agricultural Hazards

Agricultural land and rangeland are primary elements of the SRCD and are vital to the economy and important to consider when addressing issues related to groundwater, watersheds, and wildfire. Most of the agricultural hazards in the District are weather related (e.g., freeze, hail, wind, rain (flood), drought. Other hazards include insects and disease.

Avalanche

During an extreme snow year in 1927, two avalanches hit Camp 72 within five hours of each other and killed 13 people. Camp 72 was a work camp associated with the Big Creek Hydroelectric Project located north of modern day Shaver Lake and west of the Town of Big Creek. The avalanches destroyed the majority of two-story wooden structures in the camp and caused \$200,000 in damage (1927 dollars). Phone lines, tunneling equipment, and work rail lines were also damaged or destroyed. The damage also delayed work on the Big Creek project.

Deforestation in the area was a contributor to the avalanche. An avalanche in the same location today would likely have limited impact due to the regrowth of the timber.

Today, the likely impact of an avalanche would be quite limited. Backcountry skiers and snowmobilers are most at risk. If they are caught in a backcountry avalanche and someone is not on hand to dig them out, the situation is likely to be fatal. China Peak (formerly Sierra Summit) Ski Resort monitors and controls the avalanche danger within the recreation area.

There are areas along Highway 168 and the few secondary routes open in the winter that could be hit by avalanche; however, there is very little history of avalanches in these areas. If a person is not caught in an avalanche, then the only likely impact would be from road closures and damage to above ground facilities such as power lines. A long-term road closure and loss of power could strand some small communities, such as Lakeshore at Huntington Lake and China Peak Ski Resort, for extended lengths of time. This could require emergency evacuations or delivery of emergency supplies by snowmobiles or aircraft.

Dam Failure

Multiple dams on the San Joaquin and Kings rivers provide hydroelectricity, recreation, and flood control. Failure of any of these dams could endanger lands within the Sierra RCD.

Drought

The canals and irrigation districts on the valley floor provide agricultural water during the dry summer months. Their boundaries and practices can affect the SRCD conservation efforts. A number of flood control districts and groundwater recharge basins are within the District's boundaries. Groundwater issues are a recurring theme on private lands within the District and are specifically addressed in the Fresno County General Plan. In the foothills, most residents get water from wells, but groundwater is not overly abundant. Parts of the District are in state recognized groundwater basins and are now affected by new legislation that was enacted in September of 2014 by Governor Edmund G. Brown, Jr. when he signed a three-bill package known as the Sustainable Groundwater Management Act (SGMA).

Crop losses and reduced plantings have occurred during past droughts. Generally, irrigation and ground pumping were used to offset the impacts of past droughts. Both of these alternatives are becoming less reliable as surface water is diverted to other uses, and groundwater is already being over pumped, leading to lower underground water levels. The District had prolonged drought from 2012 through 2016. The winter and spring of 2017 brought a significant amount of precipitation after which the Governor declared the official end of the 5-year drought in April, 2017. However Executive Order B-40-17 lifts the drought emergency in all California counties except Fresno, Kings, Tulare and Tuolumne, where emergency drinking water projects will continue because of depleted groundwater. Additionally, this water year from October 2017 to date has seen precipitation totals severely below average.

Flood/Levee Failure

The District has two primary watersheds: the San Joaquin River and the Kings River watersheds, which greatly affect the foothills and valley floor.

Flooding and soil erosion due to heavy rains and snow runoff have been a historical problem. Abundant snowfall in the mountains combined with rain and steep terrain can mean rapid runoff and flooding. In the foothills, many streams are seasonal. Water flow can be high in peak runoff periods with historical downstream flooding. Much of the area on the valley floor is subject to flooding and ponding from the San Joaquin and Kings rivers and from several lesser watershed drainages. Severe thunderstorms and heavy rain in the summer also cause flooding. Because of widespread tree mortality, large fires, and the efforts to recover from the impacts of these fires, there is the potential for debris flows and increased erosion and sediment coming off of forestlands and flowing into the major reservoirs – in particular Millerton Lake and Pine Flat Dam.

Major past flood events are described below:

- **December 1955**—A rain on snow event caused local and downstream flooding. It occurred on the western side of the Sierras and eastern Fresno County, affecting the entire valley region. An unknown number of homes were damaged, and roads, bridges, and some dam facilities were destroyed or damaged. School and road closures resulted.
- **January 1997**—A regionwide high elevation rain on snow event caused local flooding and downstream valleywide flooding. Homes and a trailer park flooded, but numbers and values are unknown. Bridges, roads, and other infrastructure near waterways washed out. The event caused hundreds of millions in damage in the valley. In the District, fisheries and wildlife were impacted. Damage occurred to much of the flood control/dam system on the San Joaquin River as water threatened to overtop the dams. Spillway gates were opened to prevent that occurrence. This created flooding to about a dozen mobile homes and resulted in the evacuation of approximately 500 people. In the aftermath of the event, debris and mud had to be cleared from structures, roads, and facilities throughout the District. Many culverts failed, washing out roads, and the approach to one major bridge in the District on the San Joaquin River connecting Fresno and Madera County was washed away, closing that vital route for over a month. Washouts, mudslides, plugged culverts, and rockfalls along roads required months of work to clean up and correct. Some secondary mountain roads on the Sierra National Forest have never been repaired due to the cost. Exact costs are not available, but costs to infrastructure repairs within the District were easily in the tens of millions. Value of damage to habitat and fisheries within the District were never quantified, and costs to mitigate damage to the environment are also not available. In most cases, the environment was left to recover on its own due to lack of available funds.
- **July 2006**—A flash flood from thunderstorms in drainages above the north end of Huntington Lake caused flooding in Huntington Lake, Rancheria Creek, Kaiser Pass Road, and Eastwood Powerhouse. The powerhouse was inundated, the primary road washed out, and boat docks damaged at an estimated cost of \$200,000. An estimated \$250,000 in damage to private boats occurred. The event resulted in loss of power output for three weeks, closure of the primary summer road, closure of Huntington Lake to recreation for one week, and approximately \$350,000 in damage. Clean-up costs were \$150,000, and search and rescue costs were \$25,000. Four people were injured. Insured losses were \$100,000. No federal or state disaster relief was received for this event.

Based on these past events, major rain on snow events occur every 10-15 years. The primary impacts from flooding within the district include loss of fisheries and wildlife habitat; damage to roads, hydroelectric facilities, dams, bridges; and some flooding of homes. Winter road closures could require large scale evacuations and create difficulties in providing emergency services to areas cut off by flooding. There are quite a few communities that are at the end of one primary access road. In the winter, secondary or emergency roads are usually impassable. If the primary road is closed by a flood, it is likely that secondary roads will also be impacted as well. If the repair time is extended, emergency services may be required to protect the population until repairs can be made.

Since it is a special district, participation in the National Flood Insurance Program (NFIP) does not apply to the Sierra Resource Conservation District, thus NFIP Repetitive Loss and Severe Repetitive Loss properties are not tracked for the jurisdiction; therefore, the District does not have this data available. Within the District's boundaries the City of Fresno has one Repetitive Loss property but no Severe Repetitive Loss properties; The Cities of Clovis, Reedley and Sanger do not have either type. Refer to those annexes for additional information. There are two Repetitive Loss properties in the unincorporated County, but further details to determine if these are within the District's boundary are not available. There are no Severe Repetitive Loss properties in the County as detailed in Chapter 4 Section 4.3.2 of the base plan.

Hazardous Materials Incident

The SRCD is vulnerable to transportation-related hazardous materials releases because only one road serves the communities of Shaver Lake, Big Creek, and Huntington Lake. The road is steep, narrow, and winding. There is a seven-mile stretch of Highway 168 that is very vulnerable to road closure due to accidents, wildfires, or bad weather. No safe alternate routes for this section exist. Closures cut off 700 homes and 400 square miles of the Sierra National Forest open to the public.

On July 26, 2002, Highway 168 closed for two days due to a gas tanker spill during peak summer use season and cut off more than 700 residences and stranded 7,000-10,000 summer visitors to the area. The driver was injured, and direct access to the hospital was not available. The accident damaged the roadbed and culvert, and underground power lines needed to be relocated. The 10,000-gallon spill caused environmental damage to streams and surrounding timber—one-half acre of timber was lost. It caused economic losses to businesses, and people were unable to get to or from work. Most direct losses were covered by the truck company's insurance.

Severe Weather: Extreme Cold/Freeze

Of particular concern to the District is the vulnerability of citrus orchards in the western part of the District to extreme cold/freeze events. This vulnerability increased when the District consolidated with the Navelencia Resource Conservation District.

Severe Weather: Winter Storm

In January 2005, a major winter snowstorm caused regionwide closure of roads and loss of power for up to three weeks in three communities. The impacts occurred in eastern Fresno County above 4,000 feet in elevation. Damage included the following:

- Eight injuries from storm and poor road conditions
- Estimated \$3.5 million in damage to trees falling on homes and other structures
- Estimated \$2.5 million in damage to power distribution grid
- \$250,000 to open and repair road system
- 10,000-15,000 merchantable trees damaged or killed
- \$250,000 in miscellaneous damage from heavy snow and falling trees

- All businesses closed and without power, estimated \$500,000 in loss of business and product or inventory
- \$3 million in insured losses
- Schools closed for over two weeks

Similar storms are highly likely to occur in the future. The 2016/2017 weather year had extremely high precipitation, and due to warmer temperatures, the snow/rain transition occurred at higher elevations.

Soil Hazards: Erosion

With the population moving to the foothills, road and home construction is increasing. The popularity of horses and family livestock with families new to the area, combined with the zoning practice of “parceling” is contributing to an increase in soil erosion and compromising wildlife habitats and native animal populations. Soil erosion due to heavy rains and snow runoff is also a problem.

Wildfire

All communities within the District are listed on the National Fire Plan’s “Communities at Risk” list. Over one hundred years of aggressive fire suppression under the national fire suppression policy has rendered wildlands severely overgrown. Much of the private land in the foothills area is in the wildland-urban interface with increasing residential development on steep terrain in the brush on highly erodible soils. According to the Highway 168 Fire Safe Council Community Wildfire Protection Plan, the following areas of the District were prioritized for projects because of their dense population, values at risk, and fuel availability: Burrough Valley of Tollhouse, Peterson Road Subdivision, Dogwood Subdivision, Routt Mill Road, Big Sandy Rancheria, Beal fuel break, and Sugarloaf fuel break.

As more people move into the area and impacts from recreational demands increase, there will be more human-caused wildfire starts each year. And, the increased number of widely scattered homes within the District adds greatly to the danger, complexity, and cost of fighting these fires.

Currently, many of the communities in the District are limited to one route access and egress in the event of a major wildfire. Historically, these routes are closed during major events, stranding many people, including visitors, away from their families and homes. So far there has been no loss of life attributed to the limited evacuation routes, but it is likely only a matter of time before people are cut off and trapped by a major fire event.

Low intensity natural fires kept the Sierra forest from becoming overgrown. Forest overgrowth due to the efficiency of modern firefighting techniques, and to society’s current election to limit forest thinning and harvesting, is a serious problem. If wildfire does not impact the forest first, native insects will eventually kill millions of trees as has been clearly demonstrated since 2012. Explosions in insect populations usually start during a drought, when the lack of water combined

with too many trees per acre render the trees too weak to fight off the insect attacks. This has resulted in the Tree Mortality Crisis of over 5 years as declared in October 2015 by the Governor of California with his State of Emergency Declaration, which is still in effect as of March 2018.

Major past wildfires are described below:

- **1933**—The Tollhouse fire started when a local resident was cutting, stacking, and burning brush in late August along Lodge Road. The fire burned across fields and grazing lands and encircled the Town of Tollhouse, which at that time was a large and important hub for the timber industry in eastern Fresno County. The Town of Tollhouse was evacuated for safety. The fire burned portions of the flume that carried logs and boards from Shaver Lake to the valley floor. The fire raced up the hill and burned into Jose Basin and over Burrough Mountain into Blue Canyon, burning very hot and destroying conifers. The once abundant conifers that grew on the slopes did not grow back; the hill is barren of good timber. It is mostly brush now. Stables of mules and horses were scared and had to be controlled by handlers.
- **1955**—McGee fire. “The 1955 heat wave began with very hot weather and fires on August 27th. As the heat wave wore on, fires increased in number until Labor Day weekend when 139 fires were reported throughout the region.” While ten large fires were being fought in Northern CA, the McGee Fire broke out in the Sequoia Forest. This fire “was not the largest but was the most damaging.” Though fire danger was extreme, a rancher conducted a controlled burn a half-mile outside the forest boundary. It spread rapidly up Milk Ranch Creek to the East towards Pinehurst. The fire burned near Pinehurst, Miramonte, Cedarbrook and the Sequoia Lake community. “The most severe damage was to mixed stands of pine, fir and giant sequoia in the upper Mill Creek and Converse Basin.” (Source: July 2005 R5-FR-003 USDA Forest Service, California, “Fire in the Forest: A History of Forest Fire Control on the National Forests in California 1896-1956”)
- **1987**—A number of large wildfires in eastern Fresno County caused over \$1 million in damage to roads, bridges, and other improvements and over \$1 million in damage to resources. Suppression costs were estimated at another \$1 million.
- **1989**—A wildfire burned 21,000 acres near the Town of Auberry. It started near the Fresno and Madera county line on the Fresno side of the San Joaquin River. It was never determined what caused the fire; arson was suspected. The fire raced up the canyon skirting Powerhouse Road in Auberry, traveling midslope behind the settlement of Jose Basin. Fingers of the fire touched New Auberry and the Town of Auberry. The fire burned across the front of Bald Mountain into Mile High and threatened Meadow Lakes and all the homes in its path. An all out assault by air and ground stopped the fire at Sugarloaf Road at 3,800 feet in elevation. This fire caused an enormous amount of stress on local residents and businesses. Roads were blocked, people did not know if they had homes to return to, and pets were a big concern.
- **1994**—A large wildfire burned 9,000 acres near the Town of Big Creek and resulted in the evacuation of the entire community of Big Creek (for one and a half weeks) and portions of Lakeshore community at Huntington Lake. Damage was estimated at \$2 million to roads and miscellaneous improvements in the national forest and \$500,000 to the power grid. The

estimated cost to recover the forest was \$200 million. Mudslides due to fire caused \$500,000 in damage. Scenic values and wildlife were also compromised. Firefighting costs approximated \$50 million. Tourism losses due to damage are still a problem in the affected area. Annual losses to local businesses are estimated at \$10,000.

- **2013** – Aspen Fire, High Sierra District of the Sierra National – burned nearly 23,000 acres in the upper San Joaquin River Watershed.
- **2015**—The Rough Fire was a devastating fire that burned 151,623 acres of land, making it the largest fire of the year in California, involving up to 3,742 firefighters. (Source: Wikipedia)
- **2016** – Goose Fire, State Responsibility Area (SRA) 2,340 acres near the towns of Auberry, Prather and Tollhouse
- **2017** – Two fires occurred in 2017. These were the Silver Fire and the Highway Fire.

These are only examples of events in eastern Fresno County. There are other smaller incidents that have been occurring with increasing frequency. In 2017, the fire season had extended itself into late fall.

P.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the District’s planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the District’s planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The SRCD’s updated capabilities are summarized below.

P.4.1 Regulatory Mitigation Capabilities

Table P.3 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the SRCD.

Table P.3: SRCD's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	See Fresno County
Zoning ordinance	Yes	See Fresno County
Subdivision ordinance	Yes	See Fresno County
Site plan review requirements	Yes	See Fresno County
Growth management ordinance	No	
Floodplain ordinance	Yes	See Fresno County
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	See Fresno County
Building code	Yes	Version: Fresno County Building Code (2001 California Building Code)
Erosion or sediment control program	Yes	See Fresno County
Storm water management program	No	
Capital improvements plan	No	
Economic development plan	TBD	District is developing ED Plan based upon tree mortality and utilization of excess biomass as a useable renewable resource
Local emergency operations plan	No	
Other special plans	Yes	SRCD Long Range Plan 2015-2020; Community Wildfire Protection Plan (CWPP) by Highway 168 FireSafe Council and updated in 2018; Oak to Timberline FireSafe Council development of first CWPP in 2018
Flood Insurance Study or other engineering study for streams	Yes	See Fresno County

Sierra Resource Conservation District Long Range Plan 2015-2020

Sierra Resource Conservation District's current Long Range Plan describes the physical setting of the District, the history of the organization, and data and personnel resources; identifies the critical issues of the District; and develops a program of action and an annual summary report. This plan identifies several critical issues that must be addressed if the natural resource base for sustained use is to be maintained. These issues include soil erosion, watershed/wetlands, agriculture and rangeland, vegetative management, wildlife habitat, environmental education, and air quality. More recently, due to the impacts of wide-spread tree mortality, the LRP was updated to include the critical challenges associated with millions of dead and dying conifers. Additionally, due to the increase of large and unpredictable fires – with the potential to destroy communities and the surrounding environment, the District has focused most of its resources towards this challenge. The LRP reflects the effort to move from recovery to prevention, working with the FireSafe Councils, CAL FIRE and the U.S. Forest Service and others.

Highway 168 Fire Safe Council Community Wildfire Protection Plan

The Highway 168 Fire Safe Council Community Wildfire Protection Plan (CWPP) summarizes wildfire dangers and issues on a community by community basis within the Council's area of influence. The CWPP also catalogs community wildfire protection needs and identifies corrective

action and community projects that will mitigate some of the problems. The CWPP is currently under revision with the Sierra RCD and is to be completed in September 2018.

Oak to Timberline Fire Safe Council Community Wildfire Protection Plan

Oak to Timberline FireSafe Council is in the process of developing their first Community Wildfire Protection Plan (CWPP) under the auspices of Sierra RCD. The plan is expected to be completed by September 2018.

P.4.2 Administrative/Technical Mitigation Capabilities

The SRCD is a “Local State Agency” under California Public Resources Code (PRC) 9003. It has at this time five (5) part-time staff, including the District Manager, and also relies upon other outside governmental/non-governmental resources and volunteers. The Board of Directors (currently 3 members, with 2 vacancies) are under a standing resolution by the Fresno County Board of Supervisors and come from private land owners and other conservation-conscious citizens from within the District who often have expertise in a variety of natural resource fields. Each director serves a four-year term. Additional nonvoting associate directors are also appointed, of which there are currently two (2). The District works closely with the Natural Resource Conservation Service (NRCS), California Department of Conservation (DOC), Sierra Nevada Conservancy (SNC) and U.S. Forest Service under interagency agreements, as well as with many other local, state, and federal agencies, research and academic institutions.

Volunteers are an important strength in the District. The community is very aware of the wildfire issues in particular, and many within the community are motivated through the two FireSafe Councils and other entities to help by donating time and talent to improve the situation. Volunteers especially enjoy the educational aspects of teaching wildland fire safety to help prevent fire starts and educating homeowners on how to maintain their property to reduce the hazards from wildfire. Landowners are also generally ready to allow fuel breaks across their property in support of community fuel breaks that mitigate the impact from any fires that do start.

P.4.3 Fiscal Mitigation Capabilities

The SRCD is eligible for various wildfire, watershed, and community development grants from County, state, and federal agencies and programs as a local state agency under PRC9003. There was no taxing authority by agreement at the time the District was established. The District does not have a designated funding source for mitigation but seeks to implement multi-objective projects that incorporate mitigation activities and considerations.

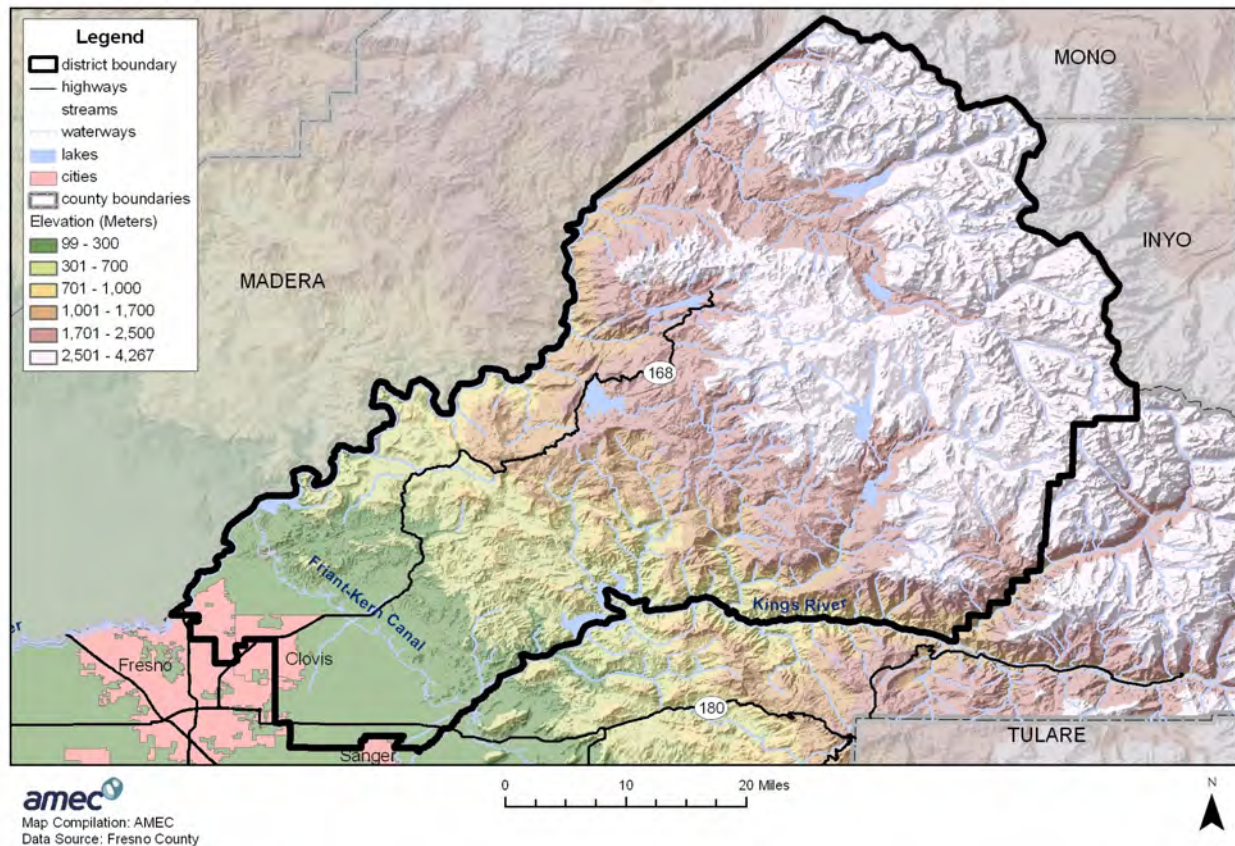
P.4.4 Mitigation Outreach and Partnerships

Highway 168 Fire Safe Council

The Highway 168 Fire Council is a critical partner for the SRCD and has served as a primary partner in the development and update of this annex. It is a volunteer-based nonprofit organization that was formed as one of currently over 150 local chapters of the California Fire Safe Council. The Highway 168 Fire Safe Council was founded in 1997 by local volunteers, businesses, and agency representatives to reduce the risk of wildfire damage to improvements and natural resources within its area of influence. Using education, project grants, and grassroots action, the Council continues to be the primary resource for local efforts to live safely with fire and reduce community risks within the wildland-urban intermix. The Council has successfully administered over \$1.5 million in community project grants to build wildfire fuel breaks and educate the community on living safely in a fire-prone ecosystem. These projects have been credited with saving over a dozen homes and millions in firefighting costs to date.

The Council's area of influence resides entirely within the boundaries of the SRCD, with which the Council has a formal memorandum of understanding to partner on the Fresno County Multi-Hazard Mitigation Plan and other efforts that are to be undertaken. Specifically, the Council represents the portion of the San Joaquin River watershed in eastern Fresno County from the community of Friant in the west to the headwaters of the San Joaquin River in the east. The boundaries of the Highway 168 FireSafe Council are shown in Figure P.3.

Figure P.3: Sierra Resource Conservation District / Highway 168 Fire Safe Council



The Highway 168 Fire Council has one part-time paid staff member that acts as project coordinator (grant specific) to supplement the predominantly volunteer efforts of the group. Volunteers include wildfire prevention and suppression experts and prescribed burn and fuel break construction experts. California Department of Forestry and Fire Protection and the U.S. Forest Service provide additional technical assistance and resources. Currently, all hazard mitigation planning and review is being performed by volunteers.

The Council has developed education materials for distribution and conducts various wildland fire education programs throughout the year at schools, town hall meetings, homeowners associations, and at the annual Fire Safe Festival. They also contribute two wildfire educational pieces a month for publication in local newspapers and have developed a serial story of a fictitious local major fire. The Council maintains a storefront office that provides fire safety information and has a library of wildfire education publications and films.

Highway 168 Fire Safe Council (PO Box 639, Prather CA 93651)
Patricia Gallegos (Project Coordinator) (559) 855-3144
Howard Hendrix (Council President)
Ryan Stewart (Council Vice President)

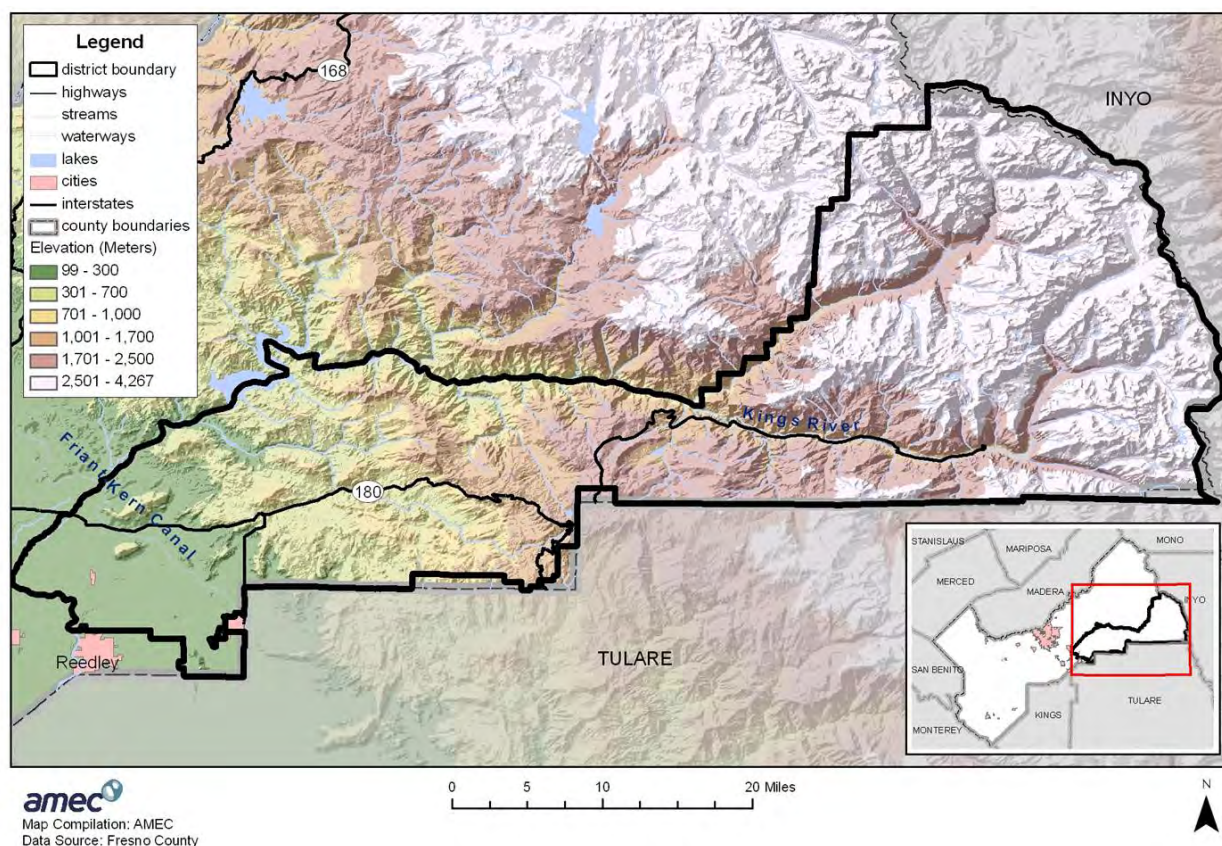
The three council members above, along with Craig Jones, Project Manager for the Sierra RCD now constitutes the Highway 168 CWPP Update Committee. This committee now meets two times per month to help expedite the update process.

Oak to Timberline Fire Safe Council

Within the Oak to Timberline FireSafe Council’s boundary are State and Federal lands, private homes, ranches, schools, churches, youth camps, businesses, and wildlife refuges, and the communities of Piedra, Tivy Valley, Wonder Valley, Squaw Valley, Dunlap, Miramonte, Pinehurst, and Sequoia to Hume Lakes. Its territory lies within the Kings and Kaweah River watersheds, which offer an array of wildlife habitats and recreational activities, as well as being a vacation destination for visitors from all over the world.

Figure P.4 shows the Oak to Timberline FireSafe Council’s boundaries.

Figure P.4: Sierra Resource Conservation District / Oak to Timberline FireSafe Council



The Oak to Timberline Fire Safe Council (OTFSC) is a key organization for the overall wildfire mitigation effort within its organizational boundaries and its contiguous neighbors and cooperators. It serves as the conduit for information, resources, and communication for the landowners, businesses, communities and residents within its area of influence. The OTFSC has

recently partnered under a MOU (Memorandum of Understanding) with the SRCD to develop its Community Wildfire Protection Plan through funding provided by the California FireSafe Council.

OTFSC is a volunteer-based, nonprofit organization that was formed as one of currently over 150 local chapters of the California Fire Safe Council. OTFSC was founded in 2005 by local volunteers, businesses, and agency representatives to reduce the risk of wildfire damage to improvements and natural resources within its area of influence. Using education and outreach efforts, project grants, and community action, the Council is a primary resource for local efforts to learn and live safely within the wildland-urban interface.

OTFSC serves a diverse region ranging from 500' to 6500' elevation. From the grasslands, through the brush and oak of the foothills, and all the way to the timberlands of the Giant Sequoias, the Council's service area encompasses nearly 217,000 acres of public and private lands.

Since 2015, the Council has successfully administered over \$475,000 in project grants from CAL FIRE and PG&E to fell dead trees along county and feeder roads in Fresno County, fell and remove logs from the Hartland and Eshom areas, and clear 1000' around PG&E assets. OTFSC relies entirely on volunteers, who include wildfire prevention and suppression experts, grant seekers experienced in writing federal grants, and local business people. CalFire, USFS, and Fresno County Office of Emergency Services provide additional technical assistance and resources. Currently, all hazard mitigation planning and review is being performed by volunteers.

The Council is developing education materials for distribution and offers wildland fire education programs at schools, town hall meetings, homeowners associations, and Mountain Rodeo Association events. They distribute an online monthly newsletter, maintain an active Facebook page, and have an informative and dynamic website.

As a community based, non-profit organization, OTFSC is prepared to fulfill its mission to “promote fire safety by providing information, education, support incentives, and projects that encourage fire safety in our communities east of the Friant-Kern Canal and south of the Kings River, from Oak to Timberline.”

Oak to Timberline Fire Safe Council (PO Box 762, Squaw Valley, CA 93675)

Jon Lovewell, chair (559) 471-6983

Jack Huneke, CWPP committee chair (559) 336-9985

oaktotimberline.org

facebook.com/oaktotimberline

Other Outreach and Partnerships

The SRCD has working relationships with several federal, state, and county agencies and private landowners. Historically, the District has worked with conservation agency partners like the Natural Resources Conservation Service to provide technical assistance, cost-share programs to encourage use of conservation practices on agricultural and rangeland, and educational activities.

Over the years, the SRCD has been active in conservation partnerships on a variety of field projects with other agencies, including the California Department of Forestry and Fire Protection (CAL FIRE), California Department of Conservation (DOC), the U.S. Forest Service, the California Department of Fish and Game, and the University of California Cooperative Extension. Multiple conservation plans have been developed and implemented on private lands.

The District also works with other agencies on wildfire-related matters. Working with professional fire experts from the U.S. Forest Service and CAL FIRE helps ensure that the District's work complements state and federal efforts and is up to standard for controlling wildfires.

The following lists the resource groups and governmental agencies that are partnered with the SRCD to address resource issues within the District:

- Natural Resource Conservation Service (NRCS)
- California Department of Conservation (DOC)
- California Association of Resource Conservation Districts (CARCD)
- Governor's Office of Planning and Research (GOPR)
- California Natural Resources Agency (CNRA)
- Sierra Nevada Conservancy (SNC)
- Dinkey Creek Landscape Collaborative
- California Department of Water Resources (DWR)
- California State Water Resources Control Board (SWRCB)
- Regional Water Quality Control Board (RWQCB)
- Yosemite/Sequoia Resource Conservation and Development (YSRC&DC)
- Fresno County Resource Advisory Council (RAC)
- Sierra/San Joaquin Noxious Weed Alliance
- Highway 168 Fire Safe Council
- Oak to Timberline Fire Safe Council
- Sierra and Sequoia National Forests
- Fresno County Board of Supervisors
- Sierra Foothill Conservancy (SFC)
- Back Country Horsemen of California
- San Joaquin River Trail Council
- Sierra Club
- CSU Fresno – Lyles College of Engineering

The District supports youth workshops, the Envirothon, and adult stewardship training programs. The District has sponsored Fresno County's Resource Conservation District Day, a "Living among the Oaks" landowner workshop, and a Rangeland Water Quality workshop series. It provides support for minority farmers in the Hmong and Punjabi communities in partnership with the NRCS.

P.4.5. Other Mitigation Efforts

The SRCD, in partnership with the Highway 168 Fire Safe Council, has completed 11 fuel break projects. Three other fuel break projects are in various stages of completion. All projects were funded through various federal, state, and County grants along with the donation of thousands of hours of volunteer time. The fuel break projects are only possible with the cooperation of private property owners, so partnerships with landholders are absolute necessities.

Already, two of the fuel break projects have helped stop the spread of major fires:

- The Peterson fire started on Peterson Road, one-half mile downslope and downwind from the community on Cressman's Road, where a shaded fuel break project had been completed only two months prior. The fire quickly became a major wind- and slope-driven crown fire with flame lengths of over 250 feet. As explained by on-site firefighters, there was no way they were going to stop that fire, and there were close to one hundred homes in the path the fire was expected to take in its first day alone. When the flame front hit the "Cressman" fuel break, it was cut off from its ability to spread through the tree tops as a crown fire. It immediately "went to ground" with a flame length of only one to two feet, and firefighters were able to stop its spread at the road running through the middle of the fuel break. All homes were saved, only minor injuries were reported, and the fire was controlled within one burn period instead of the expected multi-period fire. It was estimated that at least two dozen homes with a replacement value of over \$10 million were saved by this fuel break. Using best case estimations, an additional 2,000 acres of timberland would have burned over two additional burn periods. Additional suppression costs would likely have exceeded \$2 million. Not a bad return on a \$50,000 fuel break grant from California Department of Forestry and Fire Protection, and lots of volunteer time.
- In the second incident, a major fire burning up a very steep slope was imminently threatening 20 homes with 50 more in its path. Working from the safety of the "Beal" fuel break, which was still under construction at the time, firefighters were able to stop the fire before it could reach the homes. Property loss prevention was estimated at \$1-2 million and suppression cost savings at \$250,000 to \$500,000. And, an estimated 1,000 acres of pine and brush woodland were saved. This project was funded by an \$80,000 Proposition 40 watershed protection grant.

