CITY OF VACAVILLE

SINGLE JURISDICTION LOCAL HAZARD MITIGATION PLAN

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CITY OF VACAVILLE
LOCAL HAZARD MITIGATION PLAN (LHMP)

An Update to the 2011 Plan

June 2016

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Section 1. Introduction

Natural disasters cause death and injuries, as well as significant damage to our communities, businesses, public infrastructure, and environment. The impacts of these damages result in the displacement of people and tremendous costs due to response and recovery dollars, economic loss, and burden. The City of Vacaville (Vacaville) Local Hazard Mitigation Plan (LHMP) is an effort undertaken by the City to mitigate the effects of natural hazards and return to "the norm" sooner with fewer impacts to people and infrastructure.

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. While natural disasters cannot be prevented from occurring, the effects of natural disasters can be reduced or eliminated through a well-organized public education and awareness effort, preparedness activities and mitigation actions.

After disasters, repairs and reconstruction are often completed in such a way as to simply restore to pre-disaster conditions. Such efforts expedite a return to normalcy; however, the replication of pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. Hazard mitigation ensures that such cycles are broken and that post-disaster repairs and reconstruction result in increased resiliency for the City of Vacaville residents, business owners and city officials.

1.1 Background and Purpose

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more, as well as destroy or severely damage existing buildings, structures, infrastructure, and other facilities. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Many disasters cause extreme burden to city governments and small communities throughout California.

Over the past 60 years the Vacaville Region (Solano County) has experienced numerous natural disasters, resulting in disaster proclamations and disaster declarations. Since 1955, 17 federal declarations have been documented to effect the region Solano County, including seven flood incidences, five severe storm events, two earthquake events (Loma Prieta and South Napa), and one wildfire (Miller Canyon Wildfires). These recorded natural hazard events provide a hazard footprint across the region which helps mitigation planners understand hazards that could occur in the City of Vacaville and the associated risks to life and property. Understanding natural hazard risks provides a foundation for developing solutions to mitigate or eliminate potential impacts through public education and outreach, preparedness activities, and mitigation actions.

In an attempt to reduce the community burden from the effects of natural hazards, the City of Vacaville, in partnership with the Association of Bay Area Governments (ABAG), developed a jurisdictional annex to the ABAG overarching Multi-Hazard Mitigation Plan in 2005 and again in 2010. These historic hazard mitigation planning efforts and plans were developed in accordance with the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 provides the legislative basis for the Federal Emergency Management Agency (FEMA) hazard mitigation planning requirements and funding before and after a hazard event. FEMA requires that an LHMP be updated every 5 years. Following this requirement, the City of Vacaville recognized that during the 2015 update cycle it would be more beneficial to conduct an in-depth analysis under a separate stand-alone effort. In 2015, the City of Vacaville received grant funding from FEMA's Hazard Mitigation Grant Program to develop a City-specific update for the 2010 jurisdictional annex. This 2016 Local Hazard Mitigation Plan (LHMP) has a greater focus on the residence and assets within the City boundaries.

Through this focused 2015-16 planning effort, the City of Vacaville is ready to implement efficient and effective short- and long-term actions where needed. The purpose of the Vacaville LHMP 2016 Update is to provide the City with a blueprint for hazard mitigation action planning. The plan identifies resources, information, and strategies for risk reduction, and provides a tool to measure the success of mitigation implementation on a continual basis. The strategies identified in the 2016 LHMP are developed with the following intentions:

- Risk reduction from natural hazards through a set of defined mitigation actions.
- Establishment of a basis for coordination and collaboration among participating agencies and public.
- Assisting in meeting the requirements of federal assistance programs.

The 2016 LHMP does not supersede current city plans and strategies including the General Plan Safety Element, but rather enhances the City's ability to communicate and mitigate natural hazard risk. Information in this plan will be used to help guide and coordinate mitigation activities and decisions for City staff and citizens. Proactive mitigation planning will help reduce the cost of disaster response and recovery to the City of Vacaville and its residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions from natural hazards.

1.2 Authority

This plan update was prepared pursuant to the requirements of the DMA 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 (DMA) or DMA 2000.)

While the DMA emphasizes the need for coordinated mitigation planning and implementation efforts, the regulations establish the requirements for local hazard mitigation plans. 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) plans must meet the requirements in DMA 2000. As described in this plan, Vacaville is subject to many kinds of hazards; thus, access to federal disaster assistance and hazard mitigation funding is vital to ensure a more resilient community.

1.3 Plan Organization

The LHMP is organized into eight sections to reflect the logical procession of activities undertaken to develop the plan and includes all relevant documentation required to meet the necessary criteria for FEMA approval. Each section is briefly described below.

- **Section 1**. **Introduction** describes the background and purpose of the plan, as well as the authority for development of the plan.
- **Section 2. Community Profile** describes Vacaville's history, geography, topography, climate, population, economy, housing, and land use and development trends.
- **Section 3. What's New** provides background to the 2005 and 2010 LHMP and the 2016 LHMP Update and details the process undertaken by the LHMP Update Planning Committee to review, assess, and update the

2016 LHMP. This section also describes the changes and additions that have been identified to develop the updated plan.

- **Section 4. The Planning Process** describes the 10-Step HMP Planning Process, as well as the meetings and outreach activities undertaken to engage City officials, staff, and the public.
- **Section 5. Natural Hazard Risk Assessment** identifies and prioritizes natural hazards affecting Vacaville, and assesses the City's vulnerability from the identified hazards.
- **Section 6. Mitigation Strategy** identifies mitigation goals, assesses the City's capabilities to implement mitigation actions, reviews the status of previously identified mitigation actions, and identifies and prioritizes new mitigation actions.
- **Section 7. Plan Implementation and Maintenance** discusses plan adoption and implementation, as well as the process to monitor, evaluate, update, and maintain the LHMP. This section also includes a discussion on continued public involvement.
- **Section 8: Works Cited** provides a listing of sources used during the planning process and LHMP document development.

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Section 2. Community Profile

The Community Profile summarizes the City's history and existing environmental and socioeconomic conditions. Environmental and socioeconomic factors include geography, topography, climate, population, economic, housing, and land use and development trends.

2.1 City of Vacaville History

The City of Vacaville was established in 1851, when livestock and wheat production were the principal economic products in the county. The completion of nearby railroads in the late 1860s provided a way for ranchers to get their crops to market, but the higher cost of rail transport coupled with increased competition led to the decline of the area's wheat industry during the 1880s. Subsequently, Solano County farmers turned to other crops, most of which required irrigation. While rail transport had contributed to the decline of wheat production, the ease of access it provided gave a boost to produce farming. By the 1890s, Vaca Valley and the foothills of the Vaca Mountains were covered with orchards, and in 1892, Vacaville was formally incorporated.

After peaking in the mid-1910s, fruit production in the Vacaville area declined due to drought and soil depletion, competition during the Great Depression, and overproduction for the World War I war effort. In the mid-20th century, new employers arrived in the area, resulting in explosive growth in Vacaville. The now defunct Basic Vegetable Products company located a 1,000-worker onion dehydrating facility in Vacaville, and in 1942, Suisun Air Base (now Travis Air Force Base) was established just to the south of Vacaville.

With its industry, ease of access, and close proximity to the core of the Bay Area, Vacaville saw its population double between 1940 and 1950. Ongoing freeway construction and increasing employment in the Bay Area led to Vacaville's continued growth through the end of the 20th century and the beginning of the 21st.

As of the 2010 U.S. Census, approximately 46,600 people were employed in Vacaville. By employment, the largest industries are education and healthcare; retail; arts, entertainment, recreation, and accommodation and food services; manufacturing; and public administration (Biomedical Production and Development). Together, these industries comprise about 70 percent of Vacaville's employment. The city's ten largest individual employers are the California State Department of Corrections, Vacaville Unified School District, Kaiser Permanente, Genentech, The City of Vacaville, State Compensation Insurance Co., Alza Corporation, NorthBay VacaValley Hospital, Travis Credit Union, and Mariani Packing Company. The presence of Genentech, Alza Corporation, and Novartis in Vacaville contribute to the city's position as a center for the biotech industry. Vacaville hopes to further strengthen this position in biotech and similar cutting edge industries over the lifetime of this General Plan. (Vacaville General Plan, 2015)

2.2 Geography, Topography, and Climate

2.2.1 Geography

According to the U.S. Census Bureau, Vacaville presently covers a total area of 28.37 square miles (73.48 km^2), 99.26% of which is land, with the remaining .74% comprised of the Lagoon Valley Lake, the Putah South Canal, and various small creeks. The City is located in the northern portion of Solano County, northeast of the Cities of Fairfield and Suisun City and west of Elmira. To the northwest and southwest, Vacaville is bordered by large hills, which contain on the north side the unincorporated community of Bucktown. Progressing to the east from the Bucktown, the small communities of Hartley, Allendale, and Batavia form a border around the northern edge of Vacaville.

Interstate I-80 is a prominent transportation route that runs from the southwest to the northeast of the city. I-505 also diverges from I-80 in Vacaville and runs northwards to connect to I-5. The historic Nut Tree complex stands near the intersection of I-80 and I-505. Exits 51B through 59 on I-80 are in Vacaville, with Exit 56 leading into I-505. See Figure 2-1 and Figure 2-2 for location and geographic setting.

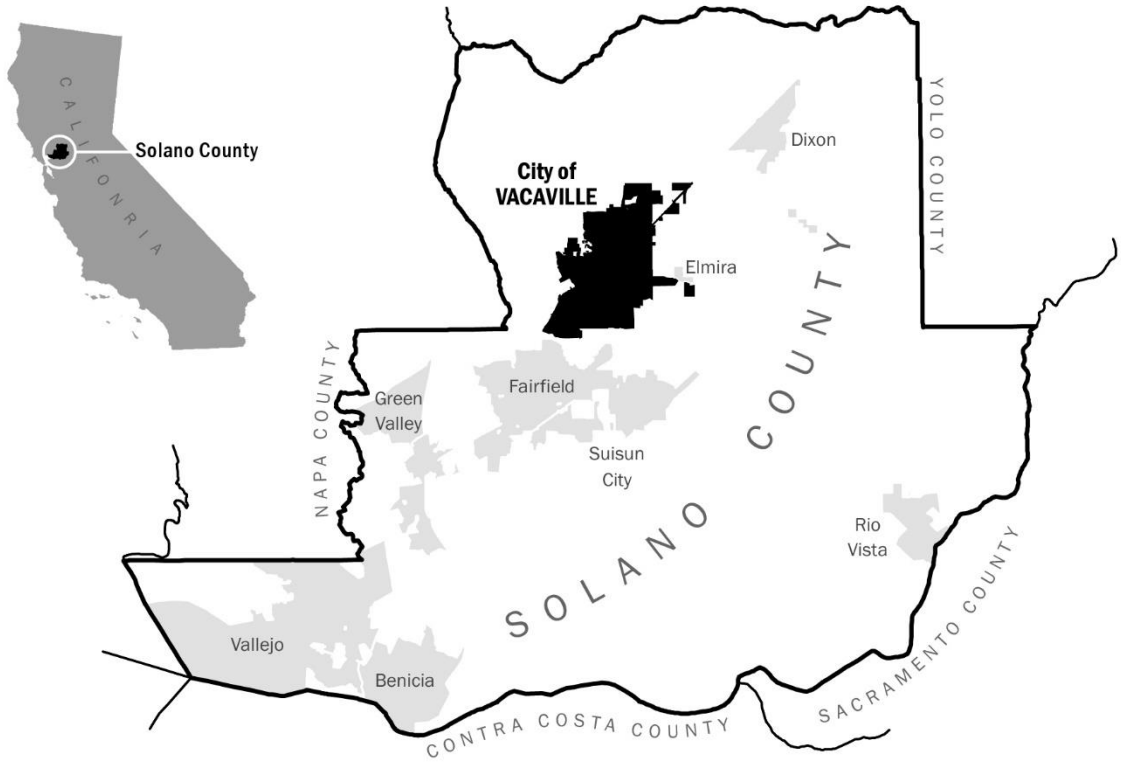


Figure 2-1: City of Vacaville Regional Map

2.2.2 Topography

To the west of Vacaville are two hilly outcroppings that are foothills of the Vaca Mountains. On the north side, the hills begin just west of Browns Valley Road, and on the south side, west of Alamo Drive. Eastwards of the City around Allendale and Elmira, it turns to farmland. To the north and south there are mainly fields and residential areas. Within the City itself, the elevation is between 300 and 90 feet, sloping from the west to the east. Vacaville is divided by the Putah South Canal, which runs north to south just east of the center of the City. There are three bodies of water within the City limits, and they lie along I-80. In the southeast corner of the City, Lagoon Valley Lake is the largest of the three at 105 acres. The next, near the center of the City, is located within Centennial Park. Former waste water treatment plan ponds are located at the very northeast corner of the city, next to the Vaca-Dixon Substation. See Figure 2-3.

2.2.3 Climate

Along with most of California, Vacaville enjoys a Mediterranean climate characterized by dry, warm to hot summers, with wet, cool winters. Located on the edge of the Bay Area, Vacaville occasionally experiences the cooling influence of marine

air spilling through the Carquinez Strait during the otherwise warm spring, summer, and early fall. Winters are at times foggy and cold, but snow is exceedingly rare.

Vacaville gets 25 inches of rain per year. The US average is 37. Average snowfall is 0 inches per year. The average US city gets 25 inches of snow per year. The number of days with any measurable precipitation is 57.

On average, there are 260 sunny days per year in Vacaville, California. The July high is around 95 degrees on average. The January low is 37 degrees on average. The comfort index, which is based on humidity during the hot months, is a 49 out of 100, where higher is more comfortable. The US average on the comfort index is 44. See Table 2-1 for a complete summary of average climate information.

Table 2-1: City of Vacaville Climate Summary Table

limate . easurements	acaville. .	nited tates
Avg. Rainfall (in.)	25	37
Avg. Snowfall (in.)	0	25
Avg. Precipitation Days	57	100
Avg. Sunny Days	260	205
Avg. July High (Degrees F)	95	86.5
Avg. Jan. Low (Degrees F)	37	20.5
Comfort Index (higher=better)	49	44
UV Index	5.1	4.3
Avg. Elevation FT.	163	1,443

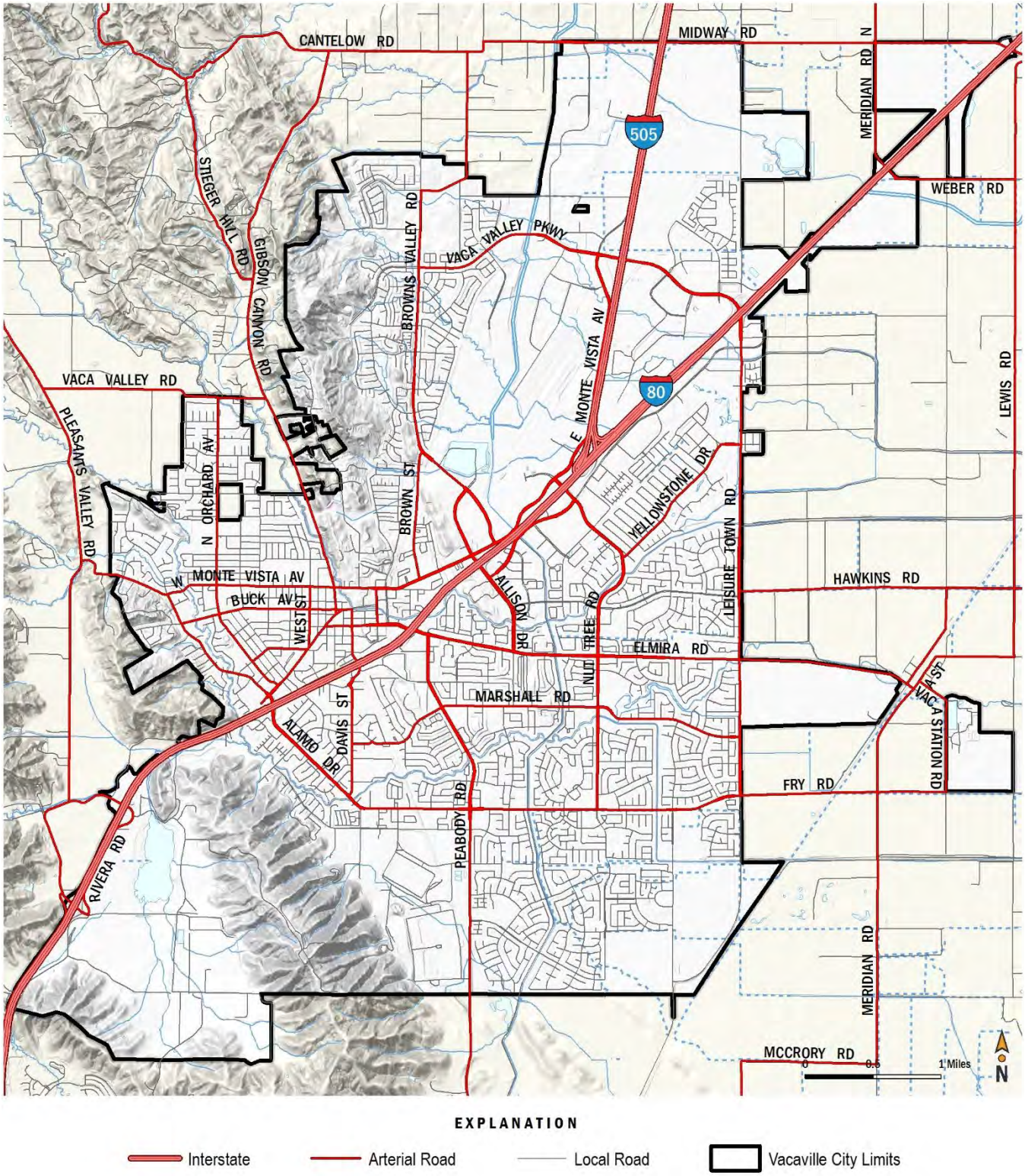


Figure 2-2: City of Vacaville regional transportation network.

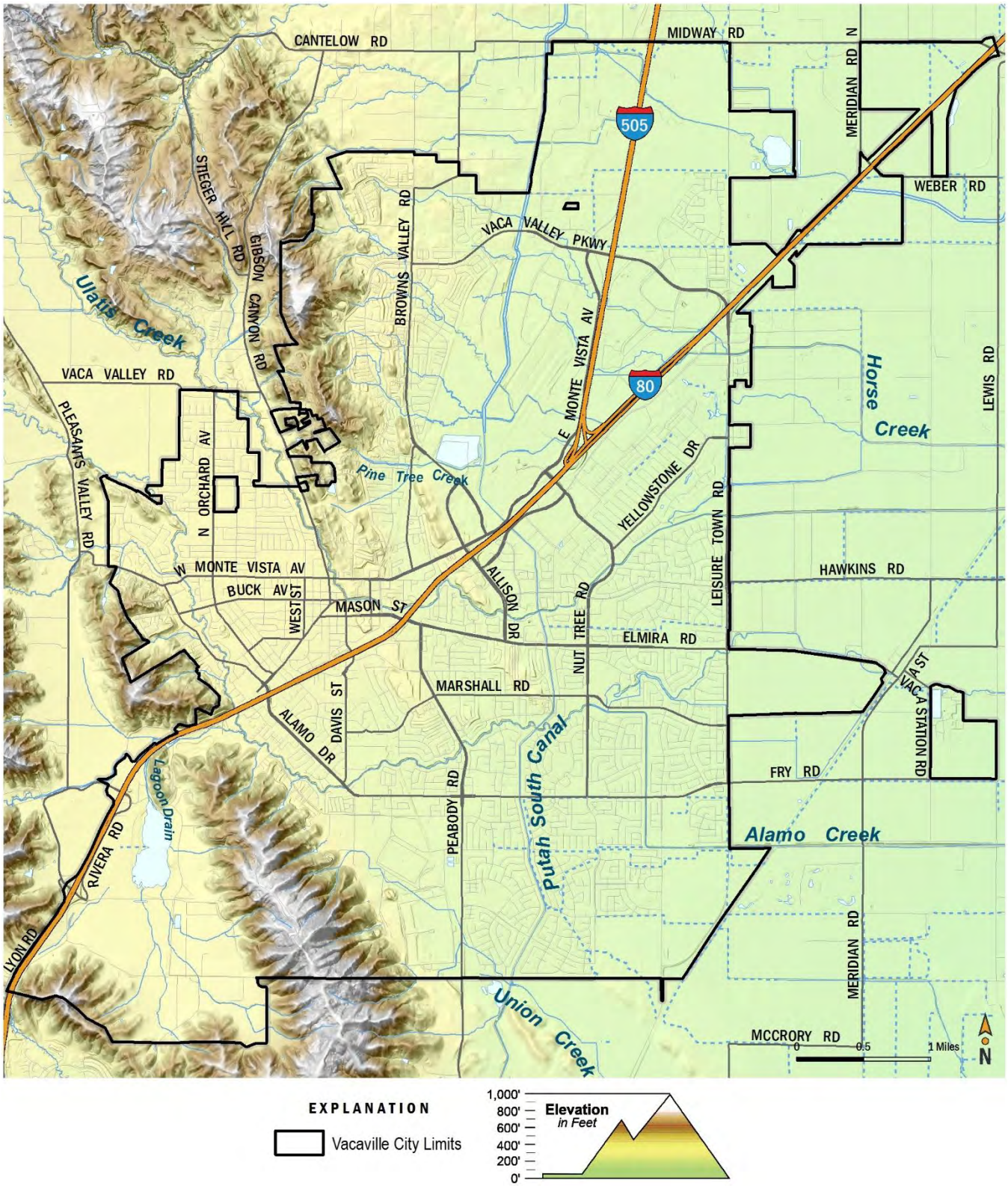


Figure 2-3: Topography of the City of Vacaville and surrounding areas

2.3 Socioeconomic Factors

The population, economic, and housing factors of the City of Vacaville are described in this section. Understanding these socioeconomic factors is imperative to determining the potential impacts a natural hazard event can have on the City's population and economy.

2.3.1 Population

According to the 2014 U.S. Census Data population projections, Vacaville's total population is approx. 95,856 residents[1]. Vacaville has 3,481 people per square mile, which is more than fourteen times the state average of 239.1 people per square mile. The City's population increased 3.7 percent between the 2010 and 2014 census data. The population is the densest (10,001-25,000 people per square mile) along Alamo Drive (west of Peabody Road), along the west side of Nut Tree Road (south of Marshall Road), along Elmira Road between Peabody Road and Nut Tree Road and near the intersection of West Monte Vista Avenue and Brown's Valley Road. The racial makeup of Vacaville is primarily White (55 percent). Hispanic or Latinos account for 22.9 percent of the population, followed by African Americans at 10.3 percent, and Asian residents make up 6.1 percent of the City's population, while mixed race persons make up 7 percent of the City. Native Americans constitute only 0.9 percent of the population, and Native Hawaiians and other Pacific Islanders make up .6 percent.

2.3.2 Employment

According to the City Profile, Vacaville has a labor force of 49,682 people, with a job growth rate of 6.7% since 2015, and an unemployment rate of 4.6%. Of the employed population, 14 percent work in office and administrative support, 10.9 percent work in executive and word administer positions; 12.58 percent work in sales occupations; 6.27 percent work in education, training, library; and 5.9 percent work in food preparation and serving. The median household income in Vacaville was $76,310 in 2015. The major employers in the City are California Department of Corrections and Rehabilitation, Vacaville Unified School District, Genentech and the City of Vacaville (City of Vacaville, Applied Geographic Solutions 2015). According to the City's 2009 Comprehensive Annual Financial Report, the top employers in the city are shown in Table 2-2.

Table 2-2: Top Employers

#	Employer	# of employees
1	California Department of Corrections and Rehabilitation	2,915
2	Vacaville Unified School District	1,273
3	Genentech	875
4	City of Vacaville	820
5	Alza	750
6	State Compensation Insurance Fund	670
7	Kaiser Permanente	600
8	VacaValley Hospital	470
9	M&G DuraVent	350
10	Travis Credit Union	311

Source: City of Vacaville, 2009 Comprehensive Annual Financial Report

[1] 2010 U.S. Census population may not account for seasonal residents.

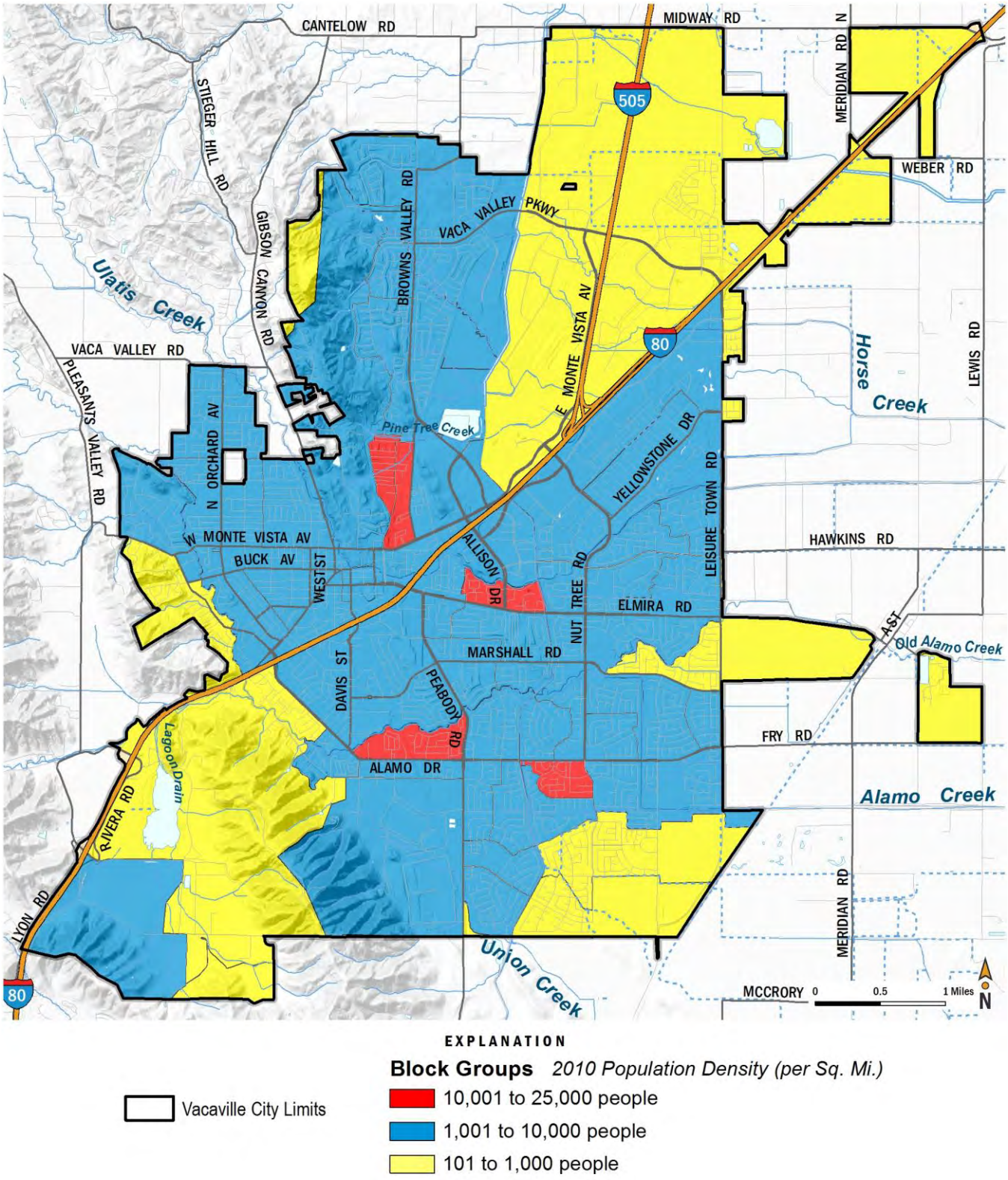


Figure 2-3: Population Density

2.3.3 Housing

According to the 2007-2011 American Community Survey, U.S. Census Data, there are 32,814 housing units in Vacaville. Of the total housing units, 60.5 percent are owner occupied and 22.6 percent are multi-unit structures. The majority of homes in Vacaville (87.4 percent) are single-unit detached homes. The median value of owner-occupied housing units, 2010-2014 was $275,100; average persons per household was 2.75.

2.3.3.1 Single-family new house construction building permits

Construction permits can often provide a valuable snapshot into the health of the housing market of a community. During the 15 year period from 1997 to 2012 the City of Vacaville's average cost of new homes built increased over $82,000, or 47 percent. After peaking in 2005, the average cost dropped dramatically in 2009, mirroring what was occurring in the rest of the U.S. at the time due to a national recession. As the economy has begun rebounding in recent years, the average cost of new homes has begun to rise again. The number of homes being constructed has not returned to pre-"crash" levels and is not expected to return to those levels for several years. See Table 2-3 for a summary of single family home construction permits in Vacaville for a 20 year period.

Table 2-3: Single-Family Construction Permit Summary

ear	verage ost	uildings ermits
1997	$173,600	326
1998	$189,700	463
1999	$175,500	383
2000	$201,700	529
2001	$204,000	320
2002	$262,400	141
2003	$262,400	482
2004	$305,300	202
2005	$347,600	269
2006	$269,600	292
2007	$277,500	291
2008	$243,700	143
2009	$225,700	304
2010	$248,400	214
2011	$241,200	140
2012	$255,700	97
2013 TBD		
2014 TBD		
2015 TBD		
2016 TBD		

Source: http://www.city-data.com/city/Vacaville-California.html#ixzz3ySnz5J68

2.4 Land Use and Future Development Areas

Most of Vacaville is comprised of single-family residential neighborhoods, with a retail corridor along Interstate 80 and a mix of uses in Downtown Vacaville. Vacaville has significant amounts of vacant land designated for development as well, most of which is located along Interstate 505 in the northeastern portion of the city (City of Vacaville 2015).

The City of Vacaville has a General Plan (GP) which serves as a blueprint for establishing long-range development policies. The GP provides a basis for private development proposals and public projects to remain consistent with existing city, regional and state policies. The GP is designed to help the city address issues related to land use, circulation (traffic), housing, open space, conservation, noise, and safety. The Land Use portion of the plan helps guide the City in determining the location of future development(s), to include possible future annexations. In addition to the General Plan, Vacaville has other plans that guide development in specific areas of the city, including specific plans, policy plans, and master plans. These plans help to shape future development and dictate the City's Sphere of Influence (SOI). Find out more about the General Plan here: http://www.vacavillegeneralplan.org/?p=2872

A specific plan is tool for systematically implementing the General Plan within a portion of the Planning Area. A specific plan is a hybrid document that combines General Plan policy statements with development regulations. It is often used to address the development requirements for a single project, such as urban infill or a new growth area. New growth area specific plans include the North Village Specific Plan, Vanden Meadows Specific Plan, Brighton Landing Specific Plan, East of Leisure Town Road Future Specific Plan, Northeast Area Future Specific Plan.

The City's largest policy plan areas, located in the northern portion of the city, have a significant inventory of vacant land capable of accommodating additional development within the existing industrial and business parks. This area is addressed by the following policy plans: Airport Business Area Policy Plan, Nut Tree Ranch Policy Plan, Interchange Business Park Policy Plan, Golden Hills Business Park Policy Plan, and Vaca Valley Business Park Policy Plan.

In 2008, the City adopted a 20-year Urban Growth Boundary (UGB), which totals 36 square miles in length. The UGB indicates the maximum allowable extent of urbanization; beyond this boundary, only agricultural or open space uses are typically permitted. The UGB was adopted by the City Council as a result of a voter signature gathering process.

Adoption of the UGB created two new significant areas of undeveloped land within the UGB: the East of Leisure Town Road Growth Area and the Northeast Growth Area, which are shown in Figure 5-4. Each of these growth areas are partially located outside of the existing city limits and SOI, but within the UGB. The East of Leisure Town Road Growth Area is approximately 1,300 acres in size, and the Northeast Growth Area is approximately 1,400 acres in size. The two growth areas are separated by the unincorporated Locke Paddon community. This General Plan establishes land use designations for new urban development within these two areas.

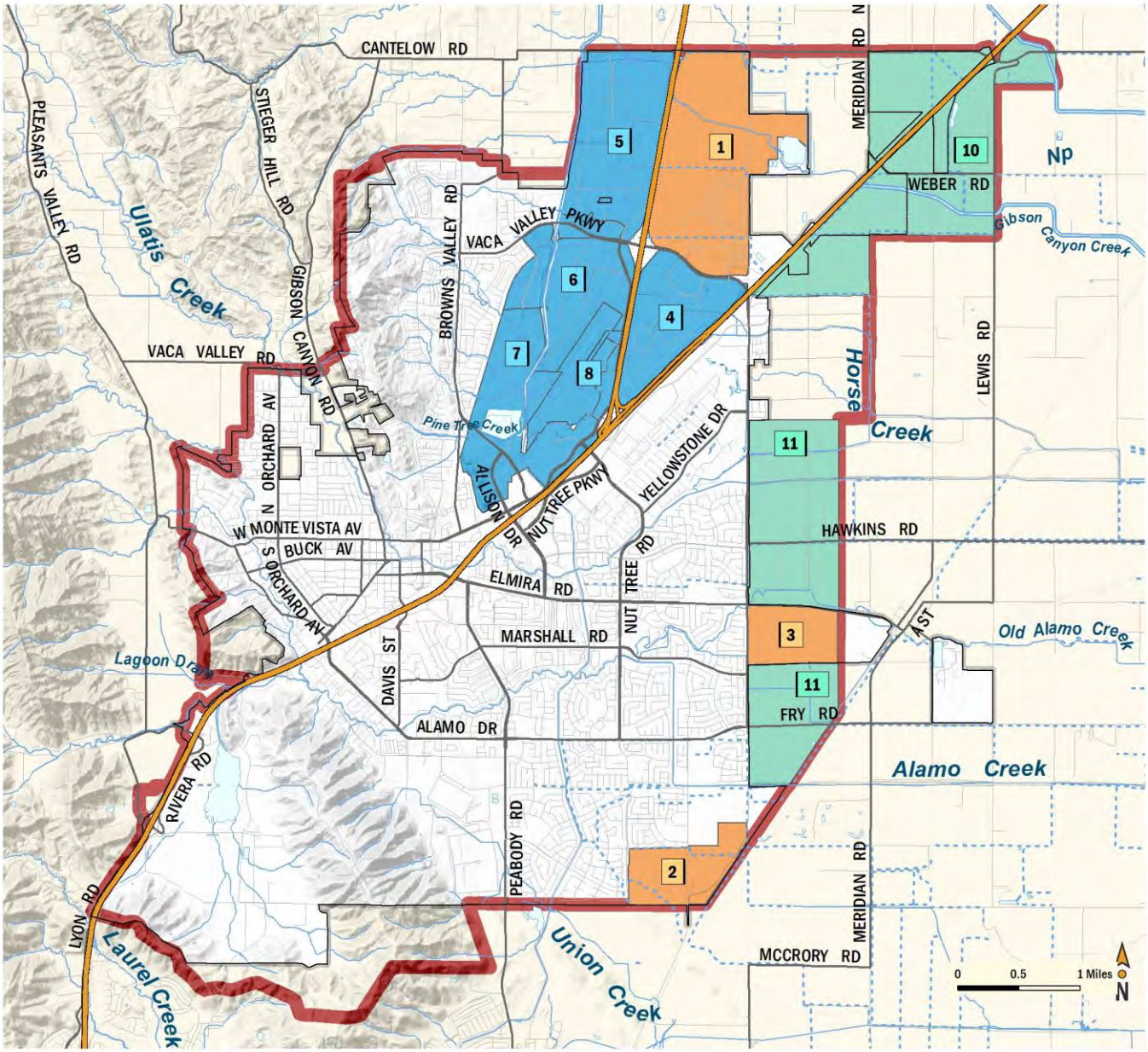


Figure 5-4: Growth Areas

Section 3.What's New

This section of the plan includes background information on the 2010 LHMP and the 2016 LHMP Updates. The 2010 Mitigation Actions were reviewed and have been changed, updated, and revised to reflect new priorities in the 2016 LHMP. The sections below describe the background and planning process for 2016 changes and updates.

3.1 2006, 2011 and 2016 LHMP Update Background

In August of 2006, the City of Vacaville adopted its first LHMP as required by DMA 2000. The 2006 LHMP provided a high-level overview of the hazards affecting the City. This plan was part of a jurisdictional annex to the 2005 Association of Bay Area Governments (ABAG) Multi-Hazard Mitigation Plan (MHMP). The 2006 plan included implementation strategies, or action items, listed under the eight major commitments, rather than by hazard. The implementation strategies were grouped by topic and each group is addressed individually in the chapter text. In this organization each of the cities and counties listed as participating jurisdictions were to find ways to address these strategies by reducing identified risks. For each the potential mitigation strategies, local governments were asked to choose their own priority for this strategy. The priorities in each of these local government Annexes were selected based on:

- level of hazards identified
- preliminary risk assessment conducted on a regional level
- supplementary hazard and risk assessment information developed by ABAG for each local government on the interactive internet site: http://quake.abag.ca.gov/mitigation
- any specific studies conducted by the local government and included in that local government's Annex to this plan.

During the 2006 and 2010 ABAG planning effort, the City of Vacaville Mitigation Planning Committee was provided a list of over 300 mitigation actions to approve, implement, and monitor. Mitigation actions from the ABAG planning effort included:

Appendix A	Infrastructure (INF)
Appendix B	Health (HEAL)
Appendix C	Housing (HSNG)
Appendix D	Economics (ECON)
Appendix E	Government (GOVT)
Appendix F	Education (EDUC)
Appendix G	Environment (ENVI)
Appendix H	Land Use (LAND)

In 2015-16, the City of Vacaville LHMP Planning Committee again examined over 300 historic mitigation actions under the above mentioned categories. It became apparent during the review process that monitoring and making progress on existing regional mitigation strategies was difficult to track and/or implement for local city planners. These difficulties were due to a number of local barriers including the following:

- Disconnected Mitigation Planning Efforts (Local versus Regional)
- Limited City resources
- Lack of Hazard Mitigation Training
- Lack of Technical Capabilities
- Lack of ownership and responsibility for implementing mitigation actions

- Plan maintenance and updating process were not clearly defined
- City government staff turnover

During the 2015-16 City of Vacaville LHMP update process, each 2010 mitigation action was examined for relevancy, future implementation and evaluated for potential follow-on effort. It was found that not one of the 300 plus mitigation actions developed during the 2010 ABAG Mult-Hazard Mitigation Planning effort were found relevant or detailed enough for implementation at a local jurisdictional level. Due to lack of relevance from past ABAG planning efforts (2005 and 2010), the City of Vacaville has decided to develop a "stand alone" local hazard mitigation plan. The 2016 City of Vacaville LHMP will serve as a "single" jurisdictional plan and provide more details on the community and the problems it faces with natural hazard risk. Mitigation Actions previously developed under the 2005 and 2010 will be completely refreshed to serve the newly completed risk assessment, planning process and implementation strategy.

3.1.1 Progress

Many of the mitigation strategies presented to the City by ABAG planners, though vague and disconnected from regional hazard mitigation reporting efforts, exist as part of the City's local ordinances, building codes, fire codes and other city sponsored natural hazard risk reduction efforts. Additional information on successful, though disconnected, planning efforts is described in Section 3.2.

The list of 2010 ABAG mitigation actions are not reported on directly, however they provided a platform upon which the 2015-16 LHMP Planning Committee was able to develop a more concise and achievable mitigation strategy. The 2015-16 LHMP Planning Committee believed the list developed as part of the 2010 mitigation planning effort was too generic, did not account for local capabilities and was not centered on the natural hazards risk reduction relevant to local conditions and problems. See Section 6 for an updated mitigation strategy based upon local capabilities and the natural hazard vulnerabilities presented in Section 5.

3.1.2 New Analysis and Methodology

The City of Vacaville has taken this opportunity to strengthen the plan through the use of new research methods and information systems. Geographic Information Systems (GIS) mapping has provided the City with the tools to develop data sets which are much more comprehensive than featured in the 2005 LHMP.

The 2016 LHMP focuses on natural hazards; the human-caused hazards of hazardous materials and public health hazards. The hazards identified in both the 2005 and 2010 LHMP have been removed, as these issues are generally covered by other planning initiatives such as the City of Vacaville General Plan Safety Element and regional emergency operations plans. The 2016 LHMP features new mitigation actions which focus on four different classifications. These classifications include:

1. Local Plans and Regulations – intended to reduce the City's vulnerability to future hazard events through the implementation of codes and regulations.

2. Structure and Infrastructure Projects – intended to protect existing structures by retrofitting, relocating, or modifying the structure to withstand a hazard event.

3. Natural Systems – to reduce the effects of hazards on the natural resources within a region by preserving and/or restoring natural areas along with their mitigation functions.

4. Public Information and Awareness – to advise residents, potential buyers, and visitors about hazards, potentially hazardous areas, and mitigation techniques.

3.2 Successful Mitigation Activities Since 2010-11

The 2010 LHMP Jurisdictional Annex to the ABAG plan, adopted and approved by the City of Vacaville and approved by California Office of Emergency Services (Cal OES), and FEMA, has been implemented through various on-going projects, plans and programs. With respect to the mitigation action items and strategy developed in 2010, Vacaville has been making improvements toward lowering natural hazard risk to life and property within the City. Significant risk reduction efforts have been made for floodplain management, flood damage prevention, and fire hazard abatement. These successful policies, programs, and projects are summarized below.

3.2.1 Flood Risk Reduction

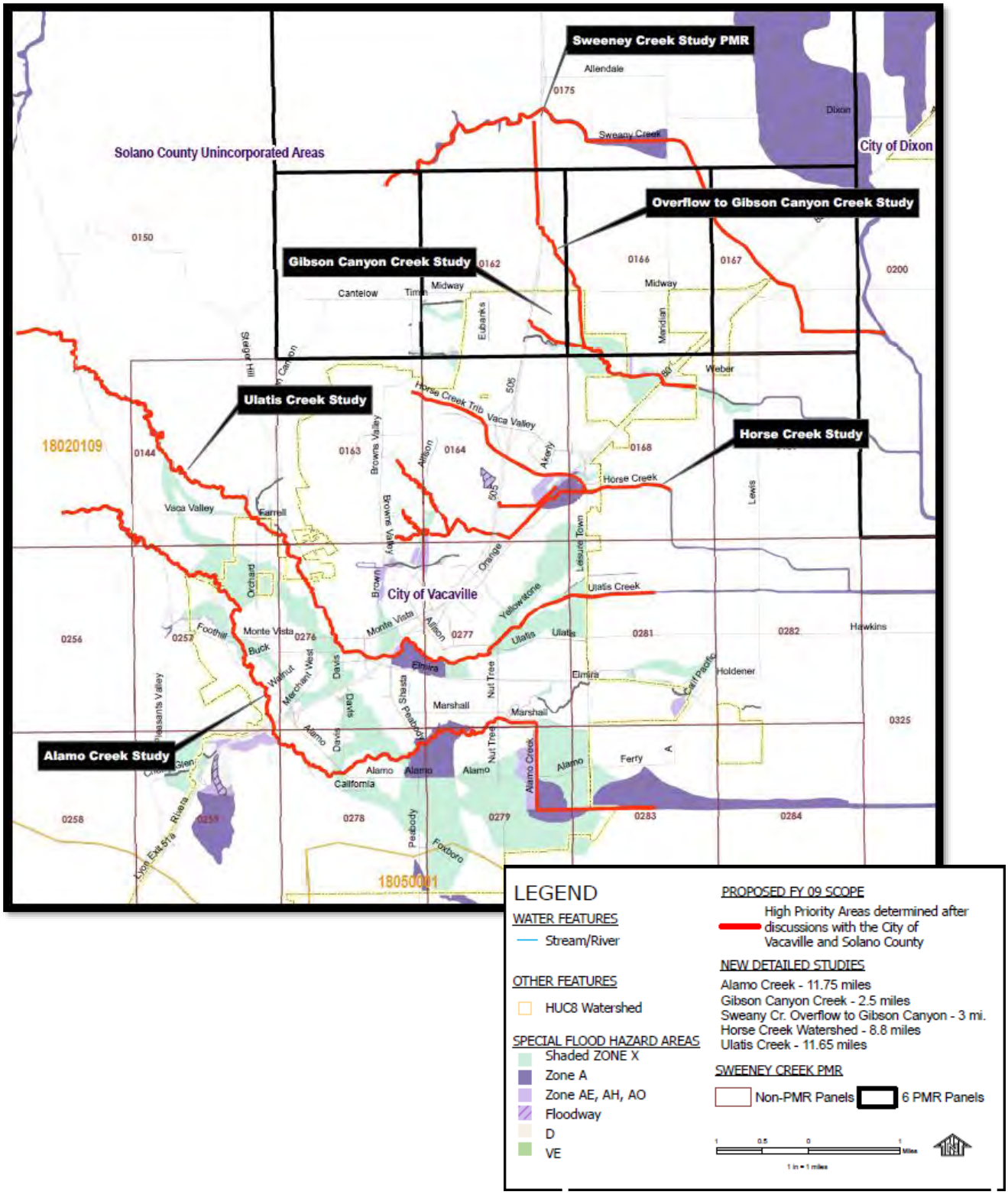
In Fiscal Year 2009, at the request of Solano County officials and due to the repetitive flooding problems that were occurring within localized areas, FEMA performed new hydrologic and hydraulic modeling on several watersheds within incorporated (City of Vacaville) and unincorporated areas of Solano County. FEMA performed field survey and new cross-sections for every 500 to 1000 FT along study area stream reaches or as needed to capture inflection points, as well as survey of structures likely to impact stream flows. Solano County provided the ground base mapping and topographic data or Light Detection and Ranging (LiDAR)[2] for utilization in the FEMA sponsored floodplain modeling effort. New detailed hydrologic and hydraulic were conducted for the following stream reaches:

- Alamo Creek – 11.75 stream miles – from 2000 ft. downstream of the City of Vacaville eastern-most boundary upstream to 6500 ft. upstream of Pleasants Valley Rd.
- Gibson Canyon Creek – 2.5 miles – from the City of Vacaville eastern-most boundary upstream to I-505.
- Horse Creek Watershed – 8.8 stream miles – from 1 mile downstream of the City of Vacaville eastern-most boundary upstream to 1300 ft. downstream of Browns Valley Road on main stem and tributaries in the City of Vacaville, as shown on the attached scoping map.
- Sweeney Creek Overflow to Gibson Canyon Creek – 3.0 stream miles - from the confluence with Gibson Canyon Creek to the overflow point on Sweeney Creek.
- Ulatis Creek – 11.65 stream miles – from 1 mile downstream of the City of Vacaville eastern-most boundary upstream to upstream to 6500 ft. upstream of Pleasants Valley Rd.

After hydrologic and hydraulic analyses were conducted for each of the reaches mentioned above, FEMA performed Physical Map Revisions (PMRs) to produce new Digital Flood Insurance Rate Maps (DFIRM) panels for areas that have undergone new floodplain studies. The FEMA scope of work map in Figure 3-1**.** details the location of the 6 DFIRM panels to be updated, the adjacent panel scales and layout for the FEMA flood study effort. As shown, the new flood studies are located within the communities of Vacaville and the unincorporated areas of Solano County.

[2] LIDAR uses ultraviolet, visible, or near infrared light to image objects and can be used with a wide range of targets, including non-metallic objects, rocks, rain, chemical compounds, aerosols, clouds and even single molecules.[1] A narrow laser beam can be used to map physical features with very high resolution.

Figure 3-1: FEMA Scope of Work Map



The Solano County flood studies were undertaken by FEMA as a national pilot to test and showcase the new Flood Insurance Rate Map (FIRM), Flood Insurance Study (FIS) report, and digital FIRM Geographical Information System (GIS) database formats. Solano County watersheds were chosen for the project because the Sweeney Creek Physical Map Revision (PMR) would allow a comparison of old and new formats. The maps, report, and GIS database produced as part of this project are the first in the nation to use the new FEMA guidance. These new guidelines will allow FEMA to advance on the vision of making and providing all FEMA regulatory and non-regulatory products in digital format. For further details on the new FEMA projects located within Solano County Visit:

http://www.r9map.org/Pages/California.aspx?choState=California

3.2.1.1.1 NRCS Ulatis Creek Basin Flood Improvement.

FEMA's FIS (Flood Insurance Study[3]) reported the existence of a Natural Resources Conservation Service (NRCS) project in the Ulatis Creek basin. The project was designed to provide protection against a 10-percent annual chance flood. Project works extend from Cache Slough upstream to approximately Interstate Highway 80 and consist of channel improvements of Ulatis, Old Alamo, Horse, and Gibson Canyon Creeks; a new channel on Alamo Creek downstream from Nut Tree Road; stabilization structures on Ulatis, Alamo, and Horse Creeks; and levees along lower Ulatis Creek and lower Old Alamo Creek. Additional improvements are proposed for Alamo, Sweeney, McCune Creeks and Dry Arroyo. Maintenance of the project is the responsibility of Solano County.

3.2.2 Drought Ordinances and Public Outreach

"Drought condition" means a condition where there is a water shortage necessitating a reduction in water use, either City-wide or in a sub-area or land-use category within the City, but that is not to the level of an emergency condition. See Section 5 for a complete description of Drought in the Vacaville region.

The City of Vacaville has gone through tremendous efforts to curb the effects of drought on their citizens. Included in these efforts was the adoption of Ordinance 1877. Under the ordinance, upon determination of a water shortage by the Utilities Department, through the Director of Utilities, City Council will review the recommendations of the City Manager and will authorize the implementation of such drought or emergency conservation measures. After holding a public hearing, the City Council will, by resolution, determine whether a drought or emergency condition exists. This will in turn determine which water conservation measures identified in the City's Urban Water Shortage Contingency Plan, in addition to those set forth in this chapter, are to be put into effect by the Utilities Department during the drought or emergency condition, and the water surcharges and/or changes in water rates to be charged to water customers and users, if any, during the drought or emergency condition. Drought or emergency conservation measures will continue to be in effect until the Utilities Department has determined that water shortage conditions have improved, justifying a less restrictive conservation level, and a resolution of the City Council is adopted declaring a reduction or elimination of conservation measures. The ordinance also states that any duly authorized representative of the City shall have the right to inspect existing and new construction for compliance with this chapter and to access the customer's water meter for inspection and for shutting off and turning on water service for installing or removing flow restrictors. Resale of water supplied by the City is prohibited, except where specifically allowed by agreement approved by the City Council. Use of reclaimed

[3] A Flood Insurance Survey (FIS) is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into an FIS. The FIS report contains detailed flood elevation data in flood profiles and data tables.

wastewater is exempt from the provisions of this chapter and is encouraged in place of potable water supplied by the City water system where it is feasible and within state reclamation guidelines. Fines for violations range from $50 up to a maximum of $500 per account holder. City Council by resolution may implement penalties in the form of surcharges for water use in excess of water conservation goals in drought and emergency conditions in which a water conservation action stage is declared as defined in the Urban Water Shortage Contingency Plan. To read the Ordinance in its entirety visit:

http://www.codepublishing.com/CA/Vacaville/

In response to the April 1, 2015 Executive Order issued by Governor Jerry Brown mandating 25% water conservation statewide, on May 5th, 2015 the State Water Resources Control Board (Board) adopted additional emergency drought regulations requiring every city and water agency to reduce their water usage 4% to 36% from their 2013 water usage. Each city's conservation standard was based on their reported residential Gallons Per Capita Per Day (GPCD) from September 2014. Accordingly, the City of Vacaville has been assigned a conservation standard of 32%, which is consistent with other cities and agencies in the Sacramento River Hydrological region. For more information on the State's Drought regulations and water conservation tiers, visit:

http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/

The City of Vacaville has set up a comprehensive and user friendly website that is available in both English and Spanish. A series of Waterwise Workshops describing current regulations and restrictions, as well as proposed water allocations and enforcement actions, were held the first week of June 2015.

On June 23, 2015 the City Council approved a series of additional water conservation measures as part of it's Urban Water Shortage Contingency Plan Stage 3 response designed to meet the 32% water conservation standard set for Vacaville by the State of California. These measures included establishing residential household allocations; specifying watering days for residential and commercial, industrial, and institutional customers; and amending and implementing fines for violations of water use prohibitions and penalties for water use in excess of household allocations. The additional measures went into effect July 1, 2015.

3.2.3 General Plan Safety Element

During the 2015 General Plan Update, the City of Vacaville also updated the General Plan Safety Element.

The City of Vacaville has adopted the Association of Bay Area Governments' (ABAG's) regional hazard mitigation plan as the City's local hazard mitigation plan. The document seeks to improve the resilience of critical systems, including infrastructure, health, housing, the economy, government services, education, the environment, and land use.

To do so, the document analyzes natural and human-made risks to these systems and discusses strategies for avoidance, preparation, and mitigation. The document emphasizes probable natural disasters, including earthquakes, wildfires, flood, major storms, and tsunamis, among others. The report includes actions and strategies for local and regional governments to strengthen systems before disasters and manage them during a subsequent recovery.

The Solano County Office of Emergency Services has also prepared a Multiple Hazard Mitigation Plan that assesses hazards, assigns responsibilities, and prescribes evacuation routes for all of Solano County, including Vacaville. The Vacaville General Plan Safety Element can be found at:

http://www.vacavillegeneralplan.org/wp-content/uploads/2015/11/7_Safety.pdf.

3.2.4 Weed Abatement Program

The City of Vacaville experiences hot and dry weather which creates a fire hazard when vegetation dries out and becomes extremely flammable. Many devastating fires can be prevented with a proper weed abatement program.

Vacaville has adopted a Weeds and Rubbish Abatement Ordinance (Vacaville Municipal Code, Chapter 8.04), requiring the removal of dry vegetation, weeds, rubbish, and other fire hazards. To compliment the ordinance, infographics have been created for citizens displaying the Vacaville Fire Department's Weed Abatement requirements and general safety tips including maintaining landscapes, precautions to take, equipment use safety, and what to do before, during and after an evacuation.

3.2.4.1.1 304.1.5 Weed abatement minimum lot requirements

Abatement of Weeds and Other Vegetation. Section 304.1.5 is added to Section 304.1 of Chapter 3 to read in full as follows:

a. For properties up to one (1) acre in size:

1. All weeds shall be abated.

2. All weeds around fence lines, sidewalks, and other objects shall be removed.

3. Trees or branches that are within ten feet (10') of the outlet of a chimney or stovepipe shall be removed or pruned to provide ten feet (10') or more of clearance.

4. Tree branches located within one hundred feet (100') of a structure or improvement shall be pruned to be not less than four feet (4') from the ground.

5. Tanks shall have not less than thirty feet (30') of clearance.

b. For properties in excess of one (1) acre but not more than five (5) acres in size:

1. A thirty foot (30') firebreak around the perimeter of the property shall be maintained.

2. All weeds around fence lines, sidewalks, and other objects shall be removed.

3. There shall be not less than one hundred feet (100') of clearance around all structures and other improvements.

4. Disking (two or more times) may be required to a depth of six to ten inches (6"-10") if the soil does not properly mix with the removed weeds.

5. Trees or branches that are within ten feet (10') of the outlet of a chimney or stovepipe shall be removed or pruned to provide ten feet (10') or more of clearance.

6. Tree branches located within one hundred feet (100') of a structure or improvement shall be pruned to be not less than four feet (4') from the ground.

7. Tanks shall have not less than thirty feet (30') of clearance.

c. For properties in excess of five acres:

1. There shall be not less than a thirty foot (30') wide firebreak around the perimeter and a thirty foot (30') wide firebreak at the center of the property.

2. There shall be not less than one hundred feet (100') of clearance around all structures and other improvements.

3. Trees or branches located within ten feet (10') of the outlet of a chimney or stovepipe shall be removed or pruned to provide ten feet (10') or more of clearance.

4. Tree branches located within one hundred feet (100') of a structure or improvement shall be removed or pruned to be not less than four feet (4') from the ground.

5. Tanks shall have not less than thirty feet (30') of clearance.

d. For hillside residential properties:

1. There shall be not less than one hundred feet (100') of clearance around all structures and other improvements.

2. All weeds around fence lines, sidewalks, and other objects shall be removed.

3. Trees and branches located within ten feet (10') of a chimney or stovepipe shall be removed or pruned to provide ten feet (10') or more of clearance.

4. Tree branches located within one hundred feet (100') of a structure or improvement shall be removed or pruned to be not less four feet (4') from the ground.

5. Tanks shall have not less than thirty feet (30') of clearance.

e. For uncultivated agricultural property - Only if there is not a current crop growing on the property:

1. There shall be not less than a thirty-foot (30') wide firebreak around the perimeter and a thirty-foot (30') wide firebreak at the center of the property.

2. There shall be not less than one hundred feet (100') of clearance around all structures and other improvements.

3. Trees and branches located within ten feet (10') of the outlet of a chimney or stovepipe shall be removed or pruned to provide ten feet (10') or more clearance.

4. Tree branches located within one hundred feet (100') of a structure or improvement shall be removed or pruned to provide ten feet (10') or more of clearance.

5. Tanks shall have not less than thirty feet (30') of clearance.

3.3 What's New in the LHMP Update

For the 2016 LHMP, the Vacaville LHMP Planning Committee reviewed and analyzed the 2010 LHMP. This included a review of the planning process, historical disasters, hazard and risk assessment, mitigation goals, mitigation actions, and plan maintenance and updating process sections.

The 2016 LHMP has been completely revamped to included Vacaville specific hazard information to fully capture the City's unique hazard environment and focus limited resources on relevant mitigation efforts. Table 3-1 details the changes incorporated into the Vacaville 2016 LHMP. These changes include an expanded community profile, extensive public outreach strategy, in-depth hazard profiles, detailed risk assessments including detailed overlay analysis and Hazus-MH loss estimation, specific mitigation actions, and a specific maintenance and updating process for the next five years.

Table 3-1: Changes to the Plan Components

2010 Vacaville HMP Sections	Changes Incorporated into the updated HMP
Introduction	▪ The 2016 LHMP includes an expanded community profile section with updated demographic and other City-specific data to inform readers of the changes in the planning area. This is important, as hazard mitigation can be conducted early and ahead of population growth and future development.
Planning Process	▪ To meet DMA 2000 criteria, the 2016 LHMP includes detailed documentation about the planning process for the planning process, its participants, and the meetings/workshops conducted have been thoroughly documented to meet FEMA requirements. See Section 4 and Appendix B. ▪ Included as part of the planning process is the documentation of the public outreach strategy and public participation in the plan development. See Section 4 and Appendix B ▪ The 2016 LHMP is a single jurisdiction plan. The previous version was a cooperative jurisdictional annex plan between the City of Vacaville and ABAG.
Historical Disasters	▪ Historical disaster information has been updated since the adoption of the 2005- 06 LHMP. New information is now included in the hazard profiles. See hazard information and photos throughout Section 5. ▪ The 2016 LHMP now includes disasters that were not federally-declared in the City, resulting in losses and damages to the City. This addition is specifically related to the 1998 and 2007 flooding, which caused significant damage in the City of Vacaville. Please refer to Section 5 for more information.
Hazard Profile and Risk Assessment	▪ The 2010 LHMP hazards have been updated and changed based upon Planning Committee priorities, FEMA guidance, and risk assessment outcomes. ▪ The 2010 LHMP hazard profiles and risk assessments have been updated with new and current data from the City. ▪ Potential impacts to the City from identified hazards have been described in terms of exposure analysis of population, parcel values (based on Solano County Assessor's data), and critical facilities in the City. This was done to aid hazard mitigation planners to compare hazard risk for each hazard and provide data on how exposure to populations and assets change with each hazard. See Section 5 for more information on hazard risk and the related exposure.

Goals, Objectives and Mitigation Actions	▪ To meet FEMA requirements, the Planning Committee reviewed the 2010 LHMP goals and determined current day validity. Due to changes in City priorities, the goals and objectives have been updated to meet the current hazard environments. ▪ The 2016 LHMP now includes an expanded City-specific capabilities assessment for implementing the mitigation actions. By understanding capabilities to conduct mitigation actions within the City, the Planning Committee developed mitigation actions that meet current-day and near-term resources. ▪ The 2016 LHMP includes detailed mitigation actions based upon the risk assessment and capabilities to carry out mitigation actions over the next 5 years. Newly identified and prioritized City-specific mitigation actions can be found in Section 6.
Plan Maintenance and Updating Process	▪ The 2015-16 LHMP now includes an expanded implementation strategy for selected mitigation actions. Implementation strategies provide a detailed step-by-step process for which mitigation champions throughout the City can follow when implementing mitigation actions. Implementation strategy worksheets can be found in Appendix D. ▪ Following FEMA guidance, the 2016 LHMP provides expanded plan maintenance and update processes. This is done to provide the City's mitigation champions and administrators a consistent method to update and report on plan progress and successes, and/or difficulties in implementing mitigation actions. See Section 7 for more information. ▪ The 2016 LHMP now includes plan monitoring and evaluation progress reporting forms which will be updated on an annual basis. The Annual Review Questionnaire and Mitigation Action Progress Report forms will assist the monitoring and evaluation process and reduce the burden of future plan updates. Reporting forms can be found in Appendix D.

Section 4.The Planning Process

This section describes each stage of the planning process used to develop the 2016 LHMP. The 2015-16 LHMP planning process provides a framework for document development and follows the FEMA recommended steps. The 2016 LHMP follows a prescribed series of planning steps which includes organizing resources, assessing risk, developing the mitigation plan, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan for approval. Each is described in this section.

4.1 Planning Process

Hazard mitigation planning in the United States is guided by the statutory regulations described in the DMA 2000 and implemented through 44 Code of Federal Regulations (CFR) Part 201 and 206. FEMA's HMP guidelines outline a four-step planning process for the development and approval of HMPs. Table 4-1 lists the specific CFR excerpts that identify the requirements for approval.

Table 4-1: DMA 2000 CFR Crosswalk

DMA 2000 (44 CFR 201.6)	2014 HMP Plan Section
(1) Organize Resources	Section 4
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	Section 5
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	Section 6
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	Section 7
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

For the development of the 2016 LHMP, a planning process was customized to address the City's unique population and demographic. All basic federal guidance documents and regulations are met through the customized process. As shown in Figure 4-1, the LHMP planning process (and documented in the corresponding sections) included organizing resources, assessing risk, developing the mitigation action strategy, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan.

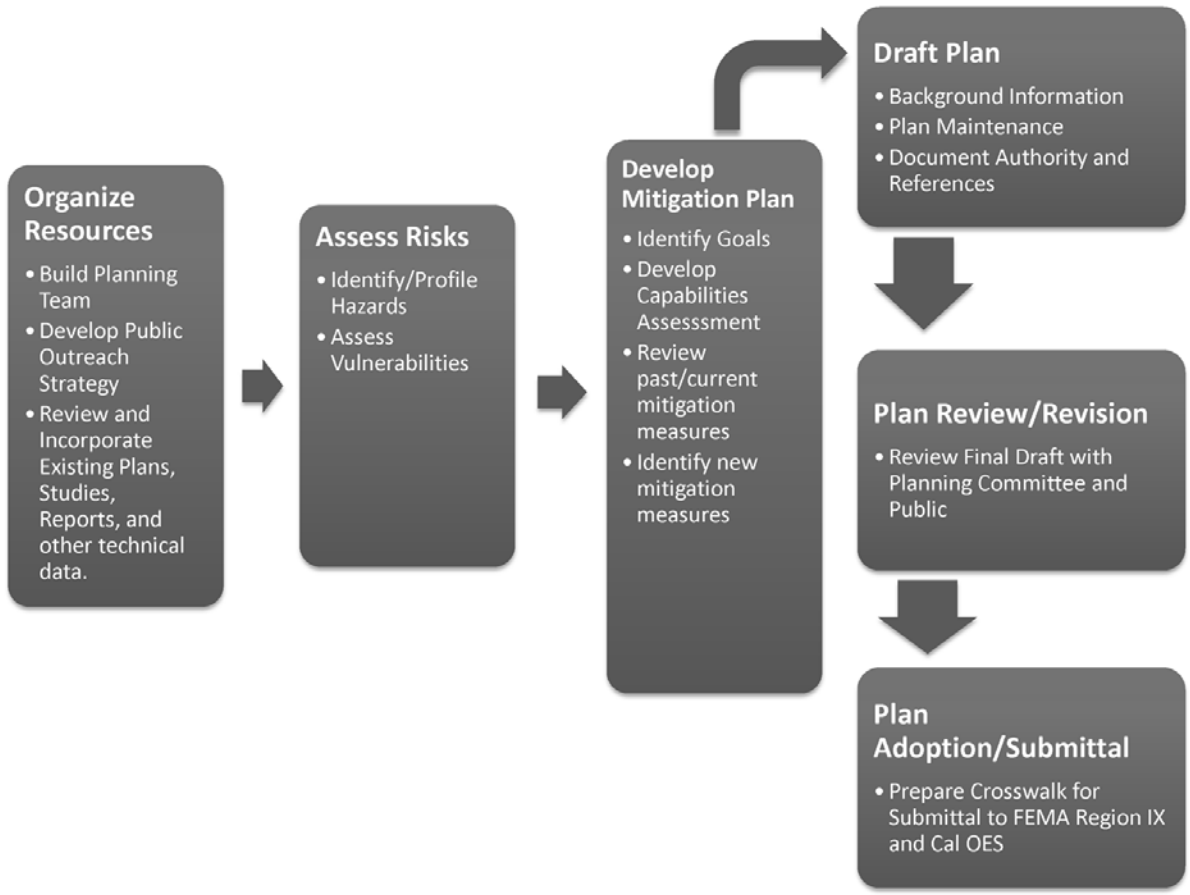
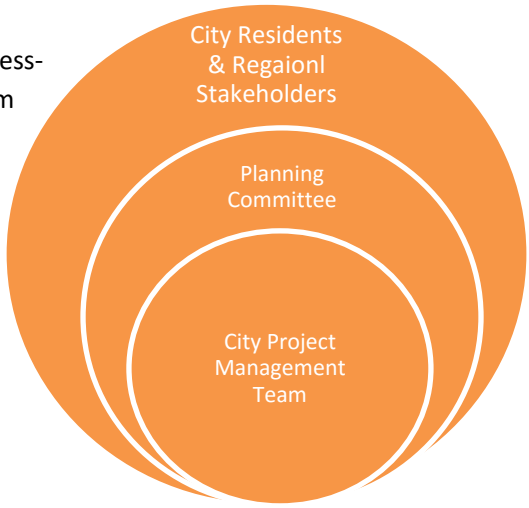


Figure 4-1: City of Vacaville LHMP Planning Process

4.2 Organize Resources

This section describes the first step of the 2016 LHMP planning process- Organizing Resources. Organizing the resources consists of planning team development and document review tasks.



4.2.1 Building the Planning Team

The Planning Team, key to the back bone of the planning process, was critical for the development of the 2016 LHMP. The Planning Team consisted of a City Project Management Team, Planning Committee, engaged City Residents and Regional Stakeholders, and a LHMP consultant used for plan development and facilitation.

4.2.1.1 Project Management Team

At the core of the 2015-16 LHMP planning process is the LHMP City Project Management Team. The LHMP City PM Team was integral in ensuring the success of the planning process, its implementation, and future maintenance. The City

developed a professional services agreement with a LHMP consultant (Dynamic Planning + Science) to provide direction for the development of the 2016 update. Members of the project management team were also a part of the LHMP Planning Committee discussed below.

4.2.1.2 Planning Committee

The 2015-16 LHMP Planning Committee consisted of key decision makers in specific government functions representing City and Regional government organizations. The committee included stakeholders who actively participated in the planning process. Planning processes included:

- A series of structured coordination meetings
- Collection of valuable local information and other requested data
- Decision on plan process and content
- Development of mitigation actions for the LHMP
- Review and comment on plan drafts
- Coordination of the public input process

The preparation of the 2016 LHMP required a series of meetings and workshops intended to facilitate discussion and initiate data collection efforts with local community officials. More importantly, the meetings and workshops prompted continuous input and feedback from local officials throughout the update process. Table 4-2 provides a list of the 2014 HMP Planning Committee members.

Table 4-2: 2014 HMP Planning Committee

Planning Committee Members	Title / Role
City Public Works	
Steve Hartwig	Director
Shawn Cunningham	Assistant Director
Tim Burke (NFIP)	City Engineer
Pat Kinney (Maintenance)	Public Works Manager
Community Development / City Planning	
Barton Brierley	Community Development Director
Jay Salazar	Building Official
City Fire	
Kris Concepcion	Fire Chief
Matt Lage	Battalion Chief
Jill Childers	Fire Prevention Bureau Manager
City Utilities	
Steve Sawyer	Assistant Director of Utilities

Planning Committee Members	Title / Role
City Administration	
Mark Mazzaferro (PIO/CM)	PIO Director
Curt Corbett (GIS)	GIS Administrator

Table 4-3: 2015-16 LHMP Stakeholder List

Planning Committee / Stakeholder Members	Name
Solano County	
Solano County Office of Emergency Services	Don Ryan
Solano County Office of Emergency Services	Alex Benetti
Regional Utilities	
Solano County GIS	Jake Armstrong (GIS Coordinator)
Solano County Water Agency (SCWA) Water Conservation	Andrew Florendo
Solano County Water Agency (SCWA) Engineering	Jeff Barich
Partner Agencies	
City of Dixon (Fire Department)	Aaron McAllister, Fire Chief
City of Fairfield (Community Development Department)	Brian Miller
Vacaville Unified School Districts	Jane Shamieh, Superintendent
Vacaville Unified School Districts	Teresa Flores, Executive Secretary
Travis Unified School District	Kelly Hatcher
Solano County Land Trust	Nicole Byrd, Executive Director
Greenbelt Alliance	Amy Henson; Marketing & Communications Director
Greenbelt Alliance	Joel Devalcourt, Regional Representative, East Bay
Greenbelt Alliance	KEN LAVIN, Outings Coordinator
Solano Resource Conservation District	Chris Rose
Association of Bay Area Governments, , Earthquake and Hazard Program Coordinator	Danielle Hutchings-Mieler
Vacaville Ulatis Lions Club	President, Lion Tajuana Slaybaugh
Cal OES (Hazard Mitigation Pre-Disaster & Flood Mitigation)	
Grants Administration / Emergency Services Coordinator	Ricardo Castillo
Senior Emergency Services Coordinator	Victoria LaMar-Haas

4.2.1.3 LHMP Consultant Team

To provide assistance to the LHMP Planning Committee, the City enlisted Dynamic Planning + Science due to its expertise in assisting public sector entities with developing hazard mitigation plans and strategies for particular hazard prone areas. Dynamic Planning + Science supported the City through facilitation of the planning process, data collection, and meeting

material and document development. The LHMP Consultant Team, as shown in Table 4-3, consists of a variety of hazard mitigation and certified urban planning professionals.

Table 4-4: HMP Consultant Team

HMP Update Project Team	HMP Update Project Team Role
Ethan Mobley, AICP	Project Manager
Brian Greer	GIS Specialist/Spatial Analyst
Jeanine Foster	Plan Review Consultant (Foster Morrison)
Chris Morrison	Plan Writing Consultant (Foster Morrison)

4.2.1.4 Planning Committee Meetings

The LHMP Planning Committee met throughout the development of the updated LHMP document. Table 4-4 provides a summary of the meetings conducted throughout the planning process, including meeting date, type, and topics discussed. Meeting documentation, including agendas, hazard maps, PowerPoint presentations, minutes, sign-in sheets, and other relevant handouts, are provided in Appendix B.

Table 4-5: Meeting Summary

Date	Meeting Type	Topics
August 2015	Planning Committee Meeting #1	*Part 1:* ▪ *Welcome and Introductions* ▪ *Mitigation Planning Defined* ▪ *Background* ▪ *Local Hazard Mitigation Planning Process* ▪ *Overall Objectives* ▪ *Project Schedule* *Part 2:* ▪ *Hazard Identification and Risk Assessment (HIRA) process* ▪ *Local Hazard Initial Review* ▪ *Critical Infrastructure / Essential Facility Review* ▪ *Hazus Earthquake Scenario Development* ▪ *Next Steps* ▪ *Wrap UP*
October 2015	Planning Committee Meeting #2	*Part I:* ▪ *Draft Risk Assessment Outcomes* *Part 2:* ▪ *Risk Factor Development* ▪ *Problem Statements Exercise*
November 2015	Planning Committee Meeting #3	*Part I:* ▪ *Problem Statement Review* ▪ *Capabilities Assessment / Problem Statement Crosswalk* *Part 2:* ▪ *Mitigation Action Review / Problem Statement Crosswalk* ▪ *Mitigation Reporting*

Date	Meeting Type	Topics
December 2015	Planning Committee Meeting #4	*Meeting Objectives:* ▪ *Review Problem Statements and Objectives (Now Mitigation Actions)* ▪ *Review Critical Facilities List and Maps* ▪ *Review Capabilities Assessment* ▪ *Review Mitigation Actions* ▪ *Prioritize Mitigation Actions*
January 2016 - March, 2016	Plan Review Meetings	*Plan Review and Refinement:* ▪ *Public Plan Review* ▪ *City Council Review*

Figure 4-2: City of Vacaville Meeting #2 Documentation

Figure 4-2: City of Vacaville Meeting #4 Documentation

4.2.2 Public Outreach

Public outreach is a major and required component of any LHMP update. The Vacaville 2016 LHMP Public Outreach Strategy was developed to maximize public involvement throughout the planning process. The LHMP Public Outreach Strategy details the utilization of websites, local media, and community-based services and establishments to engage the public throughout the LHMP planning process. This section provides additional information on the project website and workshop process used during the HMP plan development.

4.2.2.1 Hazard Mitigation Open House

The LHMP Planning Team worked with City agencies and the public during an open house at the Ulatis Community Center in September 2015.

Open house attendees were signed in and asked to place a sticker on the map where their house is located. This exercise helped guests orient themselves their location within Vacaville and improve the impact of the hazard maps at the other stations.

After orienting themselves (and grabbing some pizza), attendees traveled through the room, visiting each hazard station, reading each map and visiting with our project team and City of Vacaville staff experts in each hazard subject.

After making their way through the hazard stations, each visitor went through the final station and submitted their raffle ticket, as well as any feedback they had to offer. Visitors were also given the opportunity to share their own hazard-related Vacaville images.

Figure 4-2: Vacaville Hazard Mitigation Open House

4.2.2.2 Publicizing the Plan

The City of Vacaville's Local Hazard Mitigation Plan webpage is an information source and document repository for the City's LHMP. In addition to being a resource for the public, it is also a means of collecting disaster related stories, photos and comments from residents.

The City of Vacaville also made a presentation of the LHMP for City Council outlining the plan. The presentation emphasized the importance of mitigation, goals of the plan, the potential for hazards to occur and the vulnerability of the City.

4.2.2.3 Public Outreach Posters

During the outreach effort the Project Management Team developed a one-day public poster installation itinerary to target public meeting places that allowed the City to advertise the Hazard Mitigation Planning efforts. This effort started with parcel data that was filtered into six categories with potential for highly visible public posting locations. The parcels deemed poster outreach candidates included the categories (based on assessor's use remarks) commercial retail, shopping center, theater, restaurant, and religious facilities.

These outreach candidates were then buffered into dissolved "walkable" tenth mile clusters, of which outreach "zones" were defined and prioritized to maximize our field team's effort. For each outreach zone, a destination stop was defined for the outreach team's itinerary at a point where the field team could park and hit the ground to ask about posting the meeting information. These stops were provided to the team in the form of an email with clickable driving links to each itinerary stop. The field crew used paper maps as reference and record of the trip, where a check box for whether a poster was installed and a space for notes at each stop was provided. **Error! Reference source not found.** illustrates our poster installation process and final poster graphics.

Figure 4-3: Public Outreach Posters

4.2.2.4 Targeted Mailers

With targeted mailers, the City targeted and identified potential interested stakeholders, including residents and property owners residing near or in Floodplains and other hazard prone areas as a requirement. The City's consultant modeled a targeted approach to reach residents with property inside natural hazard areas. The City also developed a GIS-based model that intersects high natural hazard layers with county parcels to produce a mailing list targeting the residents with a vested interest in attending public workshops to learn more about the risk they face. Using the best available assessor's notification address data, each parcel was intersected with areas of high natural hazards to produce an outreach mailing list. This control allowed decision makers the ability to maximize cost-efficiency while reaching the greatest number of at-risk residents.

4.2.3 Review and Incorporate Existing Information

The LHMP Planning Committee reviewed and assessed existing plans, studies, and data available from local, state, and federal sources. Documents reviewed and incorporated as part of the LHMP planning process are shown in Table 4-6.

Table 4-6: Existing Plans, Studies, Reports, and Other Technical Data/Information

Existing Plans, Studies, Reports, and Other Technical Data/Information	Planning Process / Area of Document Inclusion
2013(Draft) California State Enhanced MHMP	Hazard Profiles
California Drought Contingency Plan	Drought Profile and Drought Mitigation Plan Development
California Drought Report 2010	Drought Profile and Drought Mitigation Plan Development
The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2)	Earthquake Hazard Profile Development
FEMA Hazard Mitigation How-to Guides	2012 Hazard Mitigation Plan Development, Start to Finish
City of Vacaville Digital Flood Insurance Rate Map (DFIRM) panels	Flood Hazard Profile and Development of FEMA special flood Hazard area depth grids.
Existing Zoning and Floodplain Management Ordinances	Flood Hazard Regulatory Environment and Mitigation Strategy
NFIP flood insurance policies and claims records.	Flood Hazard Regulatory Environment and Mitigation Strategy
FEMA E-74 Reducing the Risks of Nonstructural Earthquake Damage – A Practical Guide	Earthquake Mitigation Strategy
FEMA Local Mitigation Planning Handbook	Local Plan Integration Methods
FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013	Mitigation Strategy Development
USGS Landslide Types and Processes (White Paper)	Landslide Mitigation Strategy Development
NOAA Record Storm Events	Death and Injuries Report for past disaster declarations
13 Fuels Key Guide, Documented by Albini (1976) and Rothermel (1972).	Wildfire Hazard Profile
City of Vacaville General Plan (2015)	Local Plan Integration

Existing Plans, Studies, Reports, and Other Technical Data/Information	Planning Process / Area of Document Inclusion
American Planning Association – California Chapter; Planning for Wildfires, A Regulatory Agency Response	Wildfire Mitigation Strategy
California Geological Survey (CGS) Landslide GIS Data and Mapping Information	Landslide Hazard Profile and Mitigation Strategy Development
Ulatis Creek Drainage Study 2008	NRCS Ulatis Creek Basin Flood Improvement and Flood Hazard Profile

4.2.4 Assess Risks

In accordance with FEMA requirements, the 2016 LHMP Planning Committee identified and prioritized the natural hazards affecting Vacaville and assessed the vulnerability from them. Results from this phase of the LHMP planning process aided subsequent identification of appropriate mitigation actions to reduce risk in specific locations from hazards. This phase of the LHMP planning process is detailed in Section 5.

4.2.4.1 Identify/Profile Hazards

Based on a review of past hazards, as well as a review of the existing plans, reports, and other technical studies/data/information, the 2016 LHMP Planning Committee determined if the existing hazards were still valid, and identified new hazards that could affect the City. Updated content for each hazard profile is provided in Section 5.

4.2.4.2 Assess Vulnerabilities

Hazard profiling exposes the unique characteristics of individual hazards and begins the process of determining which areas within Vacaville are vulnerable to specific hazard events. The vulnerability assessment included field visits and a GIS overlaying method for hazard risk assessments. Using these methodologies, vulnerable populations, infrastructure, and potential loss estimates impacted by natural hazards were determined. Detailed information on vulnerability assessment for each hazard is provided in Section 5.

4.2.5 Develop Mitigation Plan

The 2016 LHMP was prepared in accordance with DMA 2000 and FEMA's HMP guidance documents. This document provides an explicit strategy and blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and Vacaville's ability to expand on and improve these existing tools. Developing the mitigation plan involved identifying goals, assessing existing capabilities, reviewing the 2010 LHMP goals, and identifying new mitigation actions. This step of the LHMP planning process is detailed in Section 6 and summarized below.

4.2.5.1 Identify Goals

To meet FEMA requirements, the Planning Committee reviewed the 2010 LHMP goals and determined current day validity. Due to changes in City priorities, the goals and objectives have been updated to meet the current hazard environments. The Goals and Objectives are presented in Section 6.

4.2.5.2 Develop Capabilities Assessment

A capabilities assessment is a comprehensive review of all the various mitigation capabilities and tools currently available to the City to implement the mitigation actions that are prescribed in the 2016 LHMP. The LHMP Planning Committee identified the technical, financial, and administrative capabilities to implement mitigation actions, as detailed in Section 6.

4.2.5.3 Identify Mitigation Actions

As part of the 2016 LHMP planning process, the LHMP Planning Committee reviewed and analyzed the status of the mitigation actions identified in the 2010 LHMP and provided data and information on the status of the existing mitigation actions. Once the review and analysis of the 2010 LHMP mitigation actions was complete, the LHMP Consultant Team and LHMP Planning Committee worked together to identify and develop new mitigation actions with implementation elements. Mitigation actions were prioritized and detailed implementation strategies were developed during Planning Committee Meeting #4. A detailed approach of the review of the existing mitigation actions, identification, and prioritization of new mitigation actions, and the creation of the implementation strategy is provided in Section 6.

4.2.5.4 Draft HMP Update

Once the risk assessment and mitigation strategy were completed, information, data, and associated narratives were compiled into the 2016 LHMP. Section 3 provides detailed information on "what's new" and updated as part of the 2016 LHMP.

4.2.5.5 Plan Review and Revision

Once the "Draft" 2016 LHMP was completed, a public and government review period was established for official review and revision. Public comments were accepted, reviewed, and incorporated into this update. Applicable comments from the public have been received and addressed prior to the *"authorization to submit"* to FEMA and Cal OES review parties.

4.2.5.6 Plan Adoption and Submittal

This plan has been submitted and approved by FEMA and adopted by the City as the official statement of Vacaville hazards. A copy of the resolution is provided in Appendix A*. This section will be completed after approval by Cal OES and FEMA.*

4.2.5.7 Plan Maintenance

Updated plan maintenance procedures, found in Section 7, include the measures Vacaville and participating agencies will take to ensure the LHMP's continuous long-term implementation. The procedures also include the manner in which the LHMP will be regularly monitored, reported upon, evaluated, and updated to remain a current and meaningful planning document.

Section 5. Natural Hazard Risk Assessment

Natural hazard risk assessment is the process of measuring the potential impact to life, property and economic impacts resulting from natural hazards. The intent of the Risk Assessment is to identify, as much as practicable given existing/available data, the qualitative and quantitative vulnerabilities of a community. The results of the risk assessment allow for a better understanding of the impacts of natural hazards to the community and provides a foundation in which to develop and prioritize mitigation actions (see Section 6) to reduce damage from natural disasters through increased preparedness and response times and the better allocation of resources to areas of greatest vulnerability.

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

1) Identify Hazards.

2) Profile Hazard Events.

3) Inventory Assets.

4) Estimate Losses.

Information gathered during the City of Vacaville planning process related to the above four steps has been incorporated into the following discussions in this chapter:

Section 5.1: Hazard Identification identifies and prioritizes the natural hazards that threaten the City. The reasoning for omitting some hazards from further consideration is also provided in this discussion.

Section 5.2 through Section 5.10: Hazard Profiles describe each of the natural hazards that pose a threat to Vacaville. Information includes the location, extent/magnitude/severity, previous occurrences, and the likelihood of future occurrences.

Section 5.11: Natural Hazard Risk Assessment presents the City's exposure to natural hazards, as it identifies at-risk populations and assets, including City-owned facilities and other critical facilities. Where the information was available, potential dollar loss estimates for facilities are provided to show a partial representation of the financial cost of a disaster to a community.

5.1 Identifying the Hazards

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The City's MHMP Planning Team reviewed a number of previously prepared hazard mitigation plans and other relevant documents to determine the universe of natural hazards that have the potential to affect the City and the nearby region. Table 5-1: Document Review Crosswalk provides a crosswalk of hazards identified in the City's 2015 General Plan Safety Element, ABAG's regional Multi-Hazard Mitigation Plan, Vacaville's Annex to the 2010 ABAG plan, and the natural hazards from the 2013 California State Hazard Mitigation Plan. Seventeen different hazards were identified based on a thorough document review. The crosswalk was used to develop a preliminary hazards list providing a framework for City MHMP Planning Team members to evaluate which hazards were truly relevant to the City and which ones are not. For example, severe weather and freeze were hazards considered to be of little relevance to the City, while earthquake, flooding, and wildfire were indicated in almost all hazard documentation.

Table 5-1: Document Review Crosswalk

Hazards	City of Vacaville General Plan	ABAG 2010 MHMP	City of Vacaville Annex to ABAG 2010 MHMP	2013 CA State HMP	Preliminary Hazards to address in MHMP Update
Earth Movements					
Earthquake/Seismic Shaking	■	■	■	■	■
Faulting				■	■
Liquefaction	■	■		■	■
Dam Failure		■		■	■
Levee Failure				■	
Drought				■	■
Erosion		■		■	
Flooding	■	■	■	■	■
Landslides	■ *"Listed Under earthquake"*	■	■	■	■
Sea Level Rise/Climate Change		■		■	■
Tsunami		■		■	
Wildfire	■	■	■	■	■
Shrink-Swell					
Coastal Flooding				■	
Extreme Heat				■	■
Freeze				■	
Severe Weather and Storms				■	
Avalanche				■	
Volcano				■	

In addition to a document review, previous hazard occurrences were used to identify hazards for this hazard mitigation plan. Previous hazard occurrences provide a historical view of hazards that have affected the City in the past, and thus provide a window into the potential hazards that can affect the City in the future. Information about federal and state disaster declarations in Solano County (declarations are declared by County) was compiled from FEMA and Cal EMA's databases, as shown in Table 5-2: Federal and State Declared Disasters. Though not a complete snapshot of hazard

incidences in the City (since not all hazard events are federally or state declared, and not all events in the County specifically affected the City), Table 5-2 provided the City MHMP Planning Team with solidified accounts of the types and extent of disasters that have affected the County dating back to 1950 when flooding affected entire regions of Solano County. As indicated in Table 5-2, large regional incidents have affected Solano County, including the Loma Prieta Earthquake in 1989. Most recently, disasters for drought and earthquake were declared in Solano County during 2014. The disaster declarations in Table 5-2, provide a baseline for consideration in the hazard prioritization process.