The District has been active in vegetation management projects, including prescribed burns, to reduce fuel loads and fire risk. Additionally, the District has taken a leadership role in the development of voluntary Oak Woodland Guidelines for Fresno County and Rangeland Water Quality Guidelines.

P.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the Sierra Resource Conservation District has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the communities the District serves. Future improvements may include providing training for staff members and volunteers related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Continuing to train staff and volunteers will lead to more informed staff and volunteers who can better communicate this information to the public.

P.5 Mitigation Strategy

P.5.1 Mitigation Goals and Objectives

The Sierra Resource Conservation District adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the District to inform future mitigation projects and planning efforts. The hazard information and mitigation projects will be useful when updating the District's Long Range Plan as well as updating the Community Wildfire Protection Plans. The District is involved in several wildfire mitigation projects including fuel break projects and vegetation management projects. The information contained in this plan will help the District to focus on areas that are most vulnerable to wildfire. The District has focused on wildfire mitigation in the past, due to it being a high significant hazard for the District. This plan will help to inform staff and volunteers to understand the connection between wildfire and other hazards, such as drought and flooding and think holistically when developing future mitigation project and planning efforts.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from the Sierra Resource Conservation District will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

P.5.2 Completed 2009 Mitigation Actions

The Sierra Resource Conservation District completed two of the mitigation actions identified in the 2009 plan, which were as follows:

- Create an Integrated Regional Water Management Plan for Eastern Fresno County
- Conduct a Fractured Rock Groundwater Capacity Study for Eastern Fresno County

These actions have increased the SRCD's capability to implement future mitigation actions and have reduced vulnerability to hazards in the District.

SRCD has also begun implementation of several other 2009 actions, which will be continued with the incorporation of these actions in the mitigation strategy for this plan update.

P.5.3 Mitigation Actions

The planning team for the SRCD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, partners, potential funding, estimated cost, and schedule are included.

The Sierra Resource Conservation District, in coordination with the Oak to Timberline FireSafe Council and Highway 168 FireSafe Council, will be participating in the new multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program, with an emphasis on wildfire, drought, flood and severe weather hazards. The county-wide project will be led by the County in partnership with all municipalities and special districts. The District agrees to help disseminate information on hazards provided by the County. More information on the multi-jurisdictional public education and awareness action can be found in the base plan Chapter 5 Mitigation Strategy.

1. Strengthen Non-Native Noxious Weed Control Efforts

Hazard(s) Addressed: Multi-Hazard: wildfire, drought

Issue/Background: The incursion of noxious weeds into California has been a concern for many years, however, in the rural and mountain regions of the County, the populations of various California Department of Food and Agriculture "A" and "B" rated weeds are still at a point that control and in some cases, eradication is possible. These weeds typically alter the water cycle and increase the threat of wildfire in the foothill and mountains. The threat of these noxious weeds has been termed by one noted weed scientist as "a disaster in slow motion."

While work is in progress on this threat, funding is very short. The Fresno County Department of Agriculture (FCDA) and the SRCD are currently partnering with landowners and other agencies to combat the spread of selected weeds, but the threat continues to grow as new weeds are introduced and less common weed populations remain undetected.

Education of landowners, agencies, and utilities is a daunting task that must be done to stem the tide of invasive weeds. Agriculture, ecosystems, waterways, and wildlife habitat are in jeopardy because of this often overlooked threat.

Control and detection of noxious weeds is very expensive and time consuming for a single agency to undertake. The FCDA has attempted to fulfill underfunded mandated control responsibilities.

Other Alternatives: None

Responsible Office: Fresno County Department of Agriculture, California Department of Food and Agriculture

Priority (High, Medium, Low): Low

Cost Estimate: \$2-5 million per year for detection and control, \$200,000 per year for education and workshops for 5-10 years

Potential Funding: Limited funding has been secured from the California Department of Food and Agriculture, watershed grants, Resource Advisory Council, and the U.S. Forest Service.

Benefits (Avoided Losses): Estimates of reduced agricultural production currently run into several millions of dollars each year for the County. Current control and education costs approximate \$150,000. Destruction of habitat, ecosystems, and waterways has not been established. Estimated benefits of noxious weed control may be in the hundreds of millions of dollars per year for the County.

Schedule: Work is ongoing as funding is available. Future, reliable funding would ensure that the weeds present now are controlled and future infestations would be detected and eradicated.

Status: 2009 project, implementation postponed due to low priority

2. Strengthen Dam Failure/Flood Planning, Coordination, and Training

Hazard(s) Addressed: Multi-hazard: flood, dam failure

Issue/Background: Dam failure and flood planning are done as required by law. However, due to lack of funding, most of this knowledge and planning are kept at the top levels. Mid- and lower-level first responders are not part of coordination planning and do not receive significant training in procedures, key downstream hazard locations, access routes, alternate evacuation routes, and where to set up roadblocks. While the probability of a dam failure is low, the potential impact is extreme. Flooding from the inability to control water during extreme weather events is much more likely, and response procedures are similar.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, Fresno County Sheriff's Office, Madera County Sheriff's Office

Priority (High, Medium, Low): Low

Cost Estimate: \$25,000

Potential Funding: Grants

Benefits (Avoided Losses):

Tremendous amounts of time will be saved and safety for first responders will be greatly enhanced.

- 10 lives saved (including first responders)
- 50 injuries avoided
- Savings from dispatching too many personnel to wrong locations or lost equipment estimated at \$100,000

Schedule: 1-3 years

Status: 2009 project, implementation postponed due to low priority

3. Improve Alternate Emergency Access Roads

Hazard(s) Addressed: Wildfire

Issue/Background: The communities of Shaver Lake, Big Creek, and Lakeshore (Huntington Lake) and 250,000 acres of the Sierra National Forest open to public use are accessed by only one main transportation route, Highway 168. This highway has a history of being closed from three days to a week almost every year because of wildfires. It also has a history of closures for up to three weeks at a time about once every five years due to vehicle accidents and washouts. Lesser closures of one-three days happen almost every two years. Two- to six-hour temporary closures happen an average of twice per month. During all of these closures, emergency responders, including ambulances, must seek alternate routes to reach emergency sites or transport patients to medical care.

In many cases, the only alternate routes into or out of the area are narrow mountain back roads, which residents and visitors (thousands on busy summer day) are using to evacuate, reach stranded family members or pets, get into the area for recreation, or get home or to work. This can create a traffic jam and stop all traffic on these alternate routes. The following can make traffic problems worse: when two large vehicles meet on a narrow section of road, an accident occurs, or a vehicle breaks down at a choke point. Traffic could cause a second emergency/disaster if (for example) a vehicle went off road and caused a wildfire. At the very least, it is unsafe and impairs the movement of emergency equipment and personnel. In some cases, the back roads cannot handle large vehicles, such as buses and structure protection fire trucks, even when there is no traffic.

With relatively low expense, improvements could be made to these back roads, located primarily in the Sierra National Forest, that would allow for the reasonable flow of public traffic and access for emergency vehicles. Two roads, one east and one west of Highway 168 would need to be improved to cover the high probability of both 168 and one of the alternate routes being closed by a major wildfire, which most experts agree is inevitable.

Other Alternatives: Close all side roads to all but emergency traffic, stranding thousands and requiring evacuation centers and large numbers of emergency personnel to reach stranded residents

and transport them to safe locations. Buses and other large vehicles would not be able to reach the cut-off area.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, Sierra National Forest

Priority (High, Medium, Low): High

Cost Estimate: \$1 million

Potential Funding: Alternate funding unknown

Benefits (Avoided Losses):

- More than 20 lives saved
- 20 or more incidents of reduced injury due to prompt emergency response, estimated savings \$500,000
- More than 100 homes saved with a value of over \$40 million
- Reduced fire suppression costs of \$20-100 million
- Reduced losses to natural resources and ecosystems, estimated value \$600 million
- Savings of \$20-100 million in forest and habitat restoration
- Reduced damage to infrastructure \$4 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings \$500,000-\$1 million
- Reduced need to set up evacuation centers and reduced cost to operate centers when needed

Schedule: Two years, April-November

Status: 2009 project; implementation in progress

4. Conduct Community Fuel Break Construction and Maintenance on a Landscape Scale

Hazard(s) Addressed: Wildfire

Issue/Background: There is a high occurrence of wildland fires in rural areas of eastern Fresno County and a heavy urban intermix of homes and businesses in very high and extreme fire danger zones. All communities in the foothill and mountain region of eastern Fresno County were included on the National Fire Plan's list of Communities at Risk.

Historically, community fuel breaks have proven to be the most effective pre-fire treatment available for lessening the impact of wildfires. These fuel breaks have proven themselves time and again in stopping the spread of even major fire events and saving lives, homes, businesses, resources, ecosystems, and suppression costs. In two recent local examples, fuel breaks were credited with saving dozens of homes, hundreds of acres, and millions of dollars in losses and suppression costs.

Current fuel break projects are effective, but due to lack of sufficient funding, there are large gaps in the system that need to be addressed before maximum benefit can be realized. Due to re-growth after 5 to 6 years, unmaintained fuel breaks start to lose some of their effectiveness, and after 10 to 12 years, unmaintained fuel breaks need to be reconstructed. Relatively inexpensive treatments with herbicides or other methods can maintain these important community projects indefinitely.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council, Sierra National Forest

Priority (High, Medium, Low): High

Cost Estimate: \$2.5 million for new construction, \$200,000 annually to maintain system

Potential Funding: Grants from other sources to complete proposed landscape-scale system of community fuel breaks, in-kind volunteer labor

Benefits (Avoided Losses): Over 20 years:

- More than 10 lives saved
- More than 500 homes saved with a value of over \$200 million
- Reduced fire suppression costs of \$100-500 million
- Reduced losses to natural resources and ecosystems, estimate value \$3 billion
- Savings of \$100-500 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated \$20 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings \$5-10 million

Schedule: 10 years, as weather permits each year

Status: 2009 project, implementation in progress

5. Create a Fuel Break Along Highway 168

Hazard(s) Addressed: Wildfire

Issue/Background: Several communities and half a million acres of heavy recreation use land are served by the two-lane state Highway 168 in eastern Fresno County, which offers the only year-round access and egress from the area. During peak-use periods, the area served by this highway may hold close to 20,000 people on a weekend day. A ten-mile stretch of the highway has a history of closures due to emergencies (wildfires, washouts) and transportation accidents, closing the area for access by emergency responders (including ambulances) and repair crews. Closures along this portion of highway prevent evacuation from the area and access by delivery vehicles (food). They also prevent people from reaching work or homes. Any evacuation centers set up above the closure may require aircraft to bring in supplies.

Other Alternatives: Develop safe alternate year-round road to service the area.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$450,000

Potential Funding: \$50,000—From alternate grant opportunities

Benefits (Avoided Losses):

A fuel break will limit the spread of wildfires caused by vehicle accidents and malfunctions from spreading into residential areas and business districts on this portion of the highway. A fuel break along the corridor will reduce the frequency and duration of closures. Also, a fuel break along this corridor will serve as a line of defense providing a place for fire crews to safely make a stand against major wildfires in the San Joaquin River drainage area that threaten the community of Shaver Lake.

- More than 5 lives saved
- 20 or more incidents of reduced injury due to prompt emergency response, estimated savings \$500,000
- More than 50 homes saved with a value of over \$20 million
- Reduced fire suppression costs of \$10-50 million
- Reduced losses to natural resources and ecosystems, estimated value \$300 million
- Savings of \$10-50 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings \$2 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings \$500,000-\$1 million
- Reduced need to set up evacuation centers and reduced cost to operate centers

It will also have the benefit of lessening traffic hazards and closures due to weather-related tree falls blocking the highway.

Schedule: Three years, April-November

Status: 2009 project, implementation not started

6. Implement a Neighborhood Chipper Program

Hazard(s) Addressed: Wildfire

Issue/Background: Rural areas in the County are subject to high incidence of wildfires. In the areas where natural growth is other than grass (i.e., brush and trees), the fire hazard and intensity are much higher. Improvements (i.e., structures, infrastructure) in these areas are subject to damage

and destruction on an annual basis. The larger the fire, the more significant the loss potential. Often, the fires originate from the improvements or from operations associated with the improvements.

Emergency responders must spend far more time defensively protecting improvements that do not have adequate clearance of flammable vegetation, which delays them from directly attacking the main fire. This typically results in a larger more destructive fire than would otherwise have occurred.

Even with state laws, clearances are often not maintained to an adequate distance to protect improvements or prevent fires that originate at the improvement from spreading to the wildlands. Currently, a very short season for hazard-reduction burning is the only viable option for elimination of the flammable material. Most of the year (10 months), this is not an option. Providing on-site chipping of the material removed by the party responsible for the improvement, (homeowner, business, agency etc.) has been shown to be an effective way to encourage proper clearances are maintained, thus reducing fire damage, frequency, and size.

Operation of a small crew in year one requires the purchase of a commercial quality chipper, necessary supplies, and insurance as well as provision of labor expenses. Supplies, insurance, maintenance, and labor expenses are also required for each additional year.

Other Alternatives:

- More aggressive enforcement of clearance regulations would work in some cases. In many instances, the minimum requirements are inadequate to protect the improvement or the surrounding wildlands.
- Development of alternate disposal options within the areas in jeopardy. Composting, biomass generation, and other options for utilization or disposal of the material have been exhaustively explored and so far rejected as economically unviable.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$120,000 first year, \$70,000 each additional year

Potential Funding: In-kind matching (labor, etc.), \$20,000 annually

Benefits (Avoided Losses):

- More than two lives saved
- More than 25 homes or business saved with a value of over \$10 million
- Reduced fire suppression costs of \$5-20 million
- Reduced losses to natural resources and ecosystems, estimated value \$50 million

- Savings of 1-5 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings greater than \$10 million
- Reduced need for emergency response and fewer emergency responders required, estimated savings \$50-500,000 annually

Schedule: Year round as weather and funding permit

Status: 2009 project, implementation under development

7. Conduct Prescribed Fires

Hazard(s) Addressed: Wildfire

Issue/Background: Historical natural fire regimes have been disrupted, which has led to ever increasing fuel loadings and disruptions of natural processes, changing the natural mix of vegetation. This increased fuel loading poses a severe threat to the communities of eastern Fresno County. In many cases, the lack of fire in a given area has led to the suppression (or extinction) of endangered species and the introduction and spread of invasive non-native species. In addition to extreme threat to life and property that modern wildfires pose, they also destroy ecosystems that had once been able to survive the occasional natural fire. The careful reintroduction of fire to the landscape through prescribed burning offers the only environmentally sound method of addressing all these issues in one cost-effective treatment.

Other Alternatives: The reduction of the fire hazard can be addressed through other expensive projects, but only prescribed fire addresses the role that fire naturally played in maintaining healthy, less fire hazardous ecosystems.

Responsible Office: Sierra Resource Conservation District/Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$100,000 annually

Potential Funding: Funding from burn program funds on national forest lands, vegetation management program funds through the California Department of Forestry and Fire Protection for private lands

Benefits (Avoided Losses):

- More than one life saved
- Suppression of nonnative invasive species, estimated savings \$5 million
- More than 10 homes saved with a value of over \$2 million
- Reduced fire suppression costs of \$2-5 million
- Reduced losses to natural resources and ecosystems, estimated value \$30 million
- Savings of 5-25 million in forest and habitat restoration

- Reduced damage to infrastructure \$500,000
- Restoration of natural systems and native species, estimated value \$15 million

Schedule: Annually, April-December, as weather and air quality dictates

Status: 2009 project, implementation under evaluation

8. Establish a System of Fire Pumper/Tanker Fill Stations and Water Storage

Hazard(s) Addressed: Multi-hazard: drought, wildfire

Issue/Background: Water is a scarce commodity in many portions of rural Fresno County. During fires (wildland and structure), the nearest available water source can be more than a half hour away, requiring an hour or more turnaround time to return to fires with a load of water. Fires could be stopped or kept smaller if the turnaround times could be reduced. During drought years, when wildfires are at their worst, potential locations for water sources are scarcest.

There are many locations with available water that can be accessed if pre-arranged agreements are in place and/or road work is done to allow trucks to access the source. Other locations have undeveloped year-round spring or creek access that would only require some basic development and installation of a hydrant or storage tank to make them usable. In some cases, property owners are willing to provide well water to maintain a fire storage tank. Maps of all available fill locations would further increase the effectiveness of current equipment and staff.

Responsible Office: California Department of Forestry and Fire Protection, U.S. Forest Service

Priority (High, Medium, Low): High

Cost Estimate: \$500,000 construction, \$25,000 annual maintenance

Potential Funding: Grants

Benefits (Avoided Losses):

- Improve water availability during times of drought
- More than five lives saved
- 20 fewer serious injuries
- More than 50 homes saved with a value of over \$20 million
- Reduced fire suppression costs of \$10-50 million
- Reduced losses to natural resources and ecosystems, estimated value \$300 million
- Savings of 10-50 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings \$2 million

Schedule: Five years, May-November each year

Status: 2009 project, implementation under evaluation

9. Implement a Public Fire Prevention, Survival, and Mitigation Education Program

Hazard(s) Addressed: Wildfire

Issue/Background: Each year, more people move into the wildland-urban intermix, and communities expand, which increases Fresno County's wildland-urban interface. Wildfire threats to homes and communities in these areas increase every year, which taxes the abilities of fire agencies to protect them. Also, fire occurrences increase as fires that originate from human encroachment spread into the surrounding wildlands. Ignorance of the hazards associated with living in these extreme fire hazard locations and prevention measures needed to prevent the accidental start of fires and increase individual and structural survivability during a fire event is ever increasing.

Programs, literature, and outreach for new residents and children have proven effective. There is also a great need to develop and distribute emergency evacuation plans, including how to stay informed, what to do, and alternate evacuation routes.

Responsible Office: Sierra Resource Conservation District, Highway 168 Fire Safe Council, Oak to Timberline Fire Safe Council, California Department of Forestry and Fire Protection, Sierra National Forest

Priority (High, Medium, Low): Medium

Cost Estimate: \$20,000 annually

Potential Funding: Agency fire prevention budgets (currently inadequate and shrinking)

Benefits (Avoided Losses):

- Fewer wildfires
- More than 20 lives saved
- More than 50 homes saved with a value of over \$20 million
- Reduced fire suppression costs of 5-10 million
- Reduced losses to natural resources and ecosystems, estimated value \$50 million
- Savings of \$1-25 million in forest and habitat restoration
- Reduced damage to infrastructure, estimated savings \$500,000
- Reduced need for emergency response and fewer emergency responders required, estimated savings \$50-\$300,000

Schedule: Annually, April-October

Status: 2009 project, implementation in progress

10. Update Highway 168 FireSafe Council's Community Wildfire Protection Plan through CA FireSafe Council Funding

Hazard(s) Addressed: Wildfire

Issue/Background: The Highway 168 FireSafe Council (FSC) CWPP needs to be updated as per requirements of National CWPP protocols.

Other Alternatives: None – this is needed to continue the efforts of the Highway 168 FSC.

Responsible Office: Sierra RCD in cooperation with the Highway 168 FSC and its partners

Priority (High, Medium, Low): High

Cost Estimate: As per current grant funding

Potential Funding: CA FireSafe Council, CalFire

Benefits (Avoided Losses): Losses to life, property, and ecological resources

Schedule: Initiated in October 2016 - Completion by September 2018

Status: New project

11. Develop Wildfire Protection Plan with Oak to Timberline FireSafe Council through CA FireSafe Council Funding

Hazard(s) Addressed: Wildfire

Issue/Background: The Southern part of Fresno County is not covered by a CWPP. The current effort and updates will allow the entire forested portion of the County to be covered.

Other Alternatives: This is the only viable alternative to ensure the entire Fresno County forested area is covered by a CWPP.

Responsible Office: Sierra RCD

Priority (High, Medium, Low): High

Cost Estimate: As per current grant funding

Potential Funding: CA FireSafe Council, CalFire

Benefits (Avoided Losses): Losses to life, property, and ecological resources

Schedule: Initiated in October 2016 - Completion by September 2019

Status: New project

12. Implement a Biomass Utilization and Dispositioning Program for Excessive Forest and Rangeland Vegetation

Hazard(s) Addressed: Multi-Hazard: wildfire, severe weather – winter storm and wind

Issue/Background: Program initiated in 2016 to begin addressing cost-effective approach with review of processing equipment.

Other Alternatives: None. The District has been significantly impacted by the Tree Mortality Crisis which has been officially declared under a State of Emergency Proclamation by the Governor of California. Nearly two-thirds of the District overlays private and public forest land.

Responsible Office: This is a combined multi-agency responsibility, including the Sierra RCD, CALFIRE in State Responsibility Areas (SRA), Natural Resources Conservation Service (NRCS) under EQIP (Environmental Quality Improvement Program) for private landowners and the U.S. Forest Service (USFS) for public lands. Sierra RCD is looking towards the integration of efforts to assure that there are no gaps that impact public safety due to extreme fuel load. The District has been working with the Governor's Office of Planning and Research to identify cost-effective technologies for increasing the utilization of these excess hazardous fuels materials for beneficial uses such as community scale electrical production, small scale biodiesel production and carbon sequestration in the form of biochar.

Priority (High, Medium, Low): High

Cost Estimate: \$15 to \$25 million for initial remediation, rehabilitation, and restoration efforts. May take over \$100 million to minimize public and environmental impacts.

Potential Funding: Sources include CALFIRE, California Energy Commission (CEC), USFS, NRCS, Pacific Gas and Electric (PG&E), and Southern California Edison (SCE).

Benefits (Avoided Losses): Losses to life, property, and ecological resources

Schedule: Initiated in October 2016 - Completion by September 2019

Status: New project

Benefits (Avoided Losses): Hundreds of millions of dollars and potentially over \$1 billion or more dollars to human life, property, businesses, and destruction to foothill and mountain communities; impact to water quality and quantity. Additionally, the benefits include avoided losses to the complex and heavily invested hydroelectric production infrastructure, including transmission lines as a significant part of the electrical grid within the District and impacts to electrical production and transmission within the whole state of California. Removing standing dead trees also has the added benefit of mitigating damage to electrical transmission lines and transportation corridors by reducing the potential for trees to be blown down from wind and winter storms. This also has a public safety benefit.

Schedule: Phase 1 – January 2018 through December 2022 / Phase 2 – January 2023 through December 2027

Status: New project; Started in 2014 with initial funding for feasibility studies. Currently in three-year initial phase on biomass conversion efforts of excess forest materials which officially commenced in January 2018 with USFS Sierra National Forest under 5-year Participating Agreement with funding for determining new approaches for managing excess biomass. Concurrently, SRCD is expecting to receive funding in mid-2018 to support private landowners through the California Association of RCDs which received \$10 million dollars from the NRCS in which to implement what is known as the RCPP (Resource Conservation Partnership Program) to address tree mortality crisis in 10 counties over the next 5 years.

13. Partner with U.S. Forest Service to Reduce Fire Risk in Wildland Urban Interface (WUI)

Hazard(s) Addressed: Wildfire

Issue/Background: Partnered with Sierra National Forest with project through March 2020 and to receive initial funding for processing equipment as a proof of concept as noted in prior project. This project will determine the ability to prevent burning of debris piles and the resultant impact to air quality and human health through alternative approaches.

Other Alternatives: None known.

Responsible Office: U.S. Forest Service Sierra National Forest under 5-year Participating Agreement with Sierra RCD.

Priority (High, Medium, Low): High

Cost Estimate: \$5 to \$10 million

Potential Funding: Other funding from CALFIRE and California Energy Commission (CEC)

Benefits (Avoided Losses): Hundreds of millions of dollars and potentially over \$1 billion or more in avoided losses to human life, property, businesses, and destruction to foothill and mountain communities; impact to water quality and quantity. Additionally, the benefits include avoided losses to the complex and heavily invested hydroelectric production infrastructure, including transmission lines as a significant part of the electrical grid within the District and impacts to electrical production and transmission within the whole state of California.

Schedule: 2017- 2020

Status: New project

14. Removal of Illegal Marijuana Grows to Reduce Fire Risk in Wildland Urban Interface (WUI)

Hazard(s) Addressed: Wildfire

Issue/Background: Many mountain and foothill residents have illegal pot grows on their properties – many do not know that they do. Pot grows have caused wildfires because of their use of stolen electricity. They also illegally use waterways and well water and make residents fearful of leaving their properties in a wildfire because of potential looting.

Other Alternatives: None

Responsible Office: Fresno County Sheriff in coordination with SRCD

Priority (High, Medium, Low): High

Cost Estimate: Low; can be done with existing staff

Potential Funding: County budget

Benefits (Avoided Losses): This will reduce fire risks, reduce polluted water and soil, and eliminate fear of illegal activity that may cause problems during evacuations or ordinary hazard removal by property owner.

Schedule:

Status: New project

15. Burns Flat Fuel Break

Hazard(s) Addressed: Wildfire

Issue/Background: The region below Pinehurst and Miramonte CA is very heavily vegetated with highly flammable fuels, having last burned in or before the McGee Fire of 1955 and is a serious wildfire threat to these villages.

Other Alternatives: Complete in small sections over a longer period of time which is a much less viable approach

Responsible Office: Sierra Resource Conservation District with Oak to Timberline Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$21,150 for 25 acres of clearing at \$850/acre

Potential Funding: CALFIRE Grant

Benefits (Avoided Losses): A fuel break extending from Dunlap Road to Todd Eymann Road widening existing access roads, fire roads and natural fuel breaks (Burns Flat) will greatly mitigate the progress of wildfire out of the canyons below and toward the more heavily populated villages.

Schedule: Completion 2 years following funding

Status: New project

16. Whispering Springs Fuel Break

Hazard(s) Addressed: Wildfire

Issue/Background: Lower elevation project off Lodge Road in Tollhouse. We cleared this area a few years ago but it could use some work. It is mostly brush and annual grass that is highly flammable. The area is filled with homes and is located on a steep slope. The Goose Fire threatened this area in 2016 but according to residents some of the work the FSC did help avert the fire away from a certain areas.

Other Alternatives: Alternatives are minimal. Short sections could be completed over a period of time but this results in a less effective fuel break and would require more maintenance over time.

Responsible Office: Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$150,000

Potential Funding: Grant money

Benefits (Avoided Losses): The area is high in values at risk, lives, homes, livestock. It is better to be prepared than worry.

Schedule: 2018

Status: New project

17. The Beal Fire Road Fuel Break

Hazard(s) Addressed: Wildfire

Issue/Background: The Historical Beal Fire Road has been in existence since 1933 when it was constructed by the CCC's under the direction of President Roosevelt. The Beal has over the years been credited with helping halt or slowing down a wildland fire. The area at mid-slope from Auberry Road has homes along the Beal for a couple of miles then turns in to Forest Service Land then picks back up with homes again before connecting with Highway 168 at mid-slope. The values at risk are high here, if a fire gets past this area it could travel into Meadow Lakes, the many

subdivisions along Highway 168 and enter Shaver Lake and possibly higher. Types of fuel include brush, annual grass and ladder fuels and some dead trees.

Other Alternatives: Few viable alternatives exist. Shorter sections over time or implementing completely new fuel breaks closer to the values at risk but both are far less effective.

Responsible Office: Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$100,000 to \$150,000

Potential Funding: Grants

Benefits (Avoided Losses): Avoid losing lives, structures, businesses, infrastructure

Schedule: 2018/2019

Status: New project

18. Peterson Road Fuel Break

Hazard(s) Addressed: Wildfire

Issue/Background: The Council has worked on Peterson twice in masticating and removing ladder fuels. Even with tree work going on we feel there is still clearing that needs to be done. The road is narrow and some three mile long and requires a lot of work to provide a safe environment for residents and homes. If a fire were to break out, it would be very difficult to safely evacuate the residents and allow firefighters to enter.

Other Alternatives: Other than doing shorter sections over time, the proposed action is the most cost effective and will result in a more effective fuel break.

Responsible Office: Highway 168 Fire Safe Council

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Potential Funding: Grant money

Benefits (Avoided Losses): In 2004 a fire was started by a welder near dry grass that traveled up slope to Cressman Road just above. The fire burned 75 acres and came to a halt when it hit the FSC Cressman fuel break. This is an effective strategy for controlling wildfires and minimizing potential damages.

Schedule: 2018/2019

Status: New project



Q.1 District Profile

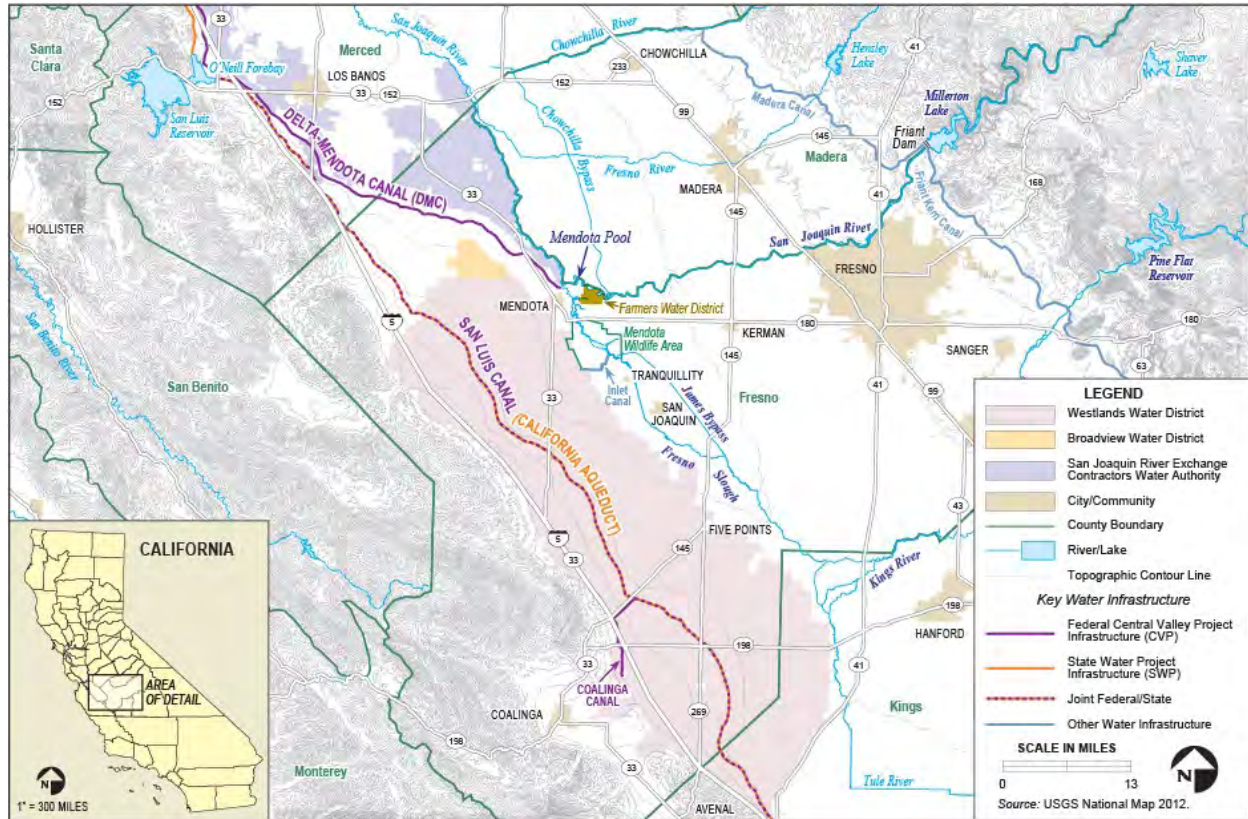
The mission of Westlands Water District (District) is to provide timely, reliable and affordable water supply to its landowners and water users, and to provide drainage service to those lands that need it. To this end, Westlands is committed to the preservation of its federal contract, which includes water and drainage service, and to the acquisition of additional water necessary to meet the needs of its landowners and water users.

Westlands formed under California Water District Law in 1952 upon petition of landowners located within the District's proposed boundaries. Westlands Water District consists of nearly 1,000 square miles of prime farmland between the Diablo Range of the California Coast Range Mountains and the trough, or lowest point, of the San Joaquin Valley in western Fresno and Kings Counties. Westlands averages 22 miles in width at its widest point and stretches about 67 miles from the City of Mendota in the north to Kettleman City in the south. When the original Westlands was organized, it included approximately 376,000 acres. In 1965, it merged with its western neighbor, Westplains Water Storage District, adding 210,000 acres and Broadview Water District, adding 10,000 acres. Additionally, lands comprising about 18,000 acres were annexed to the District after the merger to form the current 614,000-acre District with an irrigable acreage of 568,000 acres.

Westlands encompasses more than 600,000 acres of farmland and serves approximately 700 family-owned farms that average 875 acres in size. Westlands is a Central Valley Project (CVP) contractor with water service contracts for 1,196,948 AF. Westlands receives water through the Delta Division/San Luis Unit of the CVP. Major conveyance CVP facilities used for delivering water to Westlands include the Delta Mendota Canal (DMC) and the San Luis Canal (SLC). Water is delivered directly to lands in the San Luis Unit or is stored temporarily in San Luis Reservoir (SLR) for later delivery. Once diverted from the CVP facilities, water is delivered to farmers through 1,034 miles of underground pipe and over 3,300 metered delivery outlets. In addition to the CVP supply, landowners in Westlands rely on groundwater pumping, water transfers, and water acquisitions to supplement the CVP supply. If the water portfolio is insufficient to farm all land, land is fallowed.

The District's boundaries, surrounding communities, and nearby water infrastructure are shown in Figure Q.1.

Figure Q.1: Westlands Water District



Westlands Water District is in western parts of both Fresno and Kings Counties. The only communities within the District are Huron in Fresno County and Lemoore Naval Air Station in Kings County. Huron’s 2010 population was 6,754 with a population-projected increase of 25 percent by 2030. The population growth for Fresno and Kings Counties were 28 percent and 34 percent, respectively, during the period 1990 to 2010. Table Q.1 summarizes the population projections for selected communities within the District’s boundaries through 2030.

Table Q.1: Community Population Projections

Community	2000	2010	2020	2030
Firebaugh	5,743	7,549	9,700	11,700
Huron	6,306	6,754	7,500	9,000
Mendota	7,890	11,014	14,000	17,000

Q.2 Hazard Identification and Summary

The District's resources team identified the hazards that affect the District and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Fresno County (see Table Q.2).

Table Q.2: Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	High
Avalanche	Limited	Likely	Limited	Low
Dam Failure	Extensive	Occasional	Critical	High
Drought	Significant	Highly Likely	Critical	High
Earthquake	Significant	Occasional	Catastrophic	Low
Flood/Levee Failure	Extensive	Likely	Critical	Medium
Hazardous Materials Incident	Significant	Likely	Critical	Low
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Low
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	Limited	Occasional	Limited	Low
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Low
Extreme Heat	Extensive	Highly Likely	Limited	Low
Fog	Extensive	Likely	Negligible	Low
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Low
Winter Storm	Extensive	Highly Likely	Negligible	Low
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Highly Likely	Critical	High
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Low
<div> <div> Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area </div> <div> Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years. </div> <div> Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid </div> <div> Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact </div> </div>				

Impacts of past events and vulnerability to specific hazards are discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County).

Q.3 Vulnerability Assessment

The intent of this section is to assess the District’s vulnerability separate from that of the whole planning area, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table Q.2). Identifying these differences helps the reader to differentiate the jurisdiction’s risk and vulnerabilities from that of the overall County.

Note: The hazard “Significance” reflects overall ranking for each hazard, and is based on the District’s HMPC member input and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table Q.2 reflect the hazards that could potentially affect the District. Those of Medium or High significance for the District are identified below. The discussion of vulnerability for each of the following hazards is located in Section Q.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include agricultural hazards, dam failure, drought, and land subsidence.

- agricultural hazards
- dam failure
- drought
- flood/levee failure
- soil hazards: land subsidence

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the District, those hazards considered of low significance are as follows:

- avalanche
- earthquake

- hazardous materials incidents
- human health hazards
- landslide
- severe weather
- soil hazards: erosion and expansive soils
- volcano
- wildfire

Q.3.1 Assets at Risk

This section considers the District's assets at risk, which include real property; structures, and appurtenances throughout the District's Boundary (see Table Q.3). It should be noted that real property and impact locations are maintained and operated entirely by the District. The District encompasses 614,000-acres, 1,034 miles of distribution pipeline, and 3,300 ag deliveries that are used for operation and maintenance.

Table Q.3: Specific Critical Facilities and Other Assets Identified by District's Planning Team

Name of Asset	Replacement Value (\$)	Hazard Specific Info.
Distribution Pipeline	500,000,000	Drought

Q.3.2 Estimating Potential Losses and Risk

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (through HMPC member input) it differs from that of the overall County.

Table Q.3 above shows the Westlands Water District's critical facilities and assets that could be exposed to hazards. Specific losses for the incorporated communities and the portion of the County of Fresno within the District's boundaries are discussed elsewhere in this hazard mitigation plan.

Note: flood/levee failure is considered a Medium priority hazard by the District but is addressed for the cities and unincorporated Fresno County in the jurisdictional annexes and main plan risk assessment. See Chapter 4 Risk Assessment for details on vulnerability to this hazard.

Since it is a special district, participation in the National Flood Insurance Program (NFIP) does not apply to the Westland Water District, thus NFIP Repetitive Loss and Severe Repetitive Loss properties are not tracked for the jurisdiction; therefore, the District does not have this data available. There are two Repetitive Loss properties in the unincorporated County, but further details to determine if these are within the District's boundary are not available. There are no Severe Repetitive Loss properties in the County as detailed in Chapter 4 Section 4.3.2 of the base plan.

Agricultural Hazards

Due to the extent of customers that are farmers within the district, agricultural hazards can have significant impact the local economy.

Dam Failure

There are several dams within or that could affect the district facilities if a failure were to occur.

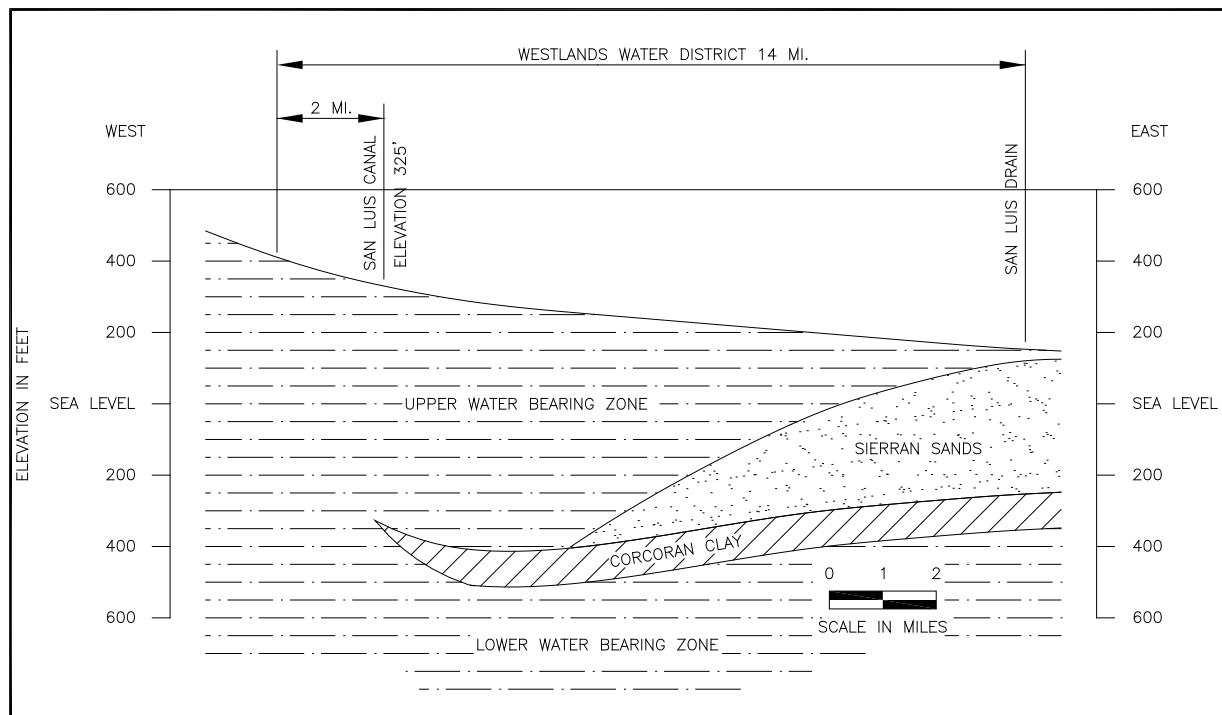
Drought

Due to the extent of customers that are farmers within the district, drought can have significant impact on the district's income and the local economy. Drought also exacerbates land subsidence as noted below.

Land Subsidence

The groundwater basin underlying Westlands is comprised generally of two water-bearing zones: (1) an upper zone above a nearly impervious Corcoran Clay layer containing the Coastal and Sierra aquifers and (2) a lower zone below the Corcoran Clay containing the Sub-Corcoran aquifer. The location of these water-bearing zones is depicted on a generalized cross section of the District shown on Figure Q.2. These water-bearing zones are recharged by subsurface inflow from the east and northeast, the compaction of water-bearing sediments, percolation of pumped groundwater, and percolation from imported and natural surface water. Land subsidence due to groundwater overdraft ranged from one to 24 feet between 1926 and 1972 (U.S. Geological Survey (USGS), 1988).

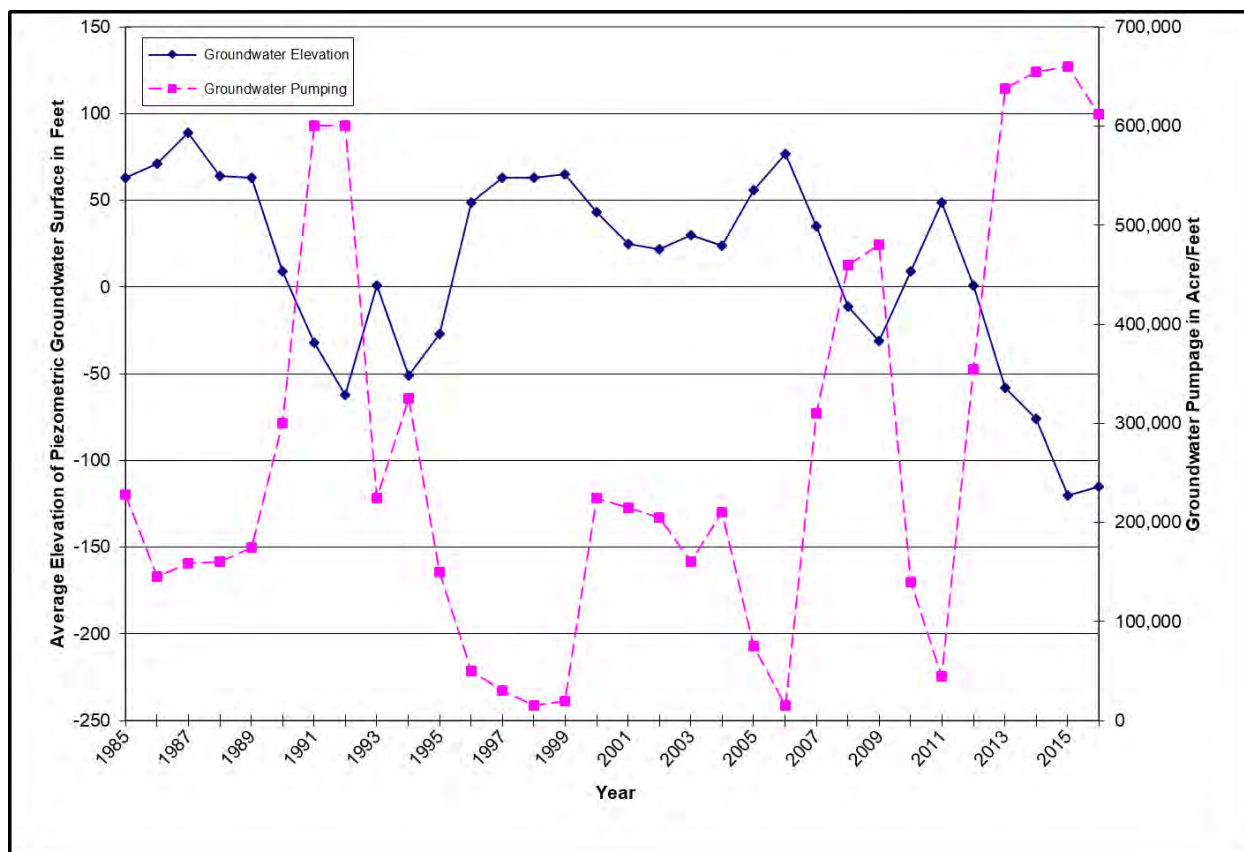
Figure Q.2: Generalized Hydrogeological Cross Section of Westlands



Surface water deliveries from the San Luis Unit (SLU) began in 1968 and largely replaced by groundwater for irrigation. However, extensive pumping occurred in 1977, a drought year when deliveries of CVP water amounted to only 25 percent of the District's entitlement. In response to the surface water shortfall, farmers reactivated old wells and constructed new wells, pumping groundwater to irrigate their crops. During 1977, groundwater pumping rose to nearly 600,000 AF and the piezometric surface declined about 90 feet, resulting in localized subsidence of about 4 inches according to USGS officials. With less groundwater use the surface level recovered through the 1980's. This cycle of groundwater use and recovery continues as groundwater pumping in the District fluctuates annually and the variation depends primarily on the amount of CVP surface water allocation.

Groundwater pumping increased to about 300,000 AF in 1989-90 because of decreased CVP water supplies caused by the drought. Pumping during 1990-91 and 1991-92 estimated to be about 600,000 AF annually. This occurred again in 2009 and for a four-year period 2012-16 (see Figure Q.3). The current piezometric groundwater elevation has dropped from a high of 89 feet to a current low of -120 feet for a total decline of 209 feet. With 100% CVP allocation in 2017 the level has increased some with less than 60,000 AF of groundwater pumped. The current 2018 water year is trending to be another critically dry year. The initial CVP surface water allocation is only 20% and groundwater pumping is again projected to greatly increase.

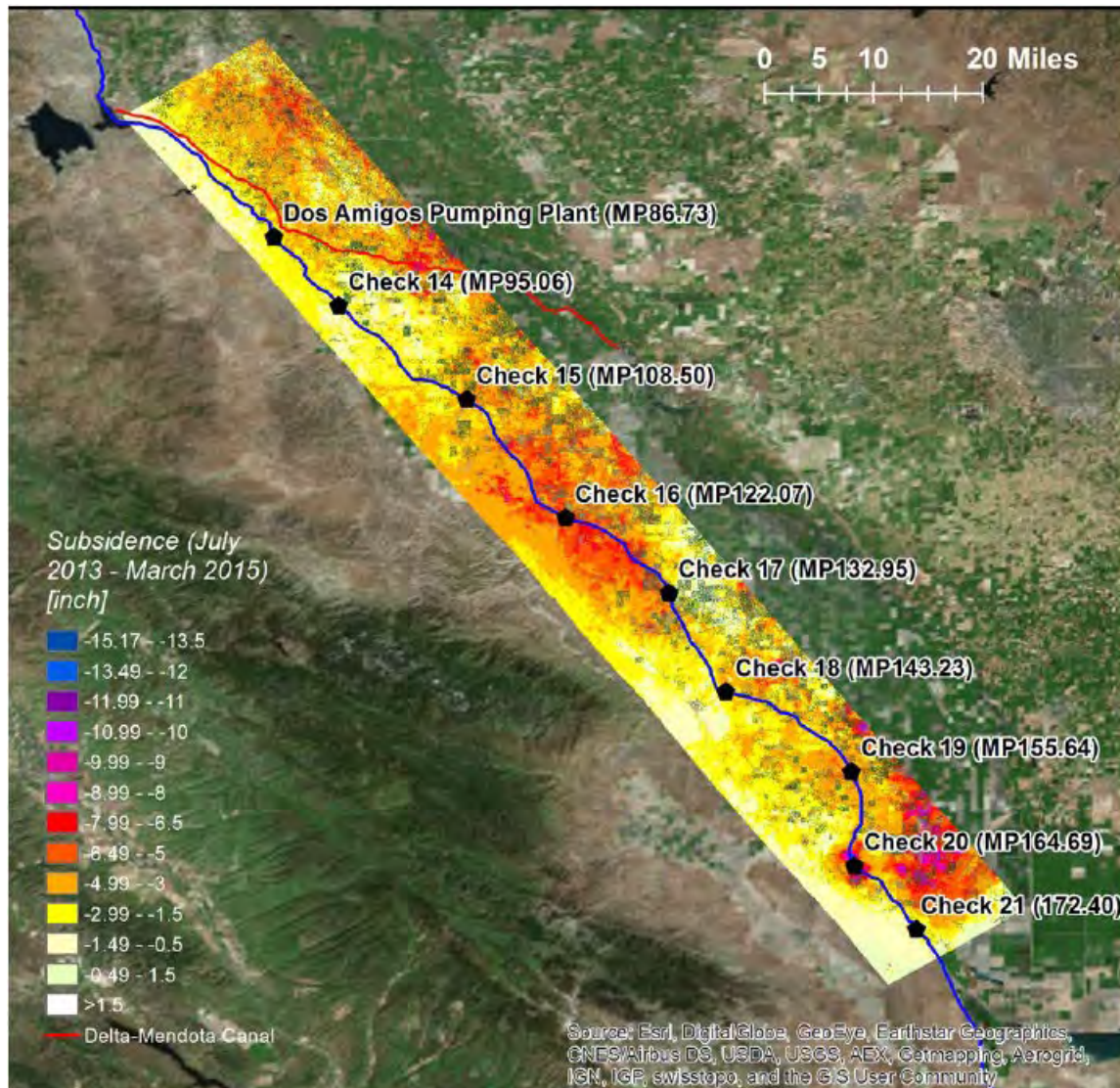
Figure Q.3: Historic Average Groundwater Elevation vs. Groundwater Pumping



Westlands does not supply groundwater to District farmers nor does the District regulate or control groundwater pumping; individuals pump their own groundwater. The District however, does survey the static water levels in the wells and the water quality and quantity of the pumped groundwater, as part of the Groundwater Management Plan completed under provisions of AB 3030 in 1996. More recent District analyses of these data indicate that a better-estimated safe yield may be between 135,000 and 200,000 AF. Going forward to protect the aquifer as a source of water supply groundwater use may be limited to levels closer to the safe yield. Groundwater sustainability legislation will begin to implement management of the groundwater resource.

Overdraft of the underlying basin in the San Joaquin Valley continues to be the major cause of subsidence in Westlands as ground water pumping increases. Consequently, land subsidence is the cause of many problems which include; (1) elevation and slope changes to the California Aqueduct that encompass a portion through the District (Figure Q.4); (2) the District's delivery system consisting of pipelines, access roads, drains, canals, and metering deliveries; (3) damage to electrical utility infrastructure; (4) groundwater well casing from forces generated by compaction of fine grained materials in the aquifer systems.

Figure Q.4: Subsidence in San Luis Field Division between July 2013 and March 2015, from UAVSAR (NASA 2015)



The California Aqueduct runs through the District from Check 13 to Check 21. NASA's figure above suggests elevation drops along the California Aqueduct, the estimates include subsidence data between July 2013 and March 2015, from O'Neill Forebay to Kettleman City, in yellows (-1.5 inches to -3.0 inches), oranges (-3.0 inches to -5.0 inches) and reds (-5.0 inches to -8.0 inches).

Subsidence caused from groundwater overdraft over the years has notable consequences to the District's distribution system, as shown below. Figure Q.5 shows an example of fracture and pipeline blow (visible in background) caused by subsidence. Figure Q.6 shows the strain on an intake structure, demonstrating how subsidence can affect key conveyance facilities and cause structure failure. Both observations are examples of the damage reported by the District's Field Engineer from a previous inspection of both sites.

Figure Q.5: Lateral 7r-4.5 Subline Earth Movement Caused Fracture and Pipeline Blow



Figure Q.6: Lateral 1R-4.0-1.0C Sunk Intake Structure



Q.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the District's planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the District's planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. Westlands Water District's updated capabilities are summarized below.

Q.4.1 Regulatory Mitigation Capabilities

Table Q.4 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table Q.4: Westlands Water District's Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	No	
Zoning ordinance	No	
Land Use	Yes	CUP
Site plan review requirements	No	
Growth management ordinance	No	
Floodplain ordinance	No	
Other special purpose ordinance (storm water, water conservation, wildlife)	Yes	USACE 404, CEQA, NEPA, MND
Building code	No	
Fire department ISO rating	No	
Erosion or sediment control program	No	
Storm water management program	No	
Capital improvements plan	No	
Economic development plan	No	
Local emergency operations plan	Yes	Operation and Maintenance
Other special plans	Yes	Dust Control
Flood Insurance Study or other engineering study for streams	No	
Elevation certificates	No	

In order to implement the mitigation action identified and detailed in Section Q.5.2, Westlands will obtain the appropriate regulatory permits. The regulatory permits include: Biological Evaluation, Land Use application, Army Corps 404, Storm water Pollution Prevention Plan, Dust Control Plan, Encroachment permit, Building Permit, California Environmental Quality Act, Mitigated Negative Declaration and National Environmental Protect Act.

Westlands would develop a Dust Control Plan as prescribed and approved by San Joaquin Valley Air Pollution Control District (SJVAPCD) to minimize and control fugitive dust during construction.

Q.4.2 Administrative/Technical Mitigation Capabilities

Table Q.5 identifies the personnel responsible for activities related to mitigation and loss prevention in the District.

Table Q.5: District's Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Resources Division	
Engineer/professional trained in construction practices related to infrastructure	Yes	Senior Field Engineer	Personnel
Planner/engineer/scientist with an understanding of natural hazards	Yes		Consultant
Personnel skilled in GIS	Yes	Associate Resource	Personnel
Full time building official	No		
Floodplain manager	No		
Emergency manager	Yes	Manager	Personnel
Grant writer	Yes	Resources Engineer	Personnel
Other personnel	Yes	Associate Resource	Personnel
GIS Data—Land use	Yes	Associate Resource	Personnel
GIS Data—Links to Assessor's data	No		
Warning systems/services (Reverse 9-11, outdoor warning signals)	No		

The District is governed by a nine-member Board of Directors and elected to four-year terms of office. The District's Board manages and conducts the business and affairs of the District. The philosophy of the District is to provide for communities and farms dependent on water deliveries commitment for the preservation of its federal contract water supply and to conduct the maintenance, operational and administrative functions of Westlands in an efficient and effective manner.

Q.4.3 Fiscal Mitigation Capabilities

Table Q.6 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table Q.6: District's Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants	No	
Capital improvements project funding	Yes	
Authority to levy costs for specific purposes	Yes	
Fees for water	Yes	
Impact fees for new development	Yes	
Incur debt through general obligation bonds	Yes	
Incur debt through special tax bonds	No	
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

The District's fiscal year begins on March 1 and ends on the last day of February. The budget adopted in February may be changed during the year as necessary. Westlands raises annual operating revenue from water sales that are billed monthly. In a normal year, its water sales revenue is used for all operating expenses. In addition, assessments are collected for non-operating costs such as repayment for the District's distribution and drainage collector systems. The District's O&M component of the water rate covers all costs associated with supplying and distributing water to customers, in addition to acquisition of capital assets and preventive maintenance programs. Rates may subsequently be adjusted if water supplies change. District O&M is added to the cost of CVP water.

Q.4.4 Mitigation Outreach and Partnerships

Cooperation from landowners, DWR, and the Bureau is essential in the drought mitigation activities needed to operate and maintain the facility during an event. Needed manpower for running equipment such as pumps and conveyance will be a cooperative effort by District personnel.

Q.4.5 Other Mitigation Efforts

Annual maintenance activity includes vegetation control (herbicide, handwork), fence/gate repairs, erosion repairs, basin roadway graveling, basin slope repairs, pump/pipeline repairs, and structure inspections. During basin replenishment and recovery periods, the District personnel will oversee the basin operations.

Q.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the Westlands Water District has several existing mechanisms in place that will help to mitigate hazards. In addition to these existing capabilities, there are also opportunities to expand or improve on these policies and programs to further protect the communities the District serves. Some of the opportunities for enhancement of the District's existing mitigation program are listed below.

- Develop a Drought Contingency Plan in partnership with the County that will help to create a framework for drought response and mitigation for the District and individuals the District serves.
- Provide training to staff members and the Board of Directors related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Continuing to inform and train staff on mitigation and the hazards that pose a risk to the communities in the District and the potential impacts to the service the District provides will lead to more informed staff members who can better communicate hazard related information to the public.

Q.5 Mitigation Strategy

Q.5.1 Mitigation Goals and Objectives

The Westlands Water District adopts the hazard mitigation goals and objectives developed by the Fresno County Hazard Mitigation Planning Committee.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the District to help inform updates and the development of plans, programs and policies. The District is dependent on continued cooperation with landowners to implement projects and better serve the communities. The hazard information contained in this plan will help to inform the ongoing outreach strategy the District has in place.

As noted in Chapter 7 Plan Implementation, the HMPC representatives from the Westlands Water District will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Q.5.2 Mitigation Actions

The Westlands Water District planning team identified and prioritized the following mitigation action. In addition to implementing the mitigation action below the Westlands Water District will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The District agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Institute a Groundwater Replenishment and Drought Resiliency Project

Hazard(s) Addressed: Multi-hazard: drought, flood, soil hazards – land subsidence

Issue/Background: The history of land subsidence in the San Joaquin Valley is integrally linked to the development of agriculture and the availability of water for irrigation. Further agricultural development without accompanying subsidence is dependent on the continued availability of surface water, which is subject to uncertainties due to climate and regulatory decisions.

Construction of a 60-acre recharge basin on District land. The recharge basin could be used to percolate and seasonally store Kings River Floodwater, CVP Section 215 and rescheduled water. The recharged water could then be recovered and used in drought years. Kings River non-project water conveyed through the James Bypass will enter the Mendota Pool/Fresno Slough and pumped

from Lateral 7 Pumping Plant into the San Luis Canal (SLC) at milepost 115.43. CVP Section 215 water from the San Joaquin River can also be conveyed in this manner. These diverse sources of supply would be pumped from the SLC via the Pleasant Valley Pumping Plant at milepost 143.16 into the Coalinga Canal (CC). This water would then be delivered through Lateral PV8P to the Project site. CVP Section 215 water will be conveyed when available and water users are not irrigating. This CVP Section 215 water would be requested and banked in the basin project. The 60-acre basin will have a recharge design capacity for up to 10,800 AF/year. After a five-year-period the amount of surface water recharged could range from 10,000 AF to as much as 50,000 AF. During drought periods, or when the lack of CVP allocation creates increased burden on groundwater supplies, the stored water would be recovered, less approximately 10% for basin losses.

Other Alternatives: No action

Responsible Office: Westlands Water District

Priority (High, Medium, Low): High

Cost Estimate: \$2.6 million

Potential Funding: District Reserve Funds, O&M, FEMA mitigation grants

Benefits (Avoided Losses): The Project will enable water storage as a long-term resiliency plan by recharging the basin with Kings River floodwater, CVP Section 215 and rescheduled water when available to minimize potential risks caused by overdraft during dry periods. This would help mitigate land subsidence from over-drafting of wells during drought, and also has the benefit of alleviating flood flows on the Kings River.

Schedule: Construction completed by Dec. 2020. Water conveyed annually.



APPENDIX A: ADOPTION RESOLUTIONS

Sample model resolution is provided below:

Resolution # _____

Adopting the Fresno County Multi-Jurisdictional Hazard Mitigation Plan Update 2018

Whereas, (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, an adopted Multi-Jurisdictional Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, (Name of Government/District/Organization) fully participated in the FEMA-prescribed mitigation planning process to prepare this Multi-Jurisdictional Hazard Mitigation Plan; and

Whereas, the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials have reviewed the Fresno County Multi-Jurisdictional Hazard Mitigation Plan () and approved it () contingent upon this official adoption of the participating governing body;

Now, therefore, be it resolved, that the (Name of Government/District/Organization) adopts the Fresno County Multi-Jurisdictional Hazard Mitigation Plan as an official plan; and

Be it resolved that the (Name of Government/District/Organization) adopts the Fresno County Multi-Jurisdictional Hazard Mitigation Plan by reference into the safety element of their general plan in accordance with the requirements of AB 2140, and

Be it further resolved, (Name of Government/District/Organization) will submit this adoption resolution to the California Office of Emergency Services and FEMA Region IX officials to enable the plan's final approval in accordance with the requirements of the Disaster Mitigation Act of 2000 and to establish conformance with the requirements of AB 2140.

Passed: _____
(date)

Certifying Official



APPENDIX B: LHMP CONTACT LIST

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
County Departments					
CAO Office	CAO	Jean Rousseau	X		7/12/17
Public Health					
	Director	David Pomaville	X		
	OES Manager	Kenneth Austin	X		7/12/17 10/6/17 11/16/17
	Analyst	Angel Lopez	X		7/12/17 10/6/17 11/16/17
	Senior Analyst	Darrel Schmidt	X		7/12/16 10/6/17 11/16/17
	Assistant OES	Steven Crump	X		
	OES	Gabriel De La Cerda	X		
	Analyst	Adan Ortiz	X		7/12/17
	EH Manager	Wayne Fox	X		
Public Works					
	Director	Steve White	X		7/12/17
	Assistant Director	Bernard Jimenez	X		
	Assistant Director	John Thompson	X		7/12/17
	Development Services Manager	William Kettler	X		
	Chief Building Inspector	Chuck Jonas	X		7/12/17
	Public Works Division Engineer	Robert Palacios	X		7/12/17
	Public Works Division Engineer	Randy Ishii	X		
	Road Superintendent	Armando Mendoza	X		7/12/17 10/6/17
	Road Superintendent	John Coffman	X		7/12/17
	Engineer	D'Andra Buchanan	X		7/12/17
	Supervising Engineer	Dale Siemer	X		10/6/17
	Business Manager	Lemuel Asprec	X		7/12/17 11/16/17
	Sr Engineer	Seabastion Artal	X		
	County Surveyor	Kevin Nehring	X		7/12/17
	Supervising Inspector	Dan Mather	X		10/6/17 11/16/17
Agriculture					

¹ Those that are not listed as attending a meeting participated in the planning process in other ways such as emails, phone calls and face-to-face meetings with the County Emergency Manager and consultants.

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
	Ag Commissioner	Les Wright	X		7/12/17
Internal Services Department					
	Director	Robert Bash	X		
	Division Manager	Jill Barr	X		7/12/17
	Analyst	Ahla Yang	X		10/6/17 11/16/17
Sheriff Department					
	Sheriff	Margaret Mimms	X		
	Captain	John Zaroni	X		7/12/17
	Lieutenant	Kathy Curtice	X		7/12/17 10/6/17 11/16/17
Public Information					
	Public Information Officer	Jordan Scott	X		11/16/17
Fresno County Fire Protection / Cal Fire					
	Chief	Mark Johnson	X		
	District Sup	Ronald Bass	X		
	Assistant Chief	Jim McDougal	X		7/12/17 10/6/17 11/16/17
	Battalion Chief	Chris Christopherson	X		7/12/17
Cities					
City of Fresno	City Manager	Wilma Quan-Schechter	X		
	EPO	Dan Vasquez	X		7/12/17 10/6/17 11/16/17
Fresno Fire	Chief	Kerri Donis	X		
City of Clovis	City Manager	Luke Serpa	X		7/12/17
	Life Safety Manager	Chad Fitzgerald	X		7/12/17 11/16/17
Clovis Fire	Chief	John Binaski	X		
City of Coalinga	City Manager	Marissa Trejo	X		
	Public Works Director	Pete Preciado	X		11/16/17
Coalinga Fire	Chief	Dwayne Gabriel	X		11/16/17
City of Firebaugh	City Manager	Ben Gallegos	X		
	Police Chief	Salvador Raygoza	X		11/16/17
Firebaugh Fire	Chief	John G. Borboa	X		
City of Fowler	City Manager	Jeannie Davis, MMC	X		
Fowler Fire	Chief	Manuel Lopez	X		7/12/17 11/16/17
City of Huron	City Manager	Jack Castro		X	
	Police Chief	George Turegano		X	
City of Kerman	City Manager	John Kunkel	X		
	Police Chief	Joseph Blohm	X		
City of Kingsburg	City Manager	Alexander J. Henderson	X		

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
Kingsburg Fire	Chief	Tim Ray	X		
	Captain	Wayne Osborne	X		7/12/17
City of Mendota	City Manager	Vince DiMaggio	X		
City of Orange Cove	Interim City Manager	Anthony B. Lopez		X	
City of Parlier	City Manager	Samuel A. Escobar		X	
	Police Chief	Rick Ehle		X	
City of Reedley	City Manager	Nicole R. Zieba	X		
	City Engineer	John Robertson	X		11/16/17
Reedley Fire	Chief	Jerald Isaak	X		7/12/17 10/6/17 11/16/17
City of San Joaquin	City Manager	Elizabeth Nunez	X		11/16/17
City of Sanger	City Manager	Tim Chapa	X		
Sanger Fire	Chief	Greg Tarascou	X		7/12/17 10/6/17 11/16/17
City of Selma	City Manager	David Elias	X		
	Police Chief	Myron Dyck	X		11/16/17
Selma	Administrative Analyst	Frankie Olivares	X		10/6/17
Selma Fire	Chief	Mike Kain	X		
Additional Fire Protection Agencies					
Hume Lake Fire	Chief	Thomas Warner		X	
Laton Fire	Chief	Andrew Barkley		X	
Bald Mountain Fire	Chief	Cam Donnahoo		X	
Bald Mountain Fire	Captain	Matt Furrer		X	
Bald Mountain Fire	Advisory Fire Chief	Don Ashbrook		X	
Big Creek Fire	Chief	LaDonna Crane	X		10/6/17
Auberry Fire	Chief	Rick Schacher	X		
Pine Ridge Fire	Chief	Gary Martin		X	
Orange Cove Fire	Chief	Ralph Michaels		X	
Oak to Timberline Fire Safe Council	Forester	Craig Jones	X		7/12/17
Oak to Timberline Fire Safe Council	Chair, CWPP Development Committee	John Huneke	X		7/12/17
Highway 168 Fire Safe Council		Pat Gallegos	X		
Highway 168 Fire Safe Council	President	Howard Hendrix	X		
Orange Cove Fire Protection District	Chief	Ralph Michaels		X	
Community Service District					
Big Creek Community Service District		Kristi Loman		X	
Biola Community Service District		Edith M. Forsstrom		X	

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
Caruthers Community Service District		Marie Mains		X	
Del Rey Community Service District		Hilda Ortiz		X	
Easton Community Service District		Luke Hoekstera		X	
Laton Community Service District		JoAnne Rempp		X	
Sierra Cedars Community Service District		Todd Bristol		X	
Drainage District					
Panoche Drainage District		Julie Cascia		X	
Silver Creek Drainage District		Jeff Bryant		X	
Flood Control District					
Fresno Metropolitan Flood Control District	Senior Analyst	Andrew Remus	X		7/12/17 10/6/17 11/16/17
Fresno Metropolitan Flood Control District	Operation Engineer	Brent Sunamoto	X		7/12/17 10/6/17 11/16/17
Irrigation District					
Alta Irrigation District		Irma Faria		X	
Alta Irrigation District	Interim Superintendent	Stanley Saski		X	10/6/17
Central California Irrigation District		Chris White		X	
Consolidated Irrigation District		Margaret Macias		X	
Consolidated Irrigation District		Phillip Desatoff		X	
Fresno Irrigation District		September Singh		X	
Fresno Irrigation District	Chief Engineer	Lawrence Kimura		X	7/12/17 10/6/17
Fresno Irrigation District	Engineer	Sen Saetern		X	11/16/17
James Irrigation District		Steve Stadler		X	
Laguna Irrigation District		Scott Sills		X	
Orange Cove Irrigation District		John Sanders		X	
Riverdale Irrigation District		Kim Mayfield		X	
Tranquility Irrigation District		Elizabeth Reeves		X	
Levee District					
Lower San Joaquin Levee District		Reggie Hill	X		10/6/17 11/16/17
Mosquito Abatement District					
Consolidated Mosquito Abatement District		Steve Mulligan		X	

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
Fresno Mosquito and Vector Control District		Julia Laciste		X	
Public Utility					
Pinedale Public Utility District		Jim Tsuruoka, General Manager		X	
Riverdale Public Utility District		Ronald Bass		X	
Tranquility Public Utility District		Laurie Siliznoff		X	
Reclamation District					
Reclamation District #1606		Steven Stadler		X	
Zalda Reclamation #801 District		Ray Carlson		X	
Resource Conservation Districts					
Excelsior & Kings River RCD		Bill Longfellow		X	
Kings River Conservation District	Resource Analyst	Soua Lee	X		11/16/17
Kings River Conservation District	Director of Resources	Rick Hoelze	X		11/16/17
Kings River Conservation District		Dave Merritt	X		
Firebaugh Resource Conservation District		Jeff Bryant		X	
James Resource Conservation District		Steven Stadler		X	
Los Banos Resource Conservation District		Jennifer Gerstenberg		X	
Panoche Resource Conservation District		Julie Cascia		X	
San Luis Resource Conservation District		Michael Cannon		X	
Sierra Resource Conservation District	District Manager	Steve Haze	X		7/12/17 10/6/17
Sierra Resource Conservation District	CWPP Project Manager	Craig Jones	X		7/12/17 10/6/17 11/16/17
Tranquility Resource Conservation District		Danny Wade		X	
Westside Resource Conservation District		Sargeant Green		X	
Water Districts					
Broadview Water District		Bobbie Ormonde		X	
Firebaugh Canal Water District		Madison Medeiros		X	
Fresno Slough Water		Danny Wade		X	
Kings River Water District		Richard Cosgrave		X	
Liberty Water District		Kevin Johansen		X	
Mercy Springs Water District		Julie Cascia		X	
Mid Valley Water District		Randy Hopkins		X	