Table 5-2: Federal and State Declared Disasters in Solano County

Disaster Number	Declaration Date	Disaster Type	Incident Type	Explanation
Federal Declarations				
Major Disaster Declarations				
47	12/23/1955	DR	Flood	Statewide Flooding
82	4/4/1958	DR	Flood	Heavy rains & Flooding
183	12/24/1964	DR	Flood	Heavy rains & Flooding
253	1/26/1969	DR	Flood	Severe Storms & Flooding
364	2/8/1973	DR	Flood	Severe Storms, High Tides, & Flooding
651	1/7/1982	DR	Flood	Severe Storms, Flood, Mudslides,& High Tide
677	2/9/1983	DR	Coastal Storm	Coastal Storms, Floods, Slides, & Tornadoes
758	2/21/1986	DR	Flood	Severe Storms & Flooding
815	9/29/1988	DR	Wildfire	Miller Canyon Wildfires
845	10/18/1989	DR	Earthquake	Loma Prieta Earthquake
894	2/11/1991	DR	Snow	Severe Freeze
1044	1/10/1995	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, & Mud Flows
1046	3/12/1995	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, & Mud Flows
1155	1/4/1997	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, & Mud Flows
1203	2/9/1998	DR	Severe Storm(s)	Severe Winter Storms & Flooding
1628	2/3/2006	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, & Mud Flows
4193	9/11/2014	DR	Earthquake	South Napa earthquake
Fire Management Assistance Declarations				
2776	6/22/2008	FM	Wildfire	Wildfire
Emergency Declarations				
3023	1/20/1977	EM	Drought	Drought
3248	9/13/2005	EM	Hurricane	Hurricane Katrina Evacuation
CAL EMA Emergency and Disaster Proclamations/Executive Orders				
	5/10/2006		Severe Storms	Roadway Damage
	2/27/2009		Drought	3-year State-wide Drought
Other Disasters				

Disaster Number	Declaration Date	Disaster Type	Incident Type	Explanation
	11/21/1950		Flood	Statewide Floods
	2/14/1964		Flood	1963 Floods – Northern California flooding
	5/20/1957		Heavy Rains	State of Emergency for producing areas of Northern California
	2/26/1958		Flood	Heavy rains & Flooding
	9/18/1965		Wildfire	Major and Widespread Fires
	2/28/1974		Economic	Gas shortage
	2/9/1976		Drought	1976/1977 were two of the driest years in CA history. Most severe in northern 2/3 of CA.
78-06-11	2/13/1978	DC	Flood	1978 Winter Storms
	3/5/1980		Severe Storms	Rain, Winds, Mudslides, & Flooding
801-01–80-25	4/1/1980		Storms	1980 April storms
	10/26/1982	GP	Severe Storms	Rains causing agricultural losses

Source: FEMA, 2013 State of California Multi-Hazard Mitigation Plan

Based on the review of hazards identified in similar and relevant documents and previous incidents, as well as historical knowledge of localized events, and developing trends, the MHMP Planning Team developed a preliminary list of hazards (7 hazards) with significant potential to occur in the City. The hazards the MHMP Planning Team focused include: flooding, earthquake/liquefaction, wildfire, drought, dam failure, extreme heat, and landslides. With an understanding of limited resources to implement mitigation actions, the seven identified hazards were further prioritized to ensure that appropriate levels of resources are allocated to the hazards determined to have the largest potential impacts on the City.

5.2 Hazard Profiles

The natural hazard profiles in this section provide a baseline definition and description in relation to the City. The hazards symbolized below are profiled individually in this section and are in order by priority. For reference, each hazard symbol is placed at the beginning of each profile in Section 5. The hazard profiles in this section provide a baseline for the Vulnerability Assessment, where the vulnerability is quantified in terms of population and assets affected for each of the priority hazards.

-Flooding

-Dam Failure

-Earthquake/ Liquefaction

Extreme Heat

-Wildfire

-Landslides

-Drought

-Climate Change

5.3 Flood (FL) Hazard Profile

Flood reduction, prevention, and mitigation is a major challenge to Vacaville residents and floodplain managers alike. In general, creeks in Vacaville flow in an east-southeasterly direction and ultimately drain into the Sacramento River via Cache Slough. According to the 2015 General Plan Safety Element, the southern portion of Vacaville drains either to the Noonan Drain, which discharges ultimately to Barker Slough, or to Union Creek, which discharges to Suisun Bay. The major stream courses within the city include:

- Alamo Creek, including its tributaries Laguna Creek and Encinosa Creek
- Ulatis Creek
- Horse Creek, including its tributary Pine Tree Creek
- Gibson Canyon Creek

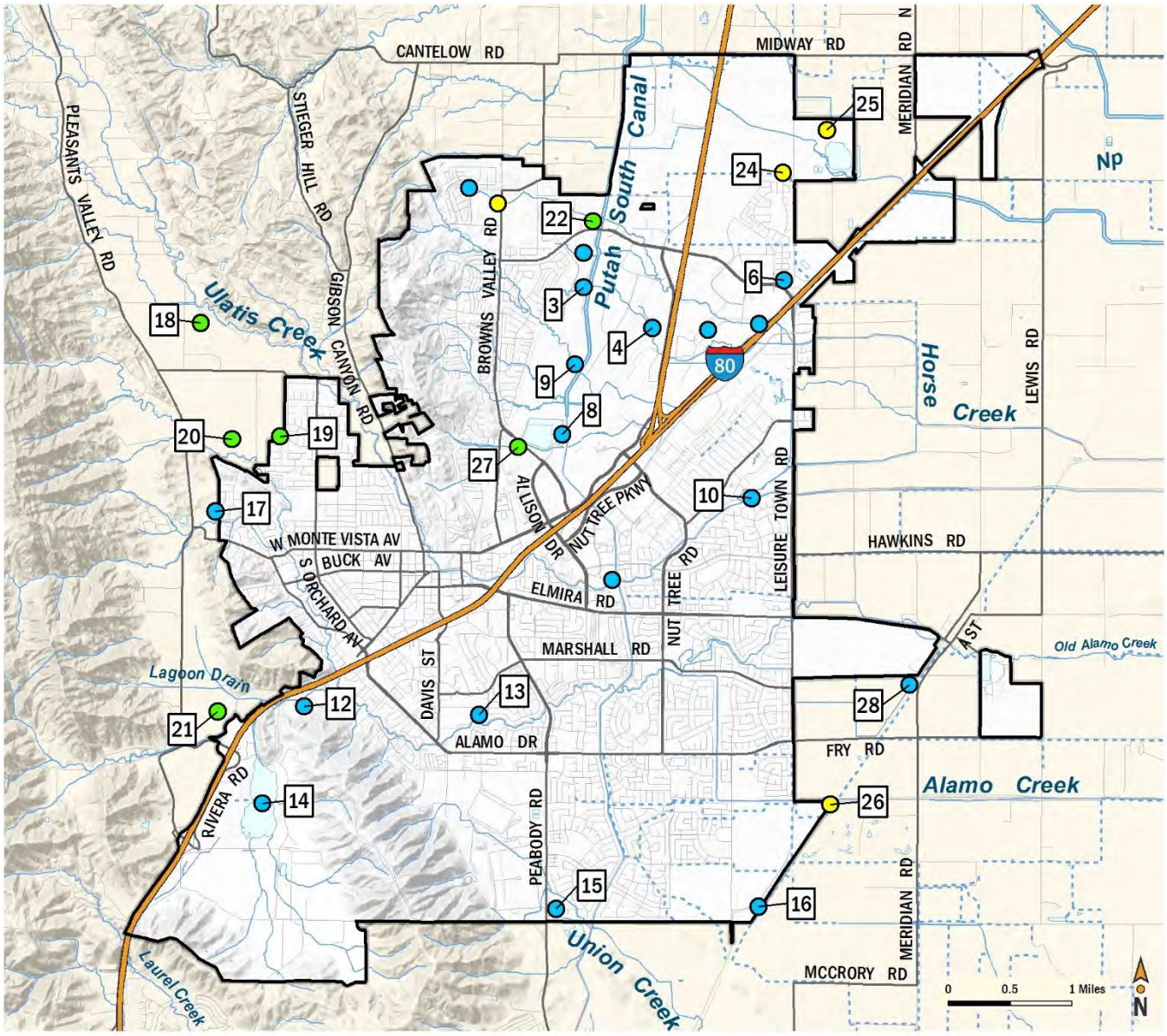
The Flood Insurance Study for the City indicates that the natural drainage patterns of many streams in the area have been modified by agricultural operations, irrigation facilities, or control structures. Alamo Creek downstream from Nut Tree Road is carried through Ulatis Creek downstream of Ulatis. It was built by the NRCS as part of a flood-control project in the Ulatis Creek basin.

There is one existing reservoir in Vacaville: the Basherini Reservoir located on Vine Street, which is owned and operated by the Solano Irrigation District.

The major creeks that flow through Vacaville are largely in their natural state and alignment, except at the eastern edge of the city where flood control channels have been constructed. The natural, unaltered portions of the creeks generally do not have adequate flow capacity to convey a 100-year storm event, which is a storm that has a 1 percent chance of occurring in any given year. In addition, there is not adequate capacity in some areas to accommodate a 10-year storm event, which is a storm that has a 10 percent chance of occurring in any given year. Occasionally, overbank flows in Vacaville have resulted in flooding of residential properties, road blockages, and traffic disruptions.

To address these flooding problems, Vacaville uses a variety of flood control facilities and measures. As shown in Figure Table 5-1, sourced from the 2015 General Plan Safety Element, the City has built several regional detention basins that reduce the flow from the Vaca Mountains before they reach the City in order to reduce urban flooding. The City also maintains a network of storm drains, and works to keep channel flowlines free from debris and vegetation. As part of past flood control efforts, certain creekways have been engineered to handle larger volumes of stormwater than they would in their natural states.

Figure 5-1: City of Vacaville Existing and Proposed Drainage Facilities



Existing Detention Basin	
1 Temporary Cheyenne Basin	10 Stonegate Basin
2 North Horse Basin #1	11 Ulatis Basin #2
3 Middle Horse Basin #1	12 Lagunitas Basin
4 Middle Horse Basin #2	13 Alamo Basin #2
5 Vaca Valley Basin	14 Lagoon Lake
6 North Village Basin #1	15 Union Basin
7 I-80 Basin	16 Southtown Basin
8 South Horse Basin #1	17 Pleasants Valley Detention Basin & Iroquois Basin
9 South Horse Basin #2	28 Brighton Landing

Proposed Detention Basin *City Projects*
18 Ulatis Basin
19 Florence Basin
20 Alamo Basin
21 Laguna Basin
22 North Horse Basin #2
27 Pine Tree Basin #1

Proposed Detention Basin *Development Project*
23 Rancho Rogelio Project
24 North Village Basin #2
25 North Village Basin #3 (Gibson Canyon Creek Basin)
26 Alamo Basin #3

Source: 2015 Draft City of Vacaville General Plan Safety Element

Recent studies have highlighted the need and potential options for enhanced flood control infrastructure within Vacaville. In 2008, the Solano County Water Agency (SCWA) conducted the Ulatis System Drainage Study, which recommended a number of storm drainage improvements in Vacaville, including new detention basins and channel improvements. The City also maintains the Storm Drainage Master Plan, which identifies storm drainage deficiencies and improvements needed to address existing localized flooding problems. The 1996 Storm Drainage Master Plan (updated in 2001) identifies regional detention basins to mitigate the increase in runoff from new development. New development is required to provide 100-year level flood protection within the proposed development area and ensure that developed areas are not adversely impacted. Please see Section 5.3.1.1 below for other applicable local building codes reducing localized run off.

5.3.1 Regulatory Environment

The regulatory environment for flood control at the local, state and federal level is complex, difficult to navigate, and varies based upon flood control structure, location of water bodies and local participation in state and federal programs. This section focuses on the regulations that the City uses to regulate development within the floodplain. This section also highlights some of the new requirements from the State of California, as well as the National Flood Insurance Program (NFIP) and the closely related Community Rating (CRS) program.

5.3.1.1 Local Building Codes

The City of Vacaville has a number of building codes and construction best management practices in place to reduce flood risk for newly constructed buildings. As the floodplain administrator for the City, the City Engineer determines if new construction will have to meet certain flood zone construction criteria.

The City of Vacaville's Municipal Code includes provisions for flood hazard reduction, which can be viewed here- http://www.codepublishing.com/CA/Vacaville/.

5.3.1.2 Local Floodplain Delineation

Under the direction of the City Engineer, the Engineering Services Division performs Flood Zone Determinations. Upon application for a building permit, the Engineering Services Division reviews the submitted application and plans to determine whether or not the site of the proposed structure is within any Special Flood Hazard Areas (SFHA) designated by FEMA on regulatory Flood Insurance Rate Maps (FIRMs). More information on FEMA flood hazard areas is provided further on in this section.

New construction and substantial improvements of any structure in the AO Zone shall have the lowest floor, including the basement, elevated at least equal to or above the depth number specified in feet on the FIRM, or elevated at least two feet above the highest adjacent grade if no depth number is specified. New construction and substantial improvements of any structure in the A Zone shall have the lowest floor, including the basement, elevated to or above the base flood elevation. Structures in all other zones shall be elevated to or above the base flood elevation. Upon the completion of subfloor or slab being installed on the lowest level of the structure, the elevation of the lowest floor, including the basement, shall be certified by a registered professional engineer or surveyor. Such certification or verification shall be provided to the floodplain administrator (City Engineer).

All new construction and substantial improvement with fully enclosed areas below the lowest floor (excluding basements) that are usable solely for parking of vehicles, building access or storage, and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement shall follow the guidelines in FEMA Technical Bulletins TB 1-93 and TB 7-93, and must exceed the following minimum criteria:

- Have a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves or other coverings or devices provided that they permit the automatic entry and exit of floodwater; or
- Be certified by a registered professional engineer or architect

All manufactured homes that are placed or substantially improved, within Zones A1-30, AH, and AE on the community's Flood Insurance Rate Map, on sites located

- Outside of a manufactured home park or subdivision,
- In a new manufactured home park or subdivision,
- In an expansion to an existing manufactured home park or subdivision, or
- In an existing manufactured home park or subdivision on a site upon which a manufactured home has incurred "substantial damage" as the result of a flood,

Shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

All manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, and AE on the community's Flood Insurance Rate Map that are not subject to the provisions of paragraph 14.18.228.040 A. will be securely fastened to an adequately anchored foundation system to resist flotation, collapse, and lateral movement, and be elevated so that either the

- Lowest floor of the manufactured home is at or above the base flood elevation, or
- Manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade.

5.3.1.3 Grading

Grading permits are issued by the City Building Official or the City Engineer, depending upon the volume of grading; and grading plan review, inspection of grading projects for compliance with all applicable codes and regulations, and enforcement of mandated State and Federal Codes, as well as County adopted California Building Standard Codes is performed by the City. In an effort to provide means for controlling soil erosion, sedimentation, increased rates of water runoff, and related environmental damage, the City requires a grading permit prior to any grading, filling, excavation, or clearing of vegetation which is not determined exempt. The City also requires mitigation of any increase in runoff generated from new development to remain on site.

5.3.1.4 National Flood Insurance Program (NFIP)

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. As a participating member of the NFIP, Vacaville is dedicated to protecting homes of more than 1,358 policies currently in force. Like most communities participating in NFIP, FEMA has prepared a detailed Flood Insurance Study (FIS) for areas of Solano County, including the City of Vacaville. The study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance of flood (the 100-year flood) and the 0.2-percent annual chance of flood (the 500-year flood). Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on FIRMs. More information on location and geographic extent are provided in Section 5.3.3

The City entered the regular phase of the NFIP on August 2nd, 1982. As a participant in the NFIP, the City is dedicated to regulating development in the FEMA regulated floodplain areas in accordance with NFIP criteria. Before a permit to build in a floodplain area is issued, Vacaville ensures that two basic criteria are met:

- All new buildings and developments undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain developments must not aggravate existing flood problems or increase damage to other properties.

Structures permitted or built in the County before the NFIP regulatory requirements were incorporated into the City ordinances (before the effective date of the County's FIRM) are called "pre-FIRM" structures. For the City, pre-FIRM structures are those permitted or built before August 2nd 1982.

Extensive FEMA NFIP databases are used to track claims for every participating community including Vacaville. NFIP insurance data provided by DWR indicates that as of June 30, 2015, there were 1,358 policies in the City, resulting in $366,500,500 of insurance in force; this amounts to $898,985 in total premiums. Of the 1,358 policies, only 269 are for structures located within the 1% annual chance flood zones, while the remaining 1,088 policies are for structures located outside of the floodplain in the B,C, & X zones.

There have been 72 closed paid losses totaling $2,476,200.92. There have been 12 substantial damage claims since 1978. Of the 72 closed paid losses, only 3 were for non-residential structures. 14 were structures located in A, AE, and AO zones, 55 structures were in the B, C, & X zones. Of the 72 paid losses, 56 were for pre-FIRM structures and 13 with post-FIRM structures; 3 losses were unknown.

Based on this analysis of insurance coverage, the City of Vacaville has significant assets at risk to the 100-year and greater floods. Of the 1,725 improved parcels within the 100-year floodplain, only 269 (15.6%) of those parcels maintain flood insurance. These uninsured structures located in mapped floodplain areas are especially vulnerable.

Currently, the City contains 4 RL properties under their jurisdictional umbrella. The total dollar amount of claims paid to date by the NFIP is $215,430.24 of structural and $75,907.72 content claims. The City also contains 1 Severe Repetitive Loss structure.

Most of the RL properties that have experienced flooding in the unincorporated portions of the County are due to overbank flooding in localized areas. Every loss claim is seasonal in nature as all loss claims have been in December, January or February. Some mitigation on these properties has been conducted and the City is currently tracking mitigation actions through standardized forms as required by FEMA. Of the 4 repetitive loss properties, none have been mitigated.

A property does not have to be currently carrying a flood insurance policy to be considered a RL or SRL property. Often homes in communities are not carrying flood insurance but are still on the community's repetitive loss list. The "repetitive loss" designation follows a property from owner to owner; from insurance policy to no insurance policy, and even after the property has been mitigated. Having an insurance policy and making claims that fall into the repetitive loss criteria will put a property on the RL list. Even after the policy on a property has lapsed or been terminated, the property will remain on Vacaville's RL list.

The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Therefore, this plan does not identify the repetitive loss properties or include claims data for any individual property.

For more information on California Regulation and the NFIP, please see California's Department of Water Resources Quick Guide here: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/docs/CAQG-screen.pdf

5.3.1.5 Community Rating System

The CRS is a voluntary incentive program within the NFIP in which communities go beyond the minimum standard for floodplain management. As a participant in the CRS program, the City of Vacaville is dedicated to meeting additional regulatory requirements to provide enhanced flood safety to its citizens. The City Engineer administers the requirements of the CRS program and documents the actions the City takes to meet requirements for a multitude of criteria. The CRS program is used to identify and track Vacaville's efforts to manage the impacts of flooding within the community. If Vacaville meets the CRS criteria "every year", insurance premium rates are discounted to reflect the reduced flood risk resulting from the city's actions. Vacaville is dedicated to meeting the following three goals of the CRS:

- Reduce flood losses in the City.
- Facilitate accurate insurance rating for individual paying flood insurance premiums.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) Vacaville is currently a Class "8" community. Floodplain insurance policy holders in the SFHA currently receive a 10 percent discount on flood insurance premiums, while those not in the SFHA receive a 5 percent premium reduction. Although insurance premium discounts are one benefit of participation in the CRS, more important, these benefits result in activities that save lives and reduce property damage. In addition to the numerical class system, the CRS classifies communities into three categories. Each category of community must deal with repetitive flood problems in different ways, depending on the severity of the repetitive-loss problem.

- Class A: A community with no unmitigated repetitive loss properties. No special requirements from the CRS.
- Class B: A community with at least one, but fewer than 10, unmitigated repetitive loss properties. Class B communities are required by the CRS to research and describe their repetitive loss problem(s), create a map showing the location of all repetitive loss properties, and complete an annual outreach activity directed to the repetitive loss addresses.
- Class C: A community with 10 or more unmitigated repetitive loss properties. The CRS requires Class C communities must perform all the requirements of a Class B community in addition to preparing a floodplain management plan and repetitive loss area analysis (RLAA) for all areas.

Note: Vacaville is a Class "B" community.

5.3.1.6 Central Valley Flood Protection Plan

According to California Government Code Sections 65302.9 and 65860.1, every jurisdiction located within the Sacramento-San Joaquin Valley, which includes Vacaville, is required to update its General Plan and Zoning Ordinance in a manner consistent with the Central Valley Flood Protection Plan (CVFPP) within 24 months after the CVFPP's adoption, which occurred in 2012. In addition, the locations of the State and local flood management facilities, locations of flood hazard zones, and the properties located in these areas must be mapped and consistent with the CVFPP. The planning area of the CVFPP is called the Systemwide Planning Area. Vacaville is not included within this area. The CVFPP also catalogs the State Plan of Flood Control, which is the collection of State and federal flood protection system in the Central Valley. None of the facilities within the State Plan of Flood Control are located in Vacaville.

5.3.1.6.1 *Government Code 65302*

Government Code 65302 authorizes, but does not require, cities and counties to adopt a local hazard mitigation plan specified in the Federal Disaster Mitigation Act of 2000 in conjunction with the safety element of the general plan.

5.3.1.6.2 *Government Code 8685.9*

Government Code 8685.9 prohibits the State share for any eligible project under the California Disaster Assistance Act from exceeding 75 percent of total State eligible costs, unless the local agency is located within a city, county, or city and county that has adopted a local hazard mitigation plan in accordance with the Federal DMA 2000 as part of the safety element of its general plan. In other words, the Legislature may provide for a State share of local costs that exceeds 75% of total State eligible costs if the local jurisdiction/agency has an adopted local hazard mitigation plan.

Most importantly the General Plan Safety Element will be required to reference information about floodplain management and flood hazards within the City. For further information, the crosswalks in Appendix C provide a checklist of the regulatory environment for California, SSJV, and SSJDD.

Government Code Section 8685.9 now provides a financial incentive for implementation of Government Code Section 65302.6, which allows local jurisdictions that adopt an LHMP as part of the City's safety element. The financial incentive is realized when local jurisdictions incur State-eligible, post-disaster costs under CDAA.

5.3.1.6.3 *California Assembly and Senate Bills*

AB 5, SB 5, SB 17, and AB 162. In 2007, several State laws were passed to address flooding risks in California. AB 5 (Wolk), SB 5 (Machado), SB 17 (Florez), and AB 162 (Wolk) require that urban and urbanizing areas in the Sacramento Valley and San Joaquin Valley, such as Vacaville, achieve, or make adequate progress toward achieving, 200-year protection by the year 2015 in order to continue to approve development in the floodplain. Specifically, AB 162 requires that each local jurisdiction's Safety Element include 200-year floodplain maps. Maps must be based on the best available data on flood protection, including areas protected by State and federal project levees, and areas outside of these areas. As of the preparation of this MHMP Update, the 200-year floodplain for the Vacaville study area had not been mapped.

State legislation also requires a jurisdiction's Safety Element to include a Levee Flood Protection Zone map and an Alluvial Fan Floodplain Evaluation and Delineation map. However, because Vacaville is not within a Levee Flood Protection Zone, this Safety Element does not include such a map. In addition, the Alluvial Fan Floodplain Evaluation and Delineation Map program only applies to counties within Southern California.

5.3.2 Past Occurrences

The City of Vacaville has been subject to periodic flooding. FEMA's Flood Insurance Study (FIS) reports the following on tributary flooding issues:

Thirty-one floods are reported to have occurred in the Ulatis Creek basin, which includes the streams studied, from 1880 through 1959. Severe flooding occurred in 1937, 1941, 1943, 1948, 1952, 1955, and 1958. Since 1959, flooding has occurred in 1962 (two periods), 1963, 1964 to 1965, 1967, 1969, and 1973. In 1958 and 1963, respectively, streams in the basin flooded approximately 20,000 and 26,000 acres of land. During both floods, most of the overflow was below the Union Pacific Railroad and was the result of a commingling of flood flows from several streams. In 1958, the flooded area extended southeast from the railroad for approximately 11 miles, and damage was estimated at $170,000. In 1963, the flooded area extended for approximately 9 miles, and damage was approximately $136,000. Since 1964, flooding has been reduced substantially by a NRCS project comprising channel improvements and levees along selected stream reaches

below Interstate Highway 80. It is estimated that the 1967 and 1973 floods have a recurrence interval of 30 years, and the 1969 event has a 7-year recurrence interval.

The most severe floods in Vacaville occurred in February and March 1940, January 1967, and January 1973. In 1940, Alamo and Ulatis Creeks flooded residential properties, requiring evacuation of homes, blocked roads, and disrupted traffic. The 1967 and 1973 floods were of similar magnitude and are considered the largest in recent years. During both flood periods, Alamo Creek overflowed its banks in several locations and flooded streets and lawns, stranded residents, and deposited debris and garbage. Several families were forced to evacuate their homes or apartments when floodwaters covered the lower floors.

In addition to the FIS, the MHMP Planning Team and the NCDC database noted the following past occurrences or added information to the FIS occurrences.

1**846, ’49, ‘50 and '52** - severe winter & flooding recorded.

1861 - December - January 1862: California's Great Flood. Four weeks of rain caused largest flood in California's recorded history. The entire Sacramento and San Joaquin valleys flooded for 300 miles (480 km), averaging 20 miles (32 km) in width. Inland sea created in Orange County lasted three weeks. Water 4 feet deep, up to 4 miles from the river.

1862 - Severe winter & flooding recorded.

1896 - The beginning of a four-year drought in the Vaca Valley area.

1906 - Storm reported highest ever rainfalls in a southeast to northwest direction from Monterey to Ione in Sierra Nevada foothills. 300,000 acres flooded in Sacramento Valley.

1907 an '09 - severe winter & flooding recorded.

1931 - Some flooding in Vacaville.

1940 -. Northern California's six day floods, Meridian and Rio Vista flooded eight feet in depth. Property damage over $10,000,000. Levees near Colusa dynamited to relieve pressure on the Meridian district. Meridian and Colusa surrounded with water for four days. Rio Vista near the junction of the Sacramento and San Joaquin rivers had more than 50,000 acres of farmland flooded up to ten feet. The river went over its banks in at least nine places between Lindsay slough and Rio Vista. New danger points in Delta area between Rio Vista and San Francisco Bay, where the Sacramento and San Joaquin rivers crests caused water level rises near Antioch and Martinez with some areas there under water.

1955 - Storm affected central Sierra and South Bay. The Eel River on the North Coast saw greatest flow on record to that date while Central Valley rivers saw near record flows. Statewide disaster declared, with the storm

Figure 5-2: Vacaville Flooding Winter 1967

Thank you local resident for providing these photos!

resulting in 74 deaths and $200 million in economic losses. Heaviest 24-hour rainfall on December 20th - 15.34 inches in Shasta County.

1955 - Severe winter & flooding recorded.

1956 - Flooding all along coastal counties.

1964 - Severe winter & flooding recorded.

1983 - Storms cause damage and extensive flooding in Vacaville area.

1986 - Sacramento River & Delta flooded. Rio Vista sustained major damage & got federal aid.

1986 - Northern California and western Nevada floods. Pineapple Express caused unprecedented amounts of rain. The nine-day storm brought half of the average annual rainfall for the year. Record flooding to southern San Francisco Bay area. Extensive flooding in Napa and Russian rivers. Napa recorded their worst flood to date. Calistoga recorded 29 inches (740 mm) of rain in 10 days (thousand-year rainfall event). 24-hour record rain events reported in Central Valley and Sierra (thousand-year rainfall). Record 24-hour rainfall in Central Valley of 17.60 inches (447 mm) at Four Trees in Feather River basin. Sacramento had 10 inches (250 mm) rain in an 11-day period. Sacramento, Yuba, and Feather River levee breaks in Olivehurst and Linda cause disasters forcing thousands of residents to evacuate. On San Joaquin River and in Delta, levee breaks along Mokelumne River caused flooding in Thornton and flood four Delta islands. Lake Tahoe rose 6 inches (150 mm) as a result of high inflow. Resulted in 13 deaths, 50,000 people evacuated, and over $400 million in property damage. 3000 residents of Linda joined in class action lawsuit Paterno v. State of California, which went to California Supreme Court in 2004. Court decision said California was liable for millions of dollars in damages due to levee failures.

1987 - Major flooding to the east and southeast of Vacaville halted railroad travel/shipping.

1995 - severe winter & flooding recorded.

Figure 5-3: Vacaville Flooding Winter 1967

Thank you local resident for providing these photos!

Figure 5-4: Vacaville Flooding Winter 2002

Thank you local resident for providing these photos!

1996-7 - New Year's Day: Northern California flood. Pineapple express hit northern California making December one of wettest on record. Klamath River in worst flood since 1974 permanently changed course in some areas. Record flows in Feather and San Joaquin River basins from rain at elevations up to 11,000 feet (3,400 m), prompting snow melt. Cosumnes River (tributary to San Joaquin River) bore brunt of flooding. Levees fail flooding Olivehurst, Arboga, Wilton, Manteca, and Modesto. Massive landslides in Eldorado National Forest east of Sacramento close Hwy 50. Damages totaled $35 million. Sierra Nevada Watersheds already saturated when 3 subtropical storms added more than 30 inches of rain. Levee failures (breaks and overtopping) in the Sacramento River Basin result in extensive damages. In San Joaquin River Basin, dozens of levees failed and produced widespread flooding. The Sacramento-San Joaquin River Delta also experienced levee breaks and overtopping. 48 counties were declared disaster areas (all 46 counties in northern California). Over 23,000 homes and businesses, agricultural lands, bridges, roads and flood management infrastructures – valued at about $2 billion – were damaged. Nine people killed and 120,000 people were evacuated from their homes. 300 square miles (780 km2) were flooded. Yosemite Valley flooded for the first time since 1861-62.

February 7, 1999 – Law enforcement officials reported local urban flooding in Vacaville. Damages were unavailable. No injuries or deaths were reported.

December 13-16, 2002 – Storms occurred over the Ulatis Creek Watershed resulting in extensive flooding and damage to many houses, barns, and other structures. The peak rainfall for the December 2002 storm occurred on December 16 between 2 am and 4 am following several days of continuous rainfall that saturated the ground. A few hours after the peak rainfall many creeks in Solano County crested causing widespread flooding. The rain gage data showed that there was significant variability of the storm across Solano County. The storm is estimated to have been a 20- to 50-year event in the Vacaville area. The Ulatis Creek stream gage at Leisure Town Road recorded a peak flow of 3,750 cfs; while the Alamo Creek stream gage, located at Vanden Road, recorded a peak flow of 3,390 cfs. The existing channel capacity along Ulatis Creek just downstream of I-80 and at the Nut Tree Road Bridge is about 3,000 cfs. The channel capacity along Alamo Creek through the Peabody Road/Tulare Drive area is less than 3,000 cfs. The 1997 FEMA Flood Insurance Study FIS was in effect at the time. 1997 FIS estimated that the peak flow in Ulatis Creek at Leisure Town Road at about 2,800 cfs during both the 10- and 100-year storm events. In Alamo Creek at Leisure Town Road FEMA estimated the peak flow at about 4,200 during a 10-year storm and about 6,000 cfs during a 100-year storm. Figure 5-6: Historic Flood Area shows areas of flooding during the storm. These areas were included as portions of the SFHA in more recent FIS and DFIRMs.

Figure 5-5: Vacaville Flooding Winter 2002

Thank you local resident for providing these photos!

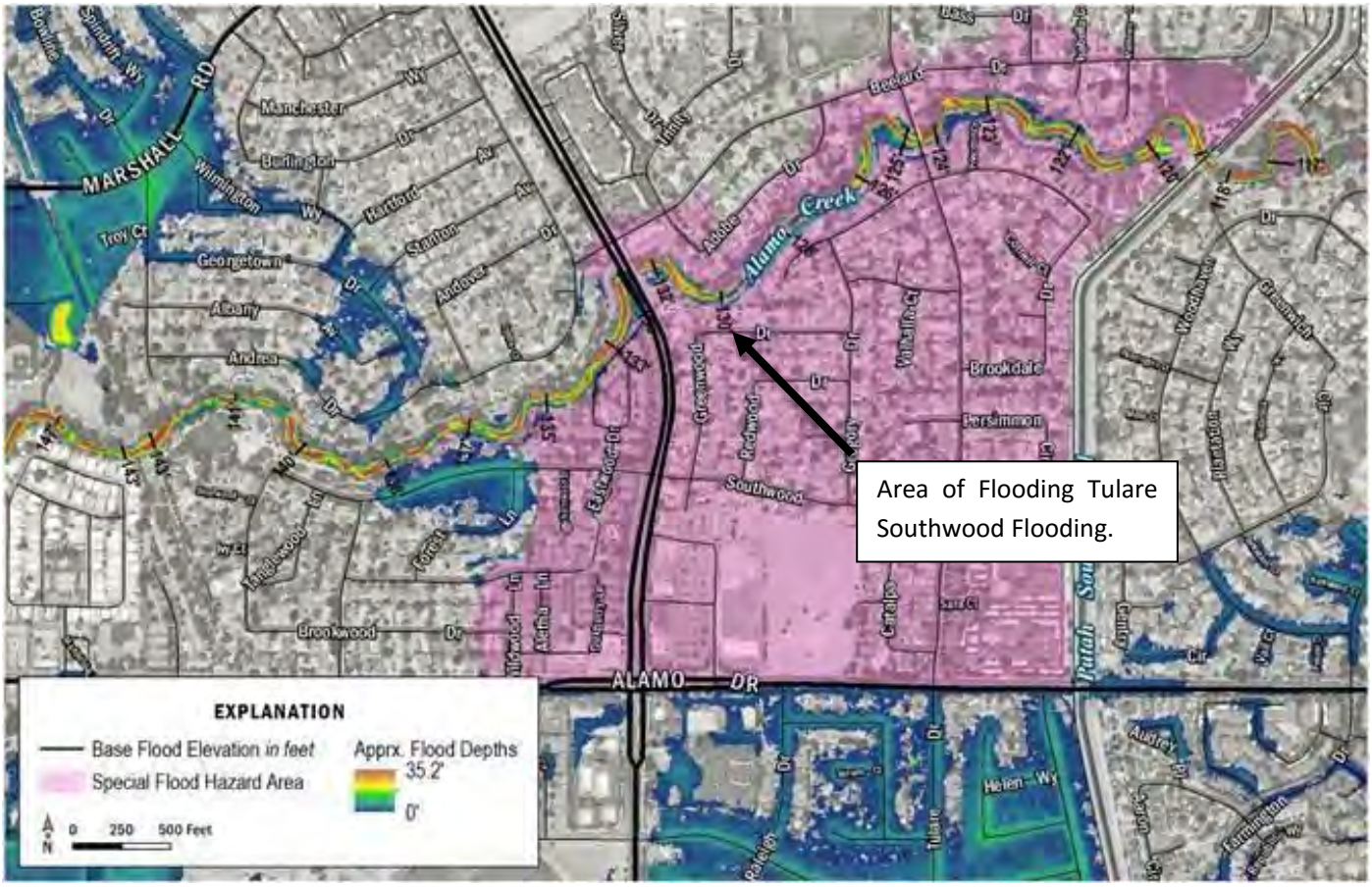


Figure 5-7: Historic Flood Area

2004 - Upper Jones Tract levee break: federal disaster declaration and $90 million damages.

2005-6 - Dec 31, Vacaville flooding. Storms occurred over the Ulatis Creek Watershed resulting in extensive flooding and damage to many houses, barns, and other structures. The peak rainfall for the December 2005 storm occurred between 7:45 pm on December 30 and 7:45 am on December 31. Similar to the December 2002 storm the peak rainfall during the December 2005 storm was proceeded by several smaller storms that saturated the ground and contributed to the flooding on the 31st. The storm is estimated to have been a 30- to over a 100-year event in the Vacaville area. The Ulatis Creek stream gage at Leisure Town Road recorded a peak flow of 4,140 cfs; while the Alamo Creek stream gage, located at Vanden Road, recorded a peak flow of 5,470 cfs. This event resulted in approximately 900 homes experiencing flooding to some degree; approximately 500 vehicles flooded, and four businesses experienced flooding. The Department of Water

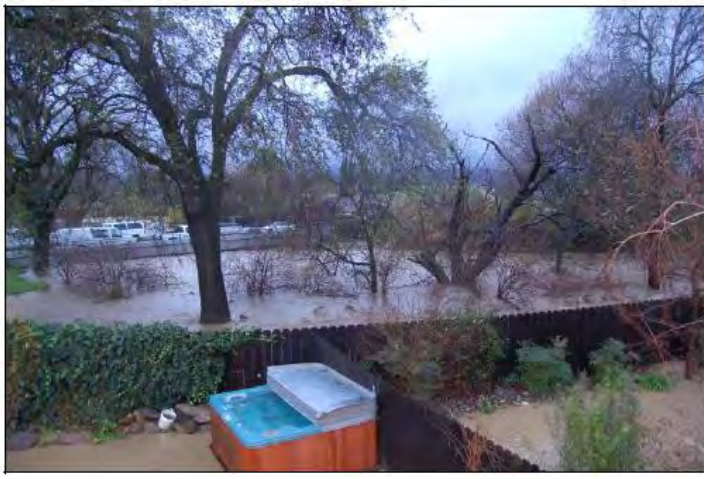


Figure 5-6: Vacaville Flooding Winter 2005

Thank you local resident for providing these photos!

Resources (DWR) declared emergency mobilization. High tides in Delta and continued wet weather expected throughout the State result in federal disaster declaration. Governor declares state of emergency due to threat of major flooding in northern California and San Joaquin Valley.

5.3.3 Location/Geographic Extent

A majority of the flood risk within Vacaville is specifically subject to inundation as a result of heavy rainfall and resulting stream and drainage canal overflows. The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used as the regulatory boundary by many agencies, and helps identify the location and extent of flooding in areas across the City. This area is also referred to as the SFHA, and is a convenient tool for assessing vulnerability and risk in flood-prone communities.

Table 5-3 shows 100-year and 500-year floodplain zones, which are estimated inundation areas based on a flood that has a 1-percent (100-year) and 2-percent (500-year) chance of occurring in any given year. Vacaville contains over 4,332.26 acres of identified flood hazard areas. Table 5-3: Special Flood Hazard Area provides the total area for both the 100-year and 500-yr. flood hazard areas.

Table 5-3: Special Flood Hazard Area

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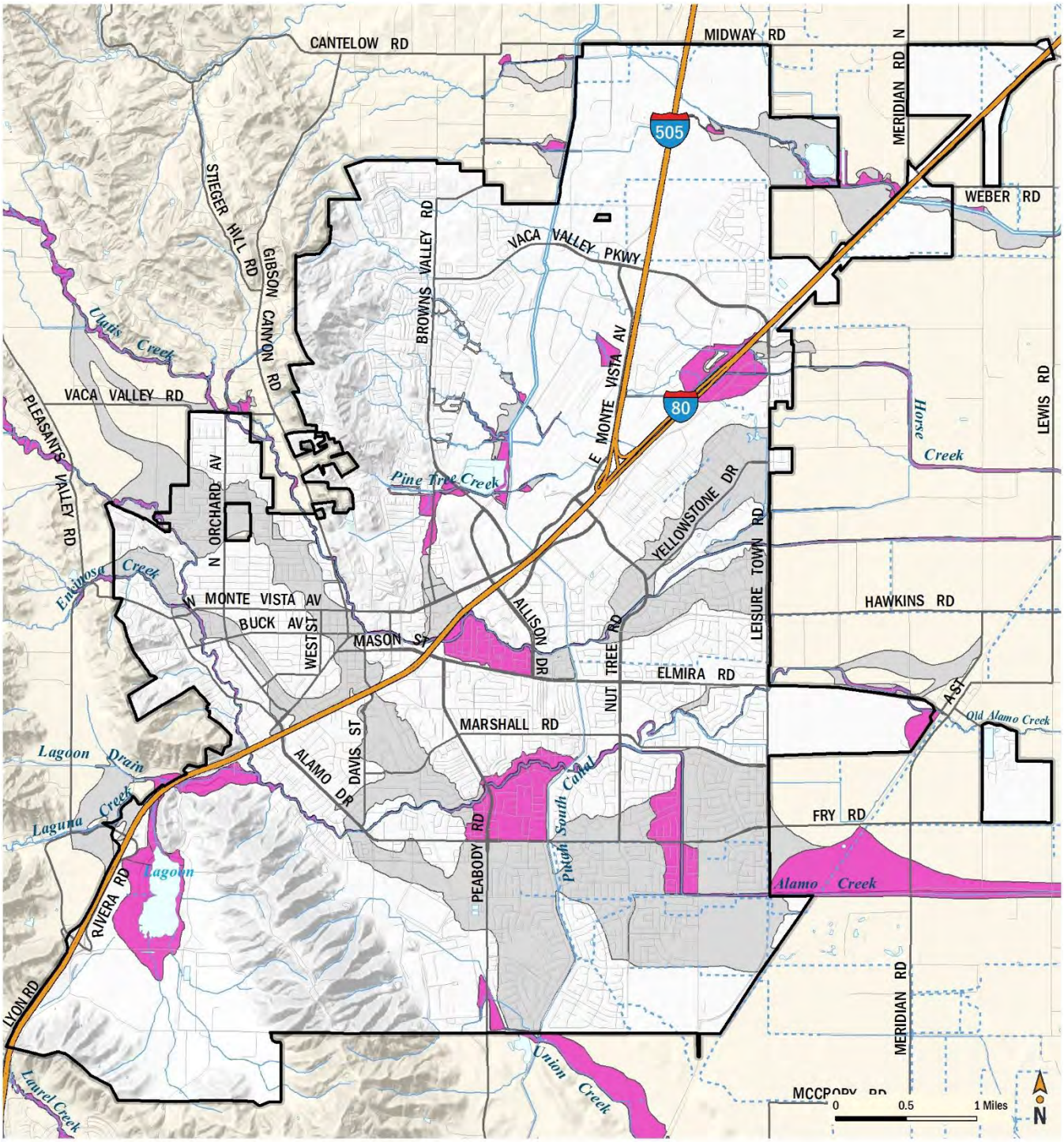
100-Year	**1.70**	**1,085.30**
A	0.90	573.51
AE	0.76	489.25
AO	0.04	22.54
500 year	**5.07**	**3,246.96**
Shaded X	5.07	3,246.96
Grand Total	**6.77**	**4,332.26**

Source: FEMA DFIRM

Figure 5-8 Flood Hazard Areas in Vacaville



EXPLANATION

Vacaville City Limits

100-year flood zone (SFHA)

500-year flood zone (Zone X, Shaded)

5.3.3.1 State Awareness Zones

In addition to FEMA's SFHAs, State Flood Awareness Zones were created when DWR analyzed floodways and future projections for population growth and development in the entire State. DWR's goal was to conduct floodplain studies in areas where future growth and development might be expected. The State Flood Awareness efforts were concentrated in areas that are currently shown by default on FEMA's Digital FIRMs (DFIRMs) as Zone X with no flood risk. DWR made a major effort to do basic flood studies in each county in California's Zone X to identify overlooked flood prone areas before development begins. The concept and final mapping products are to be used by local governments within the State to control development and protect floodplains in identified awareness zones.

The State Flood Awareness Zones depicted in Figure 5-9 City of Vacaville BAM Map are rough "approximate" flood risk areas and are meant to alert Vacaville to probable flood prone areas for potential floodplain regulation as new development approaches in these areas in the future. California DWR contracted with the US Army Corps of Engineers (USACE) Sacramento District to develop Awareness Maps for the City.

The State Flood Awareness Zones were developed under the pretense that as new development moved into the City, the City could require more detailed flood studies to assure that future flooding would be mitigated in the areas beyond the preexisting SFHAs. As development pressure increases in areas near State Flood Awareness Zones, Vacaville can work with Solano County and FEMA to develop requests for re-studies as study funds become available at the Federal level.

5.3.3.2 DWR Best Available Maps

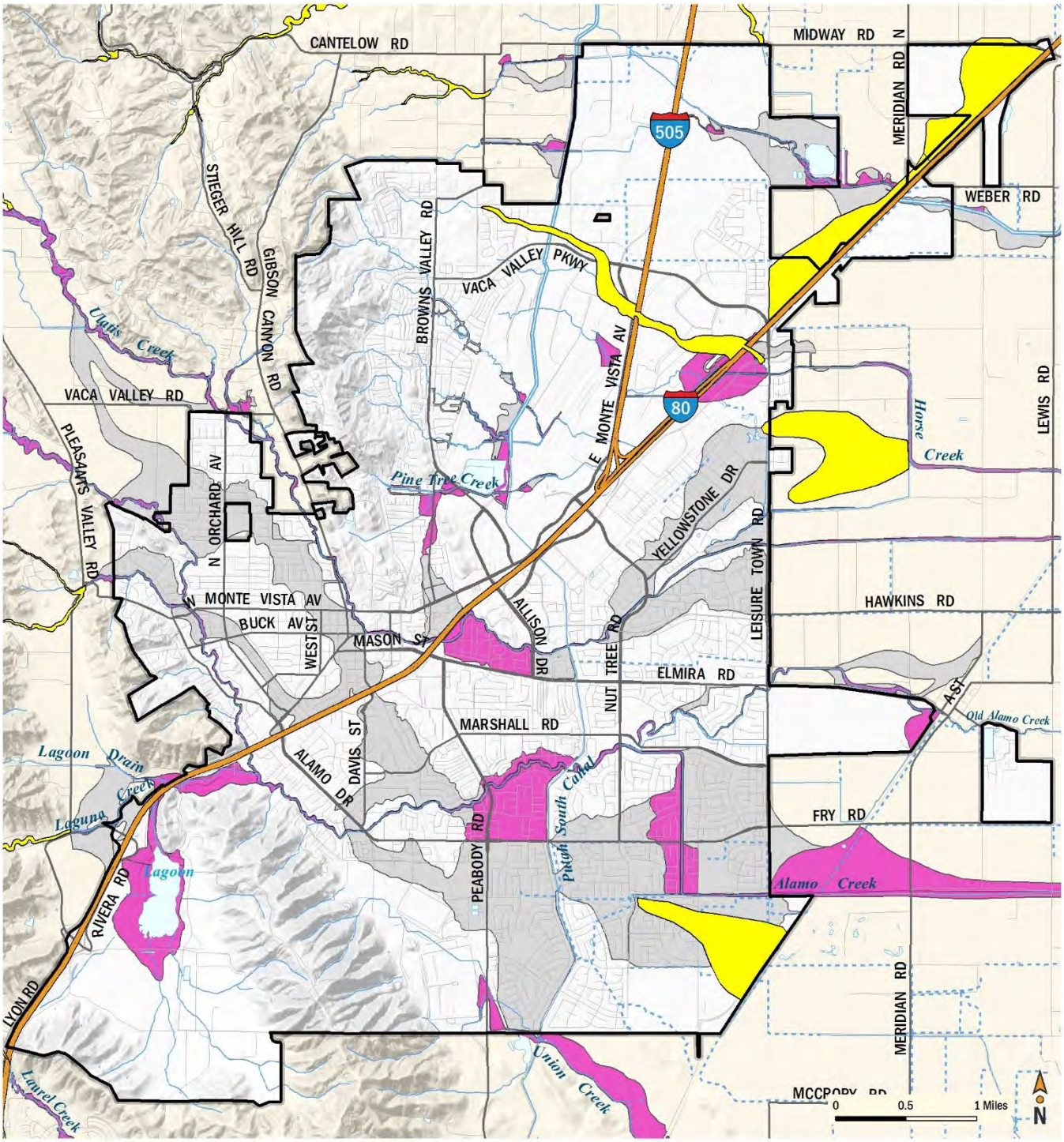
The Best Available Maps were developed pursuant to Senate Bill 5 which requires DWR to develop preliminary maps for the 100- and 200-year floodplains located within the Sacramento-San Joaquin Valley watershed. These maps were developed by DWR to better reflect the most accurate information about the flooding potential in a community and were designed to provide a better understanding of the true risk of flooding to public safety and property. SB 5 requires that these preliminary maps be provided as best available information on flood protection to cities and counties in the watershed for: 1) areas protected by State-Federal project levees, and 2) areas outside the protection of project levees.

The new maps, compiled using information from state, local and federal agencies, have no current regulatory status for floodplain development and are for information only. They do not replace existing FEMA regulatory floodplain maps (i.e., FIRMs and DFIRMs) and therefore do not make any changes in federal flood insurance requirements for homes and businesses. However, city and county governments will be able to use the maps to identify areas that warrant further study and to help make informed floodplain management and land use decisions. The floodplains shown on these maps delineate areas with potential exposure to flooding for two different storm events: one with storm flows that have a 1 percent chance of being equaled or exceeded in any year (100-year) and one with storm flows that have a 0.5 percent chance of being equaled or exceeded in any year (200-year).

These advisory maps will help communities begin early planning activities to meet SB 5 requirements calling for a minimum of 200-year protection for new development in urban and urbanizing areas. The BAM map for Vacaville is shown in Figure 5-9 City of Vacaville BAM Map. For more information on BAM Maps see the website below:

http://gis.bam.water.ca.gov/bam/

Figure 5-9 City of Vacaville BAM Map



5.3.4 Magnitude/Severity

In urban areas like Vacaville, flood problems are intensified because new homes and other structures, and new streets, driveways, parking lots, and other paved areas decrease the amount of open land available to absorb rainfall and runoff, thus increasing the volume of water that must be carried away by waterways.

5.3.5 Frequency/Probability of Future Occurrence

The FIRM maps not only identify the flood hazard zones for insurance and floodplain management purposes, but also provide a statement of probability of future occurrence. Figure 5-8 Flood Hazard Areas in Vacaville shows FEMA 100-year and 500-year flood zones. Figure 5-9 City of Vacaville BAM Map shows FEMA 100- year, and 500-year flood zones with DWR Awareness Zones.

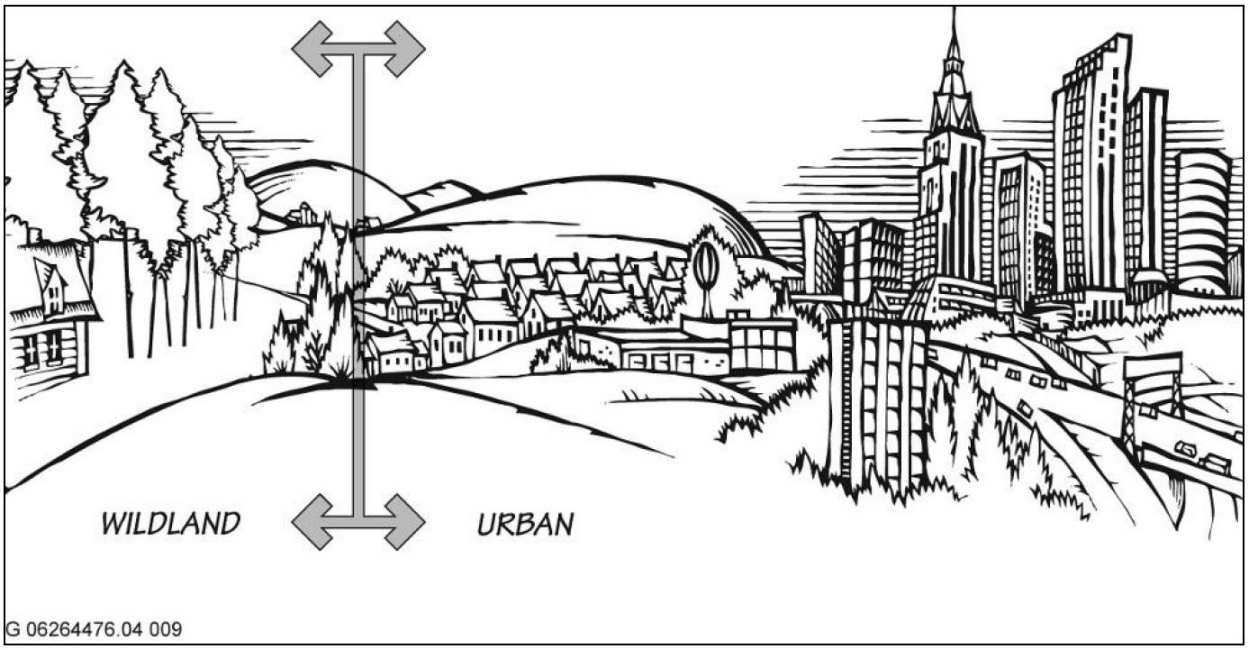
A 500-year flood has a 0.2-percent chance of occurring in any given year; a 100-year flood has a 1-percent chance, a 50-year flood has a 2-percent chance, and a 10-year flood has a 10-percent chance of occurrence. Although the recurrence interval represents the long-term average period between floods of specific magnitude, significant floods could occur at shorter intervals or even within the same year. The FIRM maps typically identify components of the 500-year and 100-year floodplains.

5.4 Wildfire (WF) Hazard Profile

As defined in the California Fire Protection (CAL FIRE) 2010 Strategic Fire Plan, a wildfire event is an unwanted wildland fire including unauthorized human-caused fires, escaped wildfire use events, escaped prescribed wildfire projects, and all other wildfires.

Wildfire hazard is a significant and recurrent threat in the City and has the potential to destroy buildings, cause damage to vital infrastructure, injure people, and can result in loss of life, agricultural land, and animals. As described in the 2015 City of Vacaville General Plan Safety Element, wildfire season commences in early spring through late fall every year during the hotter, dryer months. Highly flammable vegetation and warm, dry summers create the potential for wildland fires in Vacaville. The risk of wildland fires is related to a combination of factors, including winds, temperatures, humidity levels, and fuel moisture content. Of these four factors, wind is the most crucial. Steep slopes also contribute to fire hazards by intensifying the effects of wind and making fire suppression difficult. Where there is easy public access to dry vegetation, fire hazards increase due to greater chance of human carelessness. High hazard areas in Vacaville include outlying residential parcels and open lands adjacent to residential areas. Such development has also moved the urban wildland interface (the area where human development meets undeveloped wildland) closer to higher-risk, wildfire hazard areas, increasing the number of people and buildings at risk as illustrated in Figure 5-10: Urban Wildland Interface.

Figure 5-10: Urban Wildland Interface



Source: 2008 Solano County GP

In addition, the Safety Element indicated that open agricultural lands in eastern Vacaville pose a threat related to grass fires. Grass fires can travel very fast, and threaten nearby residential areas. Grass fire threats in open agricultural lands are a significant concern in the growth areas in the eastern and southern portions of the city,

5.4.1 Regulatory Environment

Wildfire regulatory requirements are mandated by the State of California and the City of Vacaville.

5.4.1.1 State

Wildfire State Responsibility Area (SRA) Fire Safe Regulations outline basic wildland fire protection standards for local jurisdictions. SRA Fire Safe Regulations (if policed) can decrease the risk of wildfire events in the wildland interface. SRA Fire Safe Regulations do not supersede local regulations, which equal or exceed minimum state regulations. The State statute for wildfire protection is Public Resources Code, Section 4290. Requirements in the code include information on the following (CA Fire Alliance n.d.):

1. Road Standards for Fire Equipment Access
2. Standards for Signs Identifying Streets, Roads and Buildings
3. Minimum Private Water Supply Reserves for Emergency Fire Use
4. Fuel Breaks and Greenbelts

5.4.1.2 Local

The City of Vacaville is located in a Local Responsibility Area. Fire protection for the City is the responsibility of the Vacaville Fire Department. The Vacaville Fire Department is comprised of 87 staff members. Emergency response personnel are deployed from four fire stations located strategically throughout the City.

To reduce risks from wildland fires, the City of Vacaville adopted Chapter 14.20.290 of the Municipal Code, Standards for New Construction Adjacent to Open Space Lands Where Wildfire is a threat. Chapter 14.20.290 provides development standards for new construction adjacent to permanent open or other open lands where no development is anticipated in the near future (as identified in the General Plan) and where wildfire is a threat. Some of the fire reduction strategies incorporated in the code include providing for fire access roads, maintaining a defensible space of non-combustible vegetation around structures, and installing indoor sprinkler systems.

5.4.2 Past Occurrences

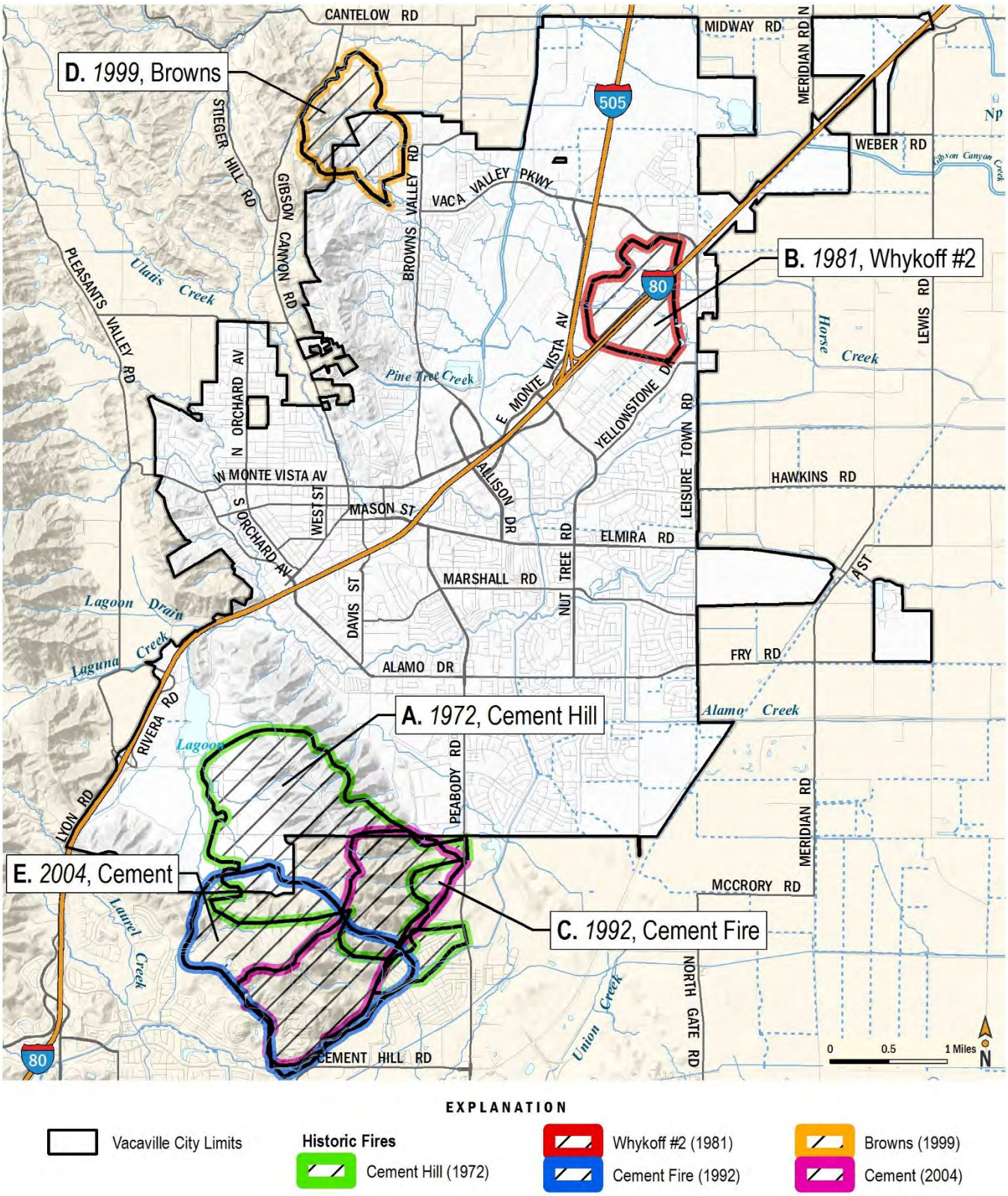
Wildfire events are of major concern to the City. Cal FIRE maintains a database of wildfire perimeters. Table 5-4 City of Vacaville Wildfire History gives the dates and fire names of the historical wildfires that have burned within Solano County limits. Figure 5-11 Wildfire History in and near Vacaville shows where those historical burn areas in the City have occurred.

Table 5-4 City of Vacaville Wildfire History

Map Abbreviation	Year	Fire Name
A	1972	Cement Hill (County/FF)
B	1981	Whykoff #2
C	1992	Cement Fire (County/FF)
D	1999	Browns (County/FF)
E	2004	Cement (County/FF)

Source: CAL FIRE

Figure 5-11 Wildfire History in and near Vacaville



In addition to the data from CAL FIRE, the MHMP Planning team noted details on major fires to occur in or near the City.

1877 - Vacaville: Fire destroyed half the business district. A second almost burned the town completely.

1888 – Vacaville: A fire burned Chinese District. Second one destroyed most of the business district.

1890 - 3 fires in Vacaville, one burned five buildings because a new water line was being laid and the water system was shut down. About one hundred persons called to Coulter Ranch to fight fires in hills north of Vacaville. A party of fire fighters were surrounded and narrowly escaped. More than three hundred acres were burnt and a large number of trees were destroyed.

1895 - Vacaville formed a fire department and 3 days later the entire north side of Main Street between Dobbins and Main Street Bridge was destroyed by fire. Involved 12 businesses, Bowles Opera House, 58 Chinese dwellings, barns and outbuildings. Damage over $30,000. Rebuilt with brick.

1900 – First fire alarm system installed in Vacaville. Fire in Chinatown in Vacaville.

1908 - Blue Ridge Mountains fire raged for two weeks.

1909 - Hotel Raleigh, one of the oldest landmarks in Vacaville, destroyed by fire. The steeple of the Presbyterian Church caught fire and top part had to be cut off to save the church.

1912 – Benicia Army Arsenal fire. Fire totally destroyed main store-house of the Army Arsenal just above Army Point. Loss estimated at $5,000,000. Nobody was injured despite many explosions of powder stores which was heard and felt for miles. Fire reported as one of the fiercest in history of the coast. Huge masses of smoke and the blaze could be seen in San Francisco. Cause of fire believed to have been spontaneous combustion in the packing of some of the ammunition.

1925 - Last remaining building of Maine Prairie destroyed in a fire.

1942 - Fire began in the Crystal Building bowling alley in Vacaville caused damage.

1949 – Grass-fire that started in Mix Canyon burned for seven (7) days.

1958 - Vacaville: Diamond Match Lumberyard burned. Flared again a month later causing more damage. Losses were greatest monetary amount in the history of the town.

1951 - The Japanese Buddhist Temple in Vacaville destroyed by fire.

1953 - Old Vacaville High School gym burned forcing the razing of entire structure.

1954 – Grass-fire with high winds burned 5,888 acres from California Medical Facility to Travis AFB.

1957 - Air tankers first used to help fight a Mt. Vaca fire.

1961 - Black Saturday"-Some ninety-five (95) fires reported. Worst was in Allendale area (95,008 acres and 10 homes destroyed). Another burned from Elmira-Travis AFB to Collinsville (40,008 acres). Third fire from Benicia-Cordelia Hills along Highway 40 to the Carquinez Bridge. 3 days later, an arson fire in Miller Canyon burned 2,808 acres along Blue Ridge in 40 hours.

1965 - "Black Thursday" - Fire between Dixon and Peabody-Vanden roads. Second fire caused by power lines falling and igniting dry grass in English Hills burned to freeway. 300-400 fire fighters fought the blaze north of Vacaville (6,588 acres, 13 homes and 45 other buildings lost). Unknown number of livestock lost. Extensive damage at Travis AFB. Meanwhile the

"Kaiser Fire" started in Napa County when power lines fell there. Burned 25,888 acres from Soscol Ridge near Highway 29 to American Canyon Road and 1-88 to the south and into Green Valley to the east.

1981 - Atlas Peak Fire in Napa burned nearly 25,868 acres (5% of the land in the County) and caused an estimated $36 million in damage and threatened Solano County.

July 4, 2015 - officials said fireworks were suspected in starting a 325-acre fire that prompted about 125 people to evacuate from their homes. City officials said no structures were lost in that blaze, which was contained, and no immediate reports of injuries.

5.4.3 Location/Geographic Extent

Using information from the California Department of Forestry (CAL FIRE) Figure 5-12 Wildfire Hazard Map, illustrates the areas at risk to a wildfire event. The areas with the highest risk of wildfire are the in the southwestern and northern portions of the City. The remainder of the City is urban/unzoned.

5.4.4 Magnitude/Severity

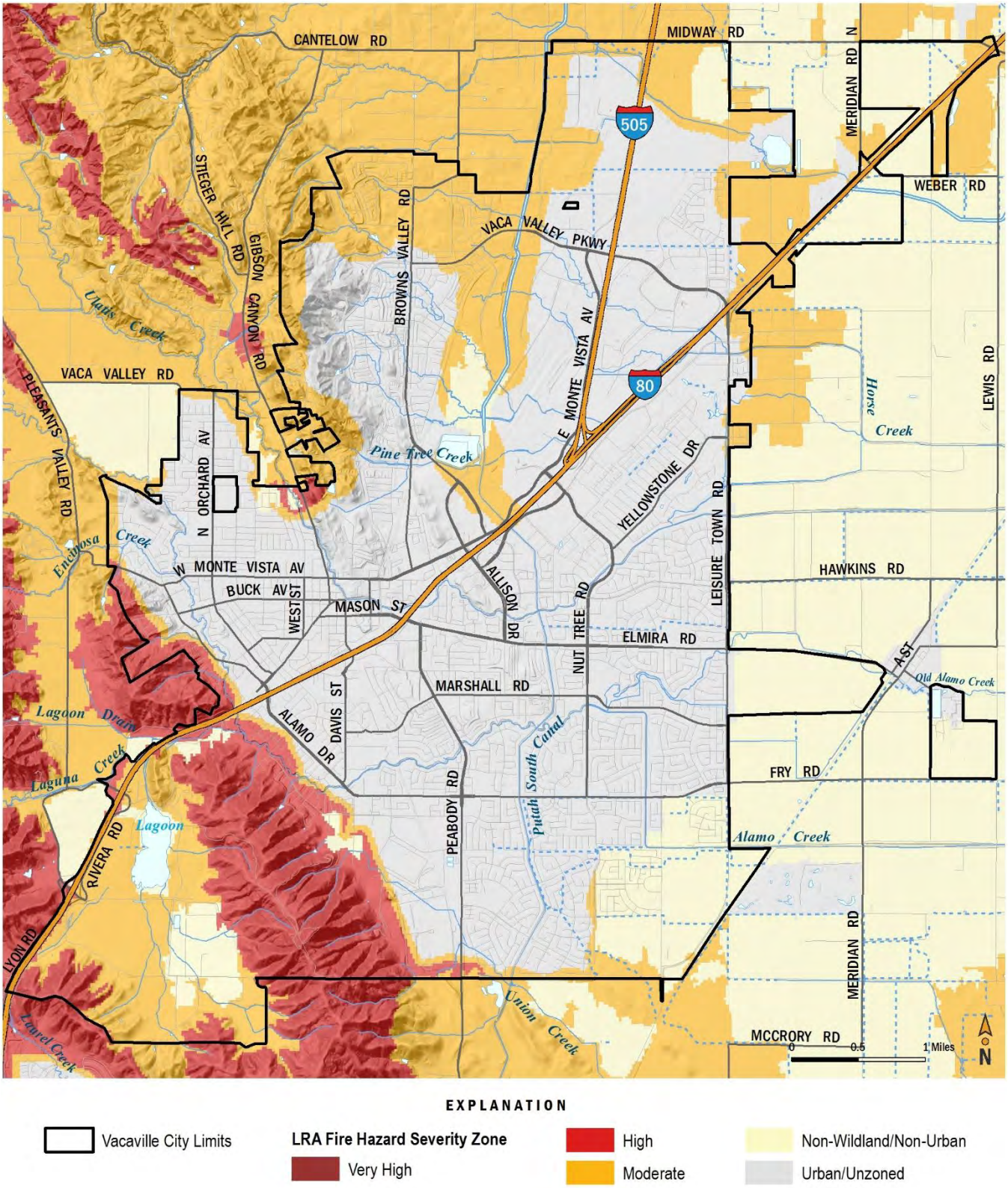
The magnitude and severity of a wildfire event is measured by calculating the number of acres burned in a specific wildfire event. A visual of the size of areas burned during wildfires in or near the City was shown in Figure 5-11 Wildfire History in and near Vacaville.

5.4.5 Frequency/Probability of Future Occurrences

CAL FIRE adopted Fire Hazard Severity Zone maps for LRA in June 2008. Fire hazard mapping is a way to measure the physical fire behavior to predict the damage a fire is likely to cause. Fire hazard measurement includes vegetative fuels, probability of speed at which a wildfire moves the amount of heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The model used to develop the information in accounts for topography, especially the steepness of the slopes (fires burn faster as they burn up-slope.). Weather (temperature, humidity, and wind) also has a significant influence on fire behavior. The areas depicted as moderate and high in are of particular concern and potential fire risk in these are constantly increasing as human development, and the wildland urban interface areas expand.

Figure 5-12 Wildfire Hazard Map



5.5 Earthquake (EQ)/Liquefaction Hazard Profile

An earthquake is both the sudden slip on an active fault and the resulting shaking and radiated seismic energy caused by the slip (USGS 2009). The majority of major active faults in the Vacaville area are strike-slip faults. For this type of fault, during an earthquake event, one side of a fault line slides past the other. The rupture from this type of fault extends almost vertically into the ground.

Earthquakes are a significant concern to the City. The area around Vacaville is seismically active since it is situated on the boundary between two tectonic plates. The City is on the North American Plate. A number of active faults cross the City, Solano County, and the surrounding San Francisco Bay Area. Earthquakes can cause serious structural damage to buildings, overlying aqueducts, transportation facilities, utilities, and can lead to loss of life. In addition, earthquakes can cause collateral emergencies including dam and levee failures, fires, and landslides. Seismic shaking is by far the single greatest cause of damage from an earthquake in Vacaville, followed by liquefaction.

Liquefaction occurs when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness. Liquefied soils behave like a liquid and are responsible for tremendous damage in an earthquake. For example, it can cause buildings to collapse, pipes to leak, and roads to buckle.

5.5.1 Regulatory Environment

Numerous building and zoning codes exist at a state and local level to decrease the impact of an earthquake event and resulting liquefaction on residents and infrastructure. Building and zoning codes include the Alquist-Priolo Earthquake Fault Zoning Act of 1972, Seismic Hazards Mapping Act of 1990, 2013 California Standards Building Code (CSBC), and 2015 City of Vacaville General Plan. To protect lives and infrastructure in the City, the following building and zoning codes are used.

The 1971 San Fernando Earthquake resulted in the destruction of numerous structures built across its path. This led to passage of the Alquist-Priolo Earthquake Fault Zoning Act. This Act prohibits the construction of buildings for human occupancy across active faults in the State of California. Similarly, extensive damage caused by ground failures during the 1989 Loma Prieta Earthquake focused attention on decreasing the impacts of landslides and liquefaction. This led to the creation of the Seismic Hazards Mapping Act. This Act increases construction standards at locations where ground failures are probable during earthquakes. Active faults in Vacaville, Solano County, and the San Francisco Bay Area have been included under the Alquist-Priolo Geologic Hazards Zones Act and Seismic Hazards Mapping Act.

The 2013 CSBC is based on the International Building Codes (IBC), which is widely used throughout the United States. CSBC was modified for California's conditions to include more detailed and stringent building requirements. The Vacaville Building Department utilizes the 2013 CSBC to regulate the infrastructure in the City. This includes unreinforced masonry (URM) buildings. Vacaville does not have any unreinforced masonry (URM) buildings. For new buildings, Vacaville includes earthquake safety provisions, with enhancements for essential services buildings, hospitals, and public schools.

The 2015 City of Vacaville General Plan includes the following policies for lowering the impacts of earthquakes on infrastructure within the City:

- Consider geologic conditions when designating land use and designing development in Vacaville. Where potential geologic or seismic risks are high and unmitigable, retain low-occupancy or open space forms of use.

- Prohibit development on ridges and slopes at or exceeding 25 percent
- Evaluate and consider the geologic and soil hazards for any proposed extension of urban or suburban land uses into areas that are characterized by slopes from 15 to 25 percent.
- Determine the geologic suitability of proposed development sites during the earliest stages of the planning process. Such analyses should consider the potential structural engineering needs of the project and the impacts development activities may have on adjacent lands.
- Require geotechnical studies prior to approving rezoning requests, specific plans, or subdivision maps in areas that have experienced landslides in the past and that are within ¼ mile of a fault.
- Require preparation of a soils report prior to issuing a building permit, except where the Building Official determines that a report is not needed.
- Require comprehensive geologic and engineering studies of critical structures such as hospitals, fire and police stations, utility centers and substations, emergency communications facilities, overpasses, and bridges, regardless of location.
- To the extent practical, do not locate structures intended for human occupancy over the trace of an inactive fault. Allow roads to be built over active faults only where alternatives are impractical.
- To the extent practical, do not allow facilities and structures that are public, high-occupancy, or critical in disaster situations (e.g. hospitals, fire and police stations, and bridges) to be sited in areas highly susceptible to damage resulting from earthquakes. If locating such a facility or structure in a high-risk area is deemed essential to the public welfare, require that they be sited, designed, and constructed with due consideration of the potential for damage.
- Limit cut slopes to 2:1 (50 percent slope) except where an engineering geologist can establish that a steeper slope would perform satisfactorily over the long term. Where practicable, require more gentle slopes than the 2:1 standard. Encourage use of retaining walls, rock-filled crib walls, or stepped-in buildings as alternatives to high cut slopes.
- Require contour rounding and revegetation to preserve natural qualities of sloping terrains, mitigate the artificial appearance of engineered slopes, and control erosion. Encourage the use of native trees and shrubbery in revegetation areas.
- Require financial protection for public agencies and individuals as a condition of development approval for projects that are located in areas where geologic conditions indicate a potential for high maintenance or repair costs.
- Require the formation of geological hazard abatement districts or other methods to reduce potential exposure to geologic hazards prior to development approval in a high risk area. Such measures ensure that geotechnical mitigation measures are maintained over the long term and that financial risks are equitably shared among owners rather than borne by the City.

5.5.2 Past Occurrences

The MHMP Planning Team noted the following regional and local events for the City of Vacaville.

1838 - June, San Francisco, magnitude 6.8- 7.4

1865 - October 8, Santa Cruz Mountains, magnitude 6.5, Intensity VIII

1868 - October 21, Hayward, magnitude 6.8-7.0, Intensity VI-VII

1892 - April 19, Vacaville, magnitude 6.4, Intensity VIII. Severe damage in Allendale, Dixon, Elmira, Vacaville, and Winters when the Calaveras Fault slipped. $225,000 property loss and one fatality. At Allendale, between Vacaville and Winters,

buildings collapsed or were shifted off foundations: and ground fissures formed, suggesting possible faulting. In Vacaville, many structures demolished including Odd Fellows Hall, Ream & Thomas Grocery, Masonic Hall and residences of Thissell, Gates and Blake. Most brick structures destroyed in Vacaville and many frame buildings damaged with chimneys destroyed. Similar damage reported in Winters (Yolo County). Damage less serious in Dixon, but many school buildings severely damaged and the Baptist Church demolished. Fairfield's Methodist Church suffered severe damage and in Elmira damage was complete. Felt north to Redding, east to Virginia City, Nevada, and south to Salinas and Fresno.

1892 - April 21, Winters, magnitude 6.2-6.4, Intensity VIII. Weakened structures in communities hit by the April 19 earthquake were further damaged. Damage most severe in Winters, where many buildings that withstood the April 19 shock were leveled. Not one building on Main Street was left habitable. At Esparto, every brick chimney fell and wood-frame buildings were wrenched out of shape. Many chimneys collapsed in Sacramento and Woodland. Additional loss was slight in Dixon and Vacaville. It was felt in an area about the same as that of the April 19 shock.

1898 – Damage to older brick buildings on Mare Island. Officer's HQs demolished as result.

1906 - April 18, the Great 1906 San Francisco Earthquake, magnitude 7.8. Ranks as one of the most significant earthquakes recorded in America. Benicia was hardest hit of nearby cities (damages included the Clock Tower at the Arsenal). Suisun also suffered damage and nearly destroyed by fire. Vallejo received some 38,080 refugees. The Vallejo Police buildings were wrenched out of shape. Many chimneys collapsed in Sacramento and Woodland. Additional loss was slight in Dixon and Vacaville. It was felt in an area about the deputized 188 citizens to join forces with the regulars to control any criminal activity. Vacaville Company I of the California Guard went to San Francisco to aid rescue efforts.

1989 - October 17, Loma Prieta Earthquake (Santa Cruz mountains) – magnitude 6.9. This quake ended decades of tranquility in the San Francisco Bay region. It killed 63 persons, injured 3,757, and displaced over 12,000. Over 20,000 homes and businesses damaged and more than 1,100 destroyed. The quake caused $6 Billion of damage. Reconstruction continues today some two decades later with replacement of Oakland-Bay Bridge. Damage occurred in Solano County in Benicia (Clock Tower and fire station) and Isleton (City Hall Community Center and fire station) as it rolled through Solano County.

5.5.3 Location/Geographic Extent

According to the USGS and the 2015 General Plan Safety Element, the Vaca-Kirby Hills Fault system is the only fault system that passes through the Vacaville Planning Area. The Vaca Fault has not experienced displacement within the past 11,700 years, and there is no evidence for displacement along the Kirby Hills Fault during the last 700,000 years. The Green Valley Fault system, which lies 12 miles to the southwest of Vacaville, has been active within the past 200 years. While more likely than either of the two previous faults to have seismic impacts on Vacaville, the United States Geological Survey (USGS), a federal science organization that examines natural resources, natural hazards, and our environment, estimates the probability of a magnitude 6.7 or greater earthquake along this fault prior to 2036 to be only 3 percent. The Rogers Creek Fault, part of the Hayward Fault System, lies roughly 24 miles to the southwest of Vacaville and has an estimated 16 percent probability of producing a magnitude 6.7 or greater earthquake prior to 2036.

Vacaville is generally characterized by areas of very low, low, and moderate risk of liquefaction. However, there are some areas with a high and very high risk of liquefaction in Vacaville due to the underlying soil types or other geologic features. For example, areas along and adjacent to Vacaville's major water ways, Ulatis and Alamo Creeks, feature high and very high levels of liquefaction susceptibility. These creek corridors cross through the community and include central areas of the City. Figure 5-13: Active Faults Map shows fault zones in or near the City of Vacaville. Figure 5-14 City of Vacaville Liquefaction Susceptibility shows the liquefaction risk in the City.

According to ABAG's technical appendices on liquefaction mapping, key component of mapping liquefaction hazard is estimating, in map form, the shaking needed to trigger liquefaction. Mapping is based, in part, on just how susceptible the materials are to liquefaction. Thus, in areas exposed to moderate shaking, a material that is highly susceptible to liquefaction may liquefy, but an adjacent material that is moderately susceptible may not. Liquefaction maps where created by a joint effort between USGS and William Lettis & Associates, Inc. (WLA) in 2001. As part of this collaborative effort, WLA received funding from USGS to develop new regionally consistent maps of Quaternary deposits (materials deposited in the last 1.6 million years). With oversight from the USGS, geologic map units in the digital Quaternary map were grouped into categories of similar susceptibility to liquefaction based on:

- typical ground water levels (for each map unit across all nine Bay Area counties),
- typical sediment properties; and
- liquefaction occurrences during past earthquakes.

Figure 5-14 shows areas with water-saturated sandy and silty materials that are susceptible to liquefaction if shaken hard enough. Susceptibility to liquefaction under earthquake shaking is delineated in five categories. Categories are described here in terms of (1) the likely proportion of all liquefaction occurrences in the region that will occur in each susceptibility category; (2) the areal abundance or frequency of occurrence within the category; (3) the strength of shaking required to produce liquefaction (as Peak Ground Acceleration - PGA), and (4) the Quaternary geologic map units included.. Table 5-5 provides the explanation of these categories in color code format which matches the map in Figure 5-14.

Table 5-5: Liquefaction Susceptibility

Very High	It is expected that about 40 - 50% of future liquefaction occurrences will be located within areas mapped as Very High susceptibility. This translates to an areal density of about one occurrence for every 1.5 square miles mapped in this category. Only modest shaking is required to cause liquefaction of deposits mapped with Very High susceptibility (PGA about 0.1g). Geologic map units included in the Very High category include latest Holocene and historical stream channels and artificial fills over Bay and other estuarine mud.
High	It is expected that about 20 - 30% of future liquefaction occurrences will be located within areas mapped as High susceptibility. This translates to an areal density of about one occurrence for every 2.3 square miles mapped in this category. Relatively modest shaking (PGA = 0.1 to 0.2g) is required to cause liquefaction of deposits mapped with High susceptibility. Geologic map units included in the High category include latest Holocene and historical alluvium, natural levees, and stream terraces.
Moderate	It is expected that about 20 - 30% of future liquefaction occurrences will be located within areas mapped as Moderate susceptibility. This translates to an areal density of about one occurrence for every 20 square miles mapped in this category. Somewhat stronger shaking (PGA > 0.1 to 0.2g) is required to cause liquefaction of deposits mapped with Moderate susceptibility. Geologic map units included in the Moderate category include latest Pleistocene and Holocene Bay and other estuarine mud, alluvial fan and levee deposits, and stream terrace deposits.
Low	It is expected that about 2% of future liquefaction occurrences will be located within areas mapped as Low susceptibility. This translates to an areal density of about one occurrence for every 40 square miles mapped in this category. Stronger shaking (PGA ~ 0.5g) is required to cause liquefaction of deposits mapped with Low susceptibility. Geologic map units included in the Low category include basin deposits, various late Pleistocene deposits, and Pleistocene marine terrace deposits.
Very Low	It is expected that less than 2% of future liquefaction occurrences will be located within areas mapped as Very Low susceptibility. This translates to an areal density of less than about one occurrence for every 40 square miles mapped in this category. Stronger shaking (PGA > 0.6g) is required to cause liquefaction of deposits mapped with Very Low susceptibility. Geologic map units included in the Very Low category include Pleistocene deposits and pre-Quaternary deposits and bedrock.

Figure 5-13: Active Faults Map

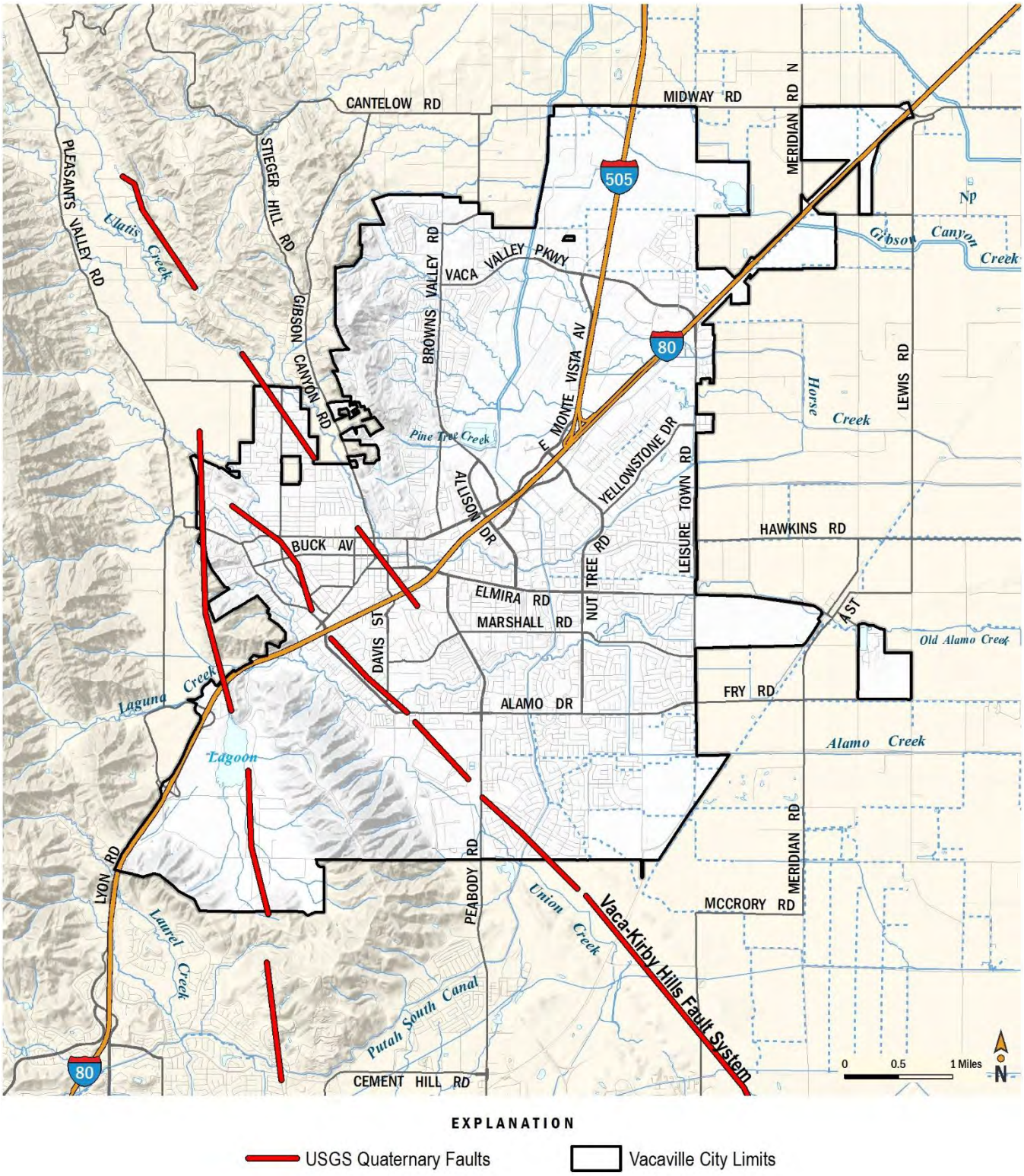
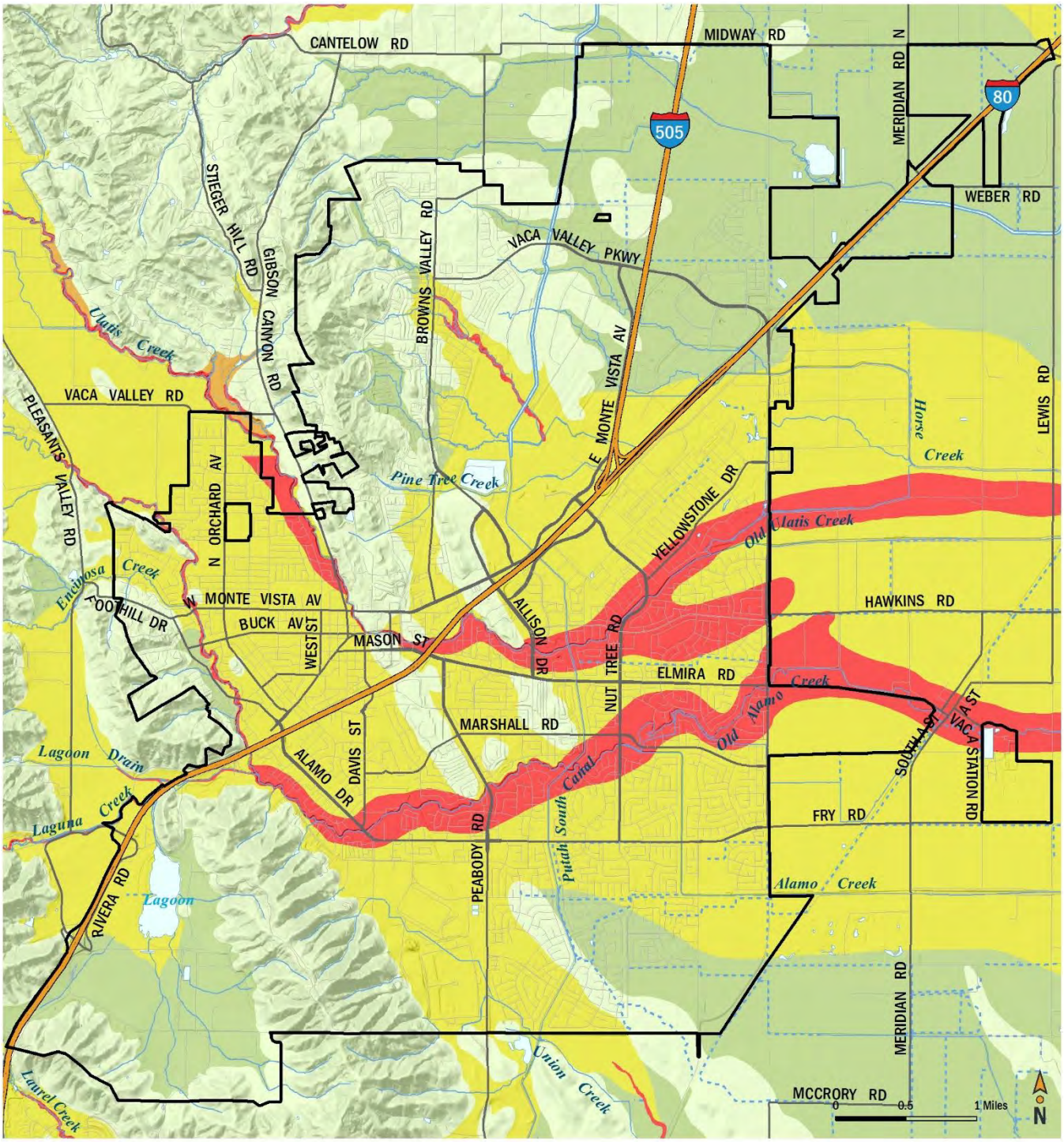


Figure 5-14 City of Vacaville Liquefaction Susceptibility



EXPLANATION

Vacaville City Limits

Liquefaction Susceptibility

Very High

High

Moderate

Low

Very Low

Important to note: Liquefaction maps presented in this document are not a substitute for a site-specific investigation by a licensed geologist or geotechnical engineer. There is a need for additional research on the shaking levels needed to trigger liquefaction for the different categories of Quaternary deposits.