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
Oro Loma Water District		Steve Sloan		X	
Pacheco Water District		Julie Cascia		X	
Panoche Water District		Julie Cascia		X	
Pleasant Valley Water District		Donna Wilt		X	
Raisin City Water District		R. Gere Gunlund		X	
San Luis Water District		Martin McIntyre		X	
Stinson Water District		Herb Simmons		X	
Tri-Valley Water District		Richard Cosgrave		X	
Westlands Water District		Bobbie Ormonde	X		
Westlands Water District	Deputy General Manager	Jose Gutierrez	X		7/12/17
Westlands Water District	Resources Engineer	Israel Sanchez	X		11/16/17
Waterworks District No. 18		Dan Pearce		X	
Pinedale County Water District		Jim Tsuruoka		X	
Freewater County Water District		Debbie Moglia		X	
Malaga County Water District		Laurie Cortez		X	
Malaga County Water District	Env Compliance	Thomas Siphonsay		X	7/12/17
Malaga County Water District		Jim Anderson		X	10/6/17
Malaga County Water District	Supervisor	Jesse Alvarez		X	11/16/17
Other Districts and Agencies					
San Joaquin River Exchange Contractors Water Authority		Larry Freeman		X	
San Joaquin Valley Air Pollution Control District		Sayed Sadredin		X	
San Joaquin Valley Air Pollution Control District		Roger McCoy		X	
State of California Public Health Drinking Water Division		Carl Carlucci		X	
California Department of Transportation		Sharri Bender Ehlert		X	
California Department of Transportation	Chief Environmental	Shane Gunn		X	7/12/17
California Department of Transportation	North Region Manager	Dan Ryan		X	7/12/17 10/6/17

Agency/Jurisdiction	Title	Name	Participating Jurisdiction	Stakeholder	Meetings ¹ Attended
California Water Resource Department		Iris Yamagata		X	
California Water Resource Department		Paul Romero		X	
California Water Resource Department		Kevin Faulkenberry		X	
Table Mtn Rancheria		Frank Marquez Jr		X	
USFS Sierra National Forest		Sunshuri Littlebuck-Naylor		X	
USFS Sierra National Forest		Carolyn Ballard		X	
USFS Sierra National Forest	Fire Chief	John Goss		X	7/12/17
Army Corp of Engineers		Thomas Jehrke		X	
Army Corp of Engineers		Mike Erskine		X	
Army Corp of Engineers	Park Manager	Jeromy Caldwell		X	10/6/17
Bureau of Reclamation	Sup Civil Engineer	Gil Reyes		X	7/12/17 10/6/17 11/16/17
USGS	Seismologist	Susan Hough		X	
CAL-OES	ESC	Terri Mejorado		X	7/12/17 10/6/17
Amec Foster Wheeler (consultant)	Project Manager	Jeff Brislawn			
	Env. Scientist	Leslie Purvis			
Mintier Harnish (subconsultant)		Larry Mintier			
		Bob Lagomarsino			
		Robert Olson			



APPENDIX C: MITIGATION STRATEGY

Categories of Mitigation Measures Considered

PREVENTION: Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- Planning
- Zoning
- Open Space Preservation
- Land Development Regulations
 - Subdivision regulations
 - floodplain development regulations
- Storm Water Management
- Fuels Management, Fire-Breaks
- Building Codes
 - Fire-Wise Construction
- (See Property Protection also)

EMERGENCY SERVICES measures protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (floods, tornadoes, ice storms, hail storms, dam failures)
 - NOAA Weather Radio
 - Sirens
 - Reverse 911
- Evacuation & Sheltering
- Communications
- Emergency Planning
 - Activating the emergency operations room (emergency management)
 - Closing streets or bridges (police or public works)
 - Shutting off power to threatened areas (utility company)
 - Holding children at school/releasing children from school (school district)
 - Passing out sand and sandbags (public works)
 - Ordering an evacuation (mayor)
 - Opening evacuation shelters (Red Cross)
 - Monitoring water levels (engineering)
 - Security and other protection measures (police)
- Monitoring of Conditions (dams)

- Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)
 - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
 - Lifeline Utilities Protection
 - Health & Safety Maintenance

PROPERTY PROTECTION: Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- Retrofitting/disaster proofing
 - Floods
 - Wet/Dry floodproofing (barriers, shields, backflow valves)
 - Relocation
 - Acquisition
 - Tornadoes
 - Safe Rooms
 - Securing roofs and foundations with fasteners and tie-downs
 - Strengthening garage doors and other large openings
 - Drought
 - Improve water supply (transport/storage/conservation)
 - Remove moisture competitive plants (Tamarisk/Salt Cedar)
 - Water Restrictions/Water Saver Sprinklers/Appliances
 - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
 - Create incentives to consolidate/connect water services
 - Recycled wastewater on golf courses
 - Earthquakes
 - Removing masonry overhangs, bracing other parts.
 - Tying down appliances, water heaters, bookcases and fragile furniture so they won't fall over during a quake.
 - Installing flexible utility connections that won't break during shaking (pipelines too!)
 - Wildfire, Grassfires
 - Replacing building components with fireproof materials
 - Roofing, screening
 - Create "Defensible Space"
 - Installing spark arrestors
 - Fuels Modification
 - Noxious Weeds/Insects
 - Mowing

- Spraying
- Replacement planting
- Stop overgrazing
- Introduce natural predators
- Insurance

NATURAL RESOURCE PROTECTION: Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- Erosion & Sediment Control
- Wetlands Protection
- Riparian Area/Habitat Protection
- Threatened & Endangered Species Protection
- Fuels Management
- Set-back regulations/buffers
- Best Management Practices

Best management practices (“BMPs”) are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground’s surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project’s design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

1. Avoidance: setting construction projects back from the stream.
2. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.

3. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained

- Dumping Regulations
- Water Use Restrictions
- Weather Modification
- Landscape Management

STRUCTURAL PROJECTS have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they “stop” flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- Detention/Retention structures
- Erosion and Sediment Control
- Basins/Low-head Weirs
- Channel Modifications
- Culvert resizing/replacement/Maintenance
- Levees and Floodwalls
- Fencing (for snow, sand, wind)
- Drainage System Maintenance
- Reservoirs(for flood control, water storage, recreation, agriculture)
- Diversions
- Storm Sewers

PUBLIC INFORMATION: A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- Hazard Maps and Data
- Outreach Projects
 - (mailings, media, web, speakers bureau)
- Library Resources
- Real Estate Disclosure
- Environmental Education
- Technical Assistance

Alternative Mitigation Measures per Category

Prevention

Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- Planning
- Zoning
- Open space preservation
- Land development regulations
 - Subdivision regulations
 - Floodplain development regulations
- Stormwater management
- Fuels management, fire breaks
- Building codes
 - Firewise construction
- (also see Property Protection)

Emergency Services

Emergency services protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (floods, tornadoes, ice storms, hail storms, dam failures)
 - NOAA weather radio all hazards
 - Sirens
 - Reverse 911
- Evacuation and sheltering

- Communications
- Emergency planning
 - Activating the emergency operations room (emergency management)
 - Closing streets or bridges (police or public works)
 - Shutting off power to threatened areas (utility company)
 - Holding children at school/releasing children from school (school district)
 - Passing out sand and sandbags (public works)
 - Ordering an evacuation (mayor)
 - Opening evacuation shelters (red cross)
 - Monitoring water levels (engineering)
 - Security and other protection measures (police)
- Monitoring of conditions (dams)
- Critical facilities protection (buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)
 - Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
 - Lifeline utilities protection
 - Health and safety maintenance

Property Protection

Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

- Retrofitting/disaster proofing
 - Floods
 - Wet/dry floodproofing (barriers, shields, backflow valves)
 - Relocation
 - Acquisition
 - Tornadoes
 - Safe rooms
 - Securing roofs and foundations with fasteners and tie-downs
 - Strengthening garage doors and other large openings
 - Drought
 - Improve water supply (transport/storage/conservation)
 - Remove moisture competitive plants (tamarisk/salt cedar)
 - Water restrictions/water saver sprinklers/appliances
 - Grazing on CRP lands (no overgrazing—see noxious weeds)
 - Create incentives to consolidate/connect water services

- Recycled wastewater on golf courses
- Earthquakes
 - Removing masonry overhangs, bracing other parts
 - Tying down appliances, water heaters, bookcases and fragile furniture so they will not fall over during a quake.
 - Installing flexible utility connections that will not break during shaking (pipelines, too)
- Wildland fire
 - Replacing building components with fireproof materials (roofing, screening)
 - Creating “defensible space”
 - Installing spark arrestors
 - Fuels modification
- Noxious weeds/insects
 - Mowing
 - Spraying
 - Replacement planting
 - Stop overgrazing
 - Introduce natural predators
- Insurance

Natural Resource Protection

Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- Storage of floodwaters
- Absorption of flood energy
- Reduction in flood scour
- Infiltration that absorbs overland flood flow
- Groundwater recharge
- Removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

Methods of protecting natural resources include:

- Erosion and sediment control
- Wetlands protection
- Riparian area/habitat protection
- Threatened and endangered species protection
- Fuels management

- Set-back regulations/buffers
- Best management practices—Best management practices (“BMPs”) are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground’s surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project’s design to permanently address nonpoint source pollutants. There are three general categories of BMPs:
 - Avoidance—Setting construction projects back from the stream.
 - Reduction—Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
 - Cleanse—Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained
- Dumping regulations
- Water use restrictions
- Weather modification
- Landscape management

Structural Projects

Structural projects have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they “stop” flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- Detention/retention structures

- Erosion and sediment control
- Basins/low-head weirs
- Channel modifications
- Culvert resizing/replacement/maintenance
- Levees and floodwalls
- Fencing (for snow, sand, wind)
- Drainage system maintenance
- Reservoirs (for flood control, water storage, recreation, agriculture)
- Diversions
- Storm sewers

Public Information

A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection

- Hazard maps and data
- Outreach projects (mailings, media, web, speakers bureau)
- Library resources
- Real estate disclosure
- Environmental education
- Technical assistance

Mitigation Alternative Selection Criteria

The following criteria were used to select and prioritize proposed mitigation measures:

STAPLE/E

- **Social**—Does the measure treat people fairly? (different groups, different generations)
- **Technical**—Will it work? (Does it solve the problem? Is it feasible?)
- **Administrative**—Do you have the capacity to implement and manage project?
- **Political**—Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?
- **Legal**—Does your organization have the authority to implement? Is it legal? Are there liability implications?
- **Economic**—Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?
- **Environmental**—Does it comply with environmental regulations?

Sustainable Disaster Recovery

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection/enhancement
- Community participation

Smart Growth Principles

- Infill versus sprawl
- Efficient use of land resources
- Full use of urban resources
- Mixed uses of land
- Transportation options
- Detailed, human-scale design

Other

- Does measure address area with highest risk?
- Does measure protect ...
 - The largest # of people exposed to risk?
 - The largest # of buildings?
 - The largest # of jobs?
 - The largest tax income?
 - The largest average annual loss potential?
 - The area impacted most frequently?
 - Critical infrastructure (access, power, water, gas, telecommunications)?
- What is timing of available funding?
- What is visibility of project?
- Community credibility

Mitigation Action Selection and Prioritization Criteria

Does the proposed action protect lives?

Does the proposed action address hazards or areas with the highest risk?

Does the proposed action protect critical facilities, infrastructure, or community assets?

Does the proposed action meet multiple objectives (multi-objective management)?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social

Does the measure treat people fairly (different groups, different generations)?

Technical

Will it work? (Does it solve the problem? Is it feasible?)

Aministrative

Is there capacity to implement and manage project?

Political

Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal

Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic

Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental

Does it comply with environmental regulations or have adverse environmental impacts

Example Mitigation Action Items by Community Rating System Mitigation Category and Hazard

Alternative Mitigation Actions	Human Health hazards (Pan flu, West Nile)	Dam Failure	Floods	Land slides/ Land Subsidence /Soil hazards	Weather Extremes (hail, lightning, wind, temps, fog, drought, tornadoes)	Earthquake	Wildfires	Winter Weather
PREVENTION								
Building codes and enforcement			■	■	■	■	■	■
Comprehensive Watershed Tax			■					
Density controls		■	■	■			■	
Design review standards			■	■		■	■	
Easements			■	■			■	
Environmental review standards			■	■		■	■	
Floodplain development regulations		■	■					
Hazard mapping		■	■	■			■	
Floodplain zoning		■	■					
Forest fire fuel reduction							■	
Housing/landlord codes					■			
Slide-prone area/grading/hillside development regulations				■			■	
Manufactured home guidelines/regulations		■	■		■	■		
Multi-Jurisdiction Cooperation within watershed		■	■					
Open space preservation		■	■	■			■	
Performance standards		■	■	■	■	■	■	■
Special use permits		■	■	■			■	
Stormwater management regulations			■					
Subdivision and development regulations		■	■	■		■	■	
Surge protectors and lightning protection					■			
Tree Management					■		■	■
Transfer of development rights			■	■			■	
Utility location				■	■			■
PROPERTY PROTECTION								

Alternative Mitigation Actions	Human Health hazards (Pan flu, West Nile)	Dam Failure	Floods	Land slides/ Land Subsidence /Soil hazards	Weather Extremes (hail, lightning, wind, temps, fog, drought, tornadoes)	Earthquake	Wildfires	Winter Weather
Acquisition of hazard prone structures		■	■	■			■	
Construction of barriers around structures		■	■					
Elevation of structures		■	■					
Relocation out of hazard areas		■	■	■			■	
Non structural improvements (safety film on windows, bookshelf anchoring, critical equipment bracing etc.)					■	■		
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)			■		■	■	■	■
PUBLIC EDUCATION AND AWARENESS								
Debris Control			■					
Flood Insurance		■	■					
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure		■	■	■	■	■	■	■
Crop Insurance					■	■		
NATURAL RESOURCE PROTECTION								
Best Management Practices (BMPs)	■		■	■	■		■	
Forest and vegetation management	■	■	■	■	■		■	■
Hydrological Monitoring	■	■	■	■	■			
Sediment and erosion control regulations		■	■	■				
Stream corridor restoration			■	■				
Stream dumping regulations			■					
Urban forestry and landscape management		■	■	■	■		■	■
Wetlands development regulations			■	■			■	
EMERGENCY SERVICES								
Critical facilities protection		■	■	■	■	■	■	■
Emergency response services		■	■	■	■	■	■	■

Alternative Mitigation Actions	Human Health hazards (Pan flu, West Nile)	Dam Failure	Floods	Land slides/ Land Subsidence /Soil hazards	Weather Extremes (hail, lightning, wind, temps, fog, drought, tornadoes)	Earthquake	Wildfires	Winter Weather
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)		■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■	■			■	
STRUCTURAL PROJECTS								
Channel maintenance			■					
Dams/reservoirs (including maintenance)		■	■					
Levees and floodwalls (including maintenance)			■					
Safe room/shelter					■	■		■
Snow fences								■
Water supply augmentation					■			
Post-disaster mitigation	■	■	■	■	■	■	■	■



APPENDIX D: REFERENCES

2006 Fresno County Agricultural Crop and Livestock Report. County of Fresno Department of Agriculture. 2006. <https://www.co.fresno.ca.us/departments/agricultural-commissioner/crop-report-history>.

2007 Fresno County Regional Housing Needs Allocation Plan. Draft. Council of Fresno County Governments. 2007. www.fresnocog.org/.

2015 Fresno County Agricultural Crop and Livestock Report. County of Fresno Department of Agriculture. 2015. <https://www.co.fresno.ca.us/departments/agricultural-commissioner/crop-report-history>.

California Department of Conservation Farmland. Mapping and Monitoring Program. www.conservation.ca.gov/dlrp/fmmp/.

California Department of Finance, www.dof.ca.gov/.

California Department of Forestry and Fire Protection. <http://calfire.ca.gov>.

California Department of Parks and Recreation Office of Historic Preservation. <http://ohp.parks.ca.gov/>.

California Department of Public Health, <https://www.cdph.ca.gov/>.

California Department of Water Resources. www.water.ca.gov/.

California Employment Development Department. www.edd.ca.gov/.

California's Forests and Rangelands: 2010 Assessment. California Department of Forestry and Fire Protection. <http://frap.fire.ca.gov/>.

California Geological Survey. www.conservation.ca.gov/CGS/.

California Governor's Office of Emergency Services. www.caloes.ca.gov/.

California Governor's Office of Emergency Services, Accidental Release Prevention (CalARP) Program. <http://www.caloes.ca.gov/cal-oes-divisions/fire-rescue/hazardous-materials/california-accidental-release-prevention>.

California Institute of Technology, Southern California Earthquake Center. <https://www.scec.org/>.

California Natural Diversity Data Base. <https://www.wildlife.ca.gov/Data/CNDDB>.

California Volcano Observatory. U.S. Geological Survey, Volcano Hazards Program.
<https://volcanoes.usgs.gov/observatories/calvo/>.

California West Nile Virus Web Site. www.westnile.ca.gov/.

Cities/Counties Ranked by Size, Numeric, and Percent Change, 2011-2016 Estimates with 2010 Census Benchmark, State of California Department of Finance.
<http://www.dof.ca.gov/forecasting/demographics/Estimates/E-4/2011-20/>.

City of Clovis. www.ci.clovis.ca.us/.

City of Coalinga. www.coalinga.com/.

City of Fresno. www.fresno.gov/.

City of Kerman. www.cityofkerman.net/.

City of Kingsburg. www.cityofkingsburg-ca.gov/.

City of Mendota. <http://ci.mendota.ca.us/>.

City of Sanger. www.ci.sanger.ca.us/.

City of Selma. www.cityofselma.com/.

Communities at Risk. California Fire Alliance.
http://osfm.fire.ca.gov/fireplan/fireplanning_communities_at_risk/.

Community Rating System. Federal Emergency Management Agency National Flood Insurance Program. www.fema.gov/.

Council of Fresno County Governments. www.fresnocog.org/.

County of Fresno Heat Emergency Contingency Plan. Draft. Fresno County Community Health. 2007.

Disease Maps 2015. U.S. Geological Survey. <http://diseasemaps.usgs.gov/>.

Enhanced Fujita Scale. National Oceanic and Atmospheric Administration Storm Prediction Center. www.spc.noaa.gov/efscale/.

Economic Development Corporation Fresno County. www.fresnoedc.com/.

Digital Flood Insurance Rate Maps, Fresno County. Federal Emergency Management Agency. 2016.

Fire Hazard Severity Zones DRAFT, 9-2007, Very High zones in LRA. California Department of Forestry and Fire Protection Fire and Resource Assessment Program. 2007.

http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones.

Five Views: An Ethnic Historic Site Survey for California. 1988.

https://www.nps.gov/parkhistory/online_books/5views/5views.htm.

The Flood Insurance Study for the County of Fresno. Federal Emergency Management Agency. 2016.

Fresno County, CA. www.co.fresno.ca.us/.

Fresno County Agricultural Commissioner. <http://www.co.fresno.ca.us/departments/agricultural-commissioner>

Fresno County Assessor's Office. www.co.fresno.ca.us/departments/assessor.

Fresno County Assessor's Office, 2017 Certified Roll Values.

<https://www.co.fresno.ca.us/departments/assessor/assessment-roll>.

Fresno County Department of Community Health.

<https://www.co.fresno.ca.us/departments/public-health/community-health>.

Fresno County Drought Related Tree Mortality Zones: Tiers 1 and 2. Fresno County, CA; FRAP, US Forest Service, 2017. <http://www.fire.ca.gov/treetaskforce/>.

Fresno County General Plan. 2000, Draft update 2017.

<https://www.co.fresno.ca.us/departments/public-works-planning/divisions-of-public-works-and-planning/development-services-division/planning-and-land-use/general-plan-maps>.

Fresno County Local Agency Formation Commission. www.fresnolafco.org/.

Fresno County Operational Area Master Emergency Services Plan. Fresno County Office of Emergency Services. 2017.

Fresno County Operational Area Dam Failure Evacuation Plan, 2003; Fresno County Operational Area Master Emergency Services Plan, 2003. Fresno County Office of Emergency Services.

Fresno County Ordinance Code. LexisNexis Municipal Codes.

2018. https://library.municode.com/ca/fresno_county/codes/code_of_ordinances. .

Fresno County Public Works and Planning. www.co.fresno.ca.us/departments/public-works-planning.

Fresno County Zoning Ordinance. Department of Public Works and Planning, Development Services Division. 2011. <https://www.co.fresno.ca.us/departments/board-of-supervisors/ordinance-code>.

Fresno History. Fresno Convention and Visitor's Bureau. www.fresnocvb.org/about/history.asp.

Fresno-Kings Unit Pre-Fire Management Plan. California Department of Forestry and Fire Protection. 2009.

Fresno Metropolitan Flood Control District. www.fresnofloodcontrol.org/.

Future Eruptions in California's Long Valley Area—What's Likely? U.S. Geological Survey. Fact Sheet 073-97. 1997. <http://pubs.usgs.gov/fs/fs073-97/>.

Getting Started: Building Support for Mitigation Planning. Federal Emergency Management Agency. FEMA 386-1. 2002. <https://www.fema.gov/media-library-data/20130726-1521-20490-3966/howto1.pdf>.

Golden Gate Weather Services. <http://ggweather.com/>.

The Great Pandemic: The United States in 1918-1919. U.S. Department of Health and Human Services. https://cybercemetery.unt.edu/archive/allcollections/20090305004013/http://vietnamese.pandemicflu.gov/pandemicflu/envi/24/1918_pandemicflu_gov/your_state/california.htm.

Hazard Mitigation Assistance Unified Guidance. Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program. Federal Emergency Management Agency (FEMA). July, 2013. https://www.fema.gov/media-library-data/15463cb34a2267a900bde4774c3f42e4/FINAL_Guidance_081213_508.pdf

HAZUS-MH 4.0 Federal Emergency Management Agency. www.fema.gov/.

Highway 168 Fire Safe Council Community Wildfire Protection Plan. Revised. Highway 168 Fire Safe Council. August 2006.

Historic American Buildings Survey. National Park Service. www.nps.gov/history/hdp/habs/.

Historic American Engineering Record. National Park Service. www.nps.gov/history/hdp/haer/.

HSIP Freedom-National Dam Inventory, 2015

Influenza. World Health Organization Epidemic and Pandemic Alert and Response.
www.who.int/csr/disease/influenza/en/.

Integrating Manmade Hazards into Mitigation Planning. Federal Emergency Management Agency. FEMA 386-7. 2003. <https://www.fema.gov/media-library-data/20130726-1524-20490-3869/howto7.pdf>.

Introduction to Hazard Mitigation. Federal Emergency Management Agency. FEMA IS-393.A, 2006. <https://training.fema.gov/is/courseoverview.aspx?code=IS-393.b>.

Kings River Conservation District. www.krcd.org/.

Levees In History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR. 2008.
http://www.floods.org/ace-files/leveesafety/lss_levee_history_galloway.ppt

Local Mitigation Planning Handbook. Federal Emergency Management Agency. March, 2013.
https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf

Multi-Hazard Identification and Risk Assessment. Federal Emergency Management Agency. 1997. <https://www.fema.gov/media-library/assets/documents/7251>.

National Aeronautics and Space Administration (NASA). <https://www.nasa.gov/>

National Center for Environmental Information Storm Events Database.
www.ncdc.noaa.gov/stormevents/

National Flood Insurance Program. Federal Emergency Management Agency.
<https://www.fema.gov/national-flood-insurance-program>.

National Inventory of Levees. FEMA NFHL and the California Department of Water Resources. 2016

National Oceanic and Atmospheric Administration. www.noaa.gov

National Oceanic and Atmospheric Administration, National Centers for Environmental Information – State Climate Summaries. <https://statesummaries.ncics.org/>

National Oceanic and Atmospheric Administration, Storm Prediction Center. www.spc.noaa.gov

National Register Database and Research.
<https://www.nps.gov/subjects/nationalregister/database-research.htm>.

National Weather Service Forecast Office, San Joaquin Valley/Hanford, California.
www.wrh.noaa.gov/hnx/.

Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities. National Institute of Building Science Multi-Hazard Mitigation Council. 2005.

Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities. National Institute of Building Science Multi-Hazard Mitigation Council. 2017. https://www.nibs.org/page/ms2_download.

The Online Tornado FAQ. National Oceanic and Atmospheric Administration Storm Prediction Center. www.spc.noaa.gov/faq/tornado/.

PandemicFlu.gov. U.S. Department of Health and Human Services. www.pandemicflu.gov/.

Population and Housing Estimates for Cities, Counties and the State, 2011-2018, with 2010 Benchmark. State of California Department of Finance. 2018.
<http://www.dof.ca.gov/forecasting/demographics/Estimates/E-5/>.

Population Projections for California and Its Counties 2000-2050, by Age, Gender and Race/Ethnicity. State of California Department of Finance. 2007.

Probabilistic Seismic Hazard Assessment for the State of California. California Geological Survey. Open-File Report 96-08. 1996.
<http://www.conservation.ca.gov/cgs/Pages/PSHA/OFR9608/psha-ofr.aspx>.

Robert T. Stafford Disaster Relief and Emergency Act. Public Law 93-288, as amended, 42 U.S.C. 5121-5207. August 2016. <https://www.fema.gov/media-library/assets/documents/15271>.

Sierra Resource Conservation District. www.sierrarc.com/.

Social Science Data Analysis Network. www.censusscope.org/.

Social Vulnerability Index. University of South Carolina Hazards and Vulnerability Research Institute. 2000. <http://artsandsciences.sc.edu/geog/hvri/sovi%20C2%AE-2000-32-variables>.

Spatial Hazard Events and Losses Database for the United States (SHELDUS). Arizona State University Center for Emergency Management and Homeland Security. .
<https://cemhs.asu.edu/sheldus/>.

State of California, Commission on Local Governance for the 21st Century.

State of California Department of Conservation Farmland Mapping and Monitoring Program.
www.conservation.ca.gov/.

State of California Enhanced Multi-Hazard Mitigation Plan (SHMP). California Governor's Office of Emergency Services. 2013. www.hazardmitigation.oes.ca.gov/.

State of California Multi-Hazard Mitigation Plan. California Governor's Office of Emergency Services. 2007. www.hazardmitigation.oes.ca.gov/.

Thompson, E. Paving Paradise: A New Perspective on California Farmland Conversion. American Farmland Trust. 2007. <https://www.farmlandinfo.org/paving-paradise-new-perspective-california-farmland-conversion>.

U.S. Census Bureau, American Community Survey, 5-Year Estimates, 2012 - 2016.

U.S. Army Corps of Engineers. www.usace.army.mil/

US Census Bureau. <http://factfinder.census.gov/>

U.S. Census Bureau, 2010 American Community Survey (2015 estimates). www.census.gov

U.S. Census Bureau, 2010 Decennial Census.

U.S. Coast Guard, National Response Center. www.nrc.uscg.mil/

U.S. Department of Agriculture (USDA), Risk Management Agency

U.S. Drought Monitor. University of Nebraska-Lincoln National Drought Mitigation Center. <http://drought.unl.edu/>.

U.S. Environmental Protection Agency, Integrated Climate and Land-Use Scenarios (ICLUS) <https://www.epa.gov/iclus>

U.S. Fish and Wildlife Service, Sacramento Office, www.fws.gov/sacramento

US Forest Service, Wildland Fire Assessment System. <http://www.wfas.net>

U.S. Geological Survey. <https://www.usgs.gov/>

U.S. Geological Survey, Cascades Volcano Observatory. <http://vulcan.wr.usgs.gov>

Western Regional Climate Center. www.wrcc.dri.edu/.



APPENDIX E: PLANNING PROCESS

From: Lopez, Angel <angellopez@co.fresno.ca.us>
Sent: Wednesday, June 07, 2017 5:13 PM
To: miribarren@alvina.k12.ca.us; twaite@fcoe.net; thybee@burrel.k12.ca.us; orschkorn@caruthers.k12.ca.us; janetyoung@cusd.com; bmannlein@fcoe.net; rcash@chusd.k12.ca.us; rfreitas@fldusd.org; ecederquist@fowlerusd.org; armand.chavez@fresnounified.org; karen.temple@fresnounified.org; aarredondo@gpusd.org; robert.frausto@kermanusd.com; garzaj@kcsd.com; mford@kingsburg-elem.k12.ca.us; jmarcum@laton.k12.ca.us; grossette@fcoe.net; smanser@monroe.k12.ca.us; warrhm@att.net; mmrodriguez@parlier.k12.ca.us; ebitter@fcoe.net; bramirez@raisincity.k12.ca.us; ecash@riverdale.k12.ca.us; marc_johnson@sanger.k12.ca.us; Kevin_edwards@sanger.k12.ca.us; msutton@selma.k12.ca.us; jharris@sierrausd.org; ddrew@washingtoncolony.k12.ca.us; jpestorich@wusd.ws; stacy_s@wpesd.org; baldo945@aol.com; sean.bradbury@fresno.edu; dhuerta@csufresno.edu; joecallahan@sccd.edu; frankgornick@whccd.edu; barbara.hiocco@reedleycollege.edu; bcservices218@gmail.com; office@biolabcd.org; carutherscsd@sbcglobal.net; drcsd@pacbell.net; emailccservices@gmail.com; latonwater@sbcglobal.net; SierraCedarsCSD@gmail.com; sstadler@krcc.org; jcascia@panochewd.org; brayant_jeff@sbcglobal.net; ashbrook.don@gmail.com; ocfpd@hotmail.com; terris@fresnofloodcontrol.org; ipf@altaid.org; cwhite@ccidwater.org; mmacias@cidwater.com; pdesatoff@cidwater.com; ssingh@fresnoirrigation.com; sstadler@jamesid.org; scott@lagunaid.com; jsanders@orangecoveid.org; riverdaleid@sbcglobal.net; liz@trqid.com; lsjld@elite.net; smulligan@mosquitobuzz.net; Julia@fresnomosquito.org; ppud@att.net; rpud@sbcglobal.net; jandlsiliznoff@outlook.com; sstadler@jamesid.org; bryant_jeff@sbcglobal.net; sstadler@jamesid.org; gerstenb@jps.net; jcascia@panochewd.org; cannon@bfarm.com; sandrits@netptc.net; danny@trqid.com; hydrobuffalo@sbcglobal.net; bormonde@westlandswater.org; firebaughcanal@sbcglobal.net; danny@trqid.com; donnahrc@aol.com; rcozzie@aol.com; kjohansen@ppeng.com; jcascia@panochewd.org; rhopkins@ppeng.com; stevesloan31@yahoo.com; jcascia@panochewd.org; jcascia@panochewd.org; donna_cfy@yahoo.com; gunlund@sbcglobal.net; associate@slwd.net; hsimmons@ppeng.com; rcozzie@aol.com; bormonde@westlandswater.org; terri@jpprop.org; danpearce@waterworksdist18.com; pe-pcwg@sbcglobal.net; mogdeb@aol.com; lcortez@malagacwd.org; lfreeman@sjrecwa.net; Seyed.Sadredin@valleyair.org; roger.mccoy@valleyair.org; carl.carlucci@cdph.ca.gov; sharri_bender_ehlert@dot.ca.gov; irisyy@water.ca.gov; promero@water.ca.gov; faulkenb@water.ca.gov; fmarquez@tmr.org; ajmasovero@fs.fed.us; nmetcalf@fs.fed.us; thomas.jehrke@usace.army.mil; michael.r.erskine@usace.army.mil; mjackson@usbr.gov; dstroup@usbr.gov; lzaninovich@usbr.gov; shanna@usgs.gov; hough@usgs.gov; dgabriel@coalinga.com; mlopez@ci.fowler.ca.us; eacres07@yahoo.com; jerry.isaak@reedley.ca.gov; schacher@netptc.net; firechief@ci.firebaugh.ca.us; fiore_warner@yahoo.com; firechief@cityofkingsburg-ca.gov; gregt@ci.sanger.ca.us; chief@hlvfd.org; mlcranes@netptc.net; andrewb_latonfire@att.net; kerri.donis@fresno.gov; mark.a.johnson@fire.ca.gov; rpud@sbcglobal.net; matt_furrer@emcorgroup.com; camahoo@yahoo.com; chief@pineridgefire.org; r.michaels@orangecovefire.com; michaelk@cityofselma.com
Cc: Brislawn, Jeff P; Austin, Kenneth; Ortiz, Adan; Crump, Stephen; De La Cerda, Gabriel

Subject: Fresno County Local Hazard Mitigation Plan-Request for Participation
Attachments: Jeff Brislawn.vcf; AB 2140 Authorities Fact Sheet 06172015 (2).pdf

Good afternoon everyone,

Fresno County is beginning the process of updating its Multi-Jurisdictional Hazard Mitigation Plan (LHMP) to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The primary purpose of the Hazard Mitigation Plan is to reduce or eliminate long-term risk to people and property from natural and human-caused hazards and their effects on the County Operational area. With an approved plan or annex local agencies become eligible to apply for federal mitigation grant funding. The 2009 plan is expired and needs a comprehensive update to comply with the DMA 2000 requirements. The emphasis of DMA 2000 is on creating an ongoing, community-wide planning process that involves the Hazard Mitigation Planning Committee, the public, and other key stakeholders. The Fresno County Office of Emergency Services is taking the lead on the project in coordination with a Hazard Mitigation Planning Committee (HMPC) comprised of various County departments, municipalities, special districts and other stakeholders. Professional planning assistance is being provided by AMEC Foster Wheeler.

The effort will begin in June and a timeline of the planning schedule will be discussed at the kickoff meeting later this month. At this point, we are soliciting input from those jurisdictions that did not participate in the 2009 plan to determine if they will be full participants in the 2017 update. The jurisdictions that participated in 2009 include:

- City of Clovis
- City of Coalinga
- City of Fresno
- City of Huron
- City of Kerman
- City of Kingsburg
- City of Mendota
- City of Sanger
- City of Selma
- Fresno Metropolitan Flood Control District
- Lower San Joaquin Levee District
- Sierra Resource Conservation District/Highway 168 Fire Safe Council

It is important that the update effort has full participation in the planning process, including representation and input, from each of the participating jurisdictions. Participation requirements include:

- Attending and participating in the HMPC meetings (three anticipated over next several months)
- Creating jurisdictional annexes based on a template from AMEC Foster Wheeler, and providing other updated information and requested data (as available)
- Identifying mitigation actions specific to the jurisdiction
- Reviewing and providing comments on plan drafts
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan
- Coordinating, and participating in the public input process
- Coordinating the formal adoption of the plan by the entity's governing board

Please reply to this notice indicating a willingness to participate in the 2017 update and provide a point(s) of contact for your Department/Agency. Please also reply if you decline to participate. As the lead coordinator on this project, Ken Austin can be contacted at (559) 600-4065 or by email at

KAustin@co.fresno.ca.us. Jeff Brislawn is the planning consultant project manager with AMEC Foster Wheeler and can be contacted at 303-820-4654 or by email at jeff.brislawn@amecfw.com.