5.5.4 Magnitude/Severity

The most common method for measuring earthquakes is magnitude, which measures the strengths of earthquake. Although the Richter scale is known as the measurement for magnitude, the majority of scientists currently use either the Mw Scale or Modified Mercalli Intensity (MMI) Scale. The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake.

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Table 5-6: Moment Magnitude Scale, there are seven earthquake magnitude classes, ranging from great to micro. A magnitude class of great can cause tremendous damage to infrastructure in Vacaville, compared to a micro class, which results in minor damage to infrastructure.

Table 5-6: Moment Magnitude Scale

Earthquake Magnitude Classes		
Magnitude Class	Magnitude Range (M = Magnitude)	Description
Great	M > 8	Tremendous damage
Major	7 <= M < 7.9	Widespread heavy damage
Strong	6 <= M < 6.9	Severe damage
Moderate	5 <= M < 5.9	Considerable damage
Light	4 <= M < 4.9	Moderate damage
Minor	3 <= M < 3.9	Rarely causes damage.
Micro	M < 3	Minor damage

The MMI Scale measures earthquake intensity as shown in Table 5-7. The MMI Scale has 12 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through XII describe damage to infrastructure during a moderate to catastrophic earthquake

Table 5-7: Modified Mercalli Scale

Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
1.0 – 3.0	I	I. Not felt except by very few people under especially favorable conditions.
3.0 – 3.9	II – III	II. Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
		III. Felt quite noticeably indoors. Many do not recognize it as an earthquake. Standing motorcars may rock slightly.
4.0 – 4.9	IV – V	IV. Felt by many who are indoors; felt by a few outdoors. At night, some awakened. Dishes, windows and doors rattle.
		V. Felt by nearly everyone; many awakened. Some dishes and windows broken; some cracked plaster; unstable objects overturned.

Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
5.0 – 5.9	VI – VII	VI. Felt by everyone; many frightened and run outdoors. Some heavy furniture moved; some fallen plaster or damaged chimneys.
		VII. Most people alarmed and run outside. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.
6.0 – 6.9	VII – IX	VIII. Damage slight in special designed structures; considerable in ordinary buildings; great in poorly built structures. Heavy furniture overturned. Chimneys, monuments, etc. may topple.
		IX. Damage considerable in specially designed structures. Buildings shift from foundations and collapse. Ground cracked. Underground pipes broken.
7.0 and Higher	VIII and Higher	X. Some well-built wooden structures destroyed. Most masonry structures destroyed. Ground badly cracked. Landslides on steep slopes.
		XI. Few, if any, masonry structures remain standing. Railroad rails bent; bridges destroyed. Broad fissure in ground.
		XII. Virtually total destruction. Waves seen on ground. Objects thrown into the air.

Since the effects of liquefaction are derived from earthquake shaking, it can be assumed that as earthquake shaking intensifies, so do the risks from liquefaction.

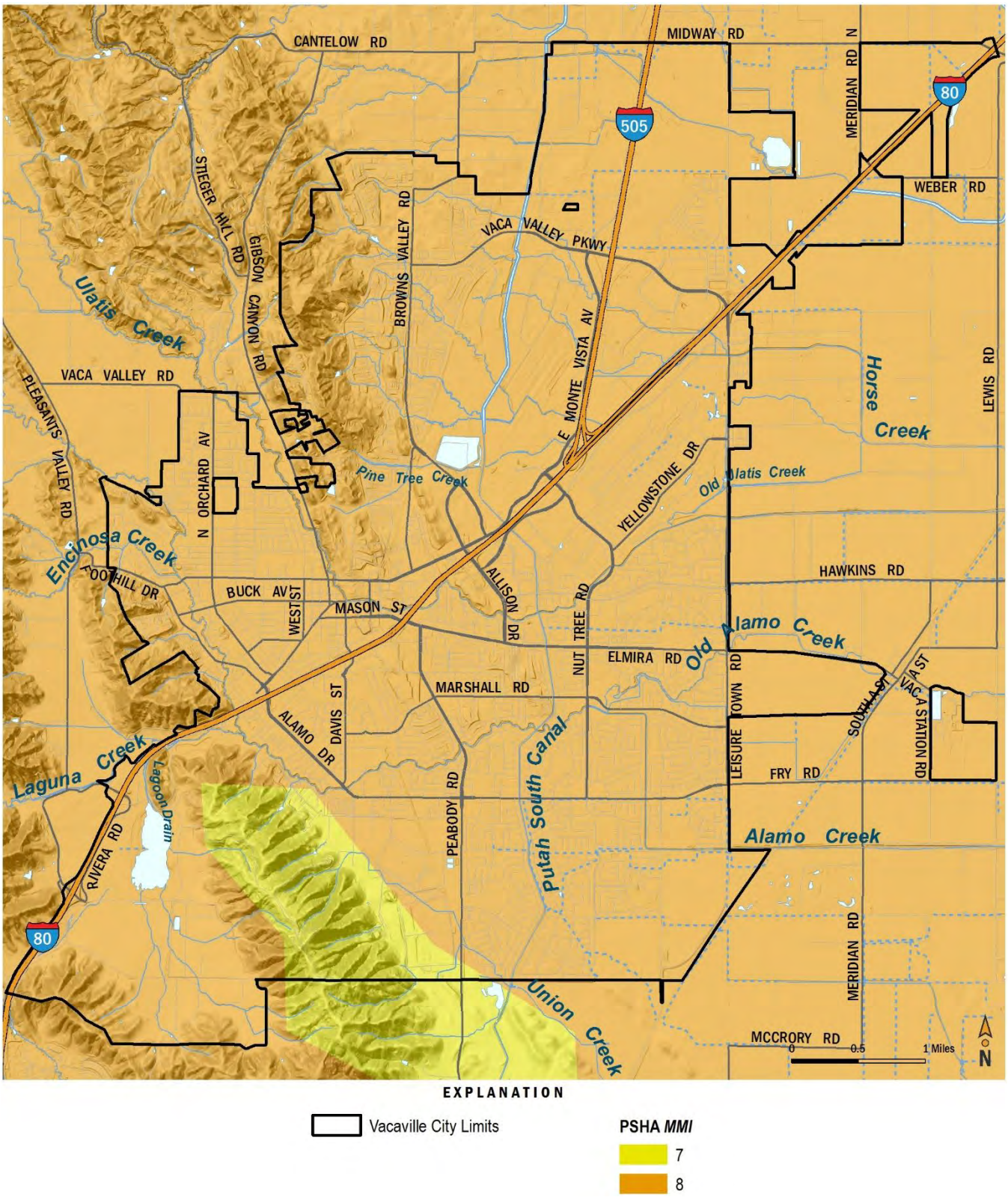
According to ABAG, Solano County is at risk from many earthquake scenarios. These include Hayward/Rodgers Creek, Green Valley, West Napa, San Andreas, Hunting Creek-Berryessa, and two Great Valley scenarios. The Concord/Green Valley fault is the only known active fault passing within County borders, in the western portion of the county. However, its close proximity to the Hayward Fault, which has the greatest likelihood of rupturing in the next 30 years of all the faults in the Bay Area, combined with moderate to high susceptibility of liquefaction throughout most of the county due to delta soils, leaves Solano County at risk in the next major earthquake. Landslides may also occur in the western portion of the county. The last major earthquake with an epicenter within Solano County was the Vacaville-Winters earthquake in 1892, estimated to be of magnitude 6.5. It is unknown which fault caused this earthquake.

Figure 5-15 shows likely shaking intensity in the region in any 50 year period from all possible faults in the region. It is an equivalent risk to a 500 year flood event. 10% in 50 years was chosen as it most closely aligns to the levels of shaking the current building code are designed to withstand. This intensity maps are not intended to be site-specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community. The darker the color and the higher the MMI, the greater ground shaking and potential damage there is in an earthquake. The region has a 10% chance of experiencing the level of ground shake intensity indicated in Figure 5-15 in any 50-year period.

Figure 5-15 was developed in conjunction with USGS and CGS by determining PSHA for Peak Ground Velocity (PGV) for 52,961 points along a grid covering the entire Bay Area, at intervals of 0.05 degrees longitude and 0.05 degrees latitude. PGV was then converted to the Modified Mercalli Intensity (MMI) measure. This analysis incorporates soil conditions which affect the velocity of ground shaking. To learn more information on this process visit ABAGs website here:

http://resilience.abag.ca.gov/earthquakes/solano/

Figure 5-15: Concord-Green Valley Scenario MMI



While earthquakes and resultant liquefaction occur less frequently than other primary natural hazard events, they have accounted for the greatest combined losses (deaths, injuries, and damage costs) in disasters since 1950 in California and have the greatest catastrophic disaster potential (Cal EMA 2010). Earthquakes over a magnitude of 6.0 affecting the San Francisco Bay Area in the last 160 years have occurred on average of once every seven years.

The USGS estimates that the probability of an earthquake occurring over the next 30 Years in the San Francisco Bay Region with a magnitude of 6.7 or greater is 72 percent. Table 5-8 from the USGS lists Average time between earthquakes in the San Francisco region together with the likelihood of having one or more such earthquakes in the next 30 years (starting from 2014). "Readiness" indicates the factor by which likelihoods are currently elevated, or lower, because of the length of time since the most recent large earthquakes. The values from the USGS include aftershocks. It is important to note that actual repeat times will exhibit a high degree of variability, and will almost never exactly equal the average listed in the table.

As shown in Figure 5-16, a Hayward North/Rodgers Creek Fault earthquake event with a magnitude of 6.7 or greater has a probability of 14.3 percent chance over the next 30 years (starting in 2014). In comparison, the Concord/Green Valley North/South Fault has 5.5 percent chance within the next 30 years (starting in 2014).

Table 5-8: San Francisco Region Earthquake Probability

Magnitude (greater than or equal to)	Average repeat time (years)	30-year likelihood of one or more events	Readiness
5	1.3	100%	1.0
6	8.9	98%	1.0
6.7	29	72%	1.1
7	48	51%	1.1
7.5	124	20%	0.9
8	825	4%	1.0

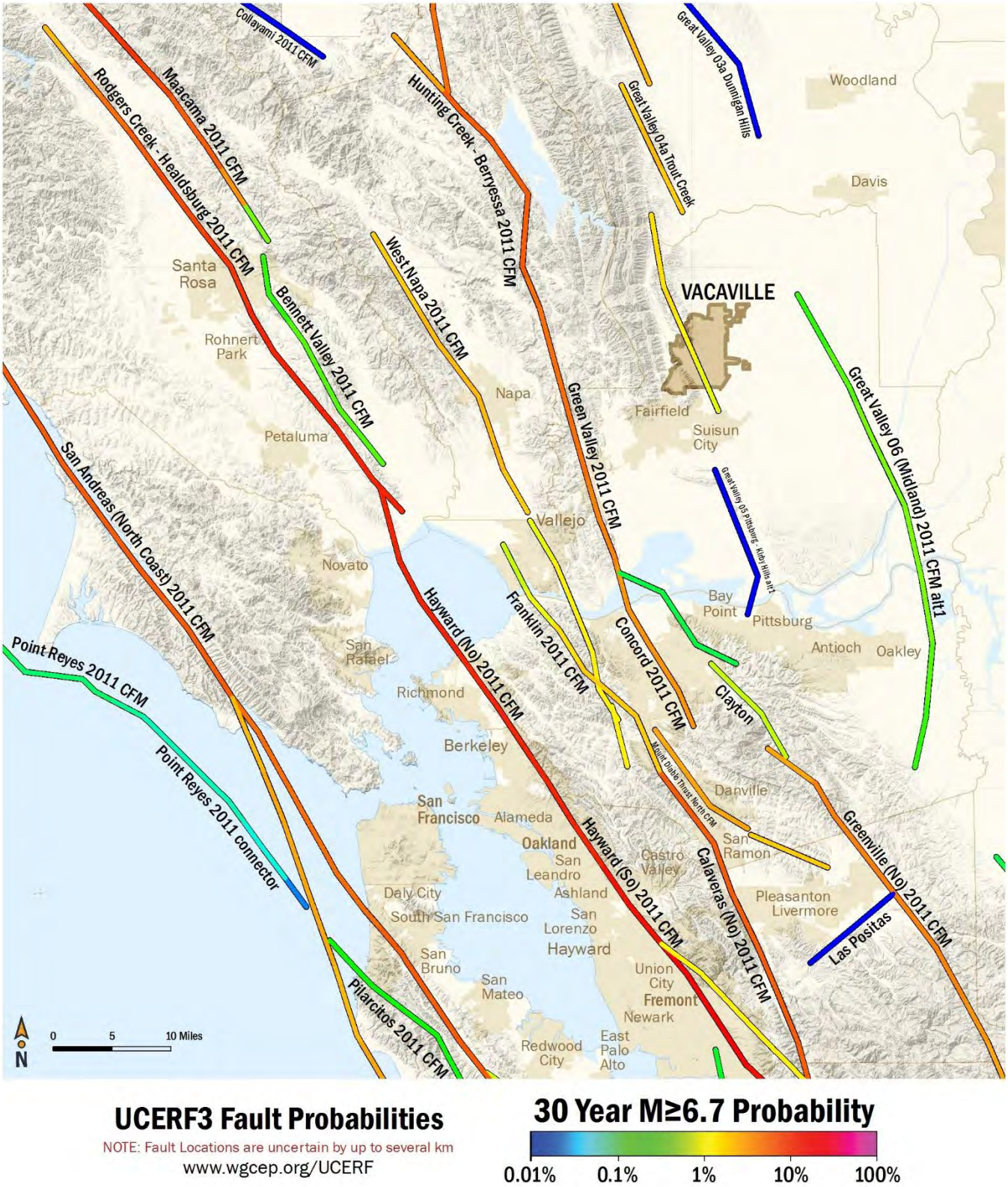
Source: USGS UCERF3: A New Earthquake Forecast for California's Complex Fault System FS 2015-3309

Uniform California Earthquake Forecasts (UCERF) estimated the likelihood that California will experience a magnitude 8 or larger earthquake in the next 30 years has increased from about 4.7% in 2007 (UCERF2[4]) to about 7.0% for the thirty-year duration starting in 2014 (UCERF3[5]).

[4] USERF2 = 2008 California Earthquake Probabilities. In April 2008, scientists and engineers released a new earthquake forecast for the State of California called the UCERF. Compiled by USGS, Southern California Earthquake Center (SCEC), and the California Geological Survey (CGS), with support from the California Earthquake Authority, it updates the earthquake forecast made for the greater San Francisco Bay Area by the 2002 Working Group for California Earthquake Probabilities.

[5] UCERF3 = 2014 California Earthquake Probabilities. UCERF3 is the first type of model, representing the latest earthquake-rupture forecast for California. It was developed and reviewed by dozens of leading scientific experts from the fields of seismology, geology, geodesy, paleoseismology, earthquake physics, and earthquake engineering. As such, it represents the best available science with respect to authoritative estimates of the magnitude, location, and likelihood of potentially damaging earthquakes throughout the state (further background on these models, especially with respect to ingredients, can be found in U.S. Geological Survey Fact Sheet 2008–3027, http://pubs.usgs.gov/fs/2008/3027/)

Figure 5-16: San Francisco Bay Region Earthquake Probability



5.6 Drought (DR)

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Drought severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity.

Drought originates from a deficiency of precipitation over an extended period, usually one or more seasons. Drought can result in a water shortage for some activity, group, or environmental sector. Drought is a complex natural hazard, which is reflected in the following four definitions commonly used to describe it:

- Agricultural – drought is defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- Hydrological – drought is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- Meteorological – drought is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- Socioeconomic – drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall. It may also be called a water management drought.

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of the basin. Since regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Similarly, changes in land use upstream may alter hydrologic characteristics such as infiltration and runoff rates, resulting in more variable streamflow and a higher incidence of hydrologic drought downstream. Land use change is one of the ways human actions alter the frequency of water shortage even when no change in the frequency of meteorological drought has been observed.

5.6.1 Regulatory Environment

A number or regulatory requirements and documents address planning for drought in the City. This includes the 2010 Solano County Water Agency Urban Water Management Plan (UWMP) and the 2013 Westside Sacramento Integrated Regional Water Management Plan. On November 18th, 2014, Ordinance 1877 was added, declaring a drought condition in the City of Vacaville. Ordinance 1877 can be read in its entirety here-
http://vacaville.granicus.com/MetaViewer.php?view_id=2&clip_id=1280&meta_id=61841

5.6.1.1 2010 Solano County Water Agency Urban Water Management Plan

Drought in Vacaville is addressed through the 2010 Solano County Water Agency's Urban Water Management Plan (UWMP). Under the Urban Water Management Planning Act (Senate Bill 318), each urban water supplier in California is required to prepare an UWMP and update the plan on or before December 31 in years ending in 5 and 0, pursuant to

California Water Code Sections 10610–10657. Amendments to SB 318 have focused on ensuring that the UWMP emphasizes and addresses drought contingency planning, water demand management, reclamation, and groundwater resources. Under the current law, all urban water suppliers with more than 3,000 service connections or water use of more than 3,000 acre-feet per year are required to submit a UWMP to the California Department of Water Resources every 5 years.

The Solano County Water Agency (SCWA) UWMP describes the agency's water system, water supply and demand, water supply reliability and water shortage contingency planning, and demand management measures. The SCWA UWMP also includes, as an appendix, the Solano Project Members' Agreement as to Drought Measures and Water Allocation (Agreement). The Solano Project is a federal project with the Bureau of Reclamation that stores water in Lake Berryessa for delivery to users throughout the region and was sized to meet only the projected water needs of Vacaville and Solano County. The Solano Irrigation District, Main Prairie Water District, City of Fairfield, City of Vacaville, and City of Vallejo, through contracts with SCWA, are entitled to annual deliveries of water from the Solano Project. The Agreement stipulates that when storage in Lake Berryessa falls below 800,000 AF as measured on December 1, all parties will participate with SCWA staff to prepare a Drought Contingency Plan (DCP). The DCP shall include water conservation measures, investigation of potential emergency supplies which could be imported without construction of new conveyance facilities, and other measures which could reduce depletion of storage in Lake Berryessa.

5.6.1.2 2013 Westside Sacramento Integrated Regional Water Management Plan

This Integrated Regional Water Management Plan (IRWM Plan) defines a clear vision for the management of water resources in the Westside Sacramento Region and highlights important actions needed to help accomplish that vision through the year 2035. This IRWM Plan complies with the Integrated Regional Water Management Guidelines for Proposition 84 and 1E published by the California Department of Water Resources (DWR) in November 2012. The Region includes all of Yolo County and portions of Lake, Napa, Solano, and Colusa Counties that are within the Cache Creek and Putah Creek watersheds. Major communities within the Region include the cities of Clearlake, Davis, Dixon, Lakeport, Rio Vista, Vacaville, West Sacramento, and Woodland. Drought and water supply issues are dealt with on a regional basis in the IRWM Plan.

5.6.2 Past Occurrences

The 2013 California State MHMP states that from 1950 to 2012, there have been eight-drought State Emergency Proclamations in California. Specifically for Vacaville and Solano County, there have been six drought events since 1896. Previous occurrences of drought are described as follows:

- **1896 to 1900:** A four-year drought occurred in the Vaca Valley area of Solano County. Within two years, fruit production in this area dropped by more than 50%
- **1975 to 1977:** The two driest years (1976 and 1977) in the State of California's history resulted in severe drought conditions in Solano County. The drought was declared an Emergency (FEMA-EM-3023) on January 20, 1977 and a State disaster in Solano County in February 1976. Total crop damages statewide totally $2.67 billion dollars for both years ($888.5 million in 1976 and $1.8 billion in 1977).
- **1991:** A drought emergency was declared for Solano County. The US Department of Agriculture (USDA) provided $995 million for crop losses in 1990-1991 nationwide, and an additional $775 million in emergency funds for 1990-1992 crop losses.
- **2004:** The Small Business Administration (SBA) declared an Economic Injury Disaster in Solano County (Declaration #10073) for drought conditions, which occurred March 1 through September 23, 2004. Small, non-farm businesses in Solano County were able to apply for Economic Injury Disaster Loans to cover working

capital needs. The declaration covered the impact of reduced revenue caused by the drought. These loans were available to offset the economic losses caused by reduced revenue from farmers and ranchers whose crop production suffered.

- **2006 to 2009:** A California State-declared three-year drought of below-average rainfall, low snowmelt runoff, and the largest court-ordered water restricting in state's history. The dry conditions damaged crops, deteriorated water quality, and caused extreme wildfire danger. Approximately $300 million in agricultural revenue loss, and a potential $3 billion in economic losses over time.
- **2012 to 2015**: The State of California imposed water conservation standards throughout the state which required that the City of Vacaville reduce its water use by 32%. This regulation triggered the City to implement its Urban Water Shortage Contingency Plan Stage 3 response, wherein the City Council established residential household allocations; specifying watering days for residential and commercial, industrial, and institutional customers; and implemented penalties for water use in excess of established allocations. The dry conditions damaged park, setback, and private landscaping that relies upon potable water. Dry conditions in the surrounding open space areas increased wildfire danger.

Additional information about previous occurrences of droughts in California (in general) can be obtained from the California DWR.

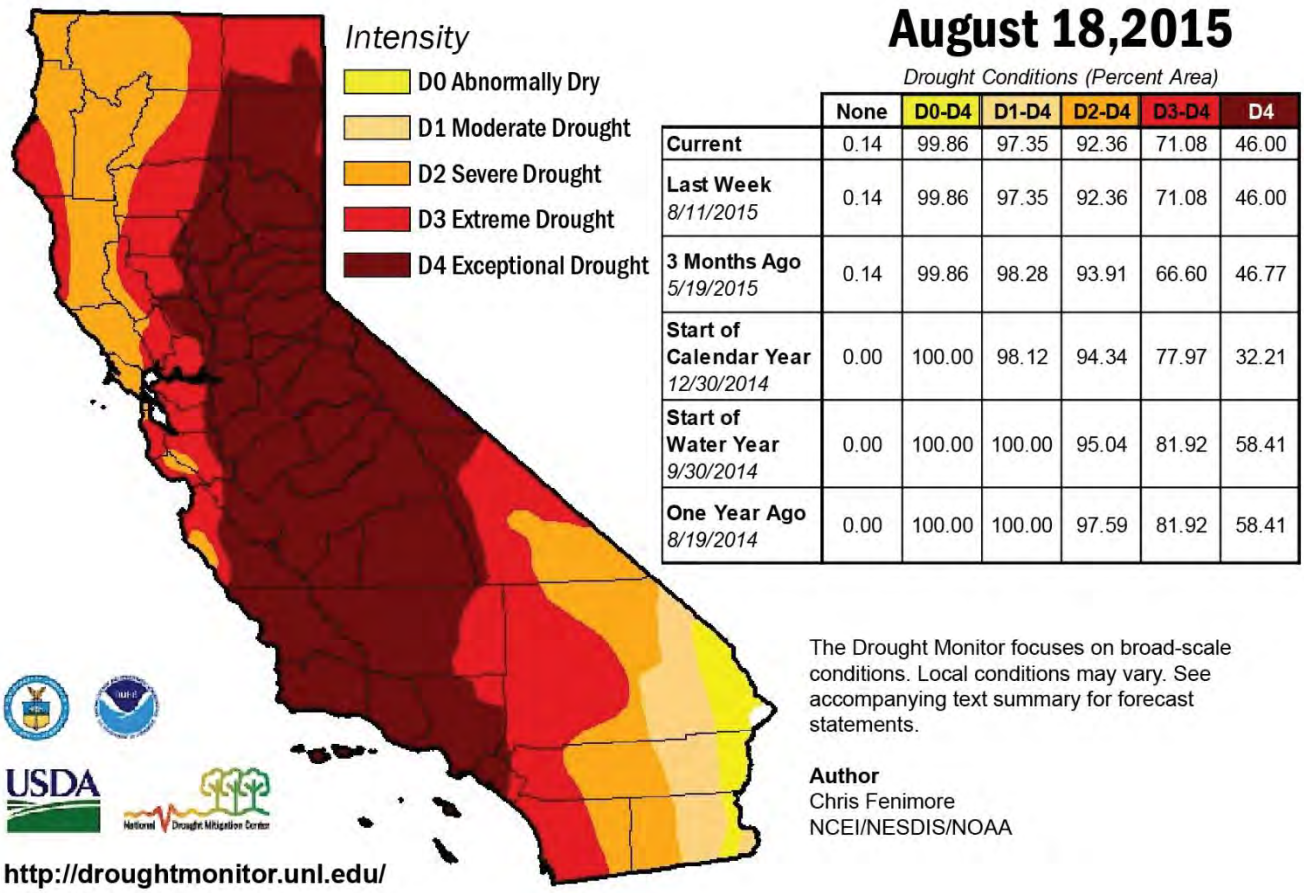
5.6.3 Location/Geographic Extent

Drought can affect the City, County, region, and the State of California as a whole. Shortages in precipitation in the Sierra Nevada's can have a more pronounced impact on water supply in the City than a drought in the San Francisco Bay Area. This is due to the region's reliance on water supply from the Tuolumne and Mokelumne watersheds. The City's primary source of water is Lake Berryessa (Putah Creek Watershed). Secondary source is groundwater (Tehema Formation Aquifer). Third source is Delta Water (Northbay Regional Waterplant). Drought has no defined geographical boundaries and cannot be depicted in map form. As such, all of the City is subject to drought.

5.6.4 Magnitude/Severity

The magnitude of drought is usually measured in time and the severity of the hydrologic deficit. There are several resources available to evaluate drought status and estimate future expected conditions. The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning. The NIDIS maintains the U.S. Drought Portal (www.drought.gov) which is a web-based access point to several drought related resources. Resources include the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO).

Figure 5-17: US Drought Monitor Map for the State of California on August 18, 2015

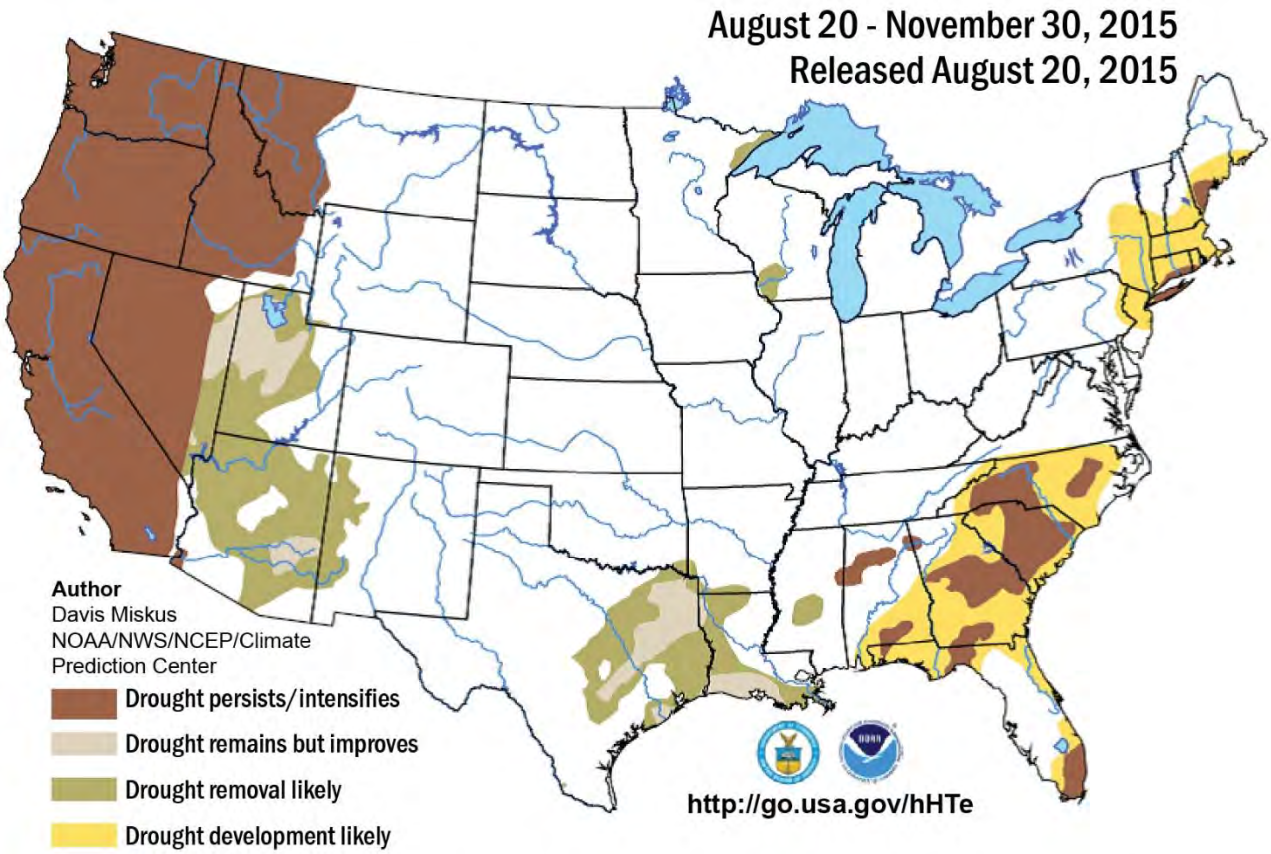


	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.14	99.86	97.35	92.36	71.08	46.00
Last Week *8/11/2015*	0.14	99.86	97.35	92.36	71.08	46.00
3 Months Ago *5/19/2015*	0.14	99.86	98.28	93.91	66.60	46.77
Start of Calendar Year *12/30/2014*	0.00	100.00	98.12	94.34	77.97	32.21
Start of Water Year *9/30/2014*	0.00	100.00	100.00	95.04	81.92	58.41
One Year Ago *8/19/2014*	0.00	100.00	100.00	97.59	81.92	58.41

The USDM provides a summary of drought conditions across the United States and Puerto Rico and is developed and maintained by the National Drought Mitigation Center (www.drought.unl.edu). USDM includes the U.S. Drought Monitor Map. This map is updated weekly by combining a variety of drought database and indicators, and local expert input into a single composite drought indicator. The map denotes four levels of drought intensity (ranging from D1 - D4) and one level of "abnormal dryness" (D0). In addition, the map depicts areas experiencing agricultural (A) or hydrological (H) drought impacts. These impact indicators help communicate whether short- or long-term precipitation deficits are occurring. An example Drought Monitor Map for the State of California on August 18, 2015 is illustrated in Figure 5-17: US Drought Monitor Map for the State of California on August 18, 2015.

The USSDO, shown in Figure 5-18: USSDO Drought Tendency Map (Valid August 20 to November 30, 2015) is a three-month projection of potential drought conditions developed by the National Weather Service's Climate Prediction Center.

Figure 5-18: USSDO Drought Tendency Map (Valid August 20 to November 30, 2015)



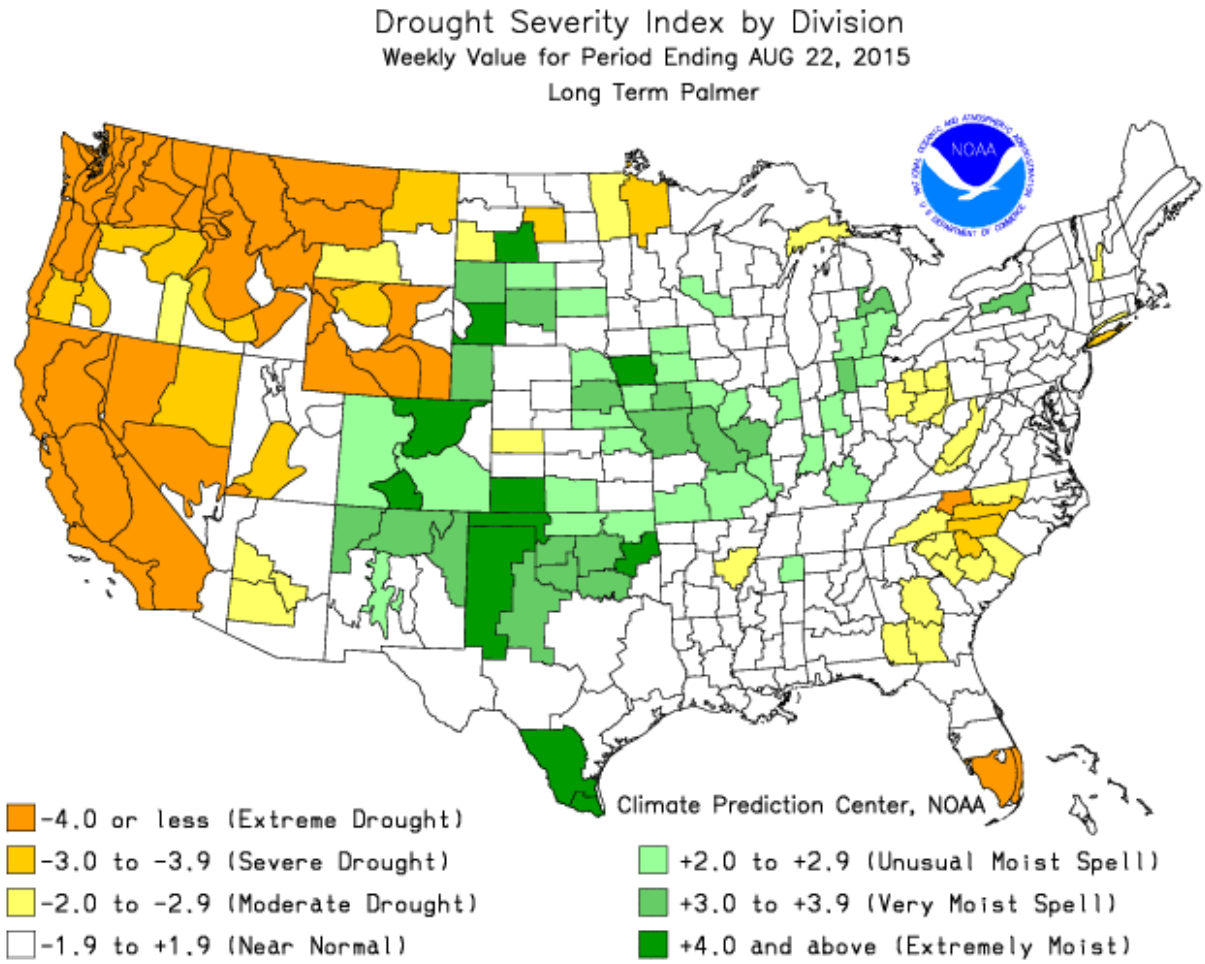
Depicts large-scale trends based on subjectively derived probabilities guided by short- and longe-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

A number of indices measure how much precipitation for a given period has deviated from historically established norms. The primary indicator for the USDM and USSDO for the western United States is the Palmer Drought Severity Index (PDSI). The PDSI is widely used by the USDA to determine when to grant emergency drought assistance to affected areas. PDSI is a commonly used index that measures the severity of drought for agriculture and water resource management. It is calculated from observed temperature and precipitation values and estimates soil moisture. However, the PDSI is not considered consistent enough to characterize the risk of drought on a nationwide basis (FEMA, 1997) and is not well suited to the dry, mountainous areas in the western U.S.

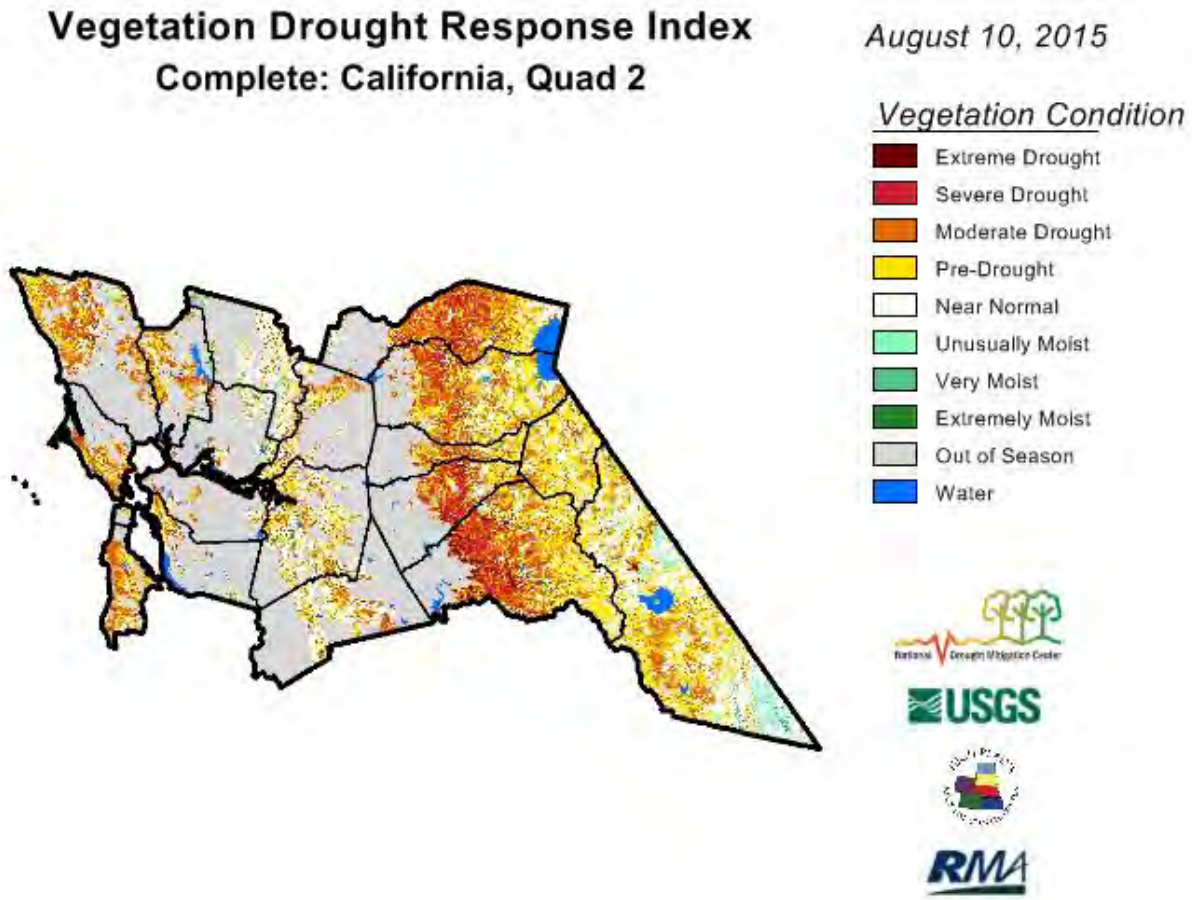
For western States with mountainous terrain and complex regional microclimates, it is also useful to supplement the PDSI values with other indices such as Surface Water Supply Index and Standardized Precipitation Index (SPI). The Surface Water Supply Index takes snowpack and other unique conditions into account. The National Drought Mitigation Center (NDMC) uses the SPI to identify emerging drought months sooner than the PDSI. It is computed on various time scales to monitor moisture supply conditions. The SPI is the number of standard deviations that precipitation value would deviate from the long-term mean. As shown in Figure 5-20: VegDRI results for the San Francisco Bay Area for August 10, 2015 the 72-month SPI through the end of August 2015 for Vacaville and Solano County is near normal.

Figure 5-19: 72-Month SPI through the end of August 2015 for Vacaville and Solano County



The Vegetation Drought Response Index, or VegDRI, is a bi-weekly depiction of vegetation stress across the contiguous United States. VegDRI is a fine resolution (1-km^2) index based on remote sensing data, and incorporates climate and biophysical data to determine the cause of vegetation stress. Development of the VegDRI map and associated products is a joint effort by the National Drought Mitigation Center (NDMC), the U.S. Geological Survey's (USGS) National Center for Earth Resources Observation and Science (EROS), and the High Plains Regional Climate Center (HPRCC). Figure 5-20: VegDRI results for the San Francisco Bay Area for August 10, 2015 illustrates the VegDRI results for the San Francisco Bay Area for August 10, 2015.

Figure 5-20: VegDRI results for the San Francisco Bay Area for August 10, 2015



5.6.5 Frequency/Probability of Future Occurrences

Currently there is no data on the probability of drought that would be comparable to the USGS effort on earthquakes in the region, or how 100-year flood maps are created. However, according to the 2012 Solano County EOP, drought cycles occur every 7 to 11 years in Vacaville and Solano County as a whole.

5.7 DamFailure (DF)

A dam failure is usually the result of neglect, poor design, and/or structural damage caused by a major event such as an earthquake. When a dam failure occurs, a gigantic quantity of water is suddenly released, destroying infrastructure and flooding the area downstream of the dam (ABAG 2011).

Dams are man-made structures built for a variety of uses. Uses include agriculture, flood protection, power generation, recreation, and water supply. Dam failure can occur with little warning. As outlined by FEMA, dam failure can occur due to one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam.
- Deliberate acts of sabotage to the dam.
- Structural failure of materials used in dam construction.
- Movement and/or failure of the foundation supporting the dam.
- Settlement and cracking of concrete in the dam.
- Piping and internal erosion of soil in the dams.
- Inadequate maintenance and upkeep of the dam.

5.7.1 Regulatory Environment

Dam regulatory requirements at a federal, state, and local level are critical for the safeguarding of agriculture, economy, power supply, and quality of life in the City. At the federal level, FEMA is working to protect from dam failure through the National Dam Safety Program (NDSP). The Water Resources and Development Act of 1996 formally established the NDSP. The NDSP is a partnership of the states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety. The Dam Safety and Security Act of 2002, signed into law on December 2, 2002, reauthorized the NDSP for 4 more years and added enhancements to the 1996 Act that are designed to safeguard dams against terrorist attacks (FEMA 2010).

Since 1972, the USACE has maintained the National Inventory of Dams (NID). Dams included in the NID are either greater than 25 feet high, hold more than 50 acre-feet of water, or are considered a significant hazard if they were to fail. Dams are classified based on the severity or magnitude of the potential devastation and losses of human life, economic, and environmental resources. Dam hazard classifications are defined as follows:

- High Hazard – loss of one human life is likely if a dam failure should occur.
- Significant Hazard – possible loss of human life and likely significant property or environmental destruction if a dam failure should occur.
- Low Hazard – no probable loss of human life and low economic, and/or environmental losses if a dam failure should occur.

At a state level, laws pertaining to the California dam safety program were originally adopted in 1929. Under this program, the DWR's Division of Safety of Dams (DSoD) independently reviews and evaluates designs of new dams. DWR performs

frequent inspections of dams under construction and of those recently completed to verify compliance with approved plans and specifications.

In the State of California, a number of governmental bodies, specifically the California Emergency Management Agency (Cal EMA) and the California Department of Water Resources (DWR), Division of Safety of Dams (DOSOD), manage the state dam safety program. Within the State, Title 19, Public Safety, Division 2 (Office of Emergency Services), Chapter 2 (Emergencies and Major Disaster), Subchapter 4 (Dam Inundation Mapping Procedures) of the California Code of Regulations (CCR) codifies the mapping criteria for dam owners and operators, specifying the mapping scope and mapping notification requirements. Dam owners are required to submit both a technical report and emergency inundation map to Cal EMA when one of the following applies:

- "Notice of Application" is filed with DWR, DOSOD; or,
- A dam is under construction (new and rehabilitation); or,
- A waiver previously granted by the Cal EMA is no longer applicable; or,
- Changes in land use and or drainage ways within the inundation zone.

The CCR identifies the scope of dam inundation mapping, which is to include the following:

- Delineated lateral boundaries and terminations of the inundation area.
    - The boundary is terminated where floodwaters become less than one (1) foot above the elevation existing before the dam failure and the water velocity is less than 8.8 feet per second.
    - Alternatively, the boundary at which the inundation area may be terminated could be an existing body of water or channel in which dam waters are discharged, provided the dam breach flood discharge does not increase the water elevation by greater than one (1) foot above the flood stage that would have occurred under non-breach conditions or cause additional downstream cumulative impacts.
- Cross-sections located along the floodway at appropriate intervals indicating the following information:
    - Sequential cross-section number,
    - Distance from dam,
    - Flood-wave arrival time,
    - Flood-wave maximum elevation,
    - De-flood time (the amount of time it would take for conditions to return to pre-flood conditions) and,
    - Peak flow.

According to the CCR, approval of an inundation map may be revoked when the inundation map no longer meets the requirements and is no longer an accurate emergency planning document. Upon notification of noncompliance by Cal EMA, the dam owner is required to submit a new and compliant inundation map and technical study within 180 days.

Under the regulation of DSoD, dam owners and operators in Solano County are required to routinely inspect their facilities. These inspections and evaluations will alert owners and operators to potential dam failures and allow immediate action to remedy the problem.

5.7.2 Past Occurrences

A search of the National Performance of Dams Program out of Stanford University revealed that no dam failure event has ever occurred near Vacaville or in Solano County as a whole.

5.7.3 Location/Geographic Extent

Table 5-9 City of Vacaville Dams

.am .ame	ear uilt	.am gt. .t.	vdraulic gt. .t.	.ederal azard lass	wner	tate .d.	. . . .d.
Bascherini	1962	35	31.5	H†	Solano Irrigation District	CA00836	1016000
Lagoon Valley County Park	1981	13	8.5	H	City Of Vacaville	CA01315	1442000
Monticello Dam ‡	1957	304	254.5	H	Dept. of Interior / Bureau of Reclamation	CA10170	

Source: CA DWR
†: H=High Hazard Dam
‡: Monticello Dam inundation zone is located within a portion of City boundary.
Important to note: All dames listed have Emergency Actions Plans on File

5.7.4 Magnitude/Severity

Since 1972, the State has required inundation maps for most dams, showing those areas within the potential dam failure inundation zone. As illustrated in, source from the 2015 Draft General Plan Safety Element, the northeastern portion of Vacaville is subject to potential dam inundation by the Monticello Dam. The inundation map shows the area likely to flood should the dam fail. Included in this inundation zone in the City of Vacaville are 142 acres of land, and four miles of roadways.

5.7.5 Frequency/Probability of Future Occurrences

No quantitative information currently exists for a dam failure in Vacaville or Solano County.

Pursuant to Government Code Section 8589.4, which is commonly referred to as the Potential Flooding - Dam Inundation Act (the "PFDI Act"), inundation maps must be prepared, delivered and approved by the OES. These maps show areas of potential flooding in the event of sudden or total failure of any dam, the failure of which would result in death or personal injury. Mapping information in EAPs is created at the local level and is osted by each corresponding state.

The City of Vacaville will determine the inundation zone with an emergency action plan for each dam in the City. There are already emergency action plans for the Bascherini Dam and the Lagoon Valley County Park.

When a dam is recognized to have a potential failure, the water level is reduced to allow for a reduction in water pressure and volume behind the dam. This reduction of water level is required by the DSoD and by safety protocols established by each dam owner (ABAG 2011).

Figure 5-21: DWR-Registered Dams, 2015

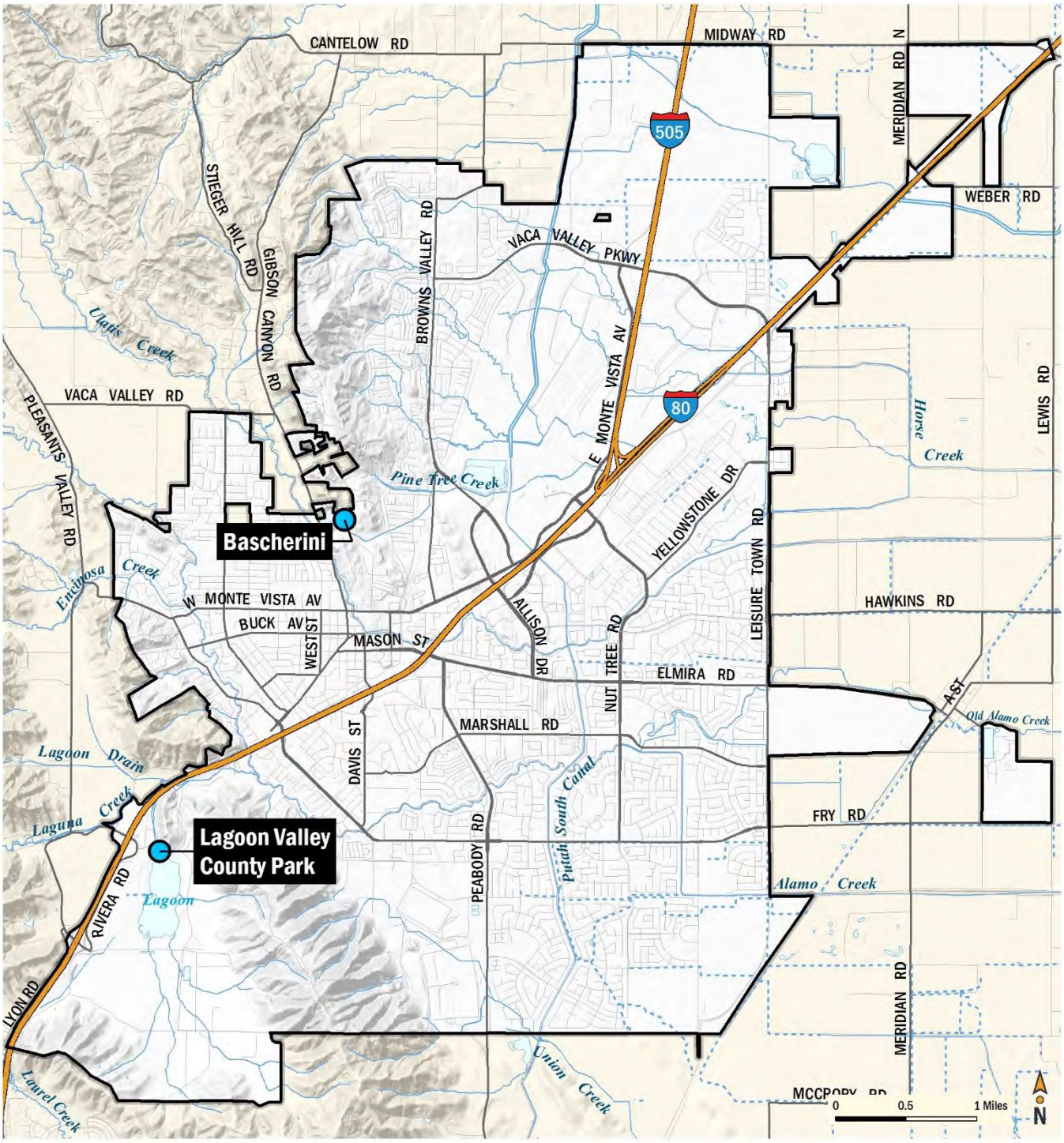
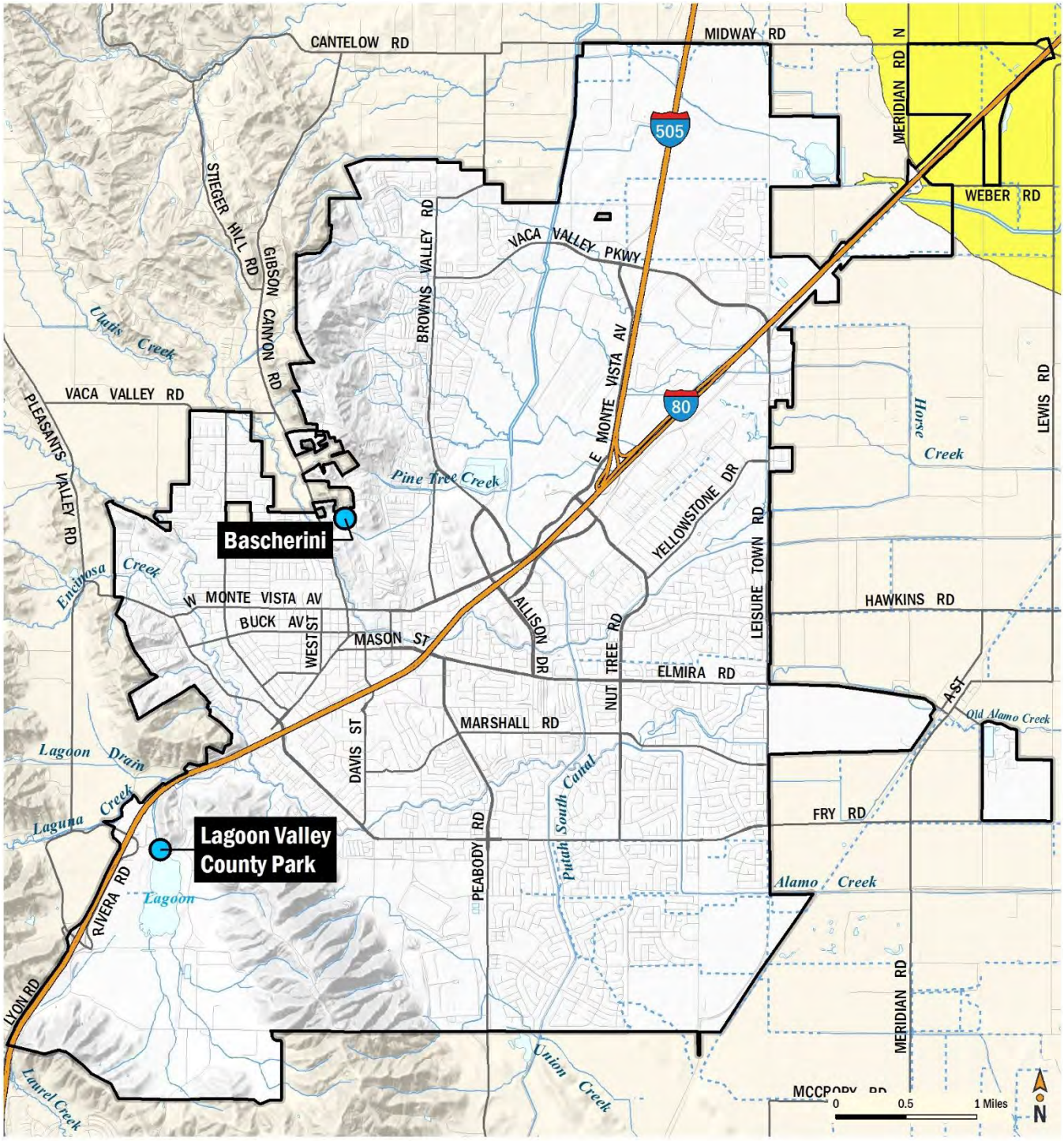


Figure 5-22: City of Vacaville - Dam Inundation Map



EXPLANATION

Dams (DWR, 2015) | Vacaville City Limits | Monticello Dam Inundation Zone

5.8 Extreme Heat (EH)

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 National Weather Service (NWS), among natural hazards, only the cold of winter—not lightning, hurricanes, tornados, 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.

5.8.1 Regulatory Environment

There are no regulations that apply to extreme heat. In fact, there are very few formal regulations that pertain to severe weather events in general.

5.8.2 Past Occurrences

The California Climate Adaptation Strategy (CAS), citing a California Energy Commission study, states that "over the past 15 years, heat waves have claimed more lives in California than all other declared disaster events combined." Despite this history, however, not a single heat emergency was formally proclaimed at the state level or declared as a federal disaster between 1960 and 2008. Though no formal explanation exists for this seeming contradiction, scholars have written about the exclusion of heat events as declared disasters. For example, Eric Klinenberg, author of an account of a heat wave which killed 739 people in the City of Chicago in July 1995, suggests that the hidden nature of social vulnerability combined with the inconspicuous nature of heat events (unlike earthquakes, floods, wildfires, tornados, etc.) prevent them from being declared as legitimate disasters. Further, although heat events can have a devastating effect on agriculture, heat-caused property damage over the last 48 years has been relatively small.

5.8.3 Location/Geographic Extent

Extreme heat affects all areas of the City, as this particular hazard has no geographic boundaries.

5.8.4 Magnitude/Severity

Figure 5-23: Heat Index and Figure 5-24: Possible Heat Disorders by Heat Index Level show the Heat Index (HI) as a function of heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes it feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the HI rises, so do health risks.

- When the HI is 90°F, heat exhaustion is possible with prolonged exposure and/or physical activity.
- When it is 90°-105°F, heat exhaustion is probable with the possibility of sunstroke or heat cramps with prolonged exposure and/or physical activity.
- When it is 105°-129°F, sunstroke, heat cramps or heat exhaustion is likely, and heatstroke is possible with prolonged exposure and/or physical activity.
- When it is 130°F and higher, heatstroke and sunstroke are extremely likely with continued exposure. Physical activity and prolonged exposure to the heat increase the risks.

Figure 5-23: Heat Index

Temperature (˚F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
Danger
Extreme Caution
Extreme Danger

Source: National Weather Service

Note: Since HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

Figure 5-24: Possible Heat Disorders by Heat Index Level

Heat Index	Category	Possible heat disorders for people in high risk groups
130˚F or higher	**Extreme Danger**	Heatstroke rish extremely high with continued exposure
105˚F - 129˚F	**Danger**	Sunstroke, Heat Cramps and Heat Exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity
90˚F - 105˚F	**Extreme Caution**	Sunstroke, Heat Cramps and Heat Exhaustion possible with prolonged exposure and/or physical activity
80˚F - 90˚F	**Caution**	Fatigue possible with prolonged exposure and/or physical activity.

Source: National Weather Service

The Western Regional Climate Center maintains a weather station in Vacaville. Its period of operation was from 1983 to 2009. According to the weather station data, high temperatures in the City exceed 90°F 87.7 days per year. Record

temperatures in the City have exceeded 90°F in the months of March through November. Record highs by month (in degrees Farenheit) in Vacaville are:

- **January**- 81 (January 8, 1962)
- **February**- 82 (February 18, 1899)
- **March**- 90(March 26, 1998)
- **April**- 99(April 21, 1949)
- **May**- 109(May 30, 1910)
- **June**- 115(June 15, 1961)
- **July**- 116 (July 23, 2006)
- **August**-114 (August 20, 1950)
- **September**- 112(September 9, 1944)
- **October**- 107(October 2, 1933)
- **November**- 94(November 4, 1910)
- **December**- 80(December 8, 1893)

5.8.5 Frequency/Probability of Future Occurrences

Extreme heat will continue to occur annually in the City. The frequency and probability of future occurrences is highly likely. Due to past existing weather patterns and climate change (discussed in Section 5.10), increases in the probability of future occurrences of severe weather events the City are anticipated.

5.9 Landslides (LS)

Landslides occur when the force pulling the material on the slope in a downward direction under gravitational influence exceeds the strength of the earth materials that compose the slope (USGS 2004). These materials may move by falling, toppling, sliding, spreading, and/or flowing. Strength of rock and soil, steepness of slope, and weight of the hillside material all play an important role in the stability of hillside areas. Weathering and absorption of water can weaken slopes, while the added weight of saturated materials or overlying construction can increase the chances of slope failure. Sudden failure can be triggered by earthquake shaking, excavation of weak slopes, and heavy rainfall.

Landslides are primarily associated with mountainous regions. Additionally, landslides can occur in areas of low relief. Landslides can occur due to geological, morphological, or human causes. These include weak and sheared materials, thawing, shrink swell, and deforestation. Because portions of western Vacaville include the foothills of the Vaca Mountains, there is a potential for landslides throughout this area. Landslides often accompany other natural hazard events, such as earthquakes, flooding, and wildfire.

5.9.1 Regulatory Environment

Vacaville has adopted the 2013 CBSC for development in hillside areas in the County. In addition, in order for the City to approve a new development, it is a prerequisite (from Section 14.09.116.130 of the municipal code) that the proposed development not be located in hillside areas with slopes of 10 percent or greater.

The Land Use and Development Code Section 14.19.244.010.G, establishes Grading Standards as follows:

"Developments in Hillside Areas. Grading related to hillside development shall be subject to the following standards:

1. The grading design shall use rounded or contoured graded slopes to provide a more naturalized appearance to graded areas;
2. Grading on slopes of 25 percent or greater shall be prohibited unless specifically approved by the Director of Community Development and the City Engineer.
3. Cut and fill slopes may be required to be landscaped and irrigated. The plans for the landscaping and irrigation of all required landscaped areas shall be subject to the approval of the Director of Community Development;
4. Drainage ditches shall be made of concrete, unless specifically authorized by the Building Official, City Engineer or the Director of Public Works, and shall conform to the standards established by the appropriate official;
5. Retaining walls shall be used to minimize the height of cut and fill slopes. The design, height and appearance of the retaining walls shall conform to the standards established by the Building Official or City Engineer, as appropriate;
6. Fire access roads and firebreaks shall conform to the standards approved by the Fire Chief;
7. Compliance with the provisions of the Hillside Development Guidelines as adopted by resolution of the City Council.

5.9.2 Past Occurrences

As shown in Figure 5-26: Landslide Hazard, the vast majority of Vacaville's area is described as flatland by the USGS with some sloped areas having had small scattered landslides. Very small areas on the northern and western edges of the city

limit have had mapped landslides; however, these areas are sparsely developed. The landslide categories on this map, sourced from the 2015 Draft City of Vacaville General Plan Safety Element, are broken down into two categories:

- Few Landslides consists of few, if any, large mapped landslides, but locally contains scattered small landslides in questionably identified larger landslides.
- Mostly Landslides consists of mapped landslides with intervening areas typically narrower than 1,500 feet and narrow borders around landslides.

No officially federally declared landslide event has occurred in the City of Vacaville or the County as a whole.

As a result of the 2005/2006 winter storm, there was a significant slide above Terrace Court, which received HMGP disaster recovery funding under FEMA Disaster 1628 (approximately $82,000 repair cost). In 2005 the City had 33 acres of land affected by existing landslides. Since then 4 acres have been repaired by developers leaving 29 acres currently considered to have some hazard potential. MHMP PLANNING TEAM – THIS INFO IS FROM 2010 ABAG PLAN. CAN IT BE CONFIRMED/UPDATED/CHANGED?

5.9.3 Location/Geographic Extent

Areas with steeper slopes, in combination with other factors described above, are more susceptible to landslides than areas on shallow slopes. This is shown on Figure 5-25 City of Vacaville – Slope Areas at Risk to Landslide, which is sourced from the 2008 Lidar[6] data.

5.9.4 Magnitude/Severity

As shown in Figure 5-26, the City have been designated as mostly and few. The magnitude and severity demonstrated in Figure 5-26 is classified in the following manor:

Mostly Landslides: Consists of mapped landslides, intervening areas typically narrower than 1500 feet, and narrow borders around landslides; defined by drawing envelopes around groups of mapped landslides.

Many Landslides: Consists of mapped landslides and more extensive intervening areas that in 'Mostly Landslides'; defined by excluding areas free of mapped landslides; outer boundaries are quadrangle and county limits to the areas in which this unit was defined.

Few Landslides: Contains few, if any, large mapped landslides, but locally contains scattered small landslides and questionably identified larger landslides; defined in most of the region by excluding groups of mapped landslides but defined directly in areas containing the 'Many Landslides' unit by drawing envelopes around areas free of mapped landslides.

Very Few Landslides: (no additional information provided)

[6] LIDAR, which stands for Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth.

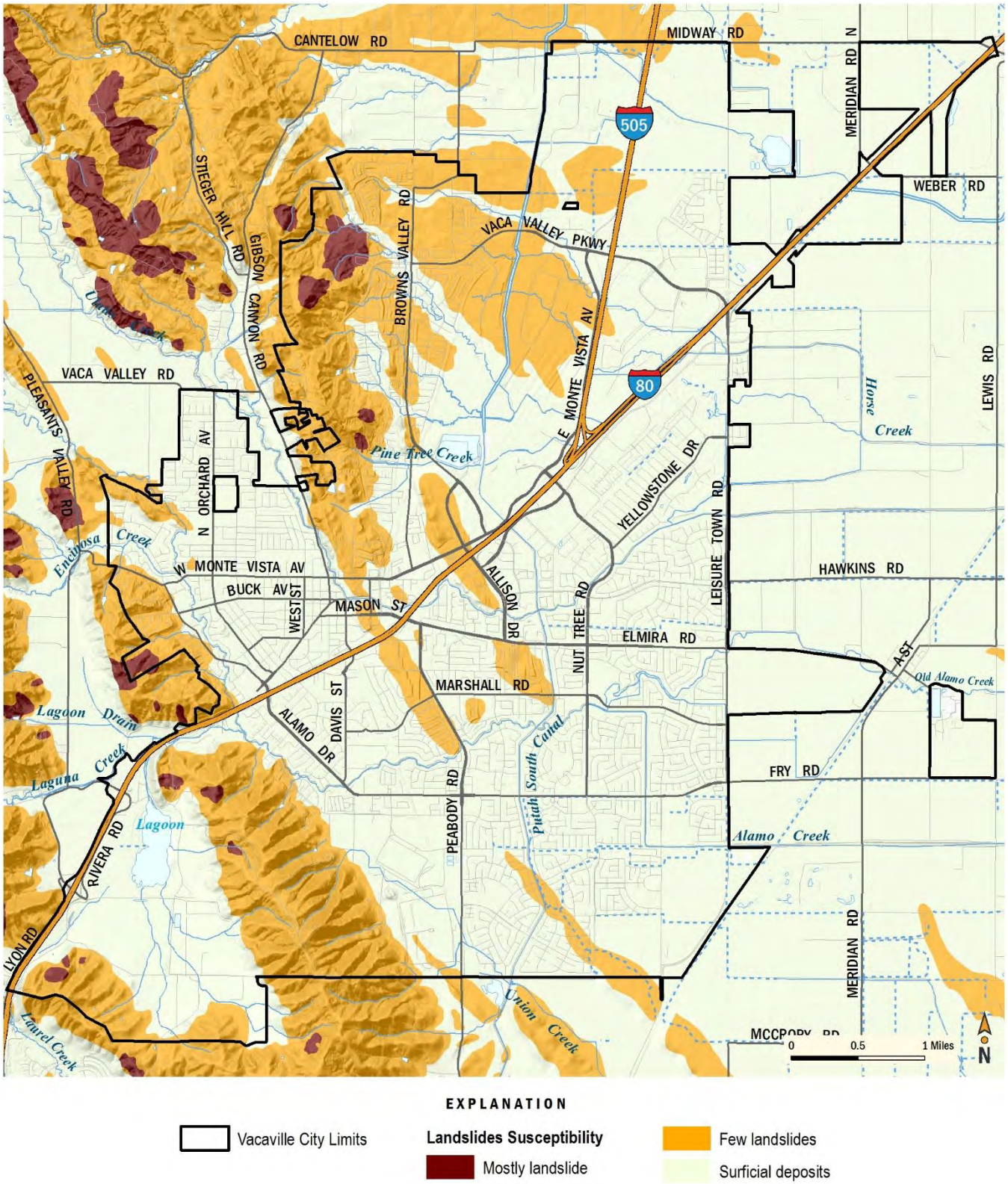
Surficial Deposits: Areas of gentile slope at low elevation that have little or no potential for the formation of slumps, translational slides, or earth flow except along stream banks and terrace margins; defined by the distribution of surficial deposits.

5.9.5 Frequency/Probability of Future Occurrences

The probability of futures landslide events occurring in the City is likely. Mismanaged intense residential and recreational development in sloped areas could increase the frequency of damaging landslides occurring in the City.

Figure 5-25 City of Vacaville – Slope Areas at Risk to Landslide

Figure 5-26: Landslide Hazard



5.10 Climate Change

Climate change refers to any distinct change in measures of climate lasting for a long period of time, more specifically major changes in temperature, rainfall, snow, or wind patterns. Climate change may be limited to a specific region, or may occur across the whole Earth. Climate change may result from:

- Natural factors (e.g., changes in the Sun's energy or slow changes in the Earth's orbit around the Sun);
- Natural processes within the climate system (e.g., changes in ocean circulation); and
- Human activities that change the atmosphere's make-up (e.g., burning fossil fuels) and the land surface (e.g., cutting down forests, planting trees, building developments in cities and suburbs, etc.).

The effects of climate change are varied: warmer and more varied weather patterns, melting ice caps, and poor air quality, for example. As a result, climate change impacts a number of natural hazards.

The 2013 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

5.10.1 Past Occurrences

Climate change has never been directly responsible for any declared disasters. Past flooding, wildfire, levee failure, and drought disasters may have been exacerbated by climate change, but it is impossible to make direct connections to individual disasters. In addition, unlike earthquake and floods that occur over a finite time period, climate change is an on-going hazard the effects of which some are already experiencing. Other effects may not be seriously experienced for decades, or may be avoided altogether by mitigation actions taken today.

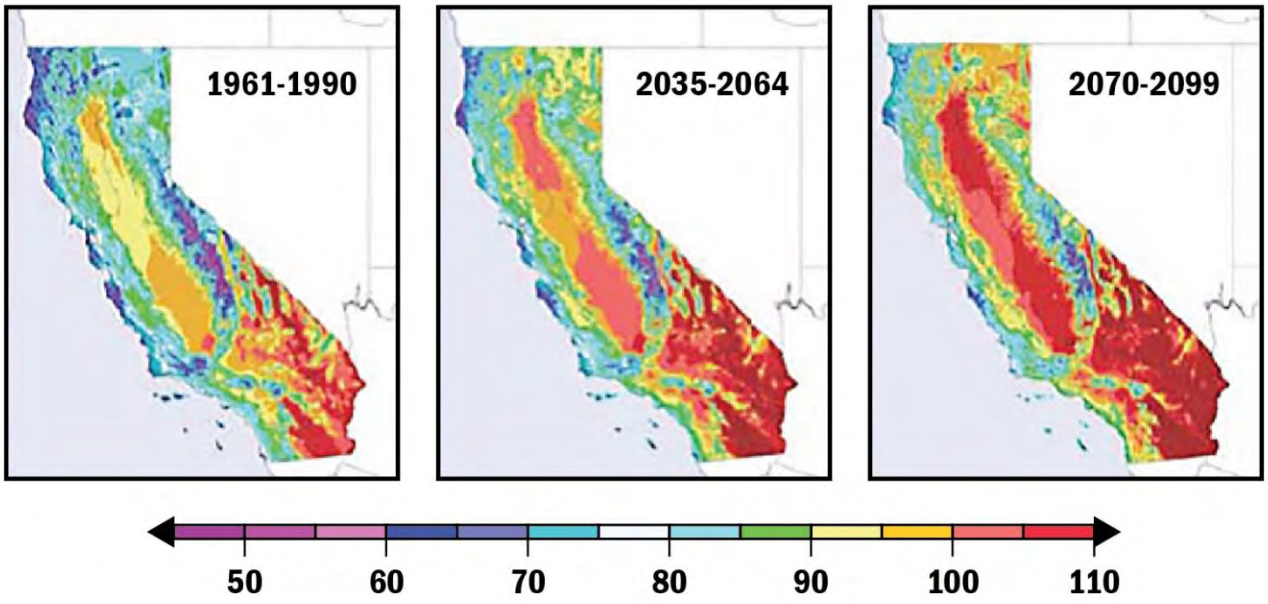
5.10.2 Location/Geographic Extent

The effects of climate change are not limited by geographical borders. The City, Solano County, the State of California, the United States, and the rest of the world are all at risk to climate change. As such, the entire City is at risk to the effects of climate change.

5.10.3 Magnitude/Severity

The California Climate Adaptation Strategy (CAS), citing a California Energy Commission study, states that "over the past 15 years, heat waves have claimed more lives in California than all other declared disaster events combined." This study shows that California is getting warmer, leading to an increased frequency, magnitude, and duration of heat waves. These factors may lead to increased mortality from excessive heat, as shown in Figure 5-27: California Historical and Projected Temperature Increases - 1961 to 2099.

Figure 5-27: California Historical and Projected Temperature Increases - 1961 to 2099



Source: Dan Cayan; California Climate Adaptation Strategy

5.10.4 Frequency/Probability of Future Occurrences

According to the ABAG 2010 Local Hazard Mitigation Plan (LHMP), climate change is one of the few natural hazards where the probability of occurrence is influenced by human action. In addition, unlike earthquake and floods that occur over a finite time period, climate change is an on-going hazard.

The 2009 Climate Adaptation Strategy (CAS) delineated how climate change may impact and exacerbate natural hazards in the future, including wildfires, extreme heat, floods, drought, and levee failure:

- Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Vacaville and the rest of California, which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions. Those most at risk and vulnerable to climate-related illness are the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors.
- Higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher, resulting in less snowpack to supply water to California users.
- Droughts are likely to become more frequent and persistent in the 21st century.
- Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect California with more frequent and/or more extensive flooding.
- Storms and snowmelt may coincide and produce higher winter runoff from the landward side, while accelerating sea-level rise will produce higher storm surges during coastal storms. Together, these changes will increase the probability of levee and dam failures in the Sacramento-San Joaquin Delta.

- Warmer weather, reduced snowpack, and earlier snowmelt can be expected to increase wildfire through fuel hazards and ignition risks. These changes can also increase plant moisture stress and insect populations, both of which affect forest health and reduce forest resilience to wildfires. An increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, vegetation conversions and habitat fragmentation.

5.11 Vulnerability Assessment

The information in this section provides an explicit representation of what a community stands to lose in a disaster. This is useful for City Staff and other decision makers who will need to balance the costs of mitigation against the potential harm to residents and damage to property. It provides comparable measurements of community natural hazard exposure [7] and assists in determining which hazards and/or what parts of the City to focus on making resilient to disaster first. Based upon possible assets at risk, hazard mitigation resources can be directed where need be, in-part, by a vulnerability assessment and information presented in this section.

The vulnerability assessment is developed by developing quantitative and qualitative information for each hazard. Through an exposure analysis, quantitative data is developed for each hazard. An exposure analysis provides quantities of people and assets at risk to particular hazards. Qualitative data has been developed and presented in this section for hazards without measurable data. Qualitative data provides information beyond quantities of people and assets at risk, but rather a description of how the hazard could affect the region around the City of Vacaville.

Note: The hazard exposure analysis has been developed with best available data and follows methodology described in the FEMA How to Guide #2 (Publication No. 386-2) "Understanding Your Risks—Identifying Hazards and Estimating Losses".

5.11.1 Methodology

A vulnerability assessment was conducted for each of the identified priority hazards. Geospatial data is essential in determining population and assets exposed to particular hazards. Geospatial analysis can be conducted if a natural hazard has a particular spatial footprint that can be overlaid against the locations of people and assets. In Vacaville, wildfire, flood, dam failure, earthquake, and landslides have known geographic extents and corresponding spatial information about each hazard.

Several sources of data are necessary to conduct a vulnerability analysis. Figure 5-28 provides an exhibit of the data inputs and outputs used to create the vulnerability analysis results presented in this section. U.S. Census data is the primary source in determining natural hazard exposure to city residents. Census data has been used to determine the population at risk, which is generally referred to as population exposure. Population exposure is provided for wildfire, flooding, dam failure, severe weather, earthquakes and landslides as potential hazards later in this section.

Together with the U.S. Census data, City asset data was used to provide a snapshot of how City assets are affected by natural hazards. For purposes of this vulnerability analysis, asset data includes parcels and critical infrastructure within the City boundaries. Critical infrastructure is described as assets that are essential for people and a community to function. critical infrastructure includes such as utilities, city-owned facilities, bridges, schools, and other community facilities that provide essential services to residents.

Critical facilities data was developed from a variety of sources including city owned and maintained data, state and federal government datasets, and private industry datasets. A critical infrastructure spatial database was developed to translate

[7] Elements at risk; Risk inventory; Exposure encompasses all elements, processes, and subjects that might be affected by a hazardous event. Consequently, exposure is the presence of social, economic, environmental or cultural assets in areas that may be impacted by a hazard.

critical facilities information into georeferenced [8] points. Critical facility points are intersected with the spatial hazard layers to develop a list of "at risk" critical facilities. The City critical facilities that intersect with natural hazards are referred to as facilities with hazard "exposure". Exposure results are presented later in this section.

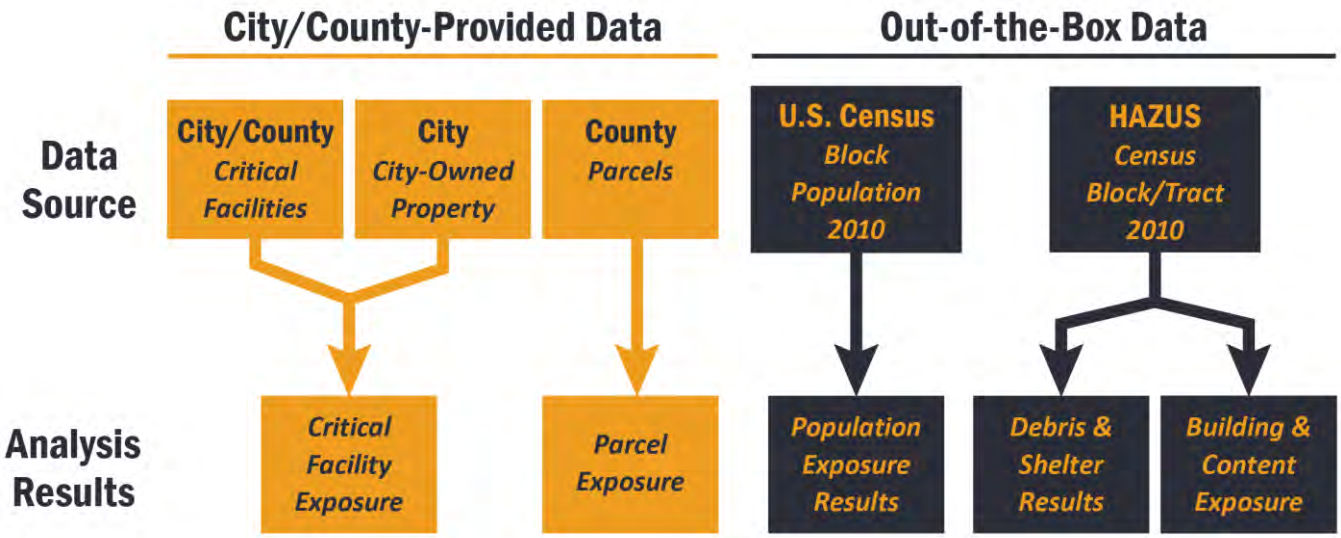


Figure 5-28: Data Source and Methodology

Lastly, FEMA's Hazus-MH MR5 (Hazus) software was implemented to conduct detailed loss estimation for flood and earthquake. Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. HAZUS uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. For purposes of this planning effort, Hazus was used to graphically illustrate the limits of identified high-risk locations due to possible earthquakes and floods.

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analyses are discussed in more general terms in alphabetical order following the discussion on wildfire, flooding, dam failure and earthquake hazards.

5.11.2 Population and Asset Exposure

In order to describe vulnerability for each hazard, it is important to understand the "total" population and "total" assets at risk. The exposure for each hazard described in this section will refer to the percent of total population or percent of total assets z. This provides the possible significance or vulnerability to people and assets for the natural hazard event and the estimated damage and losses expected during a "worst case scenario" event for each hazard. Sections below provide a description of the total population, critical facilities, and parcel exposure inputs.

[8] To georeference something means to define its existence in physical space. That is, establishing its location in terms of map projections or coordinate systems. The term is used both when establishing the relation between raster or vector images and coordinates, and when determining the spatial location of other geographical features.

5.11.2.1 Population Exposure

In order to develop hazard-specific vulnerability assessments, population near natural hazard risks should be determined to understand the total "at risk" population. We can understand how geographically defined hazards may affect the City by analyzing the extent of the hazard in relation to the location of population. For purposes of the vulnerability assessment approximately 94,821[9] (100%) of the City's population is exposed to one or more hazards within or near the City boundaries. Each natural hazard scenario affects the City residents differently depending on the location of the hazard and the population density of where the hazard could occur. Vulnerability assessment sections presented later in this section summarize the population exposure for each natural hazard.

5.11.2.2 Vulnerable Populations

The severity of a disaster depends on both the physical nature of the extreme event and the socioeconomic nature of the populations affected by the event. Important socioeconomic factors tend to influence disaster severity. A core concept in a vulnerability analysis is that different people, even within the same region, have a different vulnerability to natural hazards.

5.11.2.2.1 Income and Housing Condition

Income or wealth is one of the most important factors in natural hazard vulnerability. This economic factor affects vulnerability of low income populations in several ways. Lower income populations are less able to afford housing and other infrastructure that can withstand extreme events. Low income populations are less able to purchase resources needed for disaster response and are less likely to have insurance policies that can contribute to recovery efforts. Lower income elderly populations are less likely to have access to medical care due to financial hardship. Because of these and other factors, when disaster strikes, low income residences are far more likely to be injured or left without food and shelter during and after natural disasters.

Figure 5-29 shows the median household income distribution for the City of Vacaville in 2012. The "median" is the value that divides the distribution of household income into two equal parts (e.g., the middle). The average median household income in the City of Vacaville between 2010 and 2014 was $74,207, in the United States during the same period the median house household income was $3,482. The map in Figure 5-29 shows 2012 household income estimates using Census 2010 geographies.

5.11.2.2.2 Age

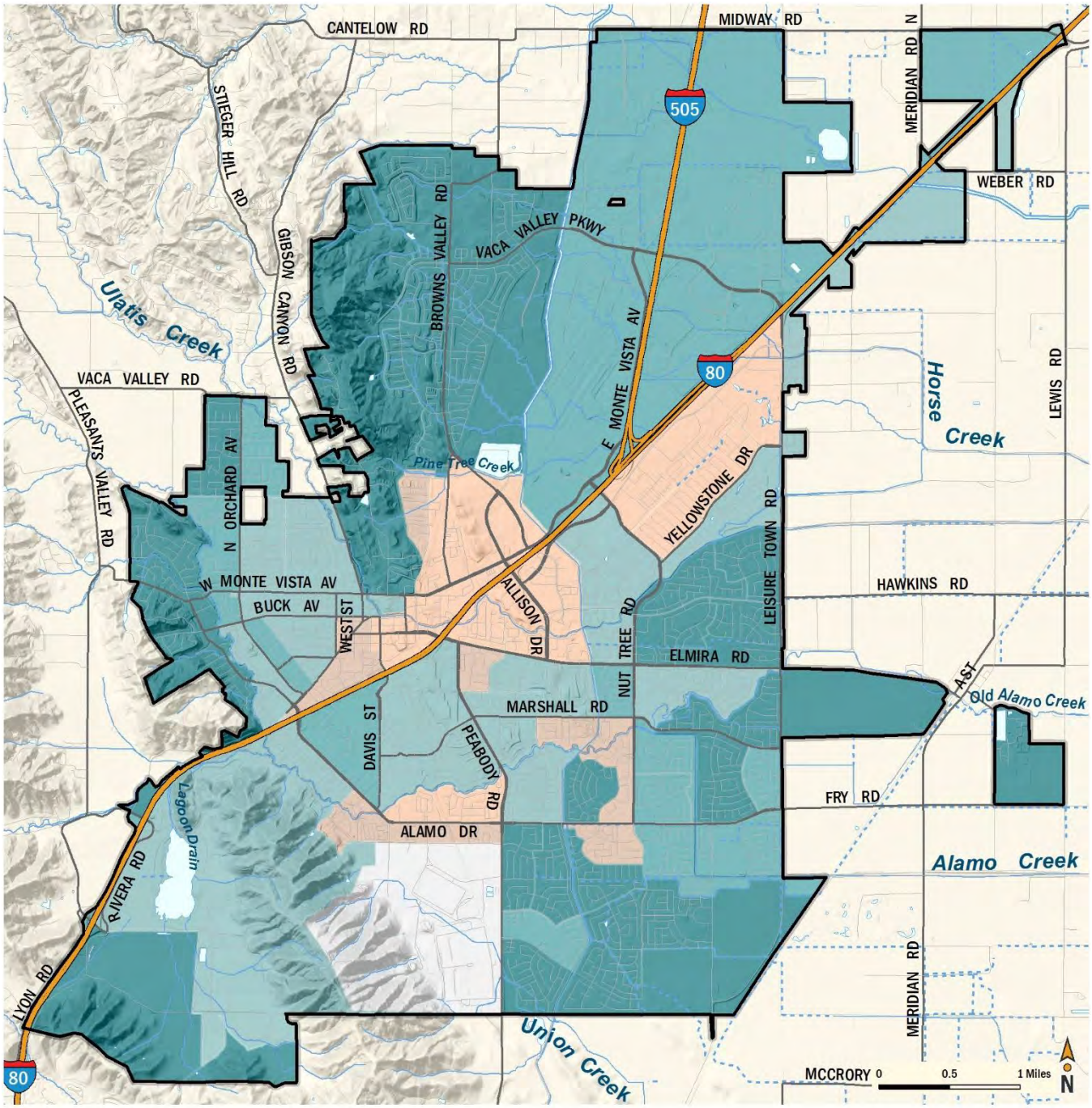
Children and the elderly tend to be more vulnerable during an extreme natural disaster. They have less physical strength to survive disasters and are often more susceptible to certain diseases. The elderly often also have declining vision and hearing and often miss reports of upcoming natural hazard events. Children, especially young children, have the inability to provide for themselves. In many cases, both children and the elderly depend on others to care for them during day to day life.

Finally, both children and the elderly have fewer financial resources and are frequently dependent on others for survival. In order for these populations to remain resilient before and after a natural hazard event, it may be necessary to augment

[9] According to the 2010 U.S. Census, the total population for the City in 2010 was 92,422. This analysis includes additional census blocks that are contained within or adjacent to city boundaries.

city residents with resources provided by the City, state and federal emergency management agencies and organizations. See Figure 5-30 and Figure 5-31 for location of vulnerable population by age within the City of Vacaville.