A kickoff meeting will be scheduled in the near future with details forthcoming. The purpose of the meeting is to introduce and outline the process, identify hazards, collect information, plan for stakeholder and public involvement, and answer any questions. Please plan to attend or send an alternate if you cannot.

Sincerely,

Angel Lopez

Staff Analyst | Fresno County Department of Public Health | Office of Emergency Services

☎ : 559.600.4499 fax 559.600.7630 | ✉ : angellopez@co.fresno.ca.us |

Fresno County Multi-Jurisdictional Hazard Mitigation Plan

Jurisdictional Annex Requirements and Outline

This document provides a suggested template for jurisdictional annexes to Fresno County's Multi-Jurisdictional Hazard Mitigation Plan. Suggested section headings and regulatory requirements are provided in an outline format, as well as brief descriptions and sample tables for the content needed. The outline is designed to be integrated with the planning process and timeline of the Hazard Mitigation Planning Committee (HMPC) for the multi-jurisdictional plan. Additional planning guidance can be referenced in the FEMA Local Mitigation Planning Handbook (Handbook) which is a tool for local governments to use in developing or updating local hazard mitigation plans (<https://www.fema.gov/media-library/assets/documents/31598>).

Section 1: Prerequisites

201.6 (c)(5) The plan shall include the following...Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Include the resolution or other documentation of your jurisdiction's adoption of the LHMP. This will occur after the plan has been submitted to CA OES and FEMA and received conditional approval.

Section 2: Jurisdictional or Community Profile

Develop a concise (1-2 pages) profile describing your jurisdiction. Include sections on the following:

- Geography and climate
- History
- Economy
- Population

If a special district, describe information on size and location, purpose, history, and customers served. Include a map of your community or district.

Section 3: Risk Assessment

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

201.6(c)(2)(iii) *For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

3.1 Hazard Identification and Profiles

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

The jurisdiction should identify hazards that could affect it, where they vary from risks facing the entire planning area and develop a hazard profile for each of these hazards. Complete the table that follows to summarize your information; the definitions for the rankings can be found on the following page.

Table x: City of XX—Hazard Profiles

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Agricultural Hazards				
Avalanche				
Dam Failure				
Drought				
Earthquake				
Expansive Soils				
Extreme Heat				
Flood				
Freeze				
Fog				
Hail				
Heavy Rain/ Thunderstorm				
Landslide				
Land Subsidence				
Severe Weather				
Soil Erosion				
Soil Liquefaction				
Tornado				
Volcano				
Wildfire				
Windstorm				
Winter Storm				

Guidelines for Hazard Rankings

Frequency of Occurrence:

Highly Likely: Near 100% probability in next year.

Likely: Between 10 and 100% probability in next year or at least one chance in ten years.

Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years.

Unlikely: Less than 1% probability in next 100 years.

Spatial Extent:

Limited: Less than 10% of planning area

Significant: 10-50% of planning area

Extensive: 50-100% of planning area

Potential Magnitude:

Catastrophic: More than 50% of area affected

Critical: 25 to 50%

Limited: 10 to 25%

Negligible: Less than 10%

Significance (your subjective opinion):

Low, Medium, High

For each hazard type, describe past events and their impacts. Provide maps of hazardous areas, if possible. Include information on the following to justify your rankings:

- Type, location, and date of event
- Nature and magnitude of event
- Deaths and injuries
- Property and infrastructure damage
- Crop losses
- Other economic/business losses
- Road and/or school closures
- Federal and state disaster relief

Example:

Extreme Heat

During the extreme heat event in summer 2006, human safety, agricultural crops, and livestock were impacted in Corcoran. There were four fatalities, of which most were elderly citizens. The cotton yield was smaller than normal, and 20 percent of the tomato crop was lost. The extreme heat also caused death in livestock and created a problem in carcass disposal. Power outage was also a problem. The city opened cooling centers during this event.

3.2 Vulnerability Assessment

201.6(c)(2)(ii) *A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;*

The vulnerability assessment analyzes the population, property, and other assets at risk to natural hazards by using the best available data.

Assets at Risk

This section lists the jurisdiction's assets at risk, including critical facilities and infrastructure; historic, cultural, and natural resources; and economic assets. It discusses the impacts that occurred in past events and vulnerability to specific hazards.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. Essential facilities are those that if damaged would have devastating impacts on disaster response and recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are the third category; examples are provided below.

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
<ul style="list-style-type: none">▪ Hospitals and other medical facilities▪ Police stations▪ Fire station▪ Emergency Operations Centers	<ul style="list-style-type: none">▪ Power plants▪ Dams/levees▪ Military installations▪ Hazardous material sites▪ Schools▪ Shelters▪ Day care centers▪ Nursing homes▪ Main government buildings	<ul style="list-style-type: none">▪ Highways, bridges, and tunnels▪ Railroads and facilities▪ Bus facilities▪ Airports▪ Water treatment facilities▪ Natural gas facilities and pipelines▪ Oil facilities and pipelines▪ Communications facilities

Natural, Cultural, and Historical Assets

Natural resource assets may include wetlands, threatened and endangered species, or other environmentally sensitive areas. Historical assets include state and federally listed historic sites.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

Use the table below to compile a detailed inventory of specific assets at risk including critical facilities and infrastructure; natural, cultural, and historical assets; and economic assets. These may include hospitals, fire stations, or historic buildings. Add additional rows as necessary. If the asset is located in a hazard area or susceptible to a specific hazards, describe this vulnerability.

Table x: Critical Facilities and other Community Assets

Name of Asset	Replacement Value	Occupancy/ Capacity #	Hazard Specific Info

Estimating Potential Losses

201.6(c)(2)(ii) (B) *The plans should describe vulnerability in terms of...An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate;*

Estimations of potential losses should be developed using best available data. This may include GIS data and/or tax assessor's data to estimate property values at risk. The table below shows the jurisdiction's total exposure to hazards in terms of population and the number and values of structures. It also shows the number and value of parcels in the 100-year (Zone A) and 500-year (X-500) flood hazard areas as mapped by FEMA. Make sure to describe how your estimates were calculated.

Table x: City of XX—Exposure to Hazards

City of XX	Population	Buildings	Value
Total Exposure (Earthquake)			
Flood: Zone A			
Flood: X-500			
Wildfire: Very High Threat ranking			

If possible, provide information on the following:

- Number of flood insurance policies - total number of buildings in community that are insured against floods through the National Flood Insurance Program (NFIP)
- Number of repetitive loss properties - number of repetitive losses properties (usually on a parcel basis), for which NFIP/FEMA has paid more than \$1,000 twice in the past 10 years
- Number of unreinforced masonry buildings
- Hospitals built before 1973
- Any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, low-income, or migrant farm workers.

Growth and Development Trends

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

Describe the types and location of new development in your jurisdiction. How much is manufactured housing? Do you have plans for new critical facilities and/or infrastructure? Are there any hazard-related concerns, such as new growth near flood or wildfire hazard areas, problems with soil hazards, etc.?

3.3 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capabilities assessment is divided into four sections: regulatory, administrative and technical, fiscal, and outreach and partnerships.

Regulatory

Table x lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities. Indicate which are in place in your jurisdiction.

Table x: City of XX—Regulatory and Planning Capabilities

Regulatory Tool	Yes/No	Comments
General plan		(date adopted, etc)
Zoning ordinance		
Subdivision ordinance		
Site plan review requirements		
Growth management ordinance		
Floodplain ordinance		
Other special purpose ordinance (stormwater, water conservation, wildfire)		
Building code		
Fire department ISO rating		
Erosion or sediment control program		
Stormwater management program		
Capital improvements plan		
Economic development plan		
Local emergency operations plan		

List the name and date of the ordinances and plans from the table above and any others that the city has adopted and briefly summarize their purpose and relationship to mitigation.

Examples:

Conservation and Open Space Zoning District – This zoning district applies to pathways, storm drainage basins, and water recharge areas throughout the city and is intended to provide for permanent open spaces in areas of the city that exhibit significant vegetation, scenic qualities, wildlife or recreation potential, and that are designated as open space sites by the General Plan.

Urban Water Management Plan, 2005 – This plan describes the vulnerability of the city’s water supply to seasonal or climatic shortage. It compares the projected normal, single-dry, and multiple-dry year water supply to the projected water demand for each of these scenarios over the next 25 years, in 5-year increments. The plan designates water shortage stages of action, including up to a 50 percent reduction, and outlines specific water supply conditions at each stage.

Administrative/Technical

The table below identifies the personnel resources responsible for activities related to mitigation and loss prevention in the jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Table x: City of XX—Personnel/Technical Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices			
Engineer/Professional trained in construction practices related to buildings and/or infrastructure			
Planner/Engineer/Scientist with an understanding of natural hazards			
Personnel skilled in GIS			
Full time building official			
Floodplain Manager			
Emergency Manager			
Grant writer			
Other personnel			
Warning Systems/Services (Reverse 9-11, outdoor warning signals)			
Other			

Briefly describe the community's administrative and/or technical challenges or obstacles to improving mitigation capabilities. What are existing strengths or areas of opportunities?

Fiscal

The following table identifies financial tools or resources that the jurisdiction could potentially use to help fund mitigation activities. Identify whether your jurisdiction has access to or is eligible to use the following financial resources for hazard mitigation

Table x: City of XX—Fiscal Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants		
Capital improvements project funding		
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services		
Impact fees for new development		
Incur debt through general obligation bonds		
Incur debt through special tax bonds		
Incur debt through private activities		

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Withhold spending in hazard prone areas		
Other		

Outreach and Partnerships

Does your jurisdiction have any past or ongoing public education or information programs, such as for responsible water use, earthquake or fire safety, household preparedness, or environmental education? Are there any partnerships or committees, such as an emergency management planning committee, in which your jurisdiction participates?

Example:

Outreach and Partnerships

Corcoran participates in the “Are You Okay?” program administered by the Kings County Sheriff’s Office. The program is a free computerized telephone system used to check on senior citizens or disabled/homebound individuals. The Amigos de la Comunidad was a successful outreach program of the Corcoran Police Department intended to form a partnership with the Spanish speaking community. The program is still in existence but not very active; it could potentially be used to communicate to the Latino community about hazards and emergencies.

Other Mitigation Efforts

Describe other ongoing and completed mitigation projects and programs. Include information such as:

- Any hazard-related certifications, such as Storm Ready certification or Firewise Communities certification?
- Past or ongoing projects or programs designed to reduce disaster losses, these may include projects to protect critical facilities.
- Improvements to stormwater system to minimize local street flooding.

Section 4: Mitigation Strategy

201.6 (c)(3) *The plan shall include...A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

Once the Risk Assessment is complete, the Mitigation Strategy must be developed. This involves 1) indicating support for the goals and objectives of the countywide plan or adding your own and 2) identifying mitigation actions for your community or district. An implementation worksheet must be completed for each identified mitigation action. The mitigation strategy should be developed through a collaborative group process and consists of goals, objectives, and mitigation actions. The following definitions are based upon those found in FEMA publication 386-3, *Developing a Mitigation Plan*:

- Goals are general guidelines that explain what you want to achieve. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. They are usually long-term, broad, policy-type statements.
- Objectives define strategies or implementation steps to attain the identified goals and are specific and measurable.
- Mitigation actions are specific actions that help achieve goals and objectives.

4.1 Goals and Objectives

201.6 (c)(3)(i) *The mitigation strategy section shall include...A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

The HMPC for the countywide plan will develop goals and objectives to provide direction for reducing hazard-related losses in Fresno County. Review these goals and identify any new unique goals and objectives for your jurisdiction.

4.2 Mitigation Actions

201.6 (c)(3)(ii) *The mitigation strategy section shall include...A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

201.6 (c)(3)(iv) *For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Through a collaborative group process, the HMPC for the countywide plan will also identify specific mitigation actions to achieve goals and objectives for reducing vulnerability to natural hazards. The HMPC will prioritize these mitigation actions using the STAPLEE criteria recommended by FEMA. STAPLEE stands for: social, technical, administrative, political, legal, economic, and environmental, which are the factors that should be considered when assessing mitigation measures. A description of the STAPLEE criteria, as well as examples of mitigation actions, can be found in your packet of jurisdictional annex information. Your jurisdiction should identify the countywide actions that it would like to specifically implement and also identify unique mitigation actions to the jurisdiction. The table on the following page can be used to summarize actions.

Table x: Summary of Mitigation Actions

Mitigation Action	Priority	Links to Goals	Hazards Addressed	Schedule
Example 1. Replace redwood water storage tanks with steel tanks to prevent losses from wildfire.	High	1,2,3	Wildfire	7 years

4.3 Action Implementation Worksheets

201.6 (c)(3)(iii) *The mitigation strategy section shall include...An action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

The jurisdiction should complete an implementation worksheet for each mitigation action identified in the previous section. The worksheet provides the details for how the jurisdiction will complete the action, such as identifying the responsible office, timeline, and funding, as well as the background information and costs/benefits of the project. An example of a completed worksheet is provided below. A blank worksheet is included on the following page.

Example Mitigation Action #1: Replace redwood water storage tanks with steel tanks

Priority (H, M, L): High

Issue/Background: The CCWD owns 11 redwood water storage tanks that are approaching 40 years of age. These tanks are made of wood and are vulnerable to fire—the 602 tank in the Jenny Lind service area was destroyed by wildfire in 2004 and had to be replaced with a steel tank. Many of these tanks are also in high wildfire risk areas. There is a strong likelihood one or more redwood tanks will be destroyed by fire in the next few years, depriving a large group of customers their drinking water and depleting water storage available for fire protection. These tanks also release small amounts of organics into the drinking water, leaving behind a taste and odor, as well as creating substrate materials for carcinogen creation. The CCWD plans to replace all redwood tanks due to the vulnerability to fire and to the problems with water quality.

Responsible Office: CCWD Engineering

Partners: California Department of Forestry and Fire Protection

Potential Funding:

- District revenue from rates, fees, property taxes, interest on investments
- FEMA Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program
- U.S. EPA
- State revolving fund grants and/or loans

Cost Estimate: The replacement cost for a typically-sized redwood tank is \$600,000. Total capital cost for replacing all redwood tanks is \$6.6 million.

Benefits (Losses Avoided):

- Reliable water delivery for domestic consumption and fire flow
- Reduce risk of property damage
- Protect public health and safety

Timeline: Replace all 11 tanks within next seven years

Mitigation Action #xx:

Action Title:	
Jurisdiction:	
Priority:	
Issue/Background:	
Ideas for Implementation:	
Responsible Office:	
Partners:	
Potential Funding:	
Cost Estimate:	
Benefits: (Losses Avoided)	
Timeline:	
Completed by:	



Help Reduce Disaster Losses in Your Community or District by Participating in the Fresno County Multi-Jurisdictional Hazard Mitigation Plan 2017 Update

The Fresno County Office of Emergency Services is taking the lead in updating its multi-jurisdictional hazard mitigation plan originally developed in 2008-2009. The purpose of this plan is to assess risk to natural and significant manmade hazards, implement actions to reduce future losses, and maintain eligibility for federal mitigation funds. Incorporated cities and special districts located in Fresno County are invited to participate in this cooperative update effort.

What is a Multi-Jurisdictional Hazard Mitigation Plan?

Hazard mitigation means any action taken to reduce or eliminate the long-term risk to human life and property from natural or manmade hazards. The Disaster Mitigation Act of 2000 requires local governments to have a hazard mitigation plan approved by the Federal Emergency Management Agency (FEMA) to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. In addition, Assembly Bill 2140, adopted by the California legislature in the fall of 2006, provides financial incentives for local jurisdictions adopting their Local Hazard Mitigation Plan as part of their General Plan.

A multi-jurisdictional hazard mitigation plan is a plan jointly prepared by more than one jurisdiction. The term “jurisdiction” in this guide means “local government.” A local government may include counties, municipalities, cities, towns, school districts, special districts, council of governments, Indian tribe or authorized tribal organizations, rural communities, or other public entities.

What Are the Benefits of Participating in a Multi-Jurisdictional Hazard Mitigation Plan?

Local jurisdictions have the option of preparing a multi-jurisdictional hazard mitigation plan under the Disaster Mitigation Act. Some of the benefits to jurisdictions of choosing to participate in a multi-jurisdictional planning process are the following:

- Enables comprehensive approaches to mitigate hazards that affect multiple jurisdictions;
- Allows for economies of scale by sharing costs and resources;
- Improves coordination and communication among local governments and districts;
- Avoids duplication of efforts;
- Imposes an external framework and schedule on the process; and
- Establishes eligibility for FEMA mitigation funding programs.

When opting to participate in a multi-jurisdictional plan update, jurisdictions still must meet all planning requirements, including formal adoption of the plan. Failure of any of the participating jurisdictions to meet the requirements will not prevent the compliant jurisdictions from adopting the plan, getting it approved by FEMA, and consequently being eligible for project grants.

(OVER)

How to Participate in the Fresno County Multi-Jurisdictional Plan Update

To participate in the multi-jurisdictional plan update, jurisdictions must complete the following steps:

- Designate a representative to serve on the Fresno County Hazard Mitigation Planning Committee, which will meet four times during the nine-month planning process.
- Send the representative to attend the Kickoff Meeting for the plan on **Wednesday, July 12, 2017, at 9:30 am in Clovis**, where additional information will be provided.
- ***If you are a previously participating Jurisdiction:*** Provide requested input to the annex for your jurisdiction. Detailed guidelines for updating your annex will be provided through the county planning process.
- ***If you are a new Jurisdiction:*** Develop an annex to the countywide plan for your jurisdiction. Detailed guidelines and support for creating your annex will be provided through the county planning process.
- Inform the public, local officials, and other interested parties about the planning process and provide opportunity for them to comment on the plan and annex.
- Formally adopt the mitigation plan and your community's/district's annex.

Fresno County will provide participating jurisdictions with general background information on hazards, guidance on planning steps, and other resources. The outline for a jurisdictional annex is provided below.

Outline of a Jurisdictional Annex
Documentation of Local Jurisdiction Adoption
I. Jurisdiction Profile
II. Planning Process
III. Risk Assessment
Hazard Identification and Profiles
Vulnerability Assessment
Capability Assessment
IV. Mitigation Strategy
Mitigation Goals
Mitigation Actions and Projects
Implementation Process and Schedule for Identified Mitigation Actions
V. Plan Maintenance Process
Monitoring, Evaluating and Updating the Plan
Incorporation into Existing Planning Mechanisms
Continued Public Involvement

For more information on this project, contact:

Jeff Brislawn

Amec Foster Wheeler
Hazard Mitigation and Emergency
Management
Phone: (303) 704-5506
Email: jeff.brislawn@amecfw.com

Ken Austin

Office of Emergency Services
Fresno County
Department of Public Health
Phone: (559) 600-4065
Email: kenaustin@co.fresno.ca.us

Angel Lopez

Office of Emergency Services
Fresno County
Department of Public Health
Phone: (559) 600-4499
Email: angellopez@co.fresno.ca.us

**Local Hazard Mitigation Plan Update Guide
for
Fresno County, California
Hazard Mitigation Planning Committee (HMPC)**

**Prepared by
Amec Foster Wheeler**

July 2017



Overview

The contents of this workbook have been designed to assist Fresno County and its jurisdictions (municipalities and special districts) in the 2017 update of the 2009 Multi-Jurisdictional, Multi-Hazard Mitigation Plan, in accordance with the Federal Disaster Mitigation Act (DMA) of 2000 update requirements. The mitigation planning regulation at 44 CFR §201.6(d)(3) states:

A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.

This guide includes a description of the necessary background information needed to support the hazard mitigation plan update process. This includes an update of the hazard identification and vulnerability assessment, revisiting the assessment of Fresno County's current hazard mitigation capabilities, and a review of the progress on mitigation projects intended to prevent or reduce future losses. The plan's key components will be revisited through a formal planning process, including re-adoption of the plan in order to securing the continued buy-in of participating jurisdictions.

The essential information needed to support the update process includes current background information about Fresno County and its jurisdictions: plans, technical studies, and data related to hazards and risks; current governing codes, ordinances, regulations, and procedures whose intent is to minimize future losses; and an update of Fresno County's technical and organizational capabilities to perform hazard mitigation/loss prevention functions. It is important that the plan shows what Fresno County is doing now to limit future disaster losses, and capture any mitigation success stories since 2009.

The planning process is heavily dependent on existing data to be supplied by each of the participants represented on the Hazard Mitigation Planning Committee (HMPC). The DMA plan development process does not require the development of new data, but requires **existing data only**. The goal of this process is to produce an updated hazard mitigation plan that meets Fresno County's needs, as well as the requirements of DMA 2000 and that contains a list of updated projects that may be eligible for streamlined federal mitigation funding pre or post disaster.

What is Mitigation?

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of \$4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Mitigation generally means reducing long-term risk from hazards to acceptable levels through predetermined measures accompanying physical development, for example: strengthening

structures to withstand high winds or snow loads; elevating, removing or limiting development in flood-prone areas; clearing defensible space around residences in Wildfire Urban Interface (WUI) areas; or designing development away from areas of geological instability. Mitigation can also protect existing development through seismic retrofitting, critical infrastructure protection, floodproofing etc.

Mitigation is different from emergency preparedness or response. Preparedness concentrates on activities which make a person, place, or organization ready to respond to a disaster with emergency equipment, food, emergency shelter, and medicine. Response activities may reduce damages, such as sandbagging during a flood, but this is a short term solution and requires advance warning and resources to be in place during the event. Mitigation of flood hazards through wise floodplain management and hazard avoidance is an example of a long term solution.

Participation

The DMA planning regulations and guidance stress that each entity seeking the required FEMA re-approval of their mitigation plan must:

- Participate in the process;
- Detail areas within the planning area where the risk differs from that facing the entire area;
- Identify specific projects to be eligible for funding; and
- Have the governing board formally adopt the plan.

For HMPC members, 'participation' means the planning committee representatives will:

- Attend and participate in HMPC meetings;
- Provide available data that is requested of the HMPC coordinator;
- Provide revisions to specific sections of the 2006 plan relevant to the jurisdiction;
- Provide a status report on mitigation actions of the 2006 plan relevant to the jurisdiction;
- Review and provide/coordinate comments on the updated plan draft;
- Advertise, coordinate and participate in the public input process; and
- Coordinate the formal adoption of the plan by the governing board.

Plan Update and Data Collection Guide

This guide contains an explanation of the types of hazard mitigation/loss prevention data that is needed for the hazard mitigation planning process. This guide identifies specific requirements for the Risk Assessment Process, which includes the Hazard Identification, Vulnerability, and Capability Assessments as well as defines requirements for the update of the Mitigation Strategy.

The worksheets have been developed to assist with the update. Each jurisdiction should utilize members of their planning subcommittee to review the existing draft and either complete the

worksheet forms **or** directly edit the respective sections of the Fresno County Hazard Mitigation Plan. A step by step process is included in this guide. Each participating jurisdiction (county, town, city, or special district) that desires credit for participation in the 2017 update must go through this process.

Data collection worksheets, or edits to respective sections of the Fresno County Hazard Mitigation Plan are due on August 31st to Jeff Brislawn (contact information below).

Project Contacts

Jeff Brislawn

Amec Foster Wheeler

Phone: (303) 704-5506

Email:
jeff.brislawn@amecfw.com

Ken Austin

Office of Emergency Services
Fresno County
Department of Public Health

Phone: (559) 600-4065

Email:
kaustin@co.fresno.ca.us

Angel Lopez

Office of Emergency Services
Fresno County
Department of Public Health

Phone: (559) 600-4499

Email:
angellopez@co.fresno.ca.us

Steps to update your jurisdiction's annex of the Fresno HMP

1. Attend plan update meetings of the countywide HMPC.
2. Download a Word (editable) version of the 2009 plan from the project Google drive (link to be provided in email)

Track all edits with Track Changes. A PDF copy of the plan can also be downloaded.
3. Reconvene a mitigation planning subcommittee for your jurisdiction
 - a. Include departments such as planning, engineering, public works, GIS, police, fire, etc as applicable
 - b. Document any meetings with sign in sheets (use blank template attached)
4. Review Chapter 4.1 Hazard Identification section in Base Plan and Annex
 - a. Identify hazard impacts to your jurisdiction since 2007 (Use historic hazard event worksheet to provide details, or collect related reports, articles or memos with damage amounts, damage assessment reports etc.)
 - b. Identify any new hazard studies or plans – send electronic versions (preferred if available), web link, or hardcopies to County HMP coordinator
5. Review Chapter 4.2 Vulnerability Assessment in Base Plan and Annex
 - a. Review discussion on potential losses and note where you may have more specific information on past losses or potential for future losses specific to your jurisdiction. *Note: Amec Foster Wheeler will be re-doing the flood, earthquake and wildfire analyses based on current countywide GIS datasets and recent Digital Flood Insurance Rate Maps and current wildfire hazard data.*
6. Review Capabilities Assessment in Annex
 - a. Review the Jurisdiction-Specific Existing Capabilities, Development Trends
 - b. Using the 'Track Changes' feature in Word, mark up the document with changes, **OR** use the attached worksheets to provide updated information.
 - c. Note any changes in hazard significance or reduction in vulnerability through the implementation of mitigation projects such as defensible space, stormwater improvements, public education efforts etc.
 - d. Note any changes in development trends. Provide an estimate of future trends (building types and counts).
 - e. Upload either 'Track Changed' Word version of chapter **or** Worksheets to the Google Drive. Provide this and notify the County HMP coordinator by **August 31st**.

7. Review Chapter 5.3 County Mitigation Action Plan summary table, specific to your jurisdiction, and the Mitigation Project Descriptions in your jurisdictional Annex.
 - a. Provide updates to the details of the project, where applicable
 - b. Note any changes in priority
 - c. Provide a status update on each project. Indicate what projects are ongoing, completed, deleted or deferred. If completed was it successful? Did the project help prevent losses from an event, or has it not been tested yet? If it has not been completed indicate reason why (i.e. lack of funding, other priorities etc.).
 - d. A worksheet and template will be provided to facilitate this, with due date TBD.
 - e. Consider ideas for new projects for your jurisdiction. These can be projects that may be in the works already but not captured in the plan or that may have become a priority following recent disaster declarations. These will be discussed at a future HMPC meeting. A worksheet and template will be provided for new projects, and for those projects to be carried forward from the existing plan, with due date TBD.
8. Review Chapter 7.0 Plan Implementation and Maintenance
 - a. Review this section for compliance; If this process was followed (i.e. annual reviews) please provide details. If not, provide specific details to actual implementation and maintenance process over past 5 years.
 - b. Note any updates/efforts to incorporate this plan into existing planning mechanisms or opportunities to do so in the future (**Important**)
 - c. Note any continued public involvement (Amec Foster Wheeler will document meetings specific to the plan update).
9. Help advertise and coordinate public meetings where applicable
10. Provide documentation of all meetings to County HMPC coordinator
11. Review and comment on the updated plan
12. When plan receives conditional approval from FEMA, re-adopt the plan
13. Continue to implement the plan!

Information Sources

The following are possible sources of information to assist with updating the plan:

- General Plans, specifically Safety Element
- Emergency Operations Plans
- Emergency Action Plans for dams
- Incident logs/After Action reports
- Damage Assessment reports
- Drought Plans
- Evacuation Plans
- Recovery Plans
- Emergency Exercise Scenarios
- GIS databases
- Hazard specific plans:
 - Community Wildfire Protection Plans
 - Flood Hazard Mitigation Plans
 - Fire Safe plans
- Capital Improvement Plans
- Capital Facilities Plans
- Strategic plans
- Land Use Plans/Codes
- Local Building codes/regulations
- Climate adaptation plans

The Risk Assessment Process

The risk assessment process includes three components: hazard identification, vulnerability assessment, and capability assessment. Data needs and worksheets for each of the risk assessment components are included in this guide. Use these worksheets to evaluate your jurisdiction's current vulnerability to the hazards in the plan. Refer to the existing plan (Chapter 4) first. The intent is to identify any changes in the significance or risks to these hazards as they pertain to your jurisdiction.

Fresno County Local Hazard Mitigation Plan Worksheet #1: Hazard Identification Update

Name of Department/Jurisdiction: _____

Use this worksheet to identify possible hazards that may impact your jurisdiction. Hazards currently identified in the plan are listed. Please rank according to the guidelines that follow the table. Use copies of Worksheet #2: Historic Hazard Event to provide evidence to justify your conclusions.

Hazard	Frequency of Occurrence	Hazard Extent	Potential Magnitude	Significance	Hazard Map? (Paper/GIS/ Source)
Dam & Levee Failure					
Drought					
Earthquakes					
Floods					
Insect Hazards					
Landslides					
Natural Health Hazards					
Severe Weather*					
Soil Hazards					
Volcanoes					
Wildfires					
*Severe Weather Includes Dust Storms, Extreme Temperatures, Fog, Hail, Heavy rains, lightning, tornadoes, windstorms, and winter storms					

Frequency of Occurrence:

Highly Likely: Near 100% probability in next year.
Likely: Between 10 and 100% probability in next year or at least one chance in ten years.
Occasional: Between 1 and 10% probability in next year or at least one chance in next 100 years.
Unlikely: Less than 1% probability in next 100 years.

Hazard Extent:

Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Potential Magnitude:

Catastrophic: Multiple deaths, complete shutdown of facilities for 30 days or more, more than 50% of property is severely damaged
Critical: Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 25% of property is severely damaged
Limited: Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property is severely damaged

Negligible: Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.

Significance (your subjective opinion): Low, Medium, High

Prepared by:

Phone: _____

Email: _____

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	
--	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	--

Fresno County Local Hazard Mitigation Plan Worksheet #2: Historic Hazard Event

Name of Department/Jurisdiction: _____

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	
Property damage	
Infrastructure damage	
Crop damage	
Business/economic impacts	
Road/school/other closures	
Other damage	
Insured losses	
Federal/state disaster relief funding	
Opinion on likelihood of occurring again	
Source of information	
Comments	

Prepared by: _____

Phone: _____

Email: _____

Fresno County Local Hazard Mitigation Plan Worksheet #3: Vulnerability Assessment

Name of Department/Jurisdiction: _____

The purpose of this worksheet is to assess the vulnerable buildings, populations, critical facilities, infrastructure, and other important assets in your community by using the best available data to complete the table and questions that follow. Use the table on the next page to compile a detailed inventory of specific assets at risk including critical facilities and infrastructure; natural, cultural, and historical assets; and economic assets as defined below. Alternately you can edit your jurisdiction's information in Section 4.3 of the plan. Attach supporting documentation, such as photographs, reports, or plans if possible. In the hazard specific column of the asset inventory table, indicate if there is a specific hazard to which the asset is at risk.

Critical Facilities

Critical Facilities must remain operational during any major disaster and be designed, located, and constructed accordingly. FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. 'Essential facilities' are those that if damaged would have devastating impacts on disaster response and/or recovery. 'High potential loss facilities' are those that would have a high loss or impact on the community. Transportation and lifeline facilities are third category of critical assets; examples are provided below.

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
<ul style="list-style-type: none"> ▪ Hospitals and other medical facilities ▪ Police stations ▪ Fire station ▪ Emergency Operations Centers 	<ul style="list-style-type: none"> ▪ Power plants ▪ Dams/levees ▪ Military installations ▪ Hazardous material sites ▪ Schools ▪ Shelters ▪ Day care centers ▪ Nursing homes ▪ Main government buildings 	<ul style="list-style-type: none"> ▪ Highways, bridges, and tunnels ▪ Railroads and facilities ▪ Bus facilities ▪ Airports ▪ Water treatment facilities ▪ Natural gas facilities and pipelines ▪ Oil facilities and pipelines ▪ Communications facilities

Natural, Cultural, and Historical Assets

Natural resource assets may include wetlands, threatened and endangered species, or other environmentally sensitive areas. Historical assets include state and federally listed historic sites.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

Asset Inventory

[illegible]

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Additional Vulnerability Questions

Describe growth and development trends and future growth areas and how they relate to hazard areas and vulnerability concerns/issues.

**Review the mitigation actions in your jurisdictional annex.
Indicate what projects have been completed or are ongoing and describe how vulnerability has changed (or not) as a result of implementing successful mitigation actions.**

Prepared by: _____

Phone: _____

Email: _____

--

Fresno County Local Hazard Mitigation Plan

Worksheet #4: Capability Assessment

Name of Department/Jurisdiction: _____

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete this worksheet and provide supporting documentation if possible, or edit your jurisdiction's table in Section 4.3 of the 2006 plan.

Regulatory

The following planning and land management tools are typically used by local jurisdictions to implement hazard mitigation activities. Please indicate which your jurisdiction has in place. If your jurisdiction does not have this capability or authority, please indicate if a higher level of government has the authority. Also use the comments column to indicate how we can obtain a copy of the plan or document (i.e. available on the web (include address), will put on ftp, will e-mail or mail, will fax).