Figure 5-29: Median Income

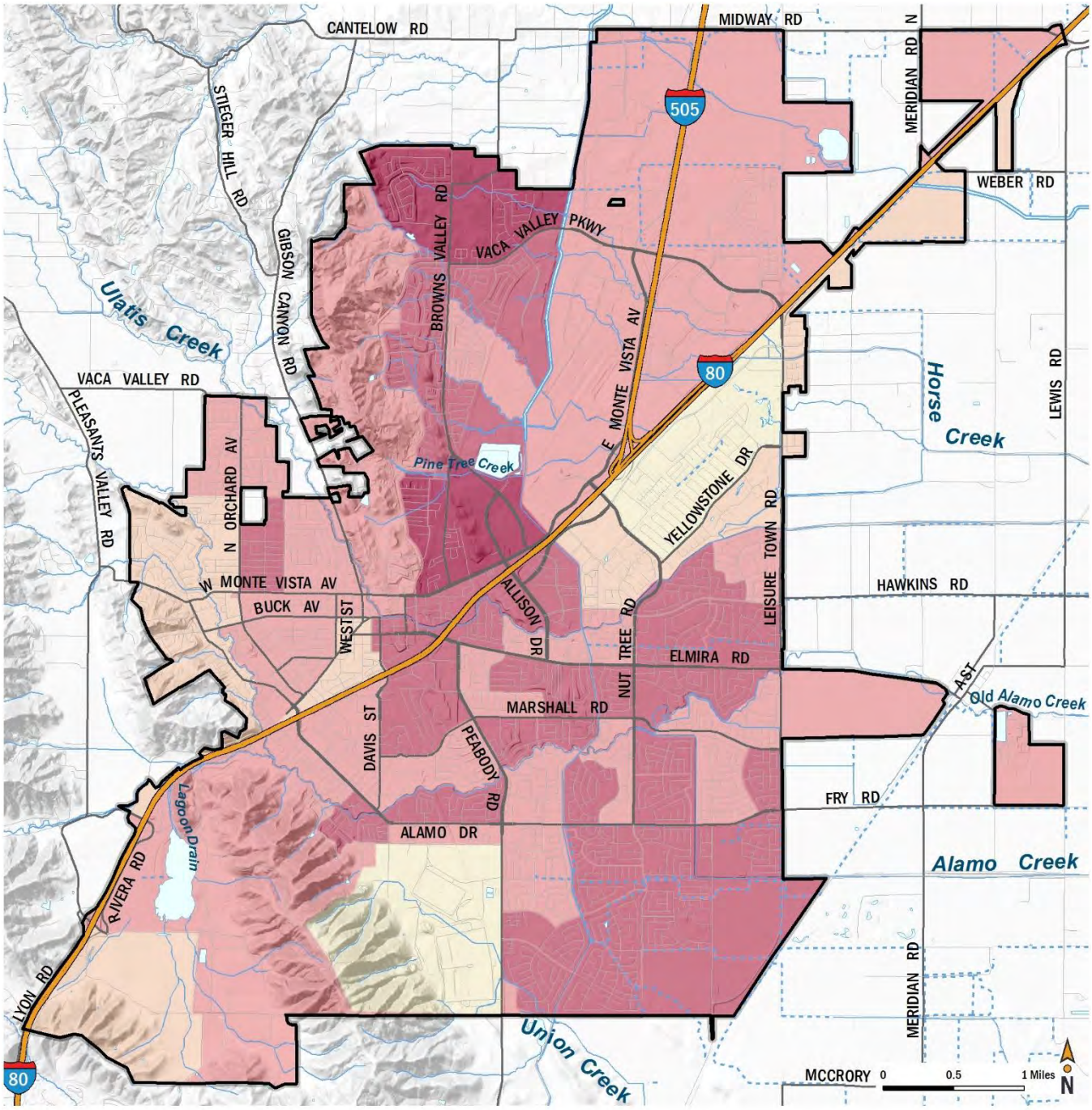


EXPLANATION

Block Groups *2012 Median Household Income (Esri/CENSUS)*

- Vacaville City Limits
- More than $82,000
- $68,001 to $82,000
- $53,001 to $68,000
- $39,001 to $53,000 (US median: $50,157)
- $24,001 to $39,000
- $24,000 or less
- No households

Figure 5-30 Population under 18

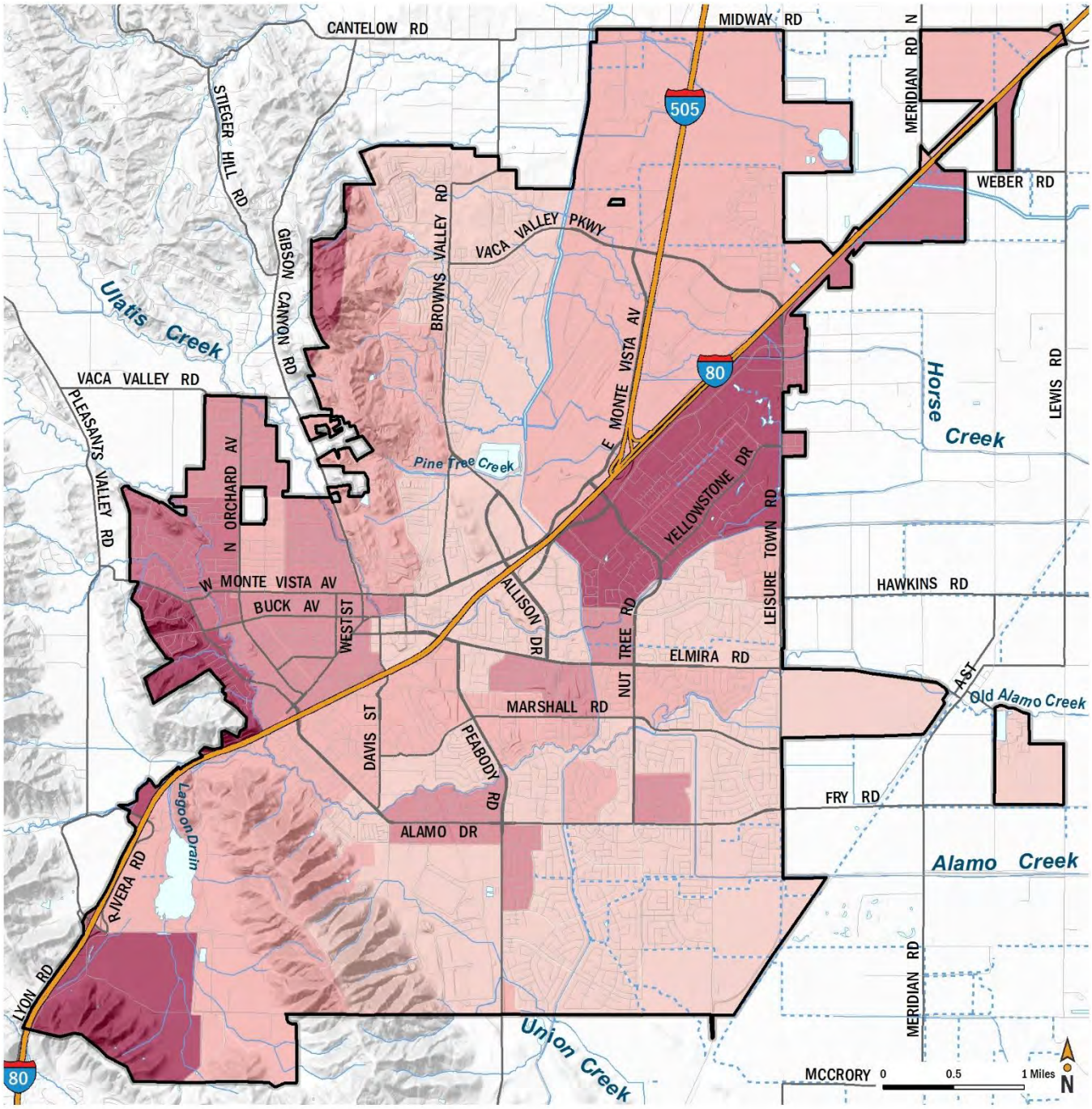


EXPLANATION

Block Groups *2012 % Population < 18 Years Old (Esri/CENSUS)*

- Vacaville City Limits
- 33.1% or more
- 26.1% to 33%
- 20.1% to 26% (US Avg: 23.6%)
- 13.1% to 20%
- 13% or less
- No population

Figure 5-31 Population Over 65



EXPLANATION

Block Groups *Percent of Population Age 65 or more (Esri/CENSUS)*

- Vacaville City Limits
- Very High (More than 20.2%)
- High (16.1% - 20.2%)
- Average (11.9% - 16%)
- Low (7.6% - 11.8%)
- Very Low (Less than 7.6%)

5.11.2.3 Parcel Exposure

The total count and value of parcels within the City of Vacaville which could be exposed to a hazard event is referred to as parcel exposure in this plan. A standardized hazard overlay was conducted to develop hazard exposure results for improved city parcels presented later in this section. The spatial overlay method identifies improvement value[10], land value, total assessed value, building replacement costs and content replacement costs for a hazard's geographic extents. 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 total loss and structures can be rebuilt. The Solano County Assessor's data is pivotal to developing parcel values exposed to each hazard. While the assessor's estimated values are a good indicator of value at risk, replacement costs for buildings gives City officials current market value of assets at risk. The replacement cost was calculated at $184/square foot and applied across all parcels with structures in the City. Replacement cost is the value of both material, labor, and design time to reconstruct a residential building. It is important to note that replacement cost is different than assessed market value for taxation purposes and is not related to housing market conditions. The City parcel information is summed and provided in Table 5-10. Structure content replacement costs were determined by assuming the contents are valued at 30% of the residential building replacement cost and 100% of commercial building replacement cost. Both the Structure Replacement Cost and Content Replacement Cost are the total value in the community at risk to a particular hazard. Table 5-10 represents the total parcel count and total possible exposure to natural hazards in the City of Vacaville.

Table 5-10: Parcel Counts and Value (IN THOUSANDS)

arcel ount	mprovement alue ($)	and alue ($)	otal ssessed alue ($)	uilding eplacement ost ($)	ontents eplacement ost ($)	otal eplacement ost ($)
29,000	$7,821,451	$2,590,332	$10,411,783	$8,279,987	$2,484,365	$10,764,352

5.11.2.4 Hazus Structure and Content Values

FEMA's loss estimation software, Hazus MH, was used to analyze the City's building risk to flood and earthquake hazards. Hazus contains a database of economic, demographic, building stock, transportation facilities, local geology, and other information that can be used for a number of steps in the risk assessment process. Hazus software operates on structure square footage, structure replacement, and content replacement costs aggregated to the census block and tract levels depending on type of hazard analysis. Table 5-11 and Figure 5-32 provides value data for building categories at the census block and census tract levels. Census block and census tracts are used to provide input information for the Hazus analysis presented in this report.

Note: The Hazus software utilizes different census level information inputs to develop loss estimates depending on the hazard module. The flood module uses census block information while the earthquake module uses census track information. It is important to understand the total values of each as estimated damage to the community is presented on a percent of total value basis.

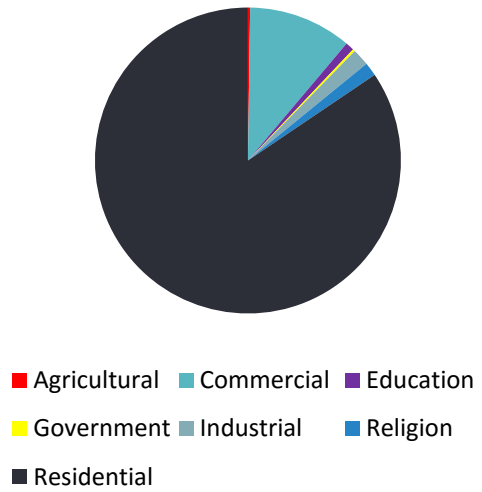
[10] A long-term asset which indicates the cost of the constructed improvements to land, such as buildings, driveways, walkways, lighting, and parking lots.

Table 5-11: Hazus Census Block Input Values (Total Community)

uilding ype	uilding \eplacement osts ($)	uilding \eplacement ost (%)	ontent \eplacement ost ($)	ontent \eplacement ost (%)	otal alue ($)	otal alue (%)
Agricultural	$22,386	0.14%	$22,386	0.14%	$44,772	0.29%
Commercial	$1,066,494	6.87%	$1,121,047	7.23%	$2,187,541	14.10%
Education	$88,333	0.57%	$88,333	0.57%	$176,666	1.14%
Governmental	$24,604	0.16%	$25,305	0.16%	$49,909	0.32%
Industrial	$175,288	1.13%	$229,134	1.48%	$404,422	2.61%
Religion	$140,641	0.91%	$140,641	0.91%	$281,282	1.81%
Residential	$8,245,561	53.15%	$4,123,256	26.58%	$12,368,817	79.73%
Total	$9,763,307		$5,750,102		$15,513,409	

Total **Building** Input Values by Occupancy

Census Block Level



Total **Content** Input Values by Occupancy

Census Block Level

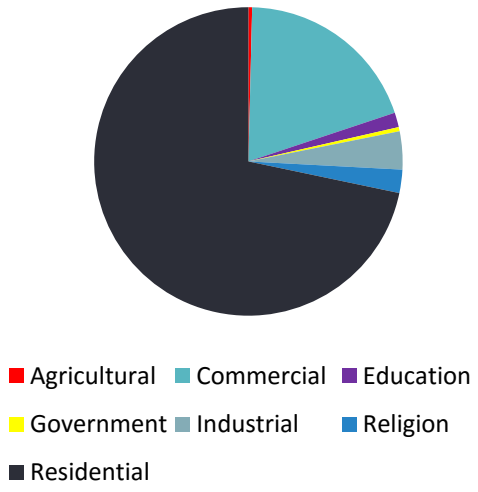


Figure 5-32: Census Block Building and Content Exposure Values

5.11.2.5 Critical Facilities Exposure

Critical facilities are of particular concern when conducting hazard mitigation planning. Critical facilities are defined as essential services, and if damaged, would result in severe consequences to the health, safety, and welfare of the public.

An inventory of critical facilities based on data from the City of Vacaville and other publicly sourced information were used to develop a comprehensive inventory of facility points and lifelines. Critical facility points include fire stations, buildings containing hazardous materials (HAZMAT), schools, transportation, utilities, and government buildings. Lifelines include communication, electric power, liquid fuel, natural gas, and transportation routes. A current representation of the critical facilities and lifelines are provided in Table 5-12 and Table 5-13. Some critical facility information has been omitted from documentation due to national security purposes. The City of Vacaville Public Works Department manages and maintains a complete list of critical facilities.

Vacaville Critical Facilities

Facility Count by Category

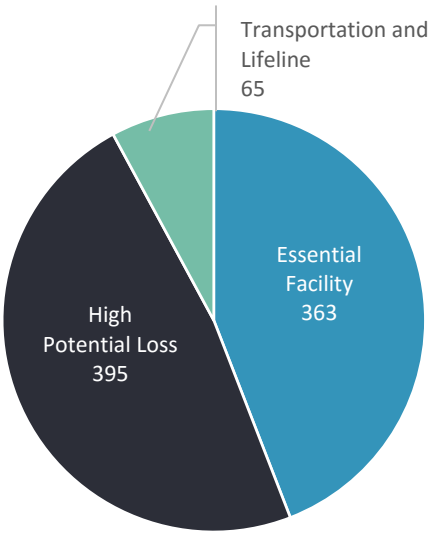


Table 5-12: Critical Facility Points

Infrastructure Type	Feature Count
Essential Facility	363
Vacaville Drainage Projects	21
COV Properties	275
Fire Station	7[11]
Gathering Facilities	48
Health Care	8
Police Station	4
High Potential Loss	395
CDSS Adult Care	15
CDSS Child Care	15
CDSS Elderly Care	23
CEC Power Plants	6
CEC Substations	2
Dam DWR	2
Electric Power Facility	2
FCC asr	168
FCC cellular	2
Hazmat SolCo	134
School	26
Transportation and Lifeline	65
Airport Facility	1
Bus Facility	1
Highway Bridge	61
Waste Water Facility	1
Grand Total	**823**

[11] Does not include Station 75.

Table 5-13: Linear Utilities

Infrastructure Type	Linear Mileage Summary
CEC Natural Gas Lines	**19.8**
2” Diameter	0.3
3” Diameter	1.5
4” Diameter	1.2
5” Diameter	0.1
6” Diameter	1.8
8” Diameter	12.5
36” Diameter	0.6
42” Diameter	0.6
N/A (Undisclosed)	1.2
CEC Transmission Lines	**29.5**
115KV	21.0
60KV	3.0
230KV	4.6
500KV	0.9
Transportation	**514.0**
Interstate	26.5
State/county highway	70.6
Access Ramp	17.0
Local road, major	146.8
Local road	224.1
Cul-de-sac	0.6
Driveway	23.3
Alley	2.2
Service road	0.1
Traffic circle	0.4
Other Road	2.5
Total Linear Mileage	563.3

5.12 Hazard Specific Vulnerability

The Disaster Mitigation Act regulations require that the City of Vacaville 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 City's vulnerability to each of the priority hazards identified in the hazard profiles. The hazards evaluated as part of this vulnerability assessment include:

-Wildfire

-Landslides

-Flooding

-Drought

-Dam Failure

-Earthquake

-Severe Weather

-Climate Change

An estimate of the vulnerability of the City to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, geographic extent, and 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. Here 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.

Extremely High—Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be inventoried and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities, historic structures, and valued natural resources. Together, this information conveys the vulnerability of that area to a hazard.

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5.12.1 Wildfire

Risk to the City of Vacaville from wildfire is of significant concern. High fuel loads in the hills, 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, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. During the May to October fire season the dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become large and out-of-control.

Community Vulnerability Rating: High, Widespread potential impact

Table 5-14: Summary of Population, Parcel Value, and Critical Infrastructure at High & Moderate Wildfire Risk

xposed opul ati on	xposed arcel al ue ($)	xposed \epl acene nt ost ($) †	xposed ritical acilities	xposed iles of ifeline	azus oss stimation
8,293	$1,121,387	$1,123,875	113	102.3	N/A
8.75% total pop.	*11% total value*	*10% total cost*	*14% of total facilities*	*18% of total mileage*	*N/A*

†-Includes building and contents replacement costs.

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Short and long-term economic losses could also result due to loss of business and other economic drivers associated with Vacaville's summer season activities. Smoke and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Generally, there are three major factors that sustain wildfires and predict a given area's potential vulnerability 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 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. Manmade structures are also considered a fuel source, 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. Residential developments in the Southwestern Region of the City (along the foothills) currently possess the highest vulnerability to wildfire. The residents of this region are also considered to be the most vulnerable due to their age and income levels. This area is comprised of lower income (that is, lower than the US median income) homes as well as a higher than average amount of residents under age 18 and an average amount of residents 65 or older. Great measures have been taken to mitigate wildfire when new development has been constructed. Los Robels Ct, for example, not only allows emergency access and serves as an evacuation route for residents but it also acts as a buffer between the foothills and buildings, reducing the amount of fuel available to spread the fire into the urban area. Nevertheless, these high fuel hazards, coupled with a greater potential for ignitions, increase the susceptibility of the City to a catastrophic wildfire.

- Topography – An area's terrain and slope 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 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 ignite more readily and burn more intensely. Thus, during periods of drought the threat of wildfire increases. Wind is the most treacherous weather factor. The greater the wind, the faster a fire can spread and the more intense it can be. Wind shifts, in addition to wind speed, can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. As part of a weather system, lightning also ignites wildfires, often in difficult to reach terrain for firefighters.

Factors contributing to the high, widespread wildfire risk in Vacaville include:

- Narrow and often one-lane and/or dead-end roads complicating evacuation and emergency response.
- Nature and frequency of ignitions; and increasing population density leading to more ignitions.
- Slope of the foothills;
- Residential development along the foothills;

5.12.1.1 Population at Risk

Wildfire risk is of greatest concern to populations residing in the moderate, high, and very high wildfire hazard zones. Solano County census block data was used to estimate populations within the hazard zones. There are a significant number of people living within the WUI described in the wildfire profiles. More than 2,200 residents in the unincorporated county live within areas considered high fire hazard and more than 1,400 residents live within a very high hazard area[12].

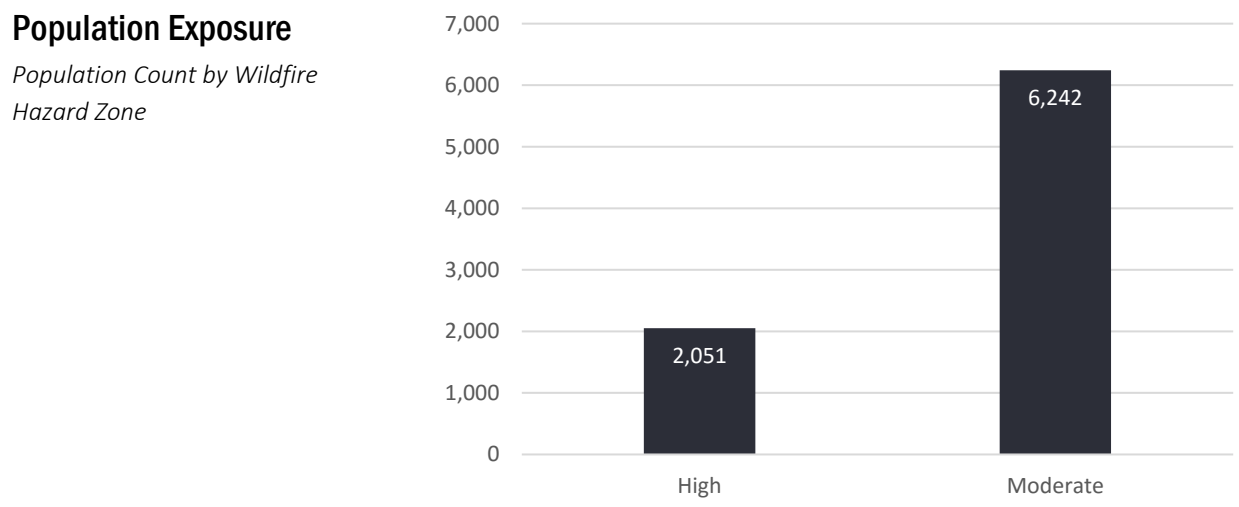

Figure 5-33: Population at risk from Wildfire Hazards

[12] High and very high Fire Hazard Severity Zones as defined by the California Department of Forestry and Fire Protection (CAL FIRE).

5.12.1.2 Residential Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. In some cases, a parcel will be within in multiple fire threat zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the fire threat layer to determine the risk for each structure. The fire threat zone in which the centroid was located was assigned to the entire parcel. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed. Building exposure was estimated by assuming $184/square foot replacement cost. Building contents exposure was estimated at 50% of the building exposure. Table 5-15 exhibits the unincorporated portions of Vacaville that have significant assets at risk to wildfire in the High and Very High fire severity zones.

Table 5-15: Residential Buildings and Content at Risk from Wildfire

Fire Severity Zones	Improved Parcel Count	Estimated Building Exposure ($000)	Estimated Content Exposure ($000)	Total Exposure ($000)	% Total Value
High	702	$229,191	$68,758	$297,949	3%
Moderate	1,976	$634,958	$190,487	$825,445	8%
Grand Total	2,525	$864,149	$259,245	$1,123,394	10%

Note: The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay. Note: Parcel information is for Residential Parcel Improvements only. The Solano County assessor's roles only provide spatial information on residential improvements which include building square footages.

5.12.1.3 Critical Facilities at Risk

Critical facilities data were overlain with fire hazard severity zone data to determine the type and number of facilities within each risk classification. Table 5-16- and Table 5-17 lists the critical facilities in the moderate and high wildfire hazard zones for unincorporated Vacaville.

Critical Infrastructure Exposure

Feature Count by Wildfire Hazard Zone

Table 5-16: Critical Facility Exposure to Wildfire

Facility Type	High	Moderate	Total
Essential Facility	7	59	66
City Drainage Projects	1	8	9
City Properties	5	50	55
Fire Station		1	1
Gathering Facilities	1		1
High Potential Loss	13	22	35
CDSS Adult Care	1	1	2
CDSS Child Care	1	1	2
CDSS Elderly Care	2	1	3
CEC Power Plants		1	1
DWR Dam		1	1
FCC ASR Tower	7	6	13
FCC Cellular Tower	2		2
Hazmat Facility		11	11
Transportation and Lifeline	2	10	12
Highway Bridge	2	10	12
Total	22	91	113

Table 5-17: Lifelines with Wildfire Risk

Critical Infrastructure Exposure

Linear Mileage by Wildfire Hazard Zone

Row Labels	High	Moderate	Total
Transportation and Lifeline	25.47	76.84	102.31
CEC NG Lines	1.36	1.95	3.31
3” Diameter	0.33	0.18	0.51
4” Diameter		0.40	0.40
8” Diameter	1.03	0.67	1.69
36” Diameter		0.06	0.06
42” Diameter		0.06	0.06
N/A (Undisclosed)		0.60	0.60
CEC Transmission Lines	0.23	13.81	14.04
60KV		1.25	1.25
115KV	0.23	11.29	11.52
230KV		1.22	1.22
500KV		0.05	0.05
Roads	23.88	61.08	84.96
Interstate	4.00	6.63	10.63
State/county highway	1.41	8.36	9.77
Local road, major	5.97	17.46	23.43
Local road	10.20	22.17	32.36
Alley		0.01	0.01
Cul-de-sac	0.05		0.05
Driveway	1.06	1.21	2.27
Ramp	1.19	3.94	5.14
Traffic circle		0.06	0.06
Other Road		1.23	1.23
Grand Total	25.47	76.84	102.31

5.12.2 Flooding

Flooding is a significant problem in Vacaville as described in the flood hazard profile. Historically, Vacaville has been subject to flooding during periods of heavy rainfall, falling primarily between the months of October through April, which causes streams and drainage canals to become overwhelmed and overflow their banks and/or inundate storm drainage systems. Occasionally, overbank flows in Vacaville have resulted in flooding of residential properties, road blockages, and traffic disruptions. In urbanizing areas, the increase in paved areas associated with new development decrease the amount of open land available to absorb rainfall and runoff, thus increasing the volume of water that must be carried away from by waterways. Flooding has damaged agricultural lands and crops; damaged or destroyed commercial and residential structures; flooded bridges and streets and caused stream channels and flood control works to erode.

Community Vulnerability Rating: High, Widespread potential impact

Table 5-18: Summary of Population, Parcel Value, and Critical Infrastructure in 100- and 500-year Flood Zones

xposed opul ati on	xposed arcel al ue ($)	xposed \epl acement ost ($) †	xposed ritical acilities	xposed iles of ifeline	azus oss stimation
34,672	$3,171,272	$4,122,957	264	139.2	$147,129
36.6% ***total pop.***	30% *total value*	38% *total cost*	29% of *total facilities*	25% *total mileage*	0.95% of total value

†-Includes building and contents replacement costs

Flooding has occurred both within the 100-year floodplain and in other localized areas. GIS was used to determine the possible impacts of flooding within the City, and where the flood risk varies across the planning area. FEMA regulatory Digital Flood Insurance Rate Map (DIFRM) data were utilized to analyze the flood risk. The effective countywide DFIRM data were augmented with preliminary data for the Sweeny Creek Physical Map Revision to produce the most comprehensive representation of the 100- and 500-year floodplains for Vacaville. Exposures were quantified using GIS analyses and loss estimation was developed using the FEMA Hazus MH software. The information in this section describes flood vulnerability methodologies for determining people and values at risk within the 100- and 500-year NFIP Flood Zones.

With over 11 state/federal flood disaster declarations occurring in Solano County since 1953, the City of Vacaville has significant flood risk which includes:

- Areas subject to the 1% annual chance and 0.2% annual chance floods as detailed in FEMA's Digital Flood Insurance Rate Maps (DFIRMs) dated August 2, 2012. This includes 1.7 square miles (1,085 acres) located within the 1% annual chance floodplain and 5.07 square miles (3,245 acres) located within the 0.2% annual chance floodplain.
- Areas subject to smaller, more frequent or repetitive flooding, stormwater flooding, or drainage problems that do not meet the NFIP mapping criteria
- Areas within other special flood-related hazards including, mudflows, flooding adjacent to closed basin lakes, land subsidence, and uncertain flow path flood hazards.

Vacaville's flood hazard can be summarized as follows:

- A majority of the flood risk within Vacaville is specifically subject to inundation as a result of heavy rainfall and resulting stream and drainage canal overflows.

- The major creeks that flow through Vacaville are largely in their natural state and alignment, except at the eastern edge of the city where flood control channels have been constructed.
- The natural, unaltered portions of the creeks generally do not have adequate flow capacity to convey a 100-year storm event, which is a storm that has a 1 percent chance of occurring in any given year.
- In addition, there is not adequate capacity in some areas to accommodate a 10-year storm event, which is a storm that has a 10 percent chance of occurring in any given year.
- Alamo and Ulatis Creeks are two primary sources of flooding in the City.
- Vacaville is substantially developed in the SFHA. Over $320M in assets or almost 4% of the total assets (1,720 improved parcels) within the City are located within the 1% annual chance floodplain; another $2.8B (9,664 improved parcels) or almost 34% of City assets are located within the 0.2% annual chance floodplain.
- Of the 94,000+ people that live in the City, over 7,200 (7.7%) individuals reside in the 1% annual chance floodplain and another nearly 27,000 (28.88%) within the 0,2% annual chance floodplain.

5.12.2.1 Population at Risk

Of greatest concern in the event of a flood is the potential for loss of life. Using 2012 population data aggregated by census blocks, an estimate was made of the population exposed to the 100- and 500-year floodplain. To account for census blocks that were partially within the floodplain, a weighted average was employed to calculate the proportion of the population within the floodplain. The results of the population overlay are shown in Figure 5-34. More than 2,500 live near or within the 100-year floodplain and approximately 20,000 more people live within the 500-year floodplain.

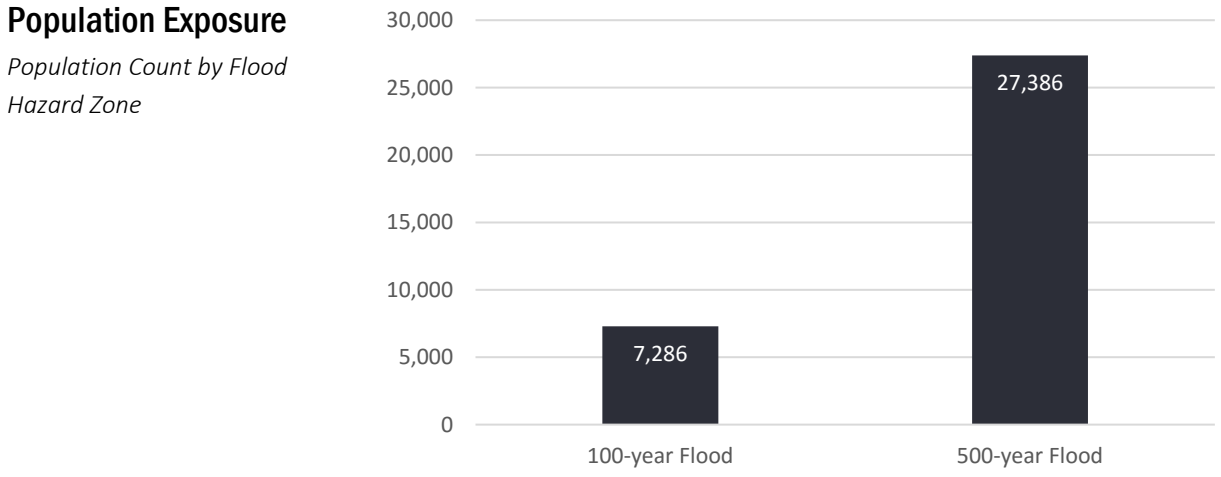

Figure 5-34: Population Exposed to NFIP Flood Zones

5.12.2.2 Residential Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels within the FEMA NFIP flood zones. In some cases, a parcel will be within in multiple flood zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the floodplain layer to determine the flood risk for each structure. The flood zone in which the centroid was located was assigned to the entire parcel. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed. Building exposure was estimated by assuming $184/square foot replacement cost. Building contents exposure was estimated at 50% of the building exposure. Table 5-19 shows the count of at-risk structures and their associated building and content exposure values.

Table 5-19: Residential Building and Content Exposed to NFIP Flood Zones

Flood Hazard Zone	Improved Parcel Count	Estimated Building Exposure ($000)	Estimated Content Exposure ($000)	Total Exposure ($000)	% Total Value
100 Year	1,720	$320,480	$96,143	$416,623	4%
500 Year	9,664	$2,846,967	$854,090	$3,701,058	34%
Grand Total	11,213	$3,167,447	$950,234	$4,117,681	38%

Notes:
1-The table above does not display loss estimation results; the table exhibits total value at risk based upon the hazard overlay.
2- Parcel information is for Residential Parcel Improvements only. The Solano County assessor's roles only provide spatial information on residential improvements which include building square footages. Estimated content exposure is half of building exposure for residential parcels. For commercial and industrial parcels, content exposure would be 100-150% of building value.

While there are several limitations to this methodology, it does allow for potential loss estimation. It should be noted that the analysis may include structures in the floodplain that are elevated at or above the level of the base flood elevation, which will likely decrease potential flood damage to these particular structures. Also, it is important to remember that the replacement costs are well below actual market values; thus, the actual value of assets at risk may be significantly higher than those included herein.

5.12.2.3 Critical Facilities Exposure

Critical facilities data were overlain with flood hazard data to determine the type and number of facilities within the 100- and 500-year floodplain. Flooding poses numerous risks to critical facilities and infrastructure:

- Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.
- Bridges washed out or blocked by floods or debris from floods also can cause isolation.
- Creek or river floodwaters can back up drainage systems causing localized flooding.
- Floodwaters can get into drinking water supplies causing contamination.
- Sewer systems can be backed up causing waste to spill into homes, neighborhoods, rivers, and streams.
- Underground utilities can also be damaged.

Table 5-20 and Table 5-21 provides an inventory of these critical facilities in the floodplain for Vacaville and provides the locations of lifelines relative to the floodplain in the unincorporated areas of the City. With a total of 264 essential facilities, high potential losses, and transportation and lifeline structures located in either the 100- or 500-year flood zone, the impact to the community could be devastating if these critical facilities were damaged or destroyed during a flood event.

Table 5-20: Critical Facility Exposed to NFIP Flood Zones

Critical Infrastructure Exposure

Feature Count by Flood Hazard Zone

Facility Type	100 Year Flood Zone	500 Year Flood Zone	Total
Essential Facility	11	125	136
City Drainage Projects	8	2	10
City Properties	1	99	100
Fire Station		3	3
Gathering Facilities	2	20	22
Health Care		1	1
High Potential Loss	6	107	113
CDSS Adult Care		2	2
CDSS Child Care		2	2

CDSS Elderly Care		10	10
DWR Dam	1		1
Electric Power Facility		2	2
FCC ASR Tower	2	42	44
Hazmat Facility	2	43	45
School	1	6	7
Transportation and Lifeline	7	8	15
Highway Bridge	7	8	15
Total	24	240	264

Table 5-21: Lifelines Exposure to NFIP Flood Zones

Critical Infrastructure Exposure

Linear Mileage by Flood Hazard Zone

Row Labels	High	Moderate	Total
Transportation and Lifeline	24.52	114.68	139.21
CEC Natural Gas Lines	2.07	3.38	5.45
2” Diameter		0.31	0.31
3” Diameter	0.42	0.24	0.66
4” Diameter		0.02	0.02
6” Diameter	0.11	0.47	0.58
8” Diameter	1.29	2.01	3.29
36” Diameter	0.01	0.04	0.05
42” Diameter	0.01	0.04	0.05
N/A (Undisclosed)	0.23	0.25	0.48
CEC Transmission Lines	1.44	3.67	5.11
60KV	0.27	0.25	0.53
115KV	1.04	2.26	3.31
230KV	0.07	1.15	1.22
500KV	0.05		0.05
Roads	21.02	107.63	128.65
Interstate	1.27	0.21	1.48
State/county highway	3.21	14.73	17.94
Local road, major	9.39	49.10	58.49
Local road	6.54	41.59	48.13
Alley		0.59	0.59
Cul-de-sac	0.04	0.10	0.14
Driveway	0.13	0.41	0.54
Ramp	0.38	0.82	1.20
Traffic circle	0.05	0.08	0.14
Grand Total	24.52	114.68	139.21

5.12.2.4 Loss Estimation Results

The Hazus analysis was used to assess the risk from and vulnerability to flooding within Vacaville. Hazus buildings data is aggregated to the census block level, known as the general building stock (GBS), which has a level of accuracy acceptable for hazard mitigation planning purposes. The following sections describe risk to and vulnerability of the GBS within the City’s mapped regulatory floodplain. The total value of exposed buildings and content within the City’s planning area was generated using Hazus and is previously summarized in Table 5-11.

Hazus calculates losses to structures from flooding by considering the depth of flooding and type of structure. Using historical flood insurance claim data, the software estimates the percentage of damage to structures and their contents by applying established depth-damage curves. Damage estimates are then translated to estimated dollar losses. The results

are summarized in Table 5-22 and Table 5-23. An estimated $29,306,000 of damage could occur in the City's regulatory floodplain if all flooding sources experienced a 100-year flood event. An all-encompassing event (all tributaries flooding to the NFIP 100-year floodzone) is estimated to cause losses of .19 percent of the total GBS within the City boundaries. An estimated $117,823,000 of damage could occur if all flooding sources experienced a 500-year flood event, representing .76 percent of the total GBS within the City boundaries.

While there are several limitations to the FEMA Hazus model, it does allow for potential loss estimation. It should be noted that the analysis may include structures in the floodplain 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 replacement costs are well below actual market values, thus, the actual value of assets at risk may be significantly higher than those included herein.

Table 5-22: Flood Loss Estimation (Based on Depth) in NFIP Flood Zones

Flood Hazard Zone	Building Loss ($000)	Content Loss ($000)	Total ($000)	% of Total Hazus Building Stock Input
100 Year	$15,226	$13,995	$29,306	0.19%
500 Year	$59,187	$57,846	$117,823	0.76%

Note:
1- Hazus Census Block Building Stock Value ($000):
2- Building Replacement Costs = $9,763,307
3- Content Replacement Cost = $5,750,102
4- Total Value = $15,513,409

Table 5-23: Flood Loss Estimation (Based on Depth) in NFIP Flood Zones by Occupancy Type

Occupancy Type	Building Loss ($000)	Content Loss ($000)	Total ($000)	% of Total Hazus Building Stock Input
Agricultural	$74	$268	$362	0.002%
Commercial	$6,885	$20,565	$27,885	0.180%
Education	$436	$2,318	$2,788	0.018%
Government	$-	$8	$8	0.000%
Industrial	$1,384	$1,934	$3,497	0.023%
Religion	$778	$4,797	$5,611	0.036%
Residential	$64,856	$41,951	$106,978	0.690%
Grand Total	$74,413	$71,841	$147,129	0.95%

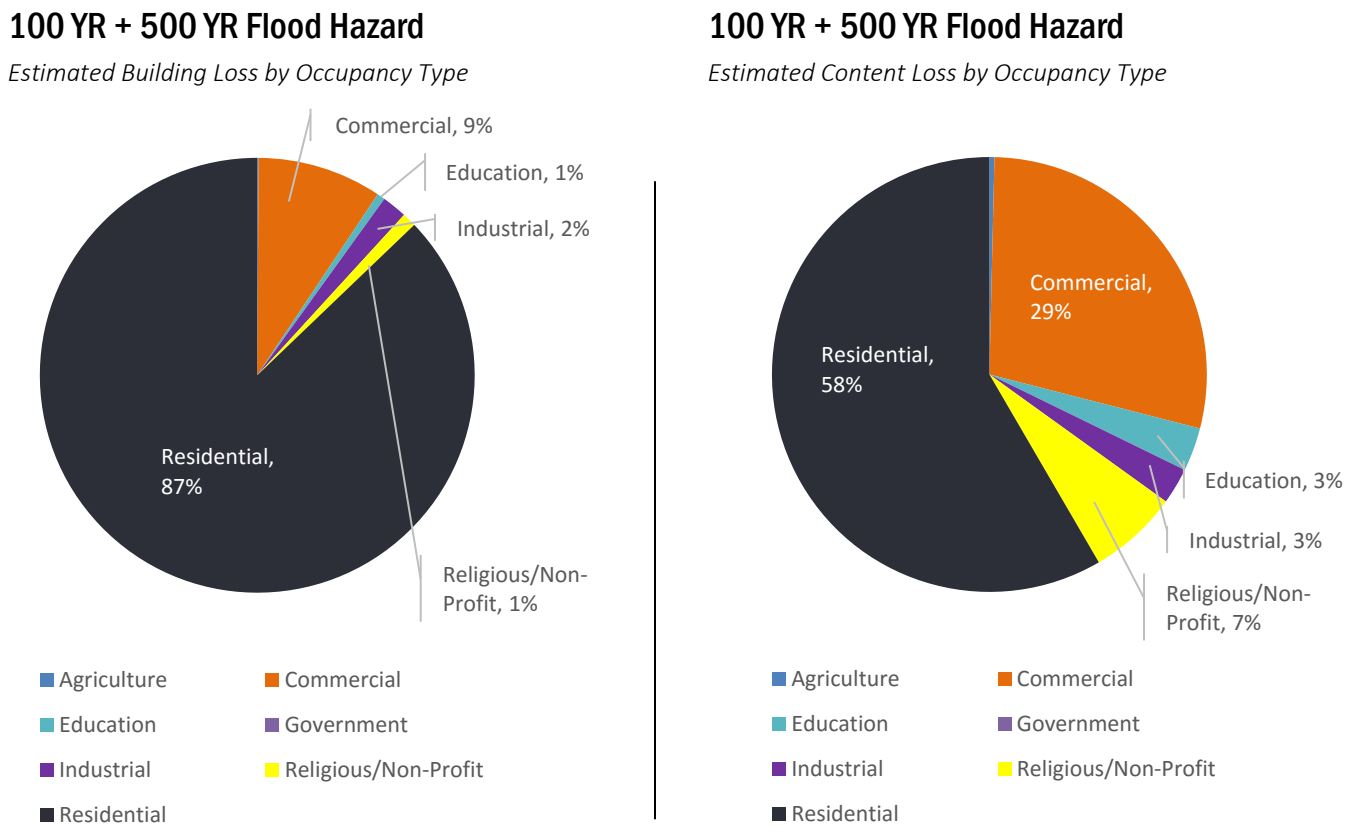

Figure 5-35: Total Building and Content Loss by Occupancy Type

5.12.3 Dam Failure

The primary danger associated with dam failure is the high velocity flooding downstream of the dam and limited warning times for evacuation. Vulnerability varies by community and depends on the particular dam profile and the nature and extent of the failure. Vulnerable population is present directly below downstream elements of the dam, especially those incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to self-evacuate from the inundation area. The vulnerable population also includes those who would not have adequate warning from a television or radio emergency warning system. Dam inundation zones created by Cal EMA were used to develop at risk populations and loss estimations for dam failure.

Community Vulnerability Rating: Medium, Moderate potential impact

Table 5-24: Summary of Population, Parcel Value, and Critical Infrastructure in Dam Inundation Zones

xposed opul ati on	xposed arcel al ue ($)	xposed \epl acement ost ($)	xposed ritical acilities	xposed iles of ifeline	azus oss stimation
2	$8,485	$36	2	6.92	N/A
0.002% ***total pop.***	0.082% *total value*	0.0003% *total cost*	0.24% of *total facilities*	1.23% *total mileage*	N/A

The most significant issue associated with dam failure involves the properties and populations in the inundation zones. Flooding as a result of a dam failure would significantly impact these areas. There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Important issues associated with dam failure hazards include the following:

- Federally regulated dams have an adequate level of oversight and sophistication in the development of emergency action plans for public notification in the unlikely event of failure; however, the protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency response planning.
- Mapping for federally regulated dams is already required and available; however, mapping for non-federal-regulated dams that estimates inundation depths is needed to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence. Mapping of dam failure scenarios for non-federal-regulated dams that are less extreme than the probable maximum flood, but have a higher probability of occurrence, can be valuable to emergency managers and community officials downstream of these facilities. This type of mapping can illustrate areas potentially impacted by more frequent events to support emergency response and preparedness actions.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.

5.12.3.1 Population at Risk

Populations located in a dam failure inundation zone can be exposed to the risk of a dam failure. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation. The estimated population living in the Monticello Dam inundation area is 2 or .002% of the population of Vacaville.

5.12.3.2 Residential Parcel Value at Risk

The City's parcel layer was used as the basis for the inventory of improved residential parcels. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the inundation zones to determine the at-risk structures. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only improved parcels were analyzed. Building exposure was estimated by assuming $184/square foot replacement cost. Building contents exposure was estimated at 50% of the building exposure. Table 5-25 shows the count of at-risk structures and their associated building and content exposure values to dam failure.

The most vulnerable properties are those closest to the dam itself as they would experience the largest, most destructive surge of water. A total of $36,000 worth of buildings and contents are exposed to dam failure hazards within the City Boundaries representing .0003% of the total value.