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
General or Comprehensive plan		
Zoning ordinance		
Subdivision ordinance		
Growth management ordinance		
Floodplain ordinance		
Other special purpose ordinance (stormwater, steep slope, wildfire)		
Building code		
Fire department ISO rating		
Erosion or sediment control program		
Stormwater management program		
Site plan review requirements		
Capital improvements plan		
Economic development plan		
Local emergency operations plan		
Other special plans		
Flood insurance study or other engineering study for streams		
Elevation certificates (for floodplain development)		
Other		

Administrative/Technical

Identify the technical and personnel resources responsible for activities related to hazard mitigation/loss prevention within your jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices			
Engineer/professional trained in construction practices related to buildings and/or infrastructure			
Planner/engineer/scientist with an understanding of natural hazards			
Personnel skilled in GIS			
Full time building official			
Floodplain manager			
Emergency manager			
Grant writer			
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)			
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)			
Other			

Additional Capabilities Questions

<p>Does your community have any hazard-related certifications, such as Storm Ready certification or Firewise Communities certification?</p>	
<p>Describe any past or ongoing public education or information programs, such as for responsible water use, earthquake or fire safety, household preparedness, or environmental education.</p>	
<p>Describe any other past or ongoing projects or programs designed to reduce disaster losses. These may include projects to protect critical facilities.</p>	

Prepared by: _____

Phone: _____

Email: _____

SIGN-IN SHEET - FRESNO COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT

Jurisdiction:

Date:**Time:**

Location:

Meeting Purpose:

[illegible]

FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN
2017 UPDATE

KICKOFF MEETING

Wednesday, July 12, 2017
10:00 am – 12:30 pm

Clovis Fire Headquarters EOC/Training Room 1233 Fifth Street Clovis, CA 93612

- 1. Introductions**
- 2. Mitigation, Mitigation Planning, and the Disaster Mitigation Act Requirements**
- 3. Benefits of Participation and the Role of the Hazard Mitigation Planning Committee**
- 4. Overview of the 2009 Fresno County Multi-Hazard Mitigation Plan**
- 5. Implementation Success Stories**
- 6. Objectives and Schedule for the Plan Update**
- 7. Review of Identified Hazards**
- 8. Coordinating with Other Agencies, Related Planning Efforts, and Recent Studies**
- 9. Planning for Public Involvement**
- 10. Updating Jurisdictional Annexes and Information Needs**
- 11. Questions and Answers/Adjourn**

SIGN-IN SHEET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC #1 – Kickoff Meeting
Wednesday July 12, 2017 10:00-12:30pm
Clovis Fire Headquarters 1233 Fifth St Clovis, CA

Name	Jurisdiction/Org./Citizen	Title	Phone	E-mail
Jeff Brislaun	Amec Foster Wheeler	Project Manager	303-704-5506	jeff.brislaun@amecfw.com
ARNANDO MENDOZA	FRESNO Co ROADS	ROAD SUPERINTENDENT	6200-4249	amendoza@co.fresno.ca.us
WAYNE OSTROM	KENSBURG CITY	CAPTAIN	559-978-1050	CAPTOSTROM@CITY OF KENSBURG - CA.GOV.
John Huneke	Oak to Timberline Fire Safe Council	—	510-915-4859	jhuneke@eaglabs.com
Kathy Curtice	Fresno Sheriff	Lieutenant	559-600-8039	Kathy.Curtice@fresnosheriff.org
Chuck Jonas	PW/DS	Buildings Officer	559-600-4217	CJONAS@Co.FRESNO.CA.US
ANDREW REMU	FMFCD	SENIOR ANALYST	559-456-3292	andrew@fresno6landconf.org
BRENT SUWAMOTO	FMFCD	OPERATIONS ENGINEER	"	BRENT@FMFCD.CA.US
JERRY ISAAK	CITY OF REEDLEY	FIRE CHIEF	559-637-4230	jerry.isaak@reedley.ca.gov
Robert Olson	Minter Assoc.	Sr. Associate	916-735-3941	ROOL1@comcast.net
Greg Tarasew	Sanger Fire	Fire Chief	875-6568	greg@ci.sanger.ca.us
Terri Mejerado	Cal OES	ESC	259-9890	terri.mejerado@caloes.ca.gov
John Thompson	County of Fresno	Dep Dir.	6004259	JOHNT@CO.FRESNO.CA.US
DAN RYAN	CALTRANS	North Region MGR	444 2494	DAN.RYAN@DOT.CA.GOV
Adan Ortiz	Fresno county OES	Analyst		

SIGN-IN SHEET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC #1 – Kickoff Meeting
Wednesday July 12, 2017 10:00-12:30pm
Clovis Fire Headquarters 1233 Fifth St Clovis, CA

Name	Jurisdiction/Org./Citizen	Title	Phone	E-mail
JOHN COFFMAN	COUNTY OF FRESNO	EASTSIDE ROAD SUPERINTENDENT	600 - 4262	JCOFFMAN@CO.FRESNO.CA.US
Jim McDougald	CAL FIRE	Assistant Chief	493-4304	Jim.mcdougald@calfire.ca.gov
CHRIS CHRISTOPHERSON	CAL FIRE	BATTALION CHIEF	493-4320	CHRIS.CHRISTOPHERSON@CALFIRE.CA.GOV
Craig Jones	Forester OTFSC	Forester	303 443-2088	craigj@colostate.edu
John Goss	Sierra National Forest	Fire Chief	559 908-6526	johngoss@fs.fed.us
Danrel Vasquez	City of Fresno	EPO	559 621-7796	DanrelV@fresno.gov
John Zanon	Fresno Sheriff	Captain	600-8502	john.zanon@fresno Sheriff.org
Shane Gunn	Caltrans	Chief ENV Maint	445-6310	Shane.gunn@dot.ca.gov
Bob Palacios	County of Fresno	Div. MGR.	600, 4267	bpalacios@co.fresno.ca.us
Jason Fossan	County of Fresno	CAO	600-7770	jfofsan@co.fresno.ca.us
STEVE HAZE	SIERRA RED	DISTRICT MGR.	855-5840	ADMIN@SIERRAREDD.COM
Thomas Siphongsay	Malaga County Water	Env. Compliance	541-9797	tsiphongsay@malagacwd.org
Chris Fitzgerald	Clovis	Life Safety	543-3285	cf@cityofclovis.com
Chris Lopez Manuel Lopez	Fowler	Chief	559-351-1002	mLopez@ci.fowler.ca.us

SIGN-IN SHEET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC #1 – Kickoff Meeting
Wednesday July 12, 2017 10:00-12:30pm
Clovis Fire Headquarters 1233 Fifth St Clovis, CA

Name	Jurisdiction/Org./Citizen	Title	Phone	E-mail
KEVIN NEHRING	FRESNO COUNTY	DEP. CO. SURVEYOR	600-4022	KNEHRING@CO.FRESNO.CA.US
Leslie Purvis	Amec Foster Wheeler	Env. Scientist	892-2921	Leslie.Purvis@amec.fw.com
LAURENCE KIMURA	FRESNO Irrigation DIST	Chief Eng'r	233-7161	LKIMURA@fresnoirrigation.com
LARRY MINTIER	MINTIER HARNISH	Environ Advisor	916/764-5700	larry@minterharnish.co.fresno.ca.us
D'Andra Buchanan	County of Fresno	Engineer III	600-4326	adbuchanan@co.fresno.ca.us
LUKE SERPA	CLOVIS	CM	324-2060	LUKES@CICLOVIS.CA.US
Darrel Schmidt	Fresno Co. Public Health	Senior Staff Analyst	600-3149	dschmidt@co.fresno.ca.us
Jose Gutierrez	Westlands Water District	Deputy General Manager	241-6215	jgutierrez@westlandswater.org
JILL BARRY	COF - ISD	ISD DIV. MGR	600-6200	JBARRY@CO.FRESNO.CA.US
GIL REYES	BUREAU OF RECLAMATION	Sup. CIVIL ENGR	559-487-5220	GREYES@USBR.GOV
Iles Wright	Ag Commissioner		600-7510	
Steve Whit	PWFD	Dir	600-4537	stwhit@pwfd.com
Lemuel Asprea	PWP	Bus Mgr	600-4298	lasprea@co.fresno.ca.us

**Fresno County Multi-Jurisdictional,
Multi-Hazard Mitigation Plan 2017 Update
Project Kick-Off Meeting Summary**

**9:30am-Noon
July 12, 2017**

Clovis Fire Headquarters EOC/Training Room 1233 Fifth Street Clovis, CA 93612

Introductions and Opening Remarks

Ken Austin with Fresno County Office of Emergency Services began the meeting with welcoming remarks and introduced Jeff Brislawn, project manager with Amec Foster Wheeler, the consulting firm hired to facilitate the planning process and develop the updated County plan. Ken asked everyone around the room to introduce themselves. 42 persons representing a mix of county departments and stakeholders were present and documented on a sign-in sheet. County representatives included Roads, ISD, Assessor's Office, Public Works and Planning and Public Health, Ag department, Sheriff's Office and Office of Emergency Services. Municipality representation included Clovis, Fowler, Reedley, Kingsburg, Sanger, and City of Fresno. Stakeholders and other interested parties present included representatives from the Sierra Resource Conservation District, Cal Fire (Fresno Kings Unit), Fresno Metro Flood Control District, Fresno Irrigation District, Westlands Water District, Malaga County Water District and Oak-Timberline and Hwy 168 Fire Safe Councils. Federal and state agency stakeholders included the California Office of Emergency Services, CalTrans, CalFire, US Forest Service – Sierra NF, and the US Bureau of Reclamation. Also represented were staff from the local Amec Foster Wheeler office and Mintier Harnish, a firm that is working on the County General Plan update and providing support to the HMP update as part of the Amec Foster Wheeler team. Jeff asked how many had participated in the 2009 planning process; only a few raised their hands. Jeff discussed the agenda items as summarized below.

Mitigation Planning and the Disaster Mitigation Act Requirements

Jeff presented PowerPoint slides that outlined the planning process and the Disaster Mitigation Act Requirements. Jeff also mentioned the increase in the number of disaster incidents and the corresponding increase in recovery costs in California and nationwide in recent years. The upside of these disasters is that more funding is becoming available for mitigation projects. The planning process involves a 4 Phase approach with 9 steps per FEMA guidance updated in 2013. The update will also align with the Community Rating System (CRS) 10 step floodplain

management planning process so that credits can be achieved since Fresno County and the City of Fresno participate in CRS.

An important aspect of the plan update is that it's needed to be eligible for FEMA mitigation grant funding. Additionally, local governmental agencies that have incorporated the HMP by reference into their General Plans are eligible to receive a potentially higher state share of California Disaster Assistance Act funding post-disaster. The plan will be updated in accordance with the Disaster Mitigation Act (DMA) of 2000.

Jeff emphasized the importance and benefits of hazard mitigation planning and the types of mitigation projects that can be funded if eligibility requirements are met. In California, these projects have included wildfire mitigation/fuels treatment, flood reduction/drainage improvements, landslide stabilization, generators and warning systems. Recent changes in FEMA policy now make certain levee projects eligible, provided they don't duplicate another federal program, and 'climate resilient' activities including groundwater recharge for drought mitigation and green infrastructure for stormwater mitigation.

Objectives and Schedule for the HIRA Update

The HMP update will be based on existing documents and studies, with the Fresno County Hazard Mitigation Plan (2009) providing the baseline for identified hazards and the groundwork for policies and actions for hazard mitigation.

Aspect of planning process include:

- Reengage the local government participants that originally had annexes to the plan
- Invite other local governments to participate in the plan update
- Raise awareness and engage the public
- Update hazards and baseline development data to reflect current conditions
- Update the mitigation strategy
- Maximize CRS planning credits where feasible

Role of the Hazard Mitigation Planning Committee (HMPC)

The County and participating jurisdictions (local governments including special districts) will comprise the HMPC to provide input into the plan update. Jeff emphasized that this is YOUR plan, local input, and participation from the county, municipalities and special districts is required for full approval from FEMA; participation includes:

- Establishing a planning committee for each jurisdiction,
- Attend planning meetings and provide requested data,
- Assist with public outreach including assisting in coordinating press releases, and advertising public meetings

-
- Providing comments on draft plans
 - Coordinating formal adoption

The county emphasized the intent to get all municipalities engaged in the update effort, at a minimum. Certain special districts, particularly those that might be applicants for FEMA mitigation funding, are also encouraged to participate if they did not do so before. The county will need to know soon of the jurisdictions new to the plan so that resources can be evaluated accordingly.

Stakeholders include other local, state and federal agencies with a stake in hazard mitigation in the County. Examples include the USFS, CalTrans, CalFire and CalOES. Neighboring counties will be notified about the update and given an opportunity to provide input into the process.

The HMP will be updated over the next six months, with two more meetings with the Hazard Mitigation Planning Committee. Amec Foster Wheeler will be updating the Hazard Identification and Risk Assessment (HIRA) in the next couple of months, with input from the HMPC. Three drafts will be created: first for review by HMPC committee, a 2nd for public review, and a 3rd for state and FEMA review. The first draft for HMPC review is targeted for December 2017, and a public review draft in January.

Review of Identified Hazards

Based on hazards from the 2009 County HMP, the list of potential natural hazards was reviewed. The focus is on natural hazards, since manmade hazards are not required by DMA 2000 regulations and often are dealt with through separate planning mechanisms. Human caused hazards included in the 2009 HMP included hazardous materials incidents. Jeff showed a slide that listed the hazards in the 2009 hazards list. After discussion, the hazards recommended for profiling in the HMP update include:

- Agricultural Hazards
- Avalanche
- Dam Failure
- Drought
- Earthquakes
- Floods
- Human Health Hazards
 - Epidemic/Pandemic
 - West Nile Virus
- Landslides
- Severe Weather
 - Extreme temperatures (heat and cold/Freeze)
 - Fog
 - Heavy rain/Thunderstorm/Hail/Lightning

-
- Snow
 - Tornadoes
 - Soil Hazards
 - Erosion, Subsidence, Expansive soils
 - Volcanoes
 - Wildfire
 - Hazardous materials/transported and fixed facility

In general, the group felt that the list was comprehensive. It was also explained that FEMA does not require human caused hazards, and every hazard profiled must have a mitigation action identified.

Jeff Brislawn asked the group to review the list of hazards and comment on how they could be enhanced or updated with:

- Historic incidents
- Incident logs
- Public perception
- Scientific studies
- Other plans and reports (e.g., flood and drainage studies, CWPPs, Internet databases)
- Recent disasters

Additional insight and details were learned during the conversation among participants. Highlights of the discussion include:

- Flood: The County has experienced flooding in 2017 due to winter storms and high summer snowmelt runoff.
- Subsidence: This has become more of an issue due to heavy groundwater withdrawal during the recent severe multi-year drought. It may be exacerbating flood hazards by lowering levee heights in some areas.
- Levee failure: There have been some concerns with levees and non-leveed embankments, including canal banks that function as levees.
- Wind: Jeff noted this seemed to be omitted in the 2009 plan. The HMPC noted Chinook/Foehn/Mono winds on the east slopes of the Sierra and Santa Ana type winds on the western side of the county. Blowing dust can be an issue with winds in the valley.
- Tree Mortality: Significant tree deaths have occurred in the Sierras and foothills due to long term drought and insect infestations. This needs to be addressed in the plan update; Jeff recommended in drought and wildfire sections are where tree issues/hazards are typically noted.

-
- Public Health: Zika was noted as more of a concern currently than West Nile virus. Air quality issues due to wildfires in other parts of the state was also noted.

Coordinating with Other Agencies\Related Planning Efforts\Recent Studies

A discussion of other agencies that should be coordinated with took place. Those noted included:

- Native American Tribes; County OES noted that they were invited.
- Fresno Council of Governments
- Utility providers in the County – PG&E and Southern California Edison have hydroelectric plants that are susceptible to disasters as well as other power infrastructure that could be affected by various hazards
- Ensure Corp of Engineers and Bureau of Reclamation are included as stakeholders
- Cal DWR and Cal Tech – may have flood/levee risk and subsidence information
- Central Valley Regional Water Quality Control Board is concerned about subsidence and water quality due to groundwater withdrawals.
- Lower San Joaquin Levee District was unable to attend but is planning to participate in the update process.

A discussion on recent studies of hazards in other documents and reports followed. Opportunities for coordinating and cross-referencing the HMP were discussed. Recent studies and related planning efforts included:

- General Plan Background Report and Safety Element revised in 2016
- An Integrated Resource Management Plan for the Southern Sierra is being updated
- CWPP updates: The Oak-Timberline and Hwy 168 Fire Safe Councils have updated CWPPs
- General plan updates are addressing climate change and adaptation
- High Speed Rail construction was noted; an EIS for this project has information on hazards
- A Unit Wide Fire Plan has mitigation initiatives that might relate to the HMP

Planning for Public Involvement

How to involve the public was discussed. The public can be a source of information on hazards and mitigation ideas. Public meetings are scoped to be part of the effort but Jeff recommend ‘piggy backing’ on other public forums where possible to ensure an audience. Suggestions included:

- Outreach through social media
- County General Plan update has a window for public comment in the next two months as well as public meetings and board and commission meetings.

-
- Advertise in Mountain Press
 - Use city websites to link to information on plan
 - Discuss HMP at FireWise and Fire Safe meetings and note in newsletters

Data Collection Needs and Next steps

Jeff noted that he will be in touch to followup on some of the previously identified data sources and plans. A handout was provided for jurisdictions new to the plan, with a companion annex template/worksheet that will need to be completed with input from the jurisdiction. A separate handout was provided to jurisdictions that already have an annex with instructions on how to update some of the information and provide input to Amec Foster Wheeler. A Google Share Drive will be set up for the project to share large documents. A GIS needs list was provided to the County to assist with data collection. Jeff agreed to provide the meeting summary, presentation and sign in sheet by email so that other HMPC members that could not attend today's meeting could get up to speed.

Adjourn

The meeting adjourned at 12:00 pm.

Summary prepared by Jeff Brislawn, Amec Foster Wheeler

Jeff.brislawn@amecfw.com

303-820-4654

1942 Broadway, Suite 314

Boulder, CO 80302

FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN
2017 UPDATE

Risk Assessment and Goals Update Meeting

Friday, October 6, 2017

9:30 am – 12:00 pm

Clovis Fire Headquarters EOC/Training Room 1233 Fifth Street Clovis, CA 93612

- ❖ **Introductions**
- ❖ **Review of the Planning Process**
- ❖ **Review of Identified Hazards**
- ❖ **Vulnerability Assessment Overview by Hazard**
- ❖ **Capabilities Assessment Update**
- ❖ **Updating Goals for the Mitigation Plan**
- ❖ **Mitigation Action Strategy update needs**
- ❖ **Update on Public Involvement Activities/public meeting planning**
- ❖ **Next Steps**
- ❖ **Questions and Answers/Adjourn**

Goals and Objectives from 2009 Plan for Review

Goal 1: Provide Protection for People's Lives from Hazards

Objective 1.1: Provide timely notification and direction to the public of imminent and potential hazards

Objective 1.2: Protect public health and safety by preparing for, responding to, and recovering from the effects of natural or technological disasters

Objective 1.3: Improve community transportation corridors to allow for better evacuation routes for the public and better access for emergency responders

Goal 2: Improve Communities' Capabilities to Mitigate Hazards and Reduce Exposure to Hazard-Related Losses

Objective 2.1: Reduce wildfires/protect life, property, and natural resources from damaging wildfires

Objective 2.2: Reduce flood and storm-related losses

Objective 2.3: Reduce hazards that adversely impact the agricultural industry

Objective 2.4: Minimize the impact to the communities due to recurring drought conditions that impact both ground water supply and the agricultural industry

Objective 2.5: Minimize the risk/loss to endangered species, native plants, land (erosion), and native wildlife

Goal 3: Improve Community and Agency Awareness about Hazards and Associated Vulnerabilities that Threaten Fresno County Planning Area Communities

Objective 3.1: Increase public awareness about the nature and extent of hazards they are exposed to, where they occur, what is vulnerable, and recommended responses to identified hazards (i.e., both preparedness and response)

Goal 4: Provide Protection for Critical Facilities, Utilities, and Services from Hazard Impacts

Goal 5: Maintain Coordination of Disaster Planning

Objective 5.1: Coordinate with changing U.S. Department of Homeland Security/FEMA needs

Objective 5.2: Coordinate with other community plans

Objective 5.3: Maximize the use of shared resources between jurisdictions and special districts for mitigation/communication

Objective 5.4: Standardize systems among agencies to provide for better interoperability

Goal 6: Maintain/Provide for FEMA Eligibility and Work to Position Jurisdictions for Grant Funding

Objective 6.1: Provide County departments and other jurisdictions with information regarding mitigation opportunities

Objective 6.2: As part of plan implementation, review actions in this plan on an annual basis to be considered for annual FEMA Pre-Disaster Mitigation grant allocations or after a presidential disaster declaration in California for Hazard Mitigation Grant Program funding as well as for other local, state, and federal funding opportunities

SIGN-IN SHEET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC #2 – Risk Assessment and Goals Meeting
Friday Oct 6, 2017 9:30am-12:00pm
Clovis Fire Headquarters 1233 Fifth St Clovis, CA

Name	Jurisdiction/Org./Citizen	Title	Phone	E-mail
Angel Lopez	Fresno County OES	Analyst	600-4604	AngelLopez@Co.Fresno.ca.us
Ken Austin	Fresno County OES	Emergency Manager	600-4065	kaustin@co.fresno.ca.us
Jeff Brislawn	AMEC Foster Wheeler	Project Mgr	303-704-5506	jeff.brislawn@amecfw.com
Stanley Sasaki	Alta Irrigation District	Interim Superintendent	805-7522	ss@altaid.org
BOB LADONARSIAN	WINTER HARBOR	PRINCIPAL	914 347.2784	BOB LADONARSIAN@WINTERHARBOR.CA.US
Armando Menara	Fresno Co.	Rd Superintendent	600-4249	armendoza@Co.Fresno.ca.us
Ahla Yang	Fresno County	Analyst	600-5909	ahlayang@co.fresno.ca.us
LADONIA CRANE	Fresno County	Fire Chief	359-2088	m.lcranes@netptc.net
Kathy Curtice	Fresno Sheriff	Lieutenant	600-8039	Kathy.Curtice@fresnosheriff.org
Dan Mather	Fresno Co.	Supervising Inspector	600-4219	dmather@co.fresno.ca.us
Terri Mejerado	CAGW. Office of Emergency Services	ESC	259-9890	terri.mejerado@caloes.ca.gov
LAWRENCE KIMURA	FRESNO Irrigation DIST	CANAL ENGR	233-7161	LKimura@fresnoirrigation.com
Dale Siemer	Fresno Co.	Supervising Engr	600-4327	dsiemer@co.fresno.ca.us
Jim Anderson	Malaga CWD	GM	485-7353	ja@malagacwd.org
Frankie Olivas	City of Selma	Admin Analyst	(559) 891-2200 x 5106	Polivares@cityofselma.com

Clovis Fire Headquarters 1233 Fifth St Clovis, CA

[illegible]

**Summary of the Fresno County
Multi-Jurisdictional Hazard Mitigation Plan Update
Risk Assessment and Goals Meeting**

**October 6, 2017
9:30– 12 PM**

Clovis Fire Headquarters EOC/Training Room 1233 Fifth Street Clovis, CA 93612

Introductions and Opening Remarks

Jeff Brislawn of Amec Foster Wheeler, the consulting firm hired to facilitate the plan development process, began the meeting with welcoming remarks. Twenty eight persons were present and documented on a sign in sheet.

Review of Mitigation, Disaster Mitigation Act (DMA) Requirements, and the Planning Process

Following introductions a PowerPoint presentation was presented by Jeff Brislawn. Jeff reviewed the planning process being followed and discussed the project status. Jeff emphasized that jurisdictions that have not submitted a review and edit of their jurisdictional annex to do so as soon as possible. New jurisdictions to the plan should also submit information requested in the data collection guide to indicate their intent to participate in the plan and provide a basis for the development of an annex.

Risk Assessment Presentation and Discussion

Jeff outlined the general risk assessment requirements before beginning a detailed discussion of each hazard. He presented highlights on each hazard included in the updated risk assessment chapter of the plan. Refer to the Fresno County HMP Risk Assessment PowerPoint presentation for specific details on each hazard and a handout summarizing hazard significance.

Additional insight and details were learned during the risk assessment conversation among participants. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion
Agricultural Hazards	<ul style="list-style-type: none"> No comment
Avalanche	<ul style="list-style-type: none"> No comment
Dam Failure	<ul style="list-style-type: none"> The significance of this hazard could be changed from High to Medium based on low probability. However, HMPC members are concerned about the volume of water released from spillway overflows, which can happen more frequently and did this year.
Drought	<ul style="list-style-type: none"> It was suggested to look at vulnerability in both Tier I and Tier II tree mortality areas. Tree fall risk to campgrounds and recreating populations from May-Oct should be noted; National Parks also.
Earthquake	<ul style="list-style-type: none"> County is doing an assessment of conditions of county owned buildings, not specific to earthquake but could have potentially useful information. There has not been an inventory of unreinforced masonry buildings done. The year built could be a used as an indicator as older buildings built prior to modern building codes could be more vulnerable.
Flood	<ul style="list-style-type: none"> Levee failure has been added in the flood hazard profile The levee and Fresno Slough was close to overtopping during runoff this year; came close to evacuation of residents in the area. Subsidence has caused a 4' drop on the Kings River Bypass levee Drought has also enabled the buildup of silt and sediment, which reduces the design flows. There is a need to remove sediment and vegetation in some areas. Potential for agricultural losses was noted The county relies heavily on major flood control facilities for mitigation; the Fresno Metropolitan Flood Control District mentioned they could provide an updated list of these.
Human Health Hazards: Pandemic	<ul style="list-style-type: none"> No comment.
Human Health Hazards: West Nile Virus	<ul style="list-style-type: none"> It was noted that Zika is a potential concern, but no evidence of it yet in local mosquitos.
Landslide	<ul style="list-style-type: none"> Hwy 164 corridor had issues a couples years ago that were being addressed by CalTrans. West side of county has highest potential Removal of dead trees might make slopes more susceptible to landslides and erosion Huntington Lake Road was also noted as a problem area.
Severe Weather: Extreme Temperatures Fog Hailstorm Thunderstorm Lightning Tornado Windstorm Snow	<ul style="list-style-type: none"> Several sub-hazards of Severe Weather were discussed. Wind is a greater concern lately with potential to knock down trees weakened by drought and disease.
Soil Hazards: Erosion	<ul style="list-style-type: none"> Runoff and erosion in the Rough Fire burn scar has caused siltation in some reservoirs.
Soil Hazards: Land Subsidence	<ul style="list-style-type: none"> See comments in flood section regarding levee impacts. This hazard should be raised from low to medium significance.

Hazard or Topic	Meeting Discussion
Soil Hazards: Expansive soils	<ul style="list-style-type: none"> No comment
Volcano	<ul style="list-style-type: none"> If ash falls on snow it could lead to rapid snowmelt which could have a cascading impact on dams (water quality) and possibly affect water availability (drought).
Wildfire	<ul style="list-style-type: none"> Integration of priority landscapes from 2010 FRAP document discussed. Comment that the "rangeland" priority landscape should be included.
Hazardous Materials	<ul style="list-style-type: none"> An updated inventory of hazardous materials facilities is being researched. The specific details on these may not be presented in the updated plan since it is a public document.

Capability Assessment Update

Jeff touched on some of the highlights of the capability assessment. Highlights include the County and City of Fresno's participation in the Community Rating System. The update of the County's General Plan will include a policy with direct reference to the HMP, and will formally incorporate the HMP by reference.

Plan Goals Update

The HMPC reviewed the goals and objectives from the previous plan to see if they were still relevant or needed updating. In general the group thought was they were still valid. The HMPC also wanted to integrate more language related to resilience in Goal 2. Jeff will revise Goal 2 per the suggestion and the group will revisit the goals for finalization at the beginning of the next meeting.

Mitigation Action Strategy update needs

Jeff noted that the mitigation action strategy will be revisited moving forward and will be the focus of the next HMPC meeting. Jeff recommended that the existing mitigation actions be reviewed by the HMPC as a status report will need to be completed for each action. Jeff will send out a worksheet to help facilitate the status reporting prior to the next meeting. There will be an opportunity to develop new mitigation actions for the plan as well. These will be identified at the next meeting.

Update on Public Involvement Activities/public meeting.

An online public survey will be developed as part of the public process; when ready the link will be provided for distribution by email and posting on jurisdiction websites. A public meeting will occur in November during the week the same timeframe as the next HMPC meeting with details forthcoming.

Plan Timeline/Next steps

The next and final HMPC planning meeting will be during the week of November 13th. The purpose of this meeting is to develop mitigation actions for the plan. Once a date has been identified, a calendar update will be sent out to save the date. The meeting materials will also be shared electronically, including the presentation and handouts.

The meeting adjourned at noon.

From: Brislawn, Jeff P
Sent: Wednesday, November 01, 2017 2:22 PM
To: Wilma.Quan-Schechter@fresno.gov; daniel.vasquez@fresno.gov;
lukes@cityofclovis.com; chadf@ci.clovis.ca.us; mtrejo@coalinga.com;
dgabriel@coalinga.com; bgallegos@ci.firebaugh.ca.us;
Salvador.Raygoza@fcle.org; jdavis@ci.fowler.ca.us; Mlopez@ci.fowler.ca.us;
jcastro001@yahoo.com; georgeturegano@fcle.org; jkunkel@cityofkerman.org;
joseph.blohm@fcle.org; ahenderson@cityofkingsburg-ca.gov;
captosborne@cityofkingsburg-ca.gov; vincedimaggio@cityofmendota.com;
samescobar@cityoforangecove.com; rick.ehle@fcle.org;
nicole.zieba@reedley.ca.gov; jerry.isaak@reedley.ca.gov;
elizabethn@cityofsanjoaquin.org; tchapa@ci.sanger.ca.us;
gregt@ci.sanger.ca.us; DavidE@CityofSelma.com; myrond@cityofselma.com;
folivares@cityofselma.com; rpud@sbcglobal.net; Jim.McDougald@FIRE.ca.gov;
Chris.Christopherson@fire.ca.gov; matt_furrer@emcorgroup.com;
camahoo@yahoo.com; chief@pineridgefire.org;
r.michaels@orangecovefire.com; michaelk@cityofselma.com;
jhuneke@eaglabs.com; miz5150@netptc.net; howardh@csufresno.edu;
bcservices218@gmail.com; office@biolabci.org; carutherscsd@sbcglobal.net;
drcsd@pacbell.net; emailccservices@gmail.com; latonwater@sbcglobal.net;
SierraCedarsCSD@gmail.com; DMERRITT@KRCD.ORG; jcascia@panochewd.org;
bryant_jeff@sbcglobal.net; ashbrook.don@gmail.com; ocfpd@hotmail.com;
andrewr@fresnofloodcontrol.org; brenthts@fresnofloodcontrol.org;
ipf@altaid.org; ss@altaid.org; cwhite@ccidwater.org; mmacias@cidwater.com;
pdesatoff@cidwater.com; ssingh@fresnoirrigation.com;
lkimura@fresnoirrigation.com; sstadler@jamesid.org; scott@lagunaid.com;
jsanders@orangecoveid.org; riverdaleid@sbcglobal.net; liz@trqid.com;
lsjld@elite.net; smulligan@mosquitobuzz.net; Julia@fresnomosquito.org;
ppud@att.net; jandsiliznoff@outlook.com; carlson@griswoldlasalle.com;
admin@sierrarcid.com; Craig.Jones@colostate.edu; gerstenb@jps.net;
cannon@bfarm.com; sandrits@netptc.net; danny@trqid.com;
hydrobuffalo@sbcglobal.net; bormonde@westlandswater.org;
firebaughcanal@sbcglobal.net; donnahrc@aol.com; rcozzie@aol.com;
kjohansen@ppeng.com; rhopkins@ppeng.com; stevesloan31@yahoo.com;
donna_cfy@yahoo.com; gunlund@sbcglobal.net; associate@slwd.net;
hsimmons@ppeng.com; jgutierrez@westlandswater.org;
danpearce@waterworksdist18.com; pe-pcwg@sbcglobal.net;
mogdeb@aol.com; lcortez@malagacwd.org; tsiphonsay@malagacwd.org;
lfreeman@sjrecwa.net; Seyed.Sadredin@valleyair.org;
roger.mccoy@valleyair.org; carl.carlucci@cdph.ca.gov;
sharri_bender_ehlert@dot.ca.gov; shane.gunn@dot.ca.gov; iris@water.ca.gov;
promero@water.ca.gov; faulkenb@water.ca.gov; fmarquez@tmr.org;
slittlebucknaylor@fs.fed.us; cballard@fs.fed.us; johngoss@fs.fed.us;
thomas.jehrke@usace.army.mil; michael.r.erskine@usace.army.mil;
mjackson@usbr.gov; dstroup@usbr.gov; greyes@usbr.gov; hough@usgs.gov;
terri.mejorado@caloes.ca.gov; jrousseau@co.fresno.ca.us;
dpomaville@co.fresno.ca.us; DSchmidt@co.fresno.ca.us;
scrump@co.fresno.ca.us; gdelacerda@co.fresno.ca.us; AOrtiz@co.fresno.ca.us;
wafox@co.fresno.ca.us; stwhite@co.fresno.ca.us; BJimenez@co.fresno.ca.us;
jthompson@co.fresno.ca.us; WKettler@co.fresno.ca.us;

CJonas@co.fresno.ca.us; RPalacios@co.fresno.ca.us; rishii@co.fresno.ca.us;
armendoza@co.fresno.ca.us; jcoffman@co.fresno.ca.us;
ADBuchanan@co.fresno.ca.us; DSiemer@co.fresno.ca.us;
lasprec@co.fresno.ca.us; sartal@co.fresno.ca.us; knehring@co.fresno.ca.us;
lwright@co.fresno.ca.us; rbash@co.fresno.ca.us; jbarr@co.fresno.ca.us; Yang,
Ahla; margaret.mims@fresnosheriff.org; john.zanoni@fresnosheriff.org;
kathy.curtice@fresnosheriff.org; Lopez, Angel; Austin, Kenneth
Cc: larry@mintierharnish.com; bob@mintierharnish.com; roa1@comcast.net; Purvis,
Leslie
Subject: Public survey on Fresno County Multi-jurisdictional Hazard Mitigation Plan update
and public meeting press release
Attachments: Fresno HMP Nov 16 Public meeting press release.docx

A public survey has been developed as part of the public input process to the Fresno County Hazard Mitigation Plan update. Please distribute the link to the survey below broadly through local media or social media outlets. I also recommend posting it on each jurisdiction's homepage. Please document how the survey is advertised or shared by sending me an email. A press release for a public meeting on November 16th is also attached. The survey and public meeting are meant for the public and not for the HMPC; HMPC attendance at the public meeting is welcome but not required.

Here is some suggested text to advertise the public survey when sharing the link:

Input on hazards and hazard planning solicited:

Fresno County is updating its Multi-Jurisdictional Hazard Mitigation Plan and is soliciting public input with a short survey. The purpose of this survey is to collect information from the public and stakeholders to better understand hazard vulnerabilities within the County as well as solicit input on needs to best mitigate, or reduce, the impacts of natural and human-caused hazards. Please complete this survey via the link below by November 30, 2017.

<https://www.surveymonkey.com/r/FresnoHMP>

In addition, a public meeting will be held Thursday, November 16 from 6:00 to 9:00 pm at the Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612. Attendees will learn more about the hazards and strategies to mitigate them at this meeting. Public input is also being sought on these same topics at this meeting.

Jeff Brislawn

Hazard Mitigation Lead/Sr Associate

Amec Foster Wheeler

Environment & Infrastructure/Hazard Mitigation and Emergency Management Program

1942 Broadway, Suite 314, Boulder CO, 80302

Direct 303-209-3781, mobile/cell 303-704-5506

jeff.brislawn@woodplc.com

www.amecfw.com www.woodplc.com

As of 10-9-17 Amec Foster Wheeler's corporate name is Wood due to acquisition by Wood Group.

FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN
2017 UPDATE

MITIGATION STRATEGY MEETING

Thursday, November 16th, 2017
9:30 to noon

Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612

- ❖ **Introductions**
- ❖ **Review of the Planning Process and HIRA Recap**
- ❖ **Public survey interim results and public meeting**
- ❖ **Finalizing Updated Goals**
- ❖ **Review of possible mitigation activities and alternatives**
- ❖ **Discuss criteria for mitigation action selection and prioritization**
- ❖ **Review of progress on existing actions in the plan**
- ❖ **Brainstorming Session: Development of new mitigation actions (group process)**
- ❖ **Prioritize mitigation actions (group process)**
- ❖ **Discuss plan implementation and maintenance**
- ❖ **Discuss next steps/Questions and Answers/Adjourn**

SIGN-IN SHEET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC #3 – Mitigation Strategy Meeting
November 16, 2017 9:30am-12:00pm
Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612

Name	Jurisdiction/Org./Citizen	Title	Phone	E-mail
Myron Dyck	City of Selma	Lieutenant	(559) 896-2525	Myron.dyck@cityofselma.com
JERRY ISAAC	CITY OF REEDLEY	FIRE CHIEF	637-4230	jerry.isaac@reedley.ca.gov
SAL RAYGOZA	CITY OF FIREBAULT	CHIEF	694-1520	salvador.raygoza@fcl.org
Daniel Vasquez	City of Fresno	EPO	970-8873	Daniel.Vasquez@fresno.gov
Craig Jones	Sierra RCD	Project Mgr	303 443-2038	craigj@colostate.edu
Reggie Hill	Lower San Joaquin L.D.	Manager	209-387-4545	isjld@elite.net
ANDREW KENNIS	FMFCD	Asst Mgr	559-785-0411	andrew.kennis@fresno.gov
John Robertson	City of Reedley	City Engineer	559 637 4200	John.Robertson@reedley.ca.gov
Kathy Curtice	Fresno Sheriff	Lieutenant	559-600-8009	Kathy.Curtice@fresnosheriff.org
Manuel Lopez	City of Fowler	Fire Chief	559 351-1002	MLOPEZ@cityof.fowler.ca.us
BOB LAGOMASSINO	MILITARY HARBOR	PRINCIPAL	910 347-2786	BOB LAGOMASSINO
GILBERT REYES	BOR	CHIEF OF OPERATIONS	559-487-5520	GREYES@USDHHS.GOV
Jim McDougall	CAL FIRE	Div Chief	559-281-4304	

SIGN-IN SHEET
FRESNO COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PROJECT
HMPC #3 – Mitigation Strategy Meeting
November 16, 2017 9:30am-12:00pm
Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612

Name	Jurisdiction/Org./Citizen	Title	Phone	E-mail
Elizabeth Nunez	city of San Joaquin	City Manager	Le93-4311	elizabethn@cityofsanjoaquin.org
Chad Fitzgerald	City of Clovis	Emergency Mgr.	593-3285	chad@cityofclovis.com
Ahla Yang	County of Fresno	Analyst	600-5909	ahlayang@co.fresno.ca.us
Jordan Scott	Co. of Fresno	PIO	600-1224	jiscott@co.fresno.ca.us
Israel Sanchez	Westlands Water District	Resource Engineer	241-6237	isanchez@westlandswater.org
Sen Saetern	Fresno IRRIGATION DISTRICT	ENGINEER	233-7161 x7406	SSAETERN@fresnoirrigation.com
LEONARDO ASPER	Co of Fresno	FWP Bus Mgr	600-4258	lasper@co.fresno.ca.us
BRENT SUMANOTO	FMFCD	OPERATIONS ENGINEER	456-3292	BRENT@FRESNOIRROIGATION.org
Souha Lee	Kings River Conservation Dist.	Resource Analyst	237-5567	Slee@KRED.org
WAYNE GABRIEL	CITY OF COALINGA	FIRE CHIEF	935-1652	wgabriel@coalinga.com
Pete Preciado	" "	Public Works Dir	935-1533	ppreciado@coalinga.com
Greg Taralau	Sanger City	Fire Chief	875-6568	gregt@ci.sanger.ca.us

November 16, 2017 9:30am-12:00pm
Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612

[illegible]

Public Notice Ad

Public Meeting on the Fresno County Multi-Hazard Mitigation Plan Update

Location: Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612

Thursday, November 16th, 2017 at 6:00-9:00 pm.

In recent months California and the U.S. has experienced significant natural disasters. Would you like to learn more about hazards that could impact Fresno County including floods, dam failures, wildfires, drought, and other hazards? A public forum to discuss these hazards, and how the County is proposing to mitigate or lessen their impact, will be held November 16th. The Fresno County Hazard Mitigation Plan is being updated under the guidance of a multi-jurisdictional Hazard Mitigation Planning Committee (HMPC) with assistance from a consultant and a FEMA grant. Attendees will learn more about the hazards and strategies to mitigate them at this meeting. Public input is also being sought on these same topics at this meeting. A short public survey related to the plan update can be accessed at:

<https://www.surveymonkey.com/r/FresnoHMP>

November 16, 2017 6:00-9:00pm
Clovis Veterans Memorial District, 808 4th Street, Clovis, CA 93612

[illegible]



Fresno County Hazard Mitigation Plan

Public survey November 2017

Online version can be found at <https://www.surveymonkey.com/r/FresnoHMP>

Background: Fresno County is updating its Multi-Hazard Mitigation Plan in 2017 per the five-year update cycle required by FEMA and the federal Disaster Mitigation Act of 2000. The purpose of this survey is to collect information from the public and stakeholders to better understand the vulnerabilities within the County and solicit input on how to best mitigate, or reduce, the impacts of natural disasters. Please complete this survey by **November 30, 2017**.

1. The hazards addressed in the Hazard Mitigation Plan are listed below. Please indicate the level of significance in your community that you perceive for each hazard. Please rate these hazards 1 through 3 as follows: 1=low, 2=moderate, 3=high.

- | | |
|---|--|
| <input type="checkbox"/> Severe Weather: Extreme Temperatures | <input type="checkbox"/> Severe Weather: Fog |
| <input type="checkbox"/> Severe Weather: Heavy Rain / Thunderstorm / Hail / Lightning | <input type="checkbox"/> Severe Weather: Snow |
| <input type="checkbox"/> Severe Weather: Tornado | <input type="checkbox"/> Agricultural Hazards |
| <input type="checkbox"/> Avalanche | <input type="checkbox"/> Dam Failure |
| <input type="checkbox"/> Drought | <input type="checkbox"/> Tree Mortality |
| <input type="checkbox"/> Earthquake | <input type="checkbox"/> Flood |
| <input type="checkbox"/> Human Health Hazards: Epidemic/Pandemic | <input type="checkbox"/> Human Health Hazards: West Nile Virus |
| <input type="checkbox"/> Landslide | <input type="checkbox"/> Soil Hazards: Erosion |
| <input type="checkbox"/> Soil Hazards: Expansive or Swelling Soils | <input type="checkbox"/> Soil Hazards: Land Subsidence |
| <input type="checkbox"/> Volcano | <input type="checkbox"/> Wildfire |
| <input type="checkbox"/> Windstorm | |

2. Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:

3. The following types of mitigation actions may be considered in the plan. Please place a check ☒ next to the types of mitigation actions that you think should have the highest priority in the plan.

- | | |
|--|---|
| <input type="checkbox"/> Wildfire fuels treatment projects | <input type="checkbox"/> Stormwater drainage improvements |
| <input type="checkbox"/> Assistance with defensible space | <input type="checkbox"/> Forest health/watershed protection |
| <input type="checkbox"/> Continued participation in the National Flood Insurance Program | <input type="checkbox"/> Flood mitigation |
| <input type="checkbox"/> Critical facilities protection | <input type="checkbox"/> Education and discounts on flood insurance |
| <input type="checkbox"/> Generators for critical facilities | <input type="checkbox"/> Floodprone property buyout |
| <input type="checkbox"/> Planning/Zoning | <input type="checkbox"/> Warning and notification systems |
| <input type="checkbox"/> Public education/awareness | <input type="checkbox"/> Landslide/mudslide mitigation |
| <input type="checkbox"/> Hazardous tree removal | <input type="checkbox"/> Evacuation route development |



Fresno County Hazard Mitigation Plan

Public survey November 2017

Online version can be found at <https://www.surveymonkey.com/r/FresnoHMP>

4. Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters.

5. How would you describe the region where you reside?

☐ San Joaquin Valley

☐ Sierra Nevada Mountains / Foothills

☐ Western Coastal Range

☐ Other: _____

6. Indicate the community where you live:

☐ Unincorporated County

☐ City of Coalinga

☐ City of Fowler

☐ City of Huron

☐ City of Kingsburg

☐ City of Orange Cove

☐ City of Reedley

☐ City of Sanger

☐ Other: _____

☐ City of Clovis

☐ City of Firebaugh

☐ City of Fresno

☐ City of Kerman

☐ City of Mendota

☐ City of Parlier

☐ City of San Joaquin

☐ City of Selma

7. Please indicate the type of environment you reside in:

☐ Grassland/plains

☐ Urban

☐ River/riparian

☐ Forest

☐ Suburban

☐ Other: _____

8. Optional: Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process.

Name: _____

Email: _____

Please return survey responses by November 30, 2017 to

Leslie Purvis, LEP

Amec Foster Wheeler/Wood plc

1281 East Alluvial Avenue, Suite 101

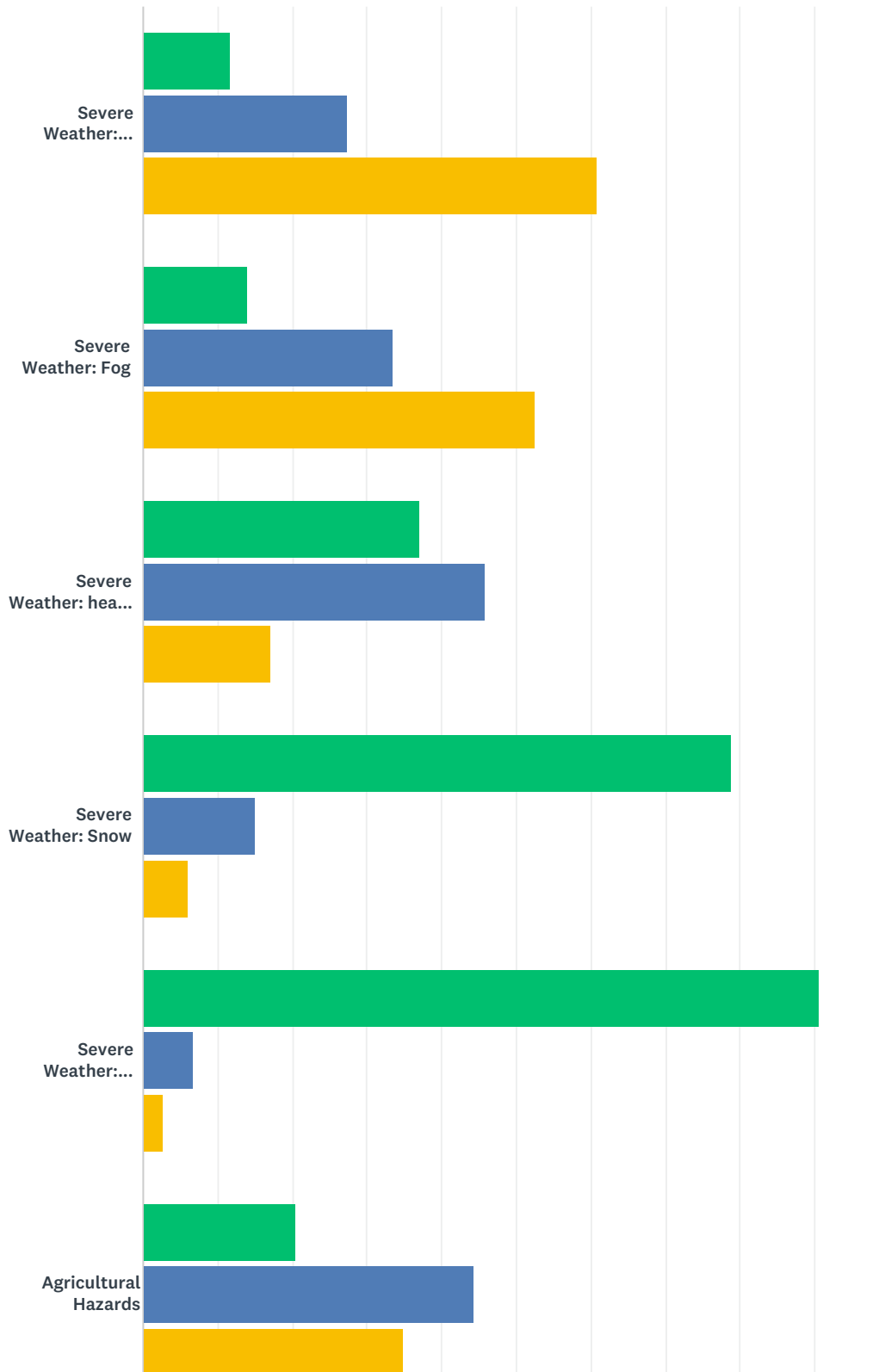
Fresno, CA 93720

Leslie.Purvis@woodplc.com

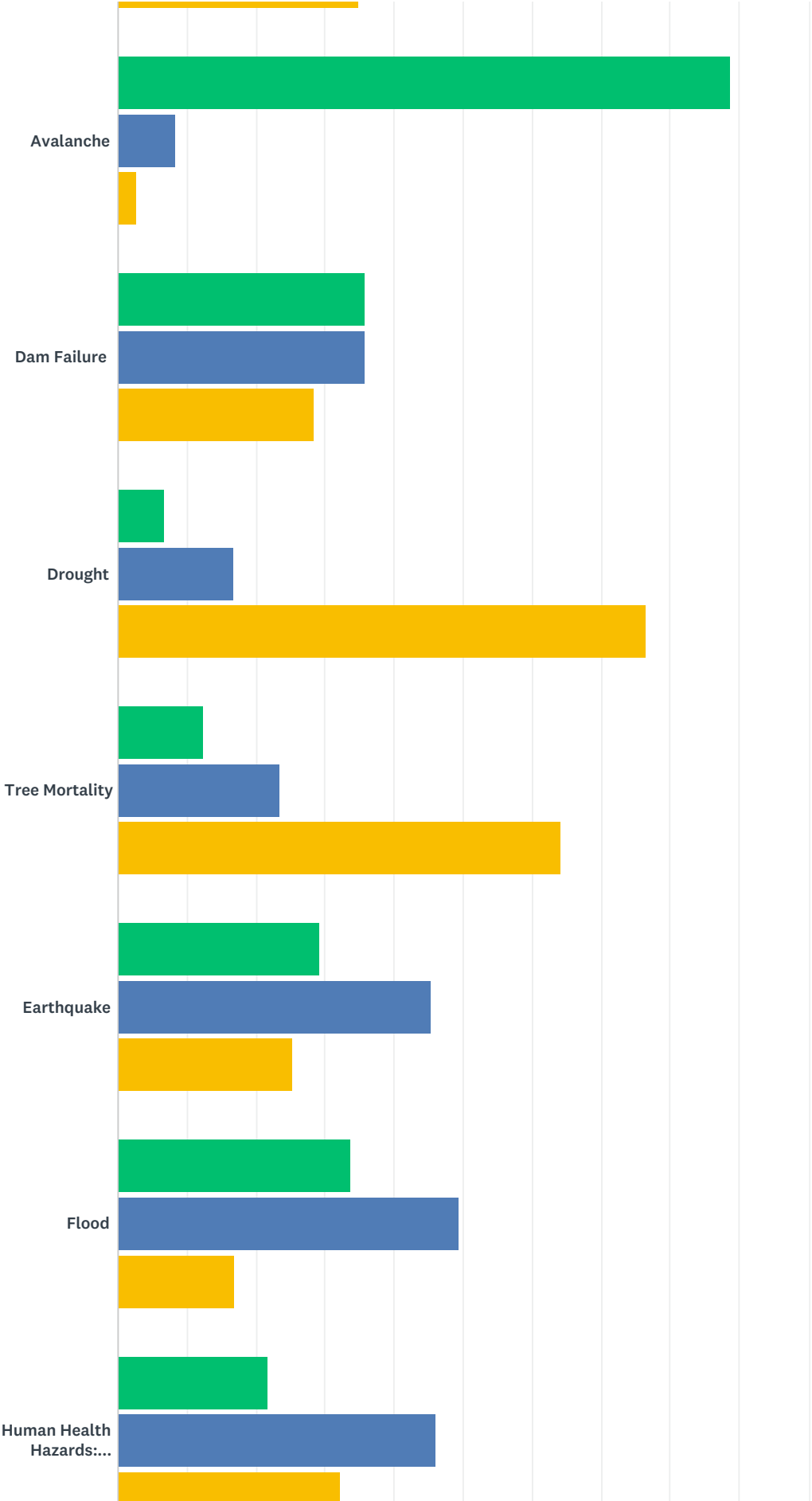
559-892-2921

Q1 The hazards addressed in the Multi-Hazard Mitigation Plan update are listed below. Please indicate the level of significance in the County that you perceive for each hazard.

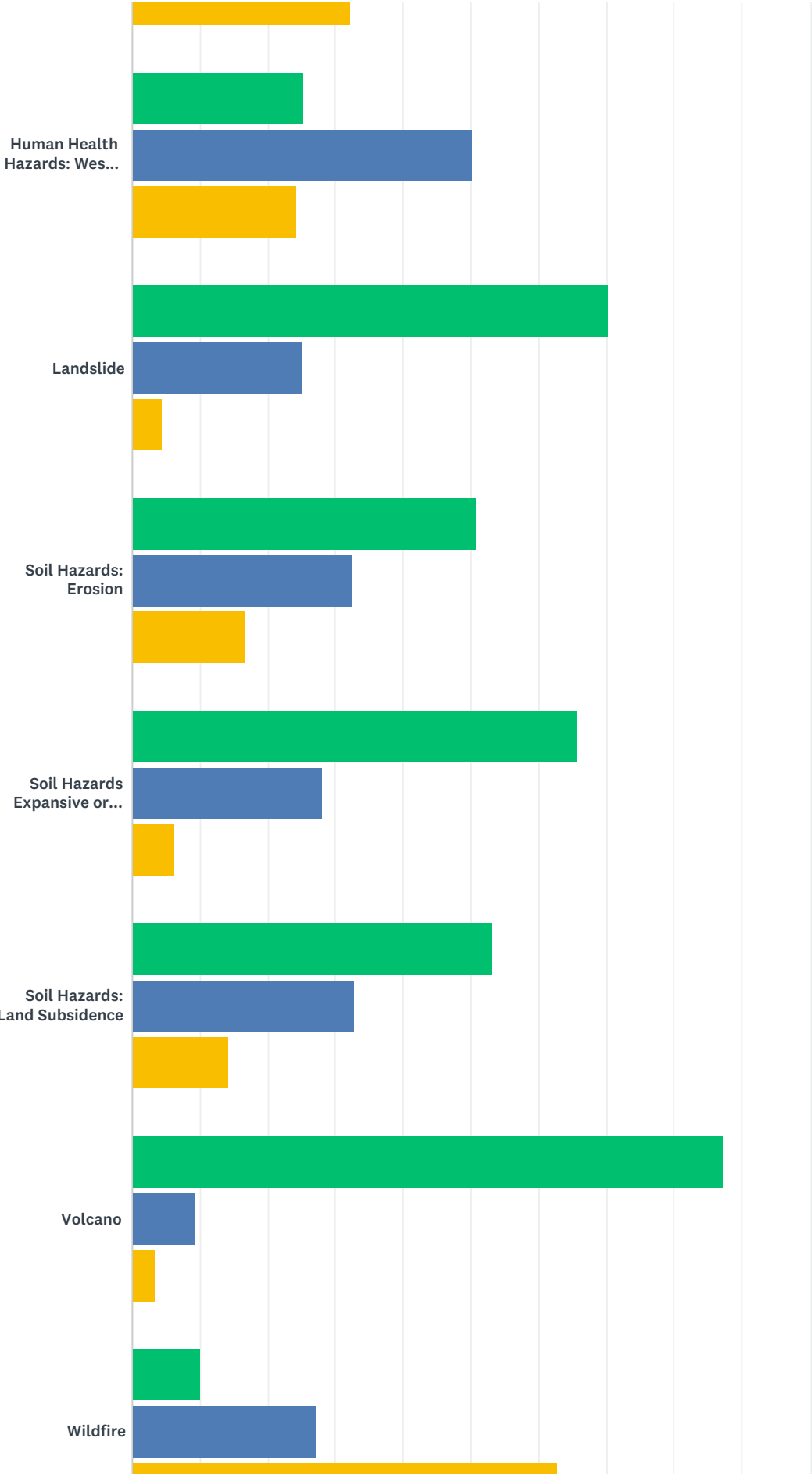
Answered: 183 Skipped: 1



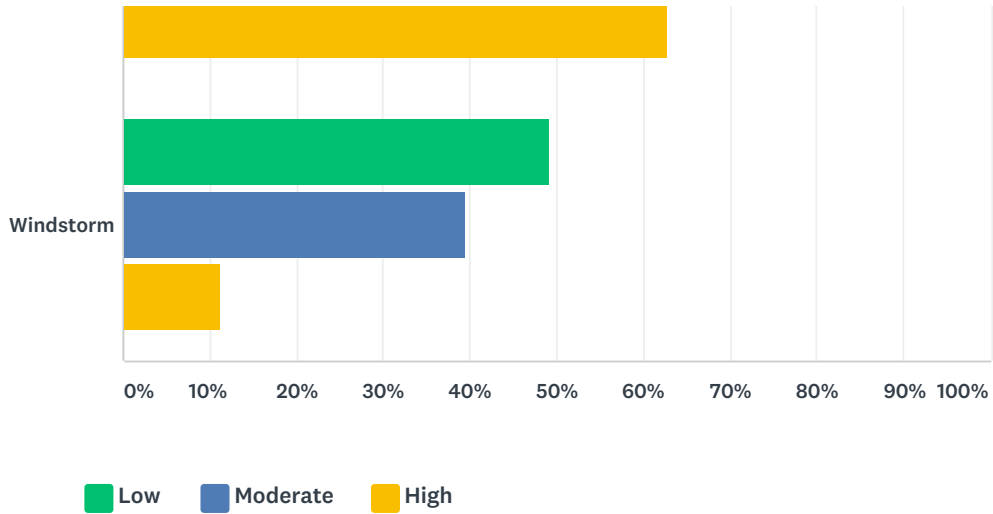
Fresno County Hazard Mitigation Plan Update Public Input Survey



Fresno County Hazard Mitigation Plan Update Public Input Survey



Fresno County Hazard Mitigation Plan Update Public Input Survey



	LOW	MODERATE	HIGH	TOTAL
Severe Weather: Extreme Temperatures	11.73% 21	27.37% 49	60.89% 109	179
Severe Weather: Fog	13.97% 25	33.52% 60	52.51% 94	179
Severe Weather: heavy Rain/Thunderstorm/Hail/Lightning	37.02% 67	45.86% 83	17.13% 31	181
Severe Weather: Snow	78.89% 142	15.00% 27	6.11% 11	180
Severe Weather: Tornado	90.50% 162	6.70% 12	2.79% 5	179
Agricultural Hazards	20.56% 37	44.44% 80	35.00% 63	180
Avalanche	88.76% 158	8.43% 15	2.81% 5	178
Dam Failure	35.75% 64	35.75% 64	28.49% 51	179
Drought	6.67% 12	16.67% 30	76.67% 138	180
Tree Mortality	12.29% 22	23.46% 42	64.25% 115	179
Earthquake	29.28% 53	45.30% 82	25.41% 46	181
Flood	33.71% 60	49.44% 88	16.85% 30	178
Human Health Hazards: Epidemic/Pandemic	21.67% 39	46.11% 83	32.22% 58	180
Human Health Hazards: West Nile Virus	25.41% 46	50.28% 91	24.31% 44	181
Landslide	70.39% 126	25.14% 45	4.47% 8	179
Soil Hazards: Erosion	50.84% 91	32.40% 58	16.76% 30	179
Soil Hazards Expansive or Swelling Soils	65.73% 117	28.09% 50	6.18% 11	178

Fresno County Hazard Mitigation Plan Update Public Input Survey

Soil Hazards: Land Subsidence	53.11% 94	32.77% 58	14.12% 25	177
Volcano	87.15% 156	9.50% 17	3.35% 6	179
Wildfire	10.00% 18	27.22% 49	62.78% 113	180
Windstorm	49.15% 87	39.55% 70	11.30% 20	177

Q2 Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:

Answered: 60 Skipped: 124

#	RESPONSES	DATE
1	fires	1/11/2018 11:10 AM
2	NO	1/5/2018 10:35 AM
3	Civil disobedience	1/1/2018 10:53 PM
4	North Korea nuke attack	12/12/2017 2:45 PM
5	Yes. Along Dinkey Creek Road east of Hwy 168	11/27/2017 8:36 PM
6	Wildfires- Foothills	11/27/2017 10:11 AM
7	no	11/26/2017 10:07 PM
8	Wildfire mitigation (foothills)	11/24/2017 11:52 AM
9	Fire Protection, Fresno County Fire Protection District	11/19/2017 8:36 AM
10	none	11/17/2017 9:43 AM
11	OES - If the Long Valley Caldera etc. should have an event during a heavy snow year, I've heard that the ash fall could result in a catastrophic melt/flood scenario.	11/17/2017 5:14 AM
12	Trucking/railway on highways	11/16/2017 8:42 PM
13	handling "mass" > than say 12 casualties cause by the same problem	11/16/2017 5:18 PM
14	Drought. Lawns should be outlawed, period. Trees and drought-tolerant landscapes only.	11/16/2017 12:17 PM
15	United States Coast Guard Auxiliary (Fire/Water/Disasters,etc)	11/16/2017 11:37 AM
16	Climate change and its ability to increase current hazards	11/15/2017 12:41 PM
17	No	11/15/2017 8:57 AM
18	terrorist activities, Sheriff	11/14/2017 9:55 PM
19	Emergency Safe drinking supply - Northeast Fresno County, Orange Cove	11/14/2017 5:46 PM
20	no	11/14/2017 11:28 AM
21	Fresno City-Gang/riots/social unrest	11/14/2017 11:01 AM
22	No	11/10/2017 10:24 PM
23	Fresno County	11/10/2017 10:12 PM
24	No	11/10/2017 12:34 PM

Fresno County Hazard Mitigation Plan Update Public Input Survey

25	Worse 24-7 biting mosquitoes after July 2017Release of altered mosquitoes, which drifted, re-colonized throughout SE Fresno causing UNNECESSARY pain to an area that had never had a Mosquito problem to begin with. We've had to seek doctor's mosquito bite infection advice on the very young and our adult selves! We have had very wet rainy seasons in the past without mosquito problems, that we had to endure this summer into autumn, unnecessarily. When you release a "questionable" live flying mating entity into a "nearby" population that unites with additional neighborhoods, your going to get overwhelming "drift, relocation, re-colonization." We were never asked our permission to be "experimented on" before the "Release!" Please protect our neighborhood families from further experimentation with latent issues maybe down the road.	11/10/2017 11:37 AM
26	Keep the rivers clean of debre so the water can flow	11/10/2017 10:14 AM
27	No.	11/10/2017 8:46 AM
28	wild fires, Fresno county and hill sides surrounded.	11/10/2017 7:51 AM
29	Highway 180 corridor, eastern Fresno County	11/9/2017 4:02 PM
30	Fires, road erosion, flooding mountain areas like Squaw Valley; dam/levee problems including outer areas of Mendota etc.	11/7/2017 8:55 PM
31	Wildfires, drought	11/7/2017 8:27 PM
32	Not at this time.	11/7/2017 10:34 AM
33	Dam Failure	11/6/2017 3:29 PM
34	No	11/6/2017 2:30 PM
35	Dust/visual imparment/respiratory imparment created from ag field plowing/discing	11/5/2017 10:32 PM
36	Canal breech in the valley	11/4/2017 6:53 AM
37	Power outage	11/4/2017 5:41 AM
38	N/A	11/3/2017 3:46 PM
39	Rising use and abuse of opioids	11/3/2017 3:19 PM
40	agressive homeless people	11/3/2017 10:28 AM
41	None at this time, thank you	11/3/2017 8:15 AM
42	No	11/3/2017 7:22 AM
43	Widespread and extended time of power outage.	11/3/2017 1:41 AM
44	No	11/2/2017 11:12 PM
45	Brown water coming from the older drinking fountains at Fresno High School	11/2/2017 9:28 PM
46	Dry Creek is under ground in my neighborhood, which doesn't seem safe for a waterway that can flood	11/2/2017 9:26 PM
47	He flooding during intense rain. Our current drainage system can't keep up with it.	11/2/2017 4:52 PM
48	None	11/2/2017 4:11 PM
49	Foot hills	11/2/2017 3:01 PM
50	No	11/2/2017 2:12 PM
51	N/A	11/2/2017 2:09 PM
52	Pesticides and production chemicals	11/2/2017 1:58 PM
53	Fire like they had in Santa Rosa	11/2/2017 1:48 PM
54	Flooding on the freeways during an intense storm, specifically highway 168 between shields and highway 180	11/2/2017 12:54 PM
55	Dams	11/2/2017 12:45 PM
56	Power lines falling & outage; fire; high winds	11/2/2017 12:42 PM
57	No	11/2/2017 12:33 PM
58	Drought Selma	11/1/2017 3:56 PM

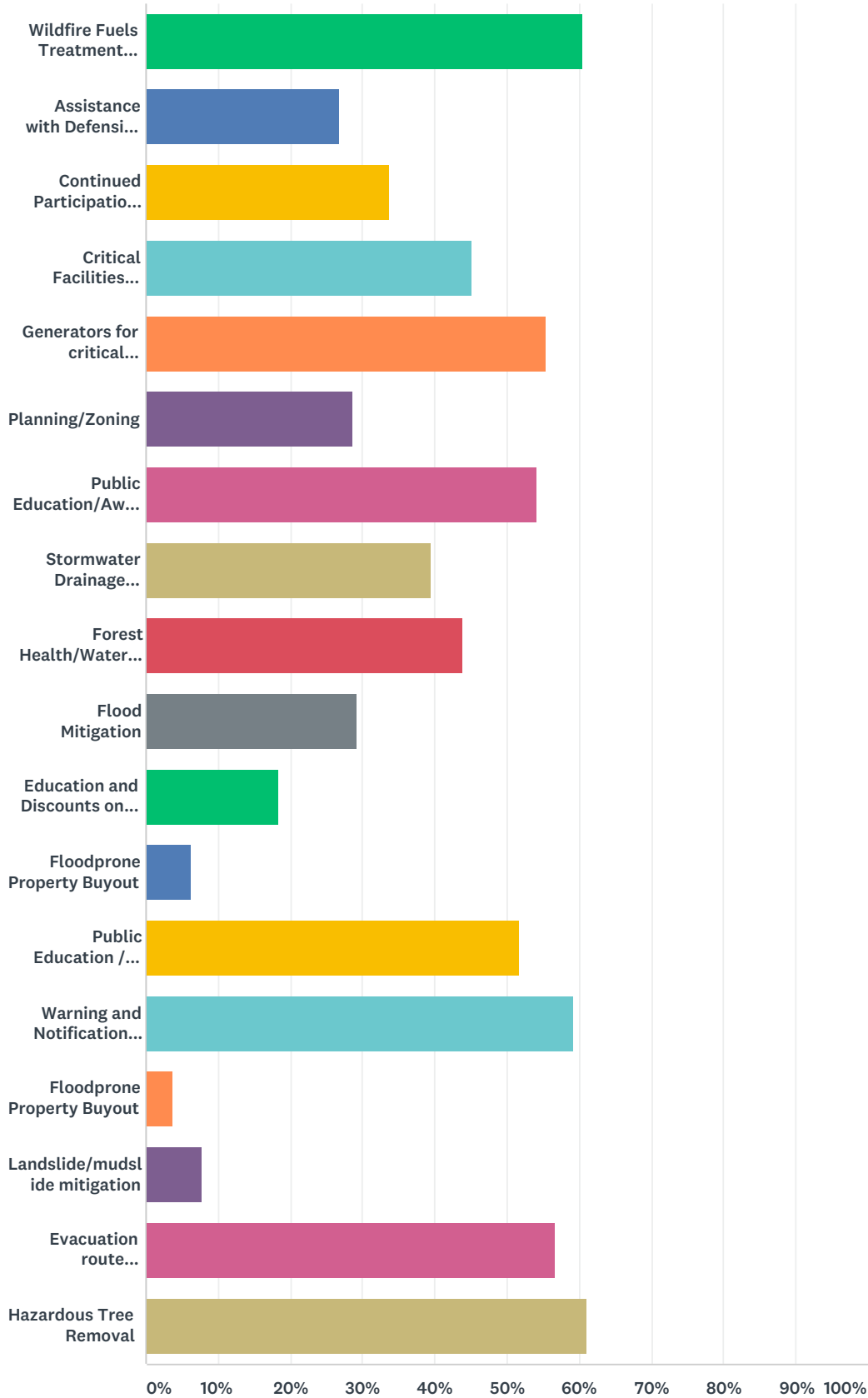
Fresno County Hazard Mitigation Plan Update Public Input Survey

59	no	10/31/2017 4:41 PM
60	Wildfires in the foothills/shaver area, Drought conditions along most of the western half of the county located further off the San Joaquin river, ground water well depth(ever increasing, we will need to address soon)	10/31/2017 1:44 PM

Q3 The following types of mitigation actions may be considered in Fresno County. Please indicate the types of mitigation actions that you think should have the highest priority in the updated Fresno County Multi-Hazard Mitigation Plan.

Answered: 157 Skipped: 27

Fresno County Hazard Mitigation Plan Update Public Input Survey



ANSWER CHOICES	RESPONSES	
Wildfire Fuels Treatment projects	60.51%	95

Fresno County Hazard Mitigation Plan Update Public Input Survey

Assistance with Defensible Space	26.75%	42
Continued Participation in the National Flood Insurance Program	33.76%	53
Critical Facilities Protection	45.22%	71
Generators for critical facilities	55.41%	87
Planning/Zoning	28.66%	45
Public Education/Awareness	54.14%	85
Stormwater Drainage Improvements	39.49%	62
Forest Health/Watershed Protection	43.95%	69
Flood Mitigation	29.30%	46
Education and Discounts on Flood Insurance	18.47%	29
Floodprone Property Buyout	6.37%	10
Public Education / Awareness of hazards	51.59%	81
Warning and Notification Systems (Indoor and Outdoor)	59.24%	93
Floodprone Property Buyout	3.82%	6
Landslide/mudslide mitigation	7.64%	12
Evacuation route development	56.69%	89
Hazardous Tree Removal	61.15%	96
Total Respondents: 157		

Q4 Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters:

Answered: 44 Skipped: 140

#	RESPONSES	DATE
1	power grid outage - aging of systems and less \$ because of emphasis on solar	1/12/2018 7:27 AM
2	fire	1/11/2018 11:11 AM
3	Abandoned dwelling abatement	1/1/2018 10:58 PM
4	Removing dead trees along roads. Reverse 911. Evacuation plans/notifications	11/27/2017 8:39 PM
5	Education, Evacuation Plans	11/27/2017 10:12 AM
6	public health, infection control	11/26/2017 10:07 PM
7	collaboration with Federal agencies (i.e. Forest, Park)	11/24/2017 11:53 AM
8	Volcano education. Mammoth mountain	11/21/2017 10:10 AM
9	Public awareness needs to be increased to the risks from natural hazards, everyone thinks "It can not happen here" as we watch increases in natural disasters around the world.	11/18/2017 8:55 AM
10	Due to wildfires- remove dry/old trees	11/17/2017 9:48 AM

Fresno County Hazard Mitigation Plan Update Public Input Survey

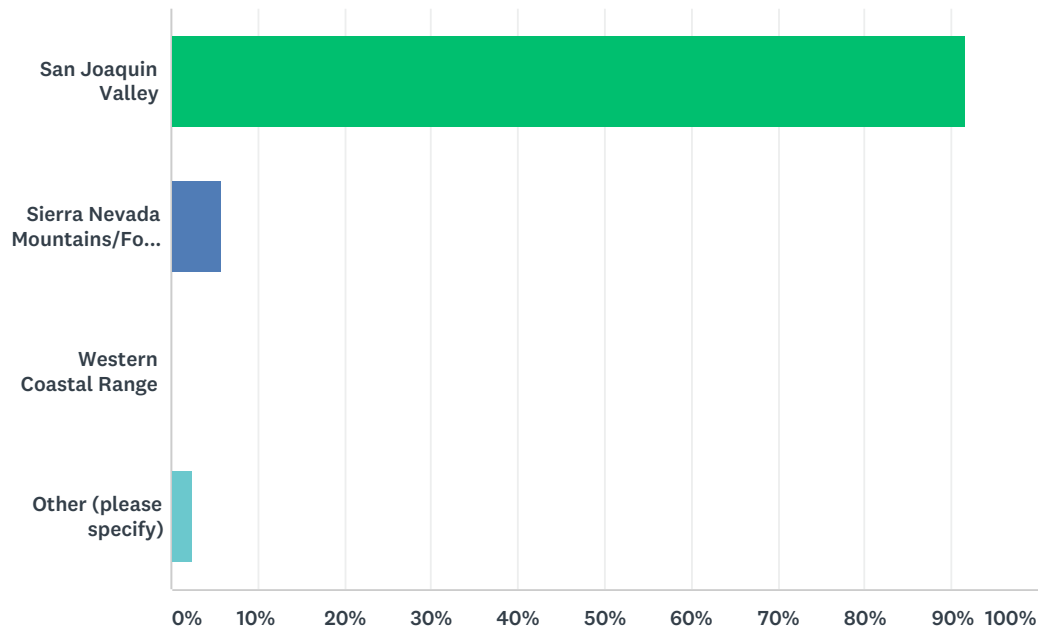
11	Globally, heat kills far more people than cold. Heat "storms" affect the elderly & low income disproportionately more than other groups. A volunteer cadre should be at the ready to assist with notifications/transportation to cooling centers.	11/17/2017 5:17 AM
12	Education on fighting floods. Every film crew shows people sandbagging incorrectly	11/16/2017 8:47 PM
13	continue to clear dead trees	11/16/2017 5:20 PM
14	I think drought and extreme high temperatures are our biggest threats. We must faithfully practice water conservation even when not technically in drought. Farmers should not be allowed to flood their fields as an irrigation practice.	11/16/2017 12:22 PM
15	Involvement from local hospital representatives, etc.	11/16/2017 11:42 AM
16	Strict zoning to prevent development in historic fire- & flood-prone areas	11/15/2017 2:38 PM
17	Local agency communication and plans. Local agencies need to have staff trained on their duties when a disaster happens. The worst things that could happen is having a great plan in place that no one knows how to adequately execute.	11/15/2017 12:43 PM
18	Expand on your emergency disaster preparedness awareness campaign to the public. Make it ongoing on radio, social media, TV, etc.	11/14/2017 5:48 PM
19	Gov't experiments unknown to public, cloud seeding, etc. weather weponry testing.	11/14/2017 11:03 AM
20	Public education/workshops for emergency preparedness	11/14/2017 9:52 AM
21	?	11/10/2017 10:25 PM
22	Staying updated proactive on social media, particularly Twitter since it's short, quick, and in real time.	11/10/2017 10:18 PM
23	Proper forest management of under brush.	11/10/2017 8:50 AM
24	Continue to be engaged with the Tribal Summit Emergency Management Planning efforts for 2018.	11/9/2017 4:05 PM
25	Public meetings in all communities, educational materials for public, more surveys such as this, sharing with the public the results of surveys	11/7/2017 9:03 PM
26	Wildfires	11/7/2017 8:29 PM
27	Work w/ CA National Gd to stop dumping of hazardous fuels that can start or intensify wildfires	11/7/2017 10:38 AM
28	none	11/6/2017 2:31 PM
29	N/A	11/3/2017 3:47 PM
30	containment of illegal immigrants	11/3/2017 10:30 AM
31	None at this time	11/3/2017 8:16 AM
32	A routing map on how to get out of city by sections of town	11/2/2017 11:13 PM
33	Pandemics	11/2/2017 9:31 PM
34	None	11/2/2017 4:12 PM
35	Communication	11/2/2017 3:02 PM
36	During the last mud/rockslide that closed the Grapevine, CHP closed The 5 and routed all traffic headed to Los Angeles over Tehachapi. However, as early as 4 pm on the day of the closure, motorists who took this route were posting warnings of being caught in mud/rockslides and telling others to NOT take this route or they would become trapped. Unfortunately the CHP continued to direct traffic over Tehachapi - a move that would prove to cause injuries and fatalities. They did not close that route until 9 pm that night. When I called them to ask why, the answer was "When we close one road to L.A. We need to leave another one open to avoid traffic jams." This just spells disaster to me - especially in the case of a potential widespread disaster where EVERYONE is trying to escape something. Better communication between agencies and the public - and reasonable protocols - are needed.	11/2/2017 2:22 PM
37	N/A	11/2/2017 2:11 PM
38	Forest health and management	11/2/2017 2:00 PM
39	Fires	11/2/2017 1:49 PM

Fresno County Hazard Mitigation Plan Update Public Input Survey

40	Ag losses due to climate change. Water conservation.	11/2/2017 1:03 PM
41	Wildfires are a huge problem during the summer, we need to better prevent them from happening.	11/2/2017 12:58 PM
42	Please consider limiting people to how much concrete they put in yards. We have major flooding problems because the water can't penetrate the ground. This includes fake grass installments.	11/2/2017 12:57 PM
43	Shelters	11/2/2017 12:43 PM
44	Allocate funds set aside on yearly basis to essentially make a safety account for expected events in the future.	10/31/2017 1:47 PM

Q5 How would you describe the region where you reside?

Answered: 156 Skipped: 28



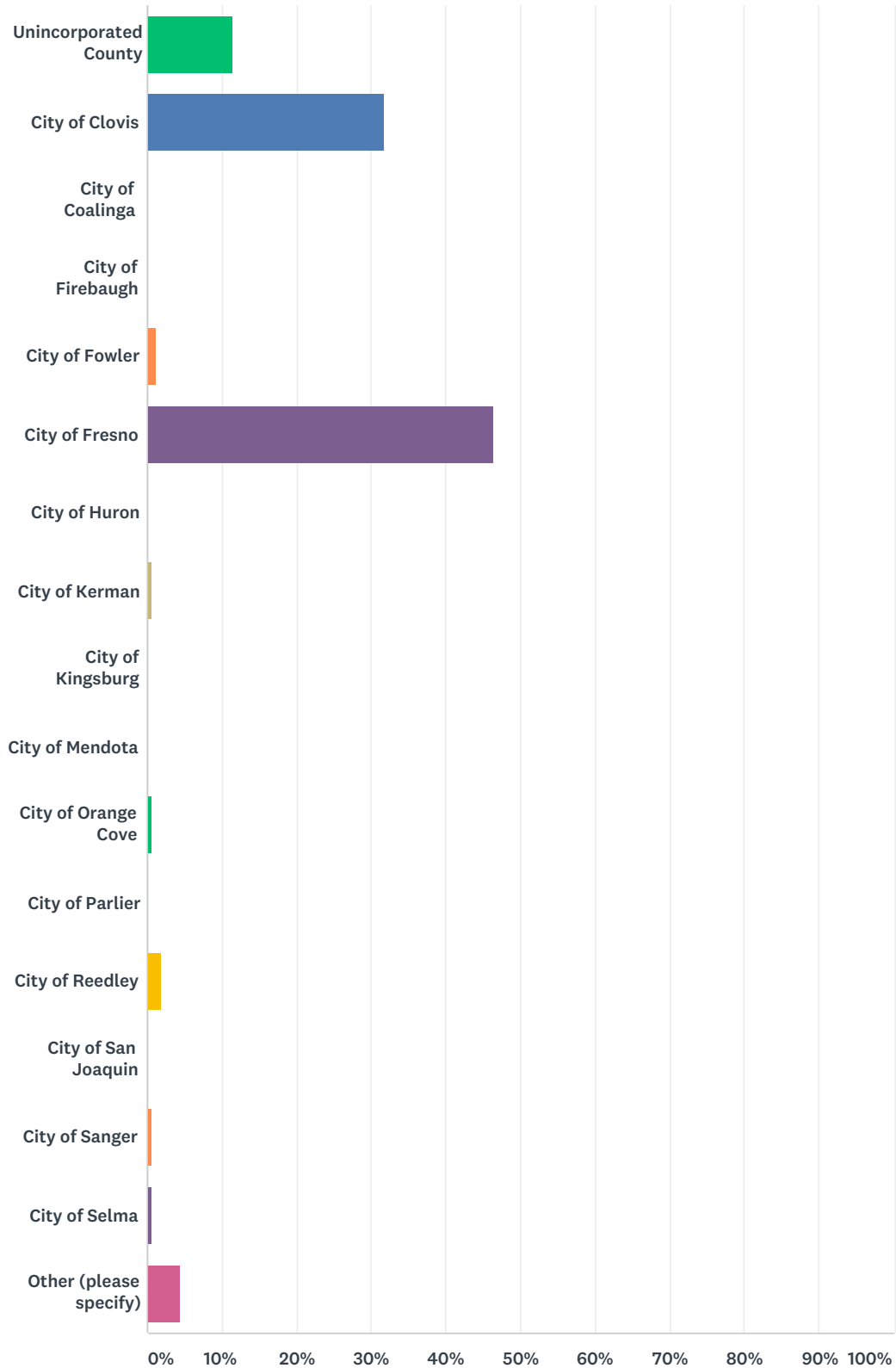
ANSWER CHOICES	RESPONSES
San Joaquin Valley	91.67% 143
Sierra Nevada Mountains/Foothills	5.77% 9
Western Coastal Range	0.00% 0
Other (please specify)	2.56% 4
TOTAL	156

#	OTHER (PLEASE SPECIFY)	DATE
1	residential	1/12/2018 8:29 AM
2	City of Fresno	11/16/2017 5:21 PM
3	Fresno/Clovis, California	11/16/2017 11:43 AM
4	In Clovis, near the foothills	11/2/2017 1:00 PM

Q6 Indicate the community where you live

Answered: 157 Skipped: 27

Fresno County Hazard Mitigation Plan Update Public Input Survey



ANSWER CHOICES	RESPONSES	
Unincorporated County	11.46%	18
City of Clovis	31.85%	50
City of Coalinga	0.00%	0

Fresno County Hazard Mitigation Plan Update Public Input Survey

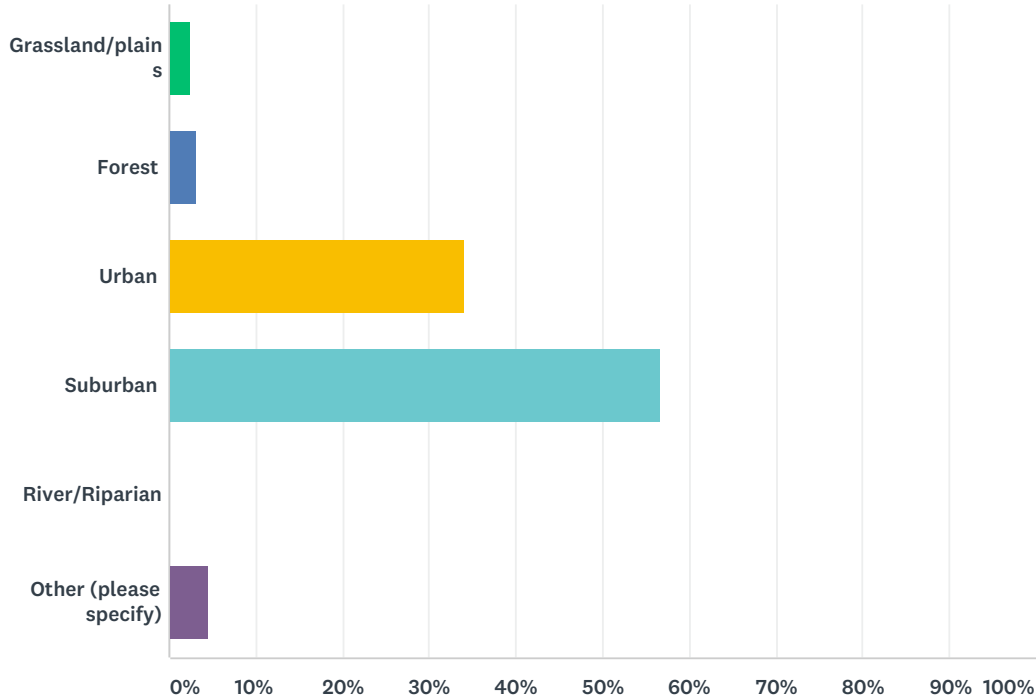
City of Firebaugh	0.00%	0
City of Fowler	1.27%	2
City of Fresno	46.50%	73
City of Huron	0.00%	0
City of Kerman	0.64%	1
City of Kingsburg	0.00%	0
City of Mendota	0.00%	0
City of Orange Cove	0.64%	1
City of Parlier	0.00%	0
City of Reedley	1.91%	3
City of San Joaquin	0.00%	0
City of Sanger	0.64%	1
City of Selma	0.64%	1
Other (please specify)	4.46%	7
TOTAL		157

#	OTHER (PLEASE SPECIFY)	DATE
1	auberry	1/11/2018 11:12 AM
2	County island in fresno	1/1/2018 10:59 PM
3	Patrol Lake Millerton/Pine Flat Lakes	11/16/2017 11:45 AM
4	city of Los Banos	11/15/2017 7:56 AM
5	Dunlap	11/9/2017 4:06 PM
6	Hanford	11/6/2017 2:32 PM
7	highway city	11/3/2017 10:31 AM

Q7 Please indicate the type of environment you reside in.

Answered: 155 Skipped: 29

Fresno County Hazard Mitigation Plan Update Public Input Survey



ANSWER CHOICES	RESPONSES	
Grassland/plains	2.58%	4
Forest	3.23%	5
Urban	34.19%	53
Suburban	56.77%	88
River/Riparian	0.00%	0
Other (please specify)	4.52%	7
Total Respondents: 155		

#	OTHER (PLEASE SPECIFY)	DATE
1	Farmland	11/15/2017 11:43 PM
2	Rural	11/14/2017 5:49 PM
3	Lower foothills	11/10/2017 10:19 PM
4	Foothills	11/9/2017 4:06 PM
5	Rural	11/7/2017 9:05 PM
6	Metro	11/4/2017 5:02 AM
7	Agriculturally developed plains/basin	10/31/2017 1:48 PM

Q8 Optional: Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:

Answered: 49 Skipped: 135



**Fresno County Multi-Hazard Mitigation Plan Update
Available for Public Review and Comment**

Would you like to learn more about what Fresno County is doing to minimize the impacts of floods, dam failures, wildfires, drought, and other hazards? A draft of the updated Multi-Hazard Mitigation Plan is being made available for public review and comment. The plan assesses risks posed by natural and man-made hazards, identifies ways to reduce those risks, and allows the County and participating jurisdictions to be eligible for mitigation grant funding from FEMA.

A multi-jurisdictional planning team, including representatives from 13 municipalities, developed the plan over the past 9 months with assistance from a consultant. The County is now soliciting public comment on the plan before it is finalized and submitted for FEMA review and approval.

The comment period will be April 16-31, 2018.

The plan and comment form are available at www.fcdph.org/oes.



**For more information, contact the
Fresno County Office of Emergency
Services at (559) 600-4065.**

From: Olivia Pimentel <OPimentel@cityofkerman.org>
Sent: Wednesday, March 14, 2018 11:09 AM
To: 'Brislawn, Jeff P'
Cc: Joseph Blohm (FCLE); 'abigail.moore@woodplc.com'
Subject: RE: Kerman Jurisdictional Annex to Fresno County LHMP for Review
Attachments: Annex E Kerman update.3.14.2018.docx

[See updated report](#)

From: Brislawn, Jeff P [mailto:jeff.brislawn@woodplc.com]
Sent: Monday, March 12, 2018 3:17 PM
To: Olivia Pimentel <OPimentel@cityofkerman.org>
Cc: Joseph Blohm (FCLE) <Joseph.Blohm@fcle.org>; 'abigail.moore@woodplc.com' <abigail.moore@woodplc.com>
Subject: RE: Kerman Jurisdictional Annex to Fresno County LHMP for Review

See pages E19-20 in attachment. Also please review other yellow highlights in document.

Jeff Brislawn
Hazard Mitigation Lead/Sr Associate
Amec Foster Wheeler's parent company is now owned by Wood plc
Environment & Infrastructure/Hazard Mitigation and Emergency Management Program
1942 Broadway, Suite 314, Boulder CO, 80302
Direct 303-209-3781, mobile/cell 303-704-5506
jeff.brislawn@woodplc.com
www.amecfw.com www.woodplc.com



From: Olivia Pimentel [mailto:OPimentel@cityofkerman.org]
Sent: Monday, March 12, 2018 4:08 PM
To: 'abigail.moore@woodplc.com' <abigail.moore@woodplc.com>; 'jeff.brislawn@woodplc.com' <jeff.brislawn@woodplc.com>
Cc: Joseph Blohm (FCLE) <Joseph.Blohm@fcle.org>
Subject: RE: Kerman Jurisdictional Annex to Fresno County LHMP for Review

I need the 2009 action plan you are referring to in order to determine whether the actions identified in 2009 were addressed or not. I did not prepare that report so I would appreciate your assistance.

From: Blohm, Joseph (Kerman PD) [mailto:Joseph.Blohm@fcle.org]
Sent: Monday, March 12, 2018 2:18 PM
To: Olivia Pimentel <OPimentel@cityofkerman.org>
Subject: FW: Kerman Jurisdictional Annex to Fresno County LHMP for Review
Importance: High

Hi Olivia,

I just got this and I'm forwarding it to you.

From: Brislawn, Jeff P [<mailto:jeff.brislawn@woodplc.com>]
Sent: Monday, March 12, 2018 1:54 PM
To: Blohm, Joseph (Kerman PD) <Joseph.Blohm@fcle.org>
Cc: Moore, Abigail <abigail.moore@woodplc.com>; Austin, Kenneth (cof) <kaustin@co.fresno.ca.us>; Lopez, Angel (cof) <angellopez@co.fresno.ca.us>; jkunkel@cityofkerman.org
Subject: FW: Kerman Jurisdictional Annex to Fresno County LHMP for Review
Importance: High

Joseph,

We are still lacking some information in the mitigation action strategy section of your annex. We need the details on the actions that were identified in 2009, and an updated schedule for any actions being carried forward from 2009. You can also add new actions to your annex if you so desire (or if the 2009 actions are completed). Please send to me by Thursday March 15 so we can get the information in the draft that will be going out for public review.

Thanks

Jeff

Jeff Brislawn

Hazard Mitigation Lead/Sr Associate

Amec Foster Wheeler's parent company is now owned by Wood plc

Environment & Infrastructure/Hazard Mitigation and Emergency Management Program

1942 Broadway, Suite 314, Boulder CO, 80302

Direct 303-209-3781, mobile/cell 303-704-5506

jeff.brislawn@woodplc.com

www.amecfw.com www.woodplc.com



From: Brislawn, Jeff P
Sent: Wednesday, February 14, 2018 5:52 AM
To: 'joseph.blohm@fcle.org' <joseph.blohm@fcle.org>
Cc: Moore, Abigail <abigail.moore@amecfw.com>; 'Austin, Kenneth' <KAustin@co.fresno.ca.us>; 'Lopez, Angel' <angellopez@co.fresno.ca.us>; 'jkunkel@cityofkerman.org' <jkunkel@cityofkerman.org>
Subject: Kerman Jurisdictional Annex to Fresno County LHMP for Review
Importance: High

Attached is your jurisdiction's updated draft annex to the Fresno County Multi-Jurisdictional Hazard Mitigation Plan 2017-18. Please circulate within your jurisdiction for review and let me and Abby Moore (cc'd) if you have comments or changes no later than March 5. Please use TRACK CHANGES in Word. Outstanding items or items where we would welcome more input or verification are highlighted in yellow.

Anything in green is text that Amec Foster Wheeler will revise in the final draft.

Review the mitigation actions and detailed action write ups. There are some that need clarification and more details which are highlighted. It is not too late to add additional mitigation projects if desired. If you reviewed and see little change please let us know that also.

Thanks

Jeff

Jeff Brislawn

Hazard Mitigation Lead/Sr Associate

Amec Foster Wheeler's parent company is now owned by Wood plc
Environment & Infrastructure/Hazard Mitigation and Emergency Management Program
1942 Broadway, Suite 314, Boulder CO, 80302
Direct 303-209-3781, mobile/cell 303-704-5506
jeff.brislaw.n@woodplc.com
www.amecfw.com www.woodplc.com



Jeff Brislaw
Hazard Mitigation Lead/Sr Associate

Amec Foster Wheeler's parent company is now owned by Wood plc
Environment & Infrastructure/Hazard Mitigation and Emergency Management Program
1942 Broadway, Suite 314, Boulder CO, 80302
Direct 303-209-3781, mobile/cell 303-704-5506
jeff.brislaw.n@woodplc.com
www.amecfw.com www.woodplc.com



This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorised use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include "Unsubscribe" in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click <http://www.woodplc.com/email-disclaimer> for notices and company information in relation to emails originating in the UK, Italy or France.

From: Michael Osborn <mosborn@ppeng.com>
Sent: Friday, March 23, 2018 3:11 PM
To: Austin, Kenneth; 'Romero, Paul@DWR'
Cc: Lopez, Angel; 'Brislawn, Jeff P'; Smith, Brian@DWR; Cristian Gonzalez; David McGlasson
Subject: RE: Fresno Hazard Mitigation Plan Update - HMPC Draft for Review
Attachments: Fresno Chapter 5.0 Mitigation Strategy3.docx

Ken and Paul,

Thanks for reaching out. The City of Mendota definitely wants to participate. Please see attached document with minor comments/edits track in Chapter 5.0.

Sincerely,

Michael Osborn, P.E. LEED-AP
Provost & Pritchard Consulting Group
Office: (559) 449-2700

From: Austin, Kenneth <KAustin@co.fresno.ca.us>
Sent: Tuesday, March 20, 2018 1:43 PM
To: 'Romero, Paul@DWR' <Paul.Romero@water.ca.gov>
Cc: Lopez, Angel <angellopez@co.fresno.ca.us>; 'Brislawn, Jeff P' <jeff.brislawn@woodplc.com>; Michael Osborn <mosborn@ppeng.com>; Smith, Brian@DWR <Brian.Smith@water.ca.gov>
Subject: RE: Fresno Hazard Mitigation Plan Update - HMPC Draft for Review

Thanks Paul. This information is very helpful and I appreciate you getting it to us. We'll discuss it with our Consultant and let you know if we will need anything else.

Ken

Ken (Casey) Austin
Emergency Manager
Fresno County Office of Emergency Services
559 600-4065

From: Romero, Paul@DWR [<mailto:Paul.Romero@water.ca.gov>]
Sent: Tuesday, March 20, 2018 1:40 PM
To: Austin, Kenneth <KAustin@co.fresno.ca.us>
Cc: Lopez, Angel <angellopez@co.fresno.ca.us>; 'Brislawn, Jeff P' <jeff.brislawn@woodplc.com>; mosborn@ppeng.com; Smith, Brian@DWR <Brian.Smith@water.ca.gov>
Subject: RE: Fresno Hazard Mitigation Plan Update - HMPC Draft for Review

Hi Ken,

I can give a bit more description, but if I understand correctly Chapter 5 is only looking for a minimal description. So, my understanding of the three projects is below from my contacts:

#12 Panoche-Silver Creek Feasibility Study: Implementation not started but problem continues. I spoke to city engineer Michael Osborn and he seemed interested in the LHMP. I have cc'd him on this email.

#13 Investigate and Construct Upper SJR Storage Options: Continuing ongoing implementation. Draft EIS completed and funding currently being sought for implementation.

#14 Analyze Flood Conveyance facilities: Implementation not started. Likely discontinued. DWR's Central Valley Flood Protection Plan looked at structures of the State Plan of Flood Control, but that is only a small part of Fresno County. No other study is being considered as I understand.

Let me know if you have any questions.

Thanks. Paul
559 230-3328

From: Austin, Kenneth [<mailto:KAustin@co.fresno.ca.us>]
Sent: Monday, March 19, 2018 9:59 AM
To: Romero, Paul@DWR <Paul.Romero@water.ca.gov>
Cc: Lopez, Angel <angellopez@co.fresno.ca.us>; 'Brislawn, Jeff P' <jeff.brislawn@woodplc.com>
Subject: FW: Fresno Hazard Mitigation Plan Update - HMPC Draft for Review
Importance: High

Hi Paul,

Thanks for taking the time to speak with me this morning and for helping to get the status on several of these LHMP projects. I'm sending you the email that our consultant, Jeff Brislawn, sent out to our planning group. You don't need to review all of the sections (unless you're interested). As we discussed I need your assistance with the status of three projects contained in Chapter 5 (Mitigation Strategy). The projects are numbers 12, 13 and 14. These 3 projects were identified in 2009 and we need to know the current status. Have they been completed, are they ongoing, discontinued or no longer feasible? Any information that you can provide would be appreciated. Please give me a call if you have questions. You can also call our consultant if you need to speak to him.

Thanks.

Ken

Ken (Casey) Austin
Emergency Manager
Fresno County Office of Emergency Services
559 600-4065

From: Brislawn, Jeff P [<mailto:jeff.brislawn@woodplc.com>]
Sent: Monday, February 12, 2018 3:07 PM
To: myrond@cityofselma.com; riverdaleid@sbcglobal.net; SierraCedarsCSD@gmail.com; Coffman, John <jcoffman@co.fresno.ca.us>; firebaughcanal@sbcglobal.net; samescobar@cityoforange Cove.com; jcasia@panochewd.org; shane.gunn@dot.ca.gov; folivares@cityofselma.com; larry@mintierharnish.com; chief@pineridgefire.org; danpearce@waterworksdist18.com; roa1@comcast.net;

bgallegos@ci.firebaugh.ca.us; bormonde@westlandswater.org; Adam Hoffman <AHoffman@sjrecwa.net>; howardh@csufresno.edu; jandsiliznoff@outlook.com; Mlopez@ci.fowler.ca.us; Craig.Jones@colostate.edu; Israel Sanchez <isanchez@westlandswater.org>; sandrits@netptc.net; Buchanan, A. D'Andra <ADBuchanan@co.fresno.ca.us>; Wright, Les <lwright@co.fresno.ca.us>; scott@lagunaid.com; Palacios, Robert <RPalacios@co.fresno.ca.us>; De La Cerda, Gabriel <gdelacerda@co.fresno.ca.us>; hsimmons@ppeng.com; greyes@usbr.gov; bryant_jeff@sbcglobal.net; Barr, Jill <jbarr@co.fresno.ca.us>; captosborne@cityofkingsburg-ca.gov; rpud@sbcglobal.net; admin@sierrarc.com; Chris.Christopherson@fire.ca.gov; ahenderson@cityofkingsburg-ca.gov; Zaroni, John J. <john.zaroni@fresnosheriff.org>; tchapa@ci.sanger.ca.us; Salvador.Raygoza@fcle.org; lfreeman@sjrecwa.net; rick.ehle@fcle.org; pdesatoff@cidwater.com; Curtice, Kathy <kathy.curtice@fresnosheriff.org>; thomas.jehrke@usace.army.mil; jcastro001@yahoo.com; mtrejo@coalinga.com; Jim Anderson <ja@malagacwd.org>; ashbrook.don@gmail.com; r.michaels@orangecovefire.com; Siemer, Dale <DSiemer@co.fresno.ca.us>; Ben Fenters <bfenters@slwd.net>; Ortiz, Adan <AOrtiz@co.fresno.ca.us>; Jim.McDougald@FIRE.ca.gov; jgutierrez@westlandswater.org; ajmasovero@fs.fed.us; Crump, Stephen <scrump@co.fresno.ca.us>; mogdeb@aol.com; Purvis, Leslie <leslie.purvis@woodplc.com>; Fox, Wayne <wafox@co.fresno.ca.us>; Wilma.Quan-Schecter@fresno.gov; sharri_bender_ehlert@dot.ca.gov; Robertson, John <John.Robertson@reedley.ca.gov>; iris@water.ca.gov; Asprec, Lemuel <lasprec@co.fresno.ca.us>; brenth@fresnofloodcontrol.org; fmarquez@tmr.org; jerry.isaak@reedley.ca.gov; lcortez@malagacwd.org; office@biolabcd.org; sstadler@jamesid.org; rcozzie@aol.com; Sayed.Sadredin@valleyair.org; carl.carlucci@cdph.ca.gov; jdavis@ci.fowler.ca.us; Steve Haze <stevehaze007@gmail.com>; mmacias@cidwater.com; donna@hrc@aol.com; georgeturegano@fcle.org; gerstenb@jps.net; Rousseau, Jean <jrousseau@co.fresno.ca.us>; caruthers@csd@sbcglobal.net; Ishii, Randy <rishii@co.fresno.ca.us>; jkunkel@cityofkerman.org; ocfpd@hotmail.com; Rick Hoelzel <rhoelzel@krcd.org>; Thompson, John R. <jthompson@co.fresno.ca.us>; liz@trqid.com; jhuneke@eaglabs.com; michael.r.erskine@usace.army.mil; Jonas, Chuck <CJonas@co.fresno.ca.us>; terri.mejorado@caloes.ca.gov; DMERRITT@KRCD.ORG; associate@slwd.net; Pomaville, David <dpomaville@co.fresno.ca.us>; Bash, Robert <rbash@co.fresno.ca.us>; Yang, Ahla <ahlayang@co.fresno.ca.us>; Mendoza, Armando <armendoza@co.fresno.ca.us>; dstroup@usbr.gov; latonwater@sbcglobal.net; Mather, Daniel N. <dmather@co.fresno.ca.us>; bcservices218@gmail.com; hydrobuffalo@sbcglobal.net; Austin, Kenneth <KAustin@co.fresno.ca.us>; Lopez, Angel <angellopez@co.fresno.ca.us>; Scott, Jordan J. <jjscott@co.fresno.ca.us>; miz5150@netptc.net; Mims, Margaret <margaret.mims@fresnosheriff.org>; Jimenez, Bernard <BJimenez@co.fresno.ca.us>; ipf@altaid.org; kjohansen@ppeng.com; hough@usgs.gov; DavidE@CityofSelma.com; dgabriel@coalinga.com; cannon@bfarm.com; lkimura@fresnoirrigation.com; stevesloan31@yahoo.com; Nehring, Kevin <knehring@co.fresno.ca.us>; cwhite@ccidwater.org; Bill Stretch <BStretch@fresnoirrigation.com>; joseph.blohm@fcle.org; slittlebucknaylor@fs.fed.us; faulkenb@water.ca.gov; ssingh@fresnoirrigation.com; gregt@ci.sanger.ca.us; andrewr@fresnofloodcontrol.org; rhopkins@ppeng.com; gunlund@sbcglobal.net; emailccservices@gmail.com; Julia@fresnomosquito.org; roger.mccoy@valleyair.org; lsjld@elite.net; Artal, Sebastian <sartal@co.fresno.ca.us>; Peter Preciado <Ppreciado@coalinga.com>; Raygoza, Salvador (Firebaugh PD) <Salvador.Raygoza@fcle.org>; ssaetern@fresnoirrigation.com; sanchez@westlandswater.org
Cc: bob@mintierharnish.com; roa1@comcast.net; Colmenares, Nicholas <nicholas.colmenares@woodplc.com>; Moore, Abigail <abigail.moore@woodplc.com>
Subject: Fresno Hazard Mitigation Plan Update - HMPC Draft for Review
Importance: High

County of Fresno

Internal Services Department (ISD) - IT Services

Service Desk 600-5900 (Help Desk)

CAUTION!!!

This email has been flagged as containing one or more attachments from an outside source.

Please check the senders email address carefully.

If you were not expecting to receive an email with attachments, please **DO NOT** open the file.

Forward the email to SPAM "SPAM@co.fresno.ca.us" and delete it.

Fresno County Hazard Mitigation Planning Committee (County staff and participating jurisdictions in particular):

The DRAFT of the Fresno County Multi-Jurisdictional Hazard Mitigation Plan 2017-18 update is available for your review. Due to the file size of the document it is being shared in in separate sections in 3 emails. Emails 2 and 3 will follow tomorrow.

Email 1: All chapters in Word, minus Chapter 4 Risk Assessment in PDF due to maps

Email 2: Hazard Identification and Risk Assessment Chapter 4 as a PDF

Email 3: Draft updated jurisdictional annexes will be sent to the points of contact for participating jurisdictions

We are requesting your review and any comments back by March 5th. Our goal is to complete a revised draft in a merged PDF for public review in mid-March. So we are nearing the finish line on the updated plan but it's important to review, and for some, provide the outstanding items by this deadline. Outstanding items or items where we would welcome more input or verification are highlighted in yellow. Anything in green is text that Amec Foster Wheeler will revise in the final draft. To focus your review I suggest the following priority areas:

Chapters 1 and 2: Yellow highlights note that there is still some uncertainty as to if some jurisdictions are participating fully in this update or not. If your jurisdiction is in yellow please contact me with questions about outstanding needs or respond to earlier requests.

Chapter 5: Review the mitigation action summary table and detailed action write ups (for County staff, jurisdictional action write ups will be in their respective annexes). There are some that need clarification and more details which are highlighted. It is not too late to add additional mitigation projects if desired.

Chapter 3: Review the planning process section and provide any additional details on public outreach and how the plan has been coordinated with or integrated into other planning efforts.

Chapter 7: Review how the plan will be implemented and maintained.

The largest section of the plan is Chapter 4 HIRA, this will be sent in a separate email due to its size. For those that want to review or comment in a Word version I will have placed it on the Google Drive here:

https://drive.google.com/drive/folders/1xHOqB3ae67qZdIKgOkfUMfuhM2-J_osf?usp=sharing

Amec Foster Wheeler will also conduct an internal review against the FEMA DMA requirements and may reach out to some of you for additional specifics. Some of the appendices including an appendix with a compendium of planning process documentation (sign in sheets, meeting items etc.) is being compiled for the next draft.

The preferred method to obtain feedback is editing the document in Word with track changes turned on. Or you can note items in an email. Please provide comments or direct edits back to me. Let me know if there are any questions.

Thanks

Jeff

Jeff Brislawn

Hazard Mitigation Lead/Sr Associate

Amec Foster Wheeler's parent company is now owned by Wood plc

Environment & Infrastructure/Hazard Mitigation and Emergency Management Program

1942 Broadway, Suite 314, Boulder CO, 80302

Direct 303-209-3781, mobile/cell 303-704-5506

jeff.brislawn@woodplc.com

www.amecfw.com www.woodplc.com



This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorised use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include "Unsubscribe" in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click <http://www.woodplc.com/email-disclaimer> for notices and company information in relation to emails originating in the UK, Italy or France.