Table 5-25: Residential Parcel Values at Risk from Dam Inundation

Dam Inundation Zone	Improved Parcel Count	Estimated Building Exposure ($000)	Estimated Content Exposure ($000)	Total Exposure ($000)	% Total Value
Monticello	21	$28	$8	$36	0.0003%

5.12.3.3 Critical Facilities at Risk

Critical Facilities at risk to dam inundation are on file with the City and for national security purposes can only be accessed through City of Vacaville Public Works Department. As a general note, low-lying areas are vulnerable to dam inundation, especially transportation routes. This includes all roads, railroads, and bridges in the flow path of water. The most vulnerable critical facilities are those in poor condition that would have difficulty withstanding a large surge of water. Utilities such as overhead power lines and communication lines could also be vulnerable. Loss of these utilities could create additional compounding issues for emergency management officials attempting to conduct evacuation and response actions.

5.12.4 Earthquake

Major Impacts from earthquakes are primarily the probable number of casualties and damage to infrastructure occurring from ground movement along a particular fault (USGS 2009). The degree of infrastructure damage depends on the magnitude, focal depth, distance from fault, duration of shaking, type of surface deposits, presence of high groundwater, topography, and the design, type, and quality of infrastructure construction.

In recent history, two major quakes have affected the City of Vacaville. According to USGS data, the 6.9 magnitude Loma Prieta earthquake in 1989 killed a total of 63 people and left nearly 3,800 injured and more than 28,000 homes and businesses were damaged. The South Napa earthquake of 2014 struck with a 6.0 magnitude, causing only one fatality but injured over 100 people and left 64,000 without power. Vacaville is fortunate that the majority of development has occurred in the past two decades under stricter seismic building codes that have all been enforced through the planning and development process.

Community Vulnerability: Medium, Moderate potential impact.

Table 5-26: Summary of Population, Parcel Value, and Critical Infrastructure in Moderate, Strong, Very Strong Earthquake Shake Zones

xposed opul ati on	xposed arcel al ue ($)	xposed \epl acement ost ($)	xposed ritical .acilities	xposed .iles of .ifeline	azus .oss stimation
94,821	$10,411,783	$10,764,352	823	563.3	$295,694
100% ***total pop.***	100% *total value*	100% *total cost*	100% of *total facilities*	100% *total mileage*	% *total value*

To analyze the risk to Vacaville residents, two earthquake scenarios were chosen that were modeled by the California Integrated Seismic Network (CISN). Scenario 1 is a Hayward North/Rodgers Creek Fault earthquake at a magnitude of 7.1. Scenario 2 is Concord/Green Valley North/South Fault earthquake at a magnitude of 6.7. The hazard foot prints for each of these scenarios were used to develop exposure results for population, critical facilities, and single family residential parcel values. FEMA Hazus analyses was used to conducted loss estimation for both scenarios and include building and content loss estimation results based on peak ground acceleration, peak ground velocity, and peak spectral acceleration modeled for each scenario.

Building codes provide one of the best methods of addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code to reduce future flood losses. It is important to note that the City of Vacaville has adopted California's 2013 Building Code standards.

Manufactured or mobile homes are often not regulated by local building codes. They do have to meet construction standards set by the U.S. Department of Housing and Urban Development that apply uniformly across the country. However local jurisdictions may regulate the location of these structures and their on-site installation.

5.12.4.1 Population at Risk

According to the 2010 US Census, the population of Vacaville is 92,428. Though rural residential construction is not particularly vulnerable to earthquakes, the chosen earthquake scenarios will directly or indirectly expose the entire population of unincorporated Vacaville to ground shaking. Depending on the time of day (the population differs based on employment opportunities) and exact location of the modeled epicenter, the two earthquake scenarios could be experienced differently. Figure 5-36 and Figure 5-37 exhibit the population totals in each modeled earthquake severity zone. Population location is based upon information taken during the 2010 U.S. Census.

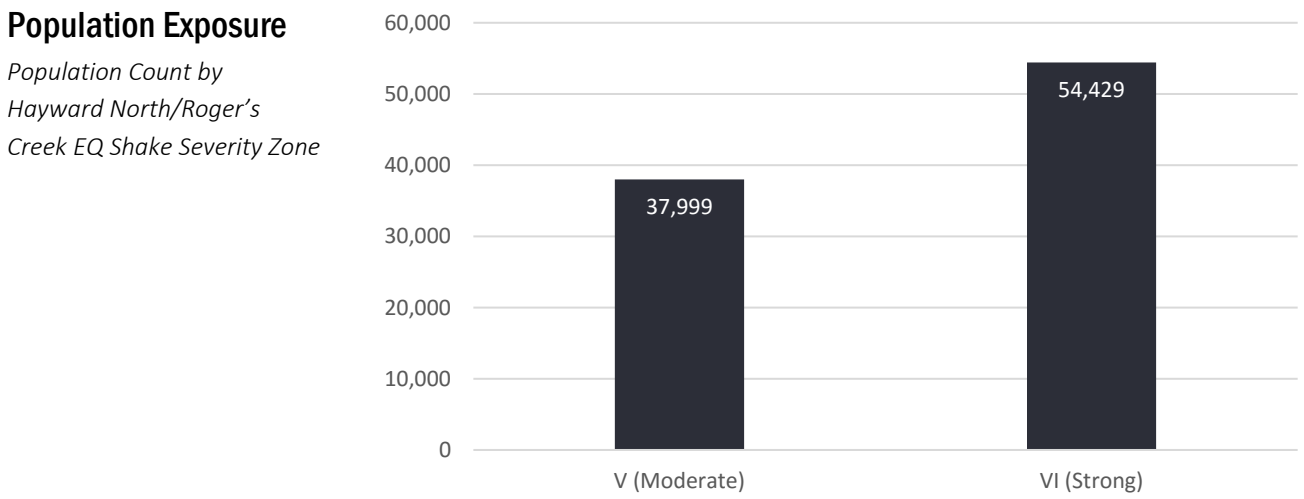

Figure 5-36: Population Exposure to Hayward North/Roger's Creek EQ Shake Severity Zone

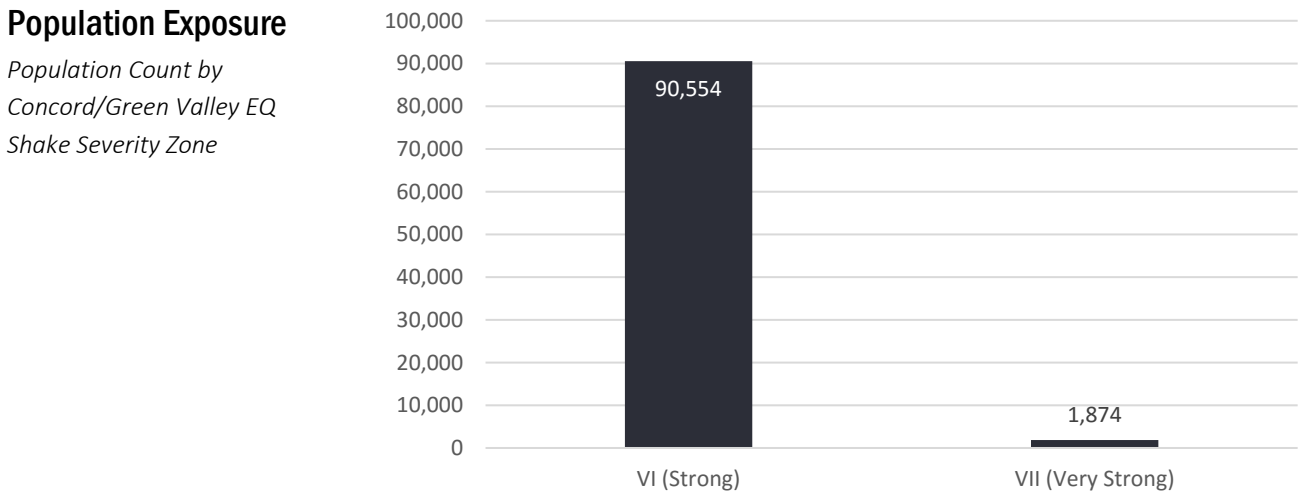

Figure 5-37: Population Exposure to Hayward North/Roger's Creek EQ Shake Severity Zone

5.12.4.2 Residential Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the shake severity zones to determine the at-risk structures. This methodology assumed that every parcel with a square footage value greater than zero was developed in some way. Only

improved parcels were analyzed. Building exposure was estimated by assuming $184/square foot replacement cost. Building contents exposure was estimated at 50% of the building exposure. The analysis indicates residential parcels for each scenario will experience similar, but different shaking patterns. For both scenarios, all parcels will experience shaking; however, the Concord / Green Valley North/South scenario will shake the improved parcels in the county more violently. The type and year of construction will greatly influence damage for structures subject to similar shaking. Table 5-28 and Table 5-29 show the count of at-risk structures and their associated building and content exposure values.

Table 5-27: Residential Parcel Value Exposure from Hayward North/Rodgers Creek EQ

Shake Severity Zone	Improved Parcel Count	Estimated Building Exposure ($000)	Estimated Content Exposure ($000)	Total Exposure ($000)	% Total Value
Moderate	8,602	$2,631,326	$789,398	$3,420,724	32%
Strong	17,381	$5,571,288	$1,671,387	$7,242,675	68%
Grand Total	25,695	$8,202,614	$2,460,785	$10,663,399	100%

Table 5-28: Residential Parcel Value Exposure from Concord/Green Valley North South EQ

Shake Severity Zone	Improved Parcel Count	Estimated Building Exposure ($000)	Estimated Content Exposure ($000)	Total Exposure ($000)	% Total Value
Strong	25,173	$8,038,928	$2,411,679	$10,450,607	98%
Very Strong	636	$163,686	$49,106	$212,792	2%
Grand Total	25,659	$8,202,614	$2,460,785	$10,663,399	100%

5.12.4.3 Critical Facilities with Damage Potential

Earthquakes pose numerous risks to critical facilities and infrastructure. Seismic risks, or losses, that are likely to result from exposure to seismic hazards include:

- Casualties (fatalities and injuries).
- Utility outages.
- Economic losses for repair and replacement of critical facilities, roads, buildings, etc.
- Indirect economic losses such as income lost during downtime resulting from damage to private property or public infrastructure.

Roads or railroads that are blocked or damaged can prevent access throughout the area and can isolate residents and emergency service providers needing to reach vulnerable populations or to make repairs.

Linear utilities and transportation routes are vulnerable to rupture and damage during and after a significant earthquake event. The cascading impact of a single failure can have affects across multiple systems and utility sectors. Degrading infrastructure systems and future large earthquakes with epicenters near critical regional infrastructure could result in system outages that last weeks for the most reliable systems, and multiple months for others.

Table 5-30 and Table 5-31, provides an inventory of critical facility locations (points only) with earthquake exposure for Hayward North / Rodgers Creek and Concord Green Valley / North/South Faults respectively. Depending on “year built”, each critical facility presented in the tables may have varying damage potential. The building codes have been amended to include provisions for seismic safety at various bench marks years.

Table 5-29: Critical Facilities with EQ Risk (Hayward North/Rodgers Creek EQ)

Critical Infrastructure Exposure

Feature Count by Hayward North/Rodgers Creek EQ

Facility Type	Moderate Shake Zone	Strong Shake Zone	Total (Each)
Essential Facility	124	239	363
City Drainage Projects	16	5	21
City Properties	93	182	275
Fire Station	2	5	7
Gathering Facilities	10	38	48
Health Care	3	5	8
Police Station		4	4
High Potential Loss	196	199	395
CDSS Adult Care	7	8	15
CDSS Child Care	7	8	15
CDSS Elderly Care	7	16	23
CEC Power Plants	6		6
CEC Substations	1	1	2
DWR Dam	2		2
Electric Power Facility	2		2
FCC ASR Tower	120	48	168
FCC Cellular Tower	2		2
Hazmat Facility	33	101	134
School	9	17	26
Transportation and Lifeline	24	41	65
Airports	1		1
Bus Facility		1	1
Highway Bridge	22	39	61
Waste Water Facility	1	1	2
Total	344	479	823

Table 5-30: Critical Facilities with EQ Risk (Concord Green Valley / North/South Fault)

Critical Infrastructure Exposure

Feature Count by Concord/Green Valley EQ

Facility Type	Strong Shake Zone	Very Strong Shake Zone	Total (Each)
Essential Facility	334	29	363
City Drainage Projects	21		21
City Properties	252	23	275
Fire Station	7		7
Gathering Facilities	42	6	48
Health Care	8		8
Police Station	4		4
High Potential Loss	353	42	395
CDSS Adult Care	14	1	15
CDSS Child Care	14	1	15
CDSS Elderly Care	23		23
CEC Power Plants	6		6
CEC Substations	2		2
DWR Dam	2		2
Electric Power Facility	2		2

FCC ASR Tower	151	17	168
FCC Cellular Tower	2		2
Hazmat Facility	112	22	134
School	25	1	26
Transportation and Lifeline	62	3	65
Airports	1		1
Bus Facility	1		1
Highway Bridge	59	2	61
Waste Water Facility	1	1	2
Total	**749**	**74**	**823**

HazMat Fixed Facilities

Although earthquakes are low probability events, they produce hazardous materials (HazMat) threats at very high levels when they do occur. Depending on the year built and construction of each facility containing HazMat, earthquake initiated hazardous material releases (EIHR) potential will vary. HazMat contained within masonry or concrete structures built before certain benchmark years reflecting code improvements may be of particular vulnerability.

Transportation

Earthquake events can significantly impact bridges which often provide the only access to some neighborhoods. Since soft soil regions generally follow floodplain boundaries, bridges that cross water courses are considered vulnerable. Since most of the City's bridges provide access across water courses, most are at least somewhat vulnerable to earthquakes. Key factors in the degree of vulnerability are the bridge's age and type of construction which indicate the standards to which the bridge was built. Special attention will be paid to the multiple bridges that cross I-505 and I-80. These interstates would serve as major emergency response and evacuation routes and have multiple bridges that cross over water, including the Putah Canal.

Utilities

Linear utilities and transportation infrastructure would likely suffer considerable damage in the event of an earthquake. Due to the amount of infrastructure and sensitivity of utility data, linear utilities are difficult to analyze without further investigation of individual system components. Table 5-32 and Table 5-33 provide best available linear utility data and it should be assumed that these systems are exposed to breakage and failure.

Table 5-31: Lifelines with EQ Risk (Hayward North/Rodgers Creek EQ)

Critical Infrastructure Exposure

Linear Mileage by Hayward North/Rodgers Creek EQ

Row Labels	Moderate	Strong	Total Miles
Transportation and Lifeline	229.46	333.81	563.28
CEC Natural Gas Lines	11.38	8.44	19.82
2” Diameter	0.33		0.33
3” Diameter	1.13	0.39	1.52
4” Diameter	1.09	0.10	1.19
5” Diameter	0.13		0.13
6” Diameter	0.98	0.86	1.84
8” Diameter	5.76	6.72	12.48
36” Diameter	0.56		0.56
42” Diameter	0.56		0.56
N/A (Undisclosed)	0.83	0.37	1.20
CEC Transmission Lines	21.81	7.69	29.50
60KV	2.63	0.37	3.00
115KV	15.20	5.81	21.01
230KV	3.47	1.09	4.56
500KV	0.51	0.42	0.94
Roads	196.28	317.69	513.96
Interstate	14.59	11.93	26.52
State/county highway	24.58	46.01	70.59
Local road, major	74.23	72.54	146.76
Local road	69.84	154.21	224.05
Alley	0.19	2.04	2.23
Cul-de-sac	0.45	0.11	0.56
Driveway	5.10	18.17	23.27
Ramp	5.20	11.77	16.97
Traffic Circle	0.14	0.28	0.42
Service Road	0.14		0.14
Other Road	1.83	0.62	2.46
Grand Total	229.46	333.81	563.28

Table 5-32: Lifelines with EQ Risk (Concord Green Valley / North/South Fault)

Critical Infrastructure Exposure

Linear Mileage by Hayward North/Rodgers Creek EQ

Row Labels	Strong	Very Strong	Total Miles
Transportation and Lifeline	550.17	13.10	563.28
CEC Natural Gas Lines	19.54	0.27	19.82
2" Diameter	0.33		0.33
3" Diameter	1.52		1.52
4" Diameter	0.56		0.56
5" Diameter	1.19		1.19
6" Diameter	0.56		0.56
8" Diameter	0.13		0.13
36" Diameter	1.84		1.84
42" Diameter	12.20	0.27	12.48
N/A (Undisclosed)	1.20		1.20
CEC Transmission Lines	29.30	0.20	29.50
60KV	20.81	0.20	21.01
115KV	3.00		3.00
230KV	4.56		4.56
500KV	0.94		0.94
Roads	501.33	12.63	513.96
Interstate	1.37	0.86	2.23
State/county highway	0.56		0.56
Local road, major	23.23	0.04	23.27
Local road	26.52		26.52
Alley	219.15	4.91	224.05
Cul-de-sac	143.45	3.31	146.76
Driveway	16.71	0.26	16.97
Ramp	0.14		0.14
Traffic Circle	67.36	3.23	70.59
Service Road	0.41	0.01	0.42
Other Road	2.46		2.46
Grand Total	550.17	13.10	563.28

5.12.4.4 Loss Estimation Results

The Hazus Level 2 analysis was used to assess the risk from and vulnerability to earthquake shaking within Vacaville. Hazus buildings data is aggregated to the **census tract level**, known as the general building stock (GBS), which has a level of accuracy acceptable for planning purposes. Where possible the GBS was enhanced using GIS data from the county as described previously. The following sections describe risk to and vulnerability of the GBS within the City.

Hazus calculates losses to structures from earthquake shaking by considering the amount of ground displacement and type of structure. The software estimates the percentage of damage to structures and their contents by applying established building fragility curves. Damage estimates are then translated to estimated dollar losses.

For each modeled earthquake scenario ground shaking data (shakemaps) were acquired from CISN and imported into Hazus. The shakemap data consist of peak ground velocity, peak ground acceleration, peak spectral acceleration at 0.3 seconds, and peak spectral acceleration at 1.0 seconds. The earthquake module operates on census tracts that often

include population and structures in the incorporated cities and the unincorporated area within a single tract. Due to this fact the results include census tracts that have a substantial portion of land within the incorporated area (loss estimates for some tracts will include structures in incorporated cities).

The results are summarized in Table 5-33 and Table 5-34 for each scenario respectively. It is important to understand that the Hazus earthquake module uses the census tract as its enumeration unit rather than the more detailed census block. The loss estimation values for earthquakes are much higher than those of the flooding and dam failure due to this fact. The portions of incorporated areas included within boundary census tracts elevate the values due to the inclusion of additional GBS. Though the difference between census tracts and census blocks are extremely disparate, the most important summary information is the percent of loss estimation against the total value. Reading from the Table 5-33, residential building and content loss estimation from the Hayward North / Rodgers Creek scenario is $29.8 million dollars and .286 percent of the total value of the residential buildings. In comparison, residential building and content loss from flooding presented in Section 5.12.2.4 is $106.9 million dollars, but is .69 percent of the total value at the census block level. In both scenarios, residential damage will be the greatest.

While there are several limitations to the FEMA Hazus model, it does allow for potential loss estimation. It is important to remember that the replacement costs are well below actual market values, thus, the actual value of assets at risk may be significantly higher than those included herein.

Table 5-33: Estimated Building and Content Loss (Hayward North/Rodgers Creek EQ)

Occupancy Type	Building Damage ($000)	Content Damage ($000)	Total Damage ($000)	% of Total Exposure Value
Agricultural	$91.34	$34.02	$125.36	0.001%
Commercial	$5,956.01	$2,456.58	$8,412.59	0.081%
Education	$380.98	$158.37	$539.35	0.005%
Government	$156.47	$61.80	$218.27	0.002%
Industrial	$978.89	$474.43	$1,453.32	0.014%
Religion	$733.21	$293.33	$1,026.54	0.010%
Residential	$24,195.08	$5,636.25	$29,831.33	0.286%
Grand Total	$32,491.98	$9,114.78	$41,606.76	0.399%
% of Total Exposure Value	0.31%	0.09%		

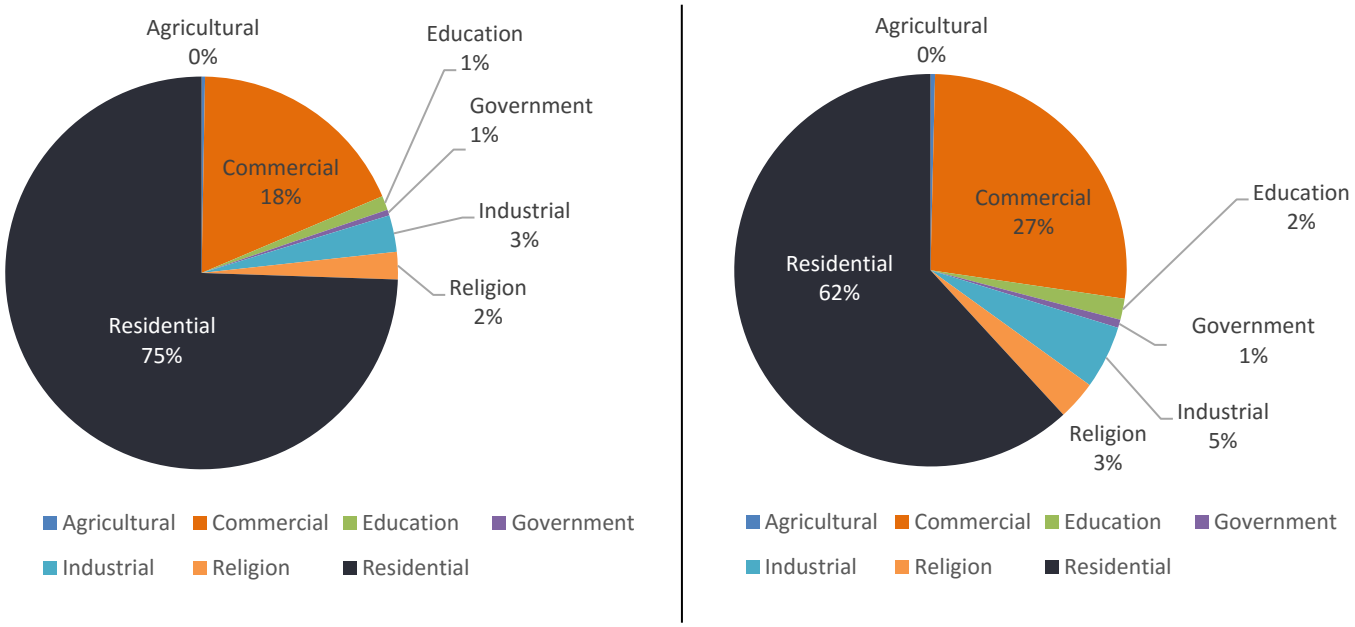

Figure 5-38: Estimated Building and Content by Occupancy Type Hayward North/Rodgers Creek EQ

Table 5-34: Estimated Building and Content Loss (Concord Green Valley / North/South Fault)

Occupancy Type	Building Damage ($000)	Content Damage ($000)	Total Damage ($000)	% of Total Exposure Value
Agricultural	$398.50	$166.92	$565.42	0.005%
Commercial	$28,099.05	$11,992.65	$40,091.70	0.385%
Education	$1,894.26	$849.06	$2,743.32	0.026%
Government	$708.89	$285.30	$994.19	0.010%
Industrial	$4,137.61	$2,129.42	$6,267.03	0.060%
Religion	$3,464.65	$1,469.97	$4,934.62	0.047%
Residential	$132,404.20	$35,018.18	$167,422.38	1.607%
Grand Total	$171,107.16	$51,911.50	$223,018.66	2.140%
% of Total Exposure Value	1.6%	0.5%		

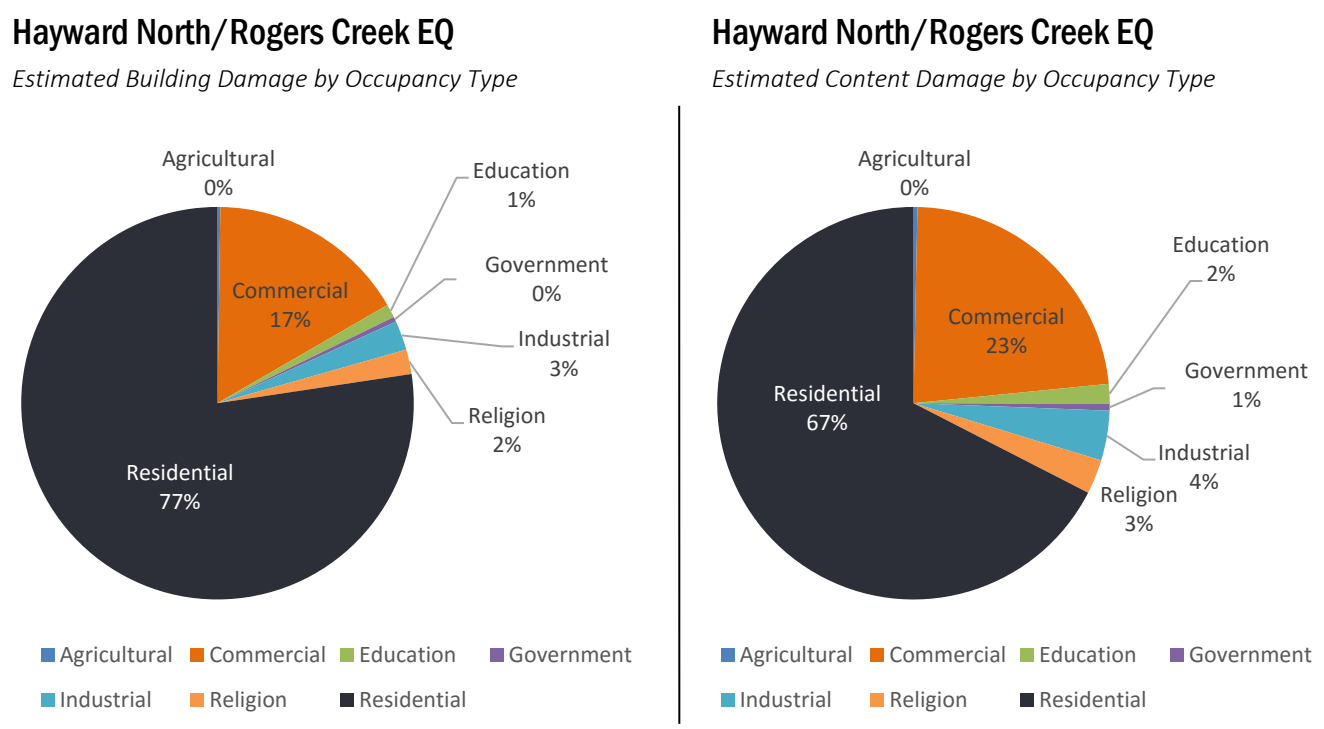

Figure 5-39: Estimated Building and Content by Occupancy Type Concord / Green Valley EQ

5.12.5 Landslides

The San Francisco Bay Area (including Solano County and Vacaville) has one of the highest levels of landslide risk in the U.S. Upland areas of the City are susceptible to landslides. To the west of Vacaville are two hilly outcroppings that are foothills of the Vaca Mountains. On the north side, the hills begin just west of Browns Valley Road, and on the south side, west of Alamo Drive. The steepest slopes are found in the southwest portion of the city suggesting a greater susceptibility to landslides at this location. This area is home to the California State Prison- Solano and single family homes (located between California Drive and Los Robles Ct.). The population in this area is considered to be vulnerable due to the average/ above average percentage of residents under age 18 and the average amount of residents 65 or older.

Human activities that contribute to landslide events include altering the natural slope gradient, increasing soil water content, and removing vegetation cover. The best available predictor of where landside may occur is the location of previous occurrences. In addition, landslides are most likely to occur during severe weather events. The ground must be saturated prior to the onset of a severe weather event for a significant landslide to occur. Transportation routes throughout Vacaville at the base or crest of cliffs should be considered vulnerable to landslide hazard.

Community Vulnerability Rating: Medium, moderate potential impact.

Table 5-35: Summary of Population, Parcel Value, and Critical Infrastructure in Landslide Zone

xposed opul ati on	xposed arcel al ue ($)	xposed \epl acement ost ($)	xposed ritical acilities	xposed iles of ifeline	azus oss stimati on
11,496	$1,563,057	$1,666,833	90	86.8	N/A
12.1% ***total pop.***	15.0% *total value*	15.5% *total cost*	11% of *total facilities*	15% *total mileage*	N/A

All estimates of future landslide numbers and costs are minimum estimates since historical records of damaging landslides in the San Francisco Bay Area are incomplete. Additionally, the estimates do not take into account any future increases or decreases in precipitation due to changing climatic conditions. It is assumed that precipitation conditions in the future will be similar to those reflected by the historical record.

5.12.5.1 Population at Risk

Landslide risk is of greatest concern to populations residing in the few landslides and mostly landslides zones. Solano County census block data were used to estimate populations within the hazard zones. Vacaville has 11,238 residents living in the Few Landslides zone and 258 living in the Mostly Landslide zone.

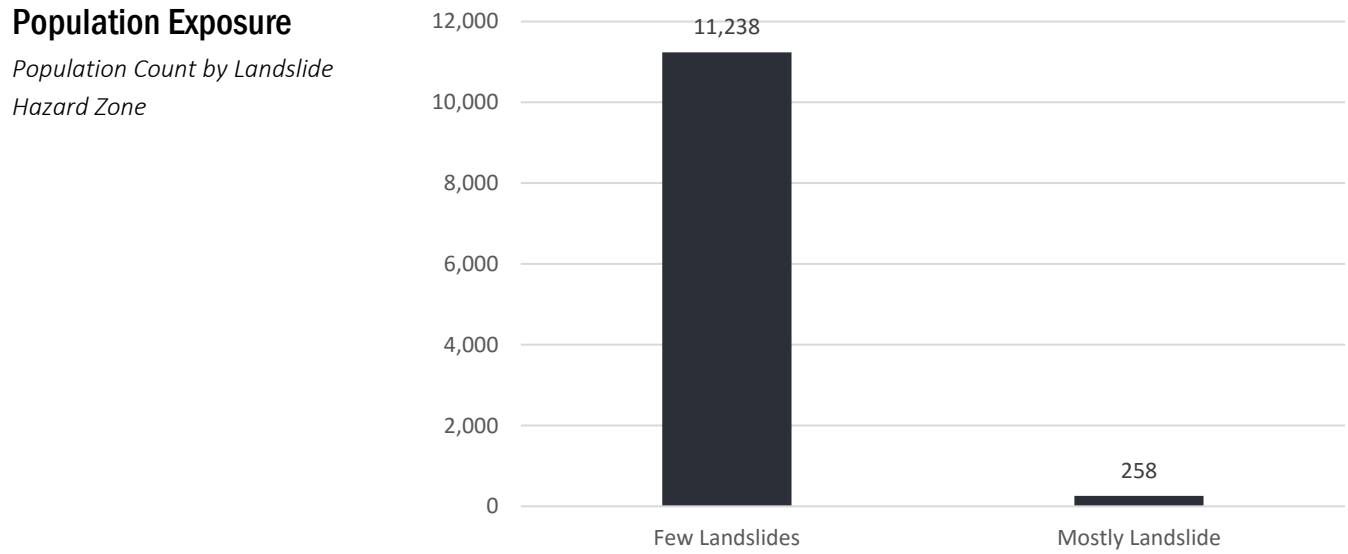

Figure 5-40: Population at risk from Landslide Hazards

5.12.5.2 Residential Parcel Value at Risk

The County's parcel layer was used as the basis for the inventory of improved residential parcels. In some cases, a parcel will be within in multiple landslide hazard zones. GIS was used to create centroids, or points, to represent the center of each parcel polygon – this is assumed to be the location of the structure for analysis purposes. The centroids were then overlaid with the landslide threat layer to determine the risk for each structure. The landslide threat zone in which the centroid was located was assigned to the entire parcel. This methodology assumed that every parcel with a square footage value greater than zero was developed or improved with a structure. Only improved parcels were analyzed. Building exposure was estimated by assuming $184/square foot replacement cost. Building contents exposure was estimated at 50% of the building exposure. Table 5-36exhibits the improved parcels within Vacaville that have significant assets at risk to landslides in the Few and Mostly landslide hazard zones.

Table 5-36: Residential Buildings and Content at Risk from Landslide

Landslide Hazard Zones	Improved Parcel Count	Estimated Building Exposure ($000)	Estimated Content Exposure ($000)	Total Exposure ($000)	% Total Value
Few Landslides	3,834	$1,270,396	$381,119	$1651,515	15%
Mostly Landslides	32	$11,052	$3,315	$14,367	0.13%
Grand Total	3,866	$1,281,448	$384,434	1,665,882	15.13%

5.12.5.3 Critical Facilities at Risk

Critical facilities data were overlain with landslide hazard severity zone data to determine the type and number of facilities within each risk classification. Table 5-38 and Table 5-39 lists the critical facilities in the few and mostly landslide hazard zones for the City of Vacaville.

Table 5-37: Critical Facility Exposure to Landslides

Critical Infrastructure Exposure

Feature Count by Landslide Hazard Zone

Facility Type	Few Landslides	Total
Essential Facility	44	44
City Drainage Projects	5	5
City Properties	36	36
Fire Station	1	1
Gathering Facilities	1	1
Police Station	1	1
High Potential Loss	40	40
CDSS Adult Care	2	2
CDSS Child Care	2	2
CDSS Elderly Care	3	3
CEC Power Plants	1	1
DWR Dam	1	1
FCC ASR Tower	15	15
FCC Cellular Tower	2	2
Hazmat Facility	12	12
School	2	2
Transportation and Lifeline	6	6
Highway Bridge	6	6
Total	90	90

Table 5-38: Lifelines with Landslide Risk

Critical Infrastructure Exposure

Linear Mileage of Transportation Infrastructure and Lifelines by Landslide Hazard Zone

Row Labels	Few Landslides	Mostly Landslides	Total
Transportation and Lifeline	85.61	1.18	86.79
CEC NG Lines	1.96		1.96
3” Diameter	0.11		0.11
4” Diameter	0.79		0.79
8” Diameter	1.06		1.06
CEC Transmission Lines	11.42	0.45	11.87
60KV	0.37		0.37
115KV	11.05	0.45	11.50
Roads	72.23	0.73	72.96
Interstate	2.71		2.71
State/county highway	9.92		9.92
Local road, major	23.15	0.27	23.42
Local road	31.65	0.33	31.98
Alley	0.15		0.15
Cul-de-sac	0.05		0.05
Driveway	2.91	0.13	3.04
Ramp	1.43		1.43
Traffic circle	0.13		0.13
Service Road	0.14		0.14
Grand Total	85.61	1.18	86.79

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5.12.6 Drought

Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply.

Community Vulnerability Rating: Medium, moderate potential impact.

Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the balance between a natural event (less precipitation than expected) and the demand humans place on the water supply. The City of Vacaville may experience significant negative economic impacts, requiring mitigation at the local level due to widespread and deep water shortages, even in a year of average or above-average precipitation in the Lake Berryessa watershed. Due to the lack of defined geographical boundaries, the vulnerability assessment for drought differs from other natural hazards. The impacts of drought can be categorized as economic, environmental, or social. Drought vulnerability is primarily measured by its potential impact to sectors of the City's economy and residents. Some of the potential impacts to the economy include the following:

- Decreased municipal and industrial water supply;
- Fiscal impacts on water supply agencies / companies; and
- Fiscal Impact to residents
    - Fines of up to $500.00 (Each Day)
    - Increased Water Rates

5.12.6.1 Statewide Mandatory Water Reductions

In 2015, in response to historic drought conditions in California, the State Water Resources Control Board (State Water Board) has approved new regulations targeting a reduction in outdoor urban water use. Violation of any of the prohibited or restricted water use activities may be punished by a fine of up to five hundred dollars ($500) for each day in which the violation occurs. The regulations prohibit:

- The direct application of water to any hard surface for washing.
- Watering of outdoor landscapes that cause runoff to adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots or structures.
- Using a hose to wash a motor vehicle, unless the hose is fitted with a shut-off nozzle.
- Using potable water in a fountain or decorative water feature, unless the water is recirculated.

Also in 2015, the City of Vacaville implemented the mandatory restrictions on water use and stepped up conservation outreach to help Vacaville residents to reduce water use and protect water supply reserves at Lake Berryessa for potential string of dry years. The Solano Project is a federal project with the Bureau of Reclamation that stores water in Lake Berryessa for delivery to users throughout the region and was sized to meet only the projected water needs of Vacaville and Solano County. The Solano Irrigation District, Main Prairie Water District, City of Fairfield, City of Vacaville, and City of Vallejo, through contracts with SCWA, are entitled to annual deliveries of water from the Solano Project. The Agreement stipulates that when storage in Lake Berryessa falls below 800,000 AF as measured on December 1, all parties will participate with SCWA staff to prepare a Drought Contingency Plan (DCP). For real time Lake Berryessa AF information see the California Data Exchange Center Lake Berryessa (BSA) page here: http://cdec.water.ca.gov/cgi-progs/queryDaily?BER

5.12.6.2 Regulatory Drought Map Portal

The Association of California Water Agencies has provided a map portal for those interested in how local agencies and communities are responding to drought conditions. The map portal provides information on mandatory restrictions and reductions, local drought declarations and other actions that have been taken across California and the Vacaville region. Figure 5-41, *ACAA Water Regulation Map Portal*, provides a snapshot of the many drought related restrictions and new regulations for the Delta region. See Figure 5-41.

As discussed in section Drought Hazard Profile's Regulatory Environment, drought in Vacaville is addressed through the 2010 Solano County Water Agency's Urban Water Management Plan (UWMP). The California Drought Contingency Plan (DCP) was prepared in conjunction with the 2009 California Water Plan and will be updated every five years. The purpose of the plan is to minimize drought impacts by improving agency coordination, enhancing monitoring and early warning capabilities, conducting water shortage impact assessments, and implementing preparedness, response, and recovery programs.

The California Water Plan presents strategic plan elements including a vision, mission, goals, guiding principles, and recommendations for current water conditions, challenges and activities. The plan includes future uncertainties and climate change impacts, scenarios for 2050, and a roadmap for improving data and analytical tools needed for integrated water management and sustainability. The California Water Plan Update 2018 is currently in development.

See: http://www.water.ca.gov/waterplan/

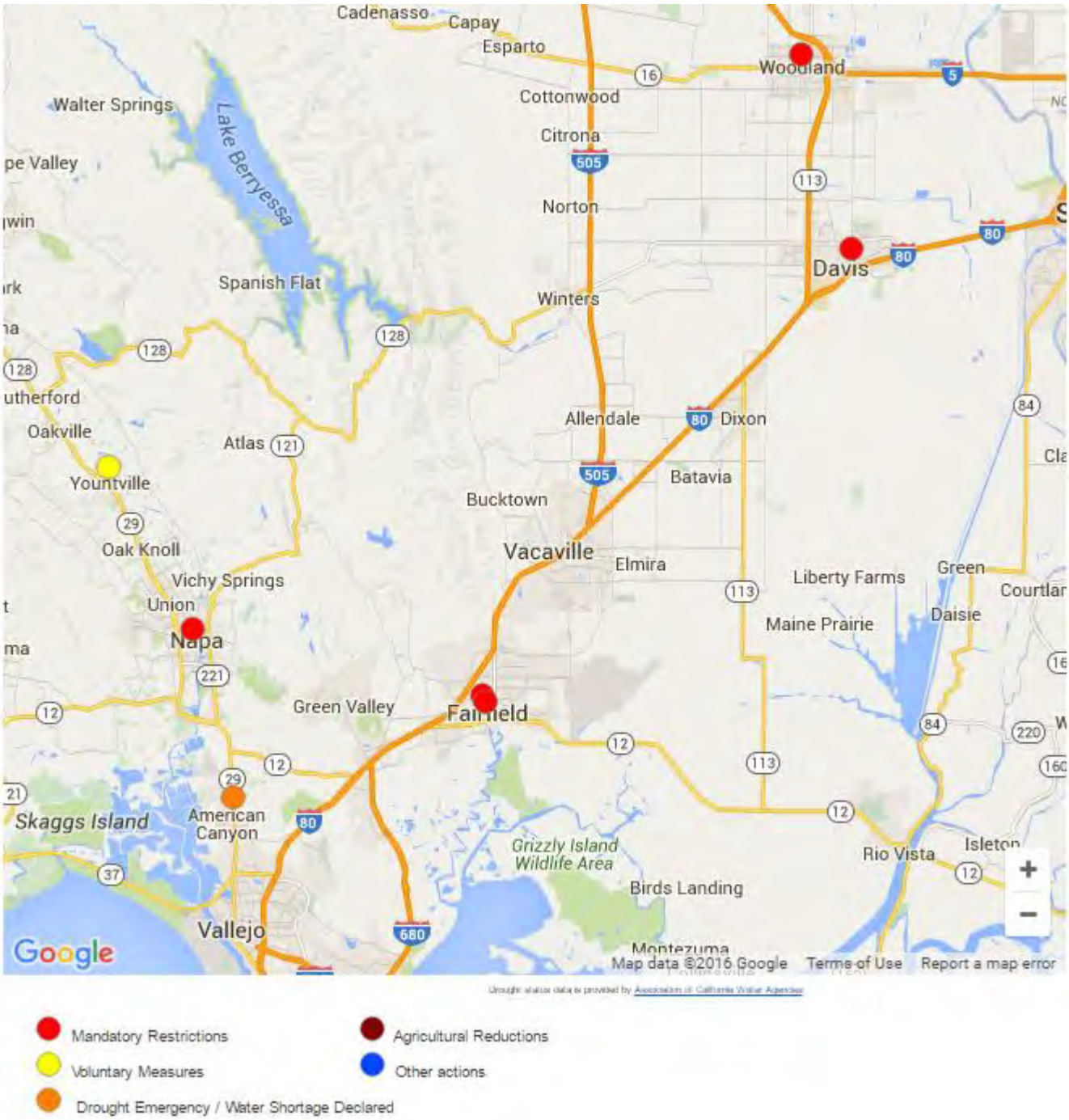

Figure 5-41: Drought Regulations in Effect for Region

Visit portal website for more information here: http://www.acwa.com/content/drought-map

5.12.7 Severe Weather

Severe weather includes heavy rains or heavy snow and ice, often accompanied by strong winds, or hail. Heavy rains coupled with low temperatures or other severe weather conditions can result in increases in traffic accidents, disruptions in transportation, commerce, government, education, cause damage to buildings, communication towers, and electric power lines, and cause loss of life. Most commonly severe weather incidents can cause prolonged utility outages due to falling trees or other debris. Severe weather in Vacaville generally includes heavy rains and is periodically accompanied by strong winds, lightning, or hail.

Community Vulnerability Rating: High, Widespread potential impact

Severe weather can result in the closing of major and or secondary roads, particularly in rural locations, strand motorists, transportation accidents, loss of utility services, and loss of life. Environmental impacts of cold temperatures and heat include damage to shrubbery and trees and other vegetation. Personnel property such as cars, RVs, and small equipment is extremely vulnerable to severe weather hazards especially hail and damage as a result of fallen trees and other storm debris.

The agricultural industry is especially vulnerable to severe weather, mostly extreme temperatures. Freezing temperatures can cause significant loss to crops, and excessive heat can cause high levels of mortality among livestock as well as damage to crops. Historically, severe weather has caused large losses to agricultural crops. Severe weather, including heat has resulted in over $33.6 Million dollars in crop damage in Solano County.

According to historical hazard data, severe weather is an annual occurrence in Vacaville. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the City. Wind and lightning often accompany these storms and have caused damage in the past. However, actual damage associated with the primary effects of severe weather have been limited. It is the secondary hazards caused by weather, such as floods, fire, and agricultural losses that have had the greatest impact on the City. The risk and vulnerability associated with these secondary hazards are discussed in other sections.

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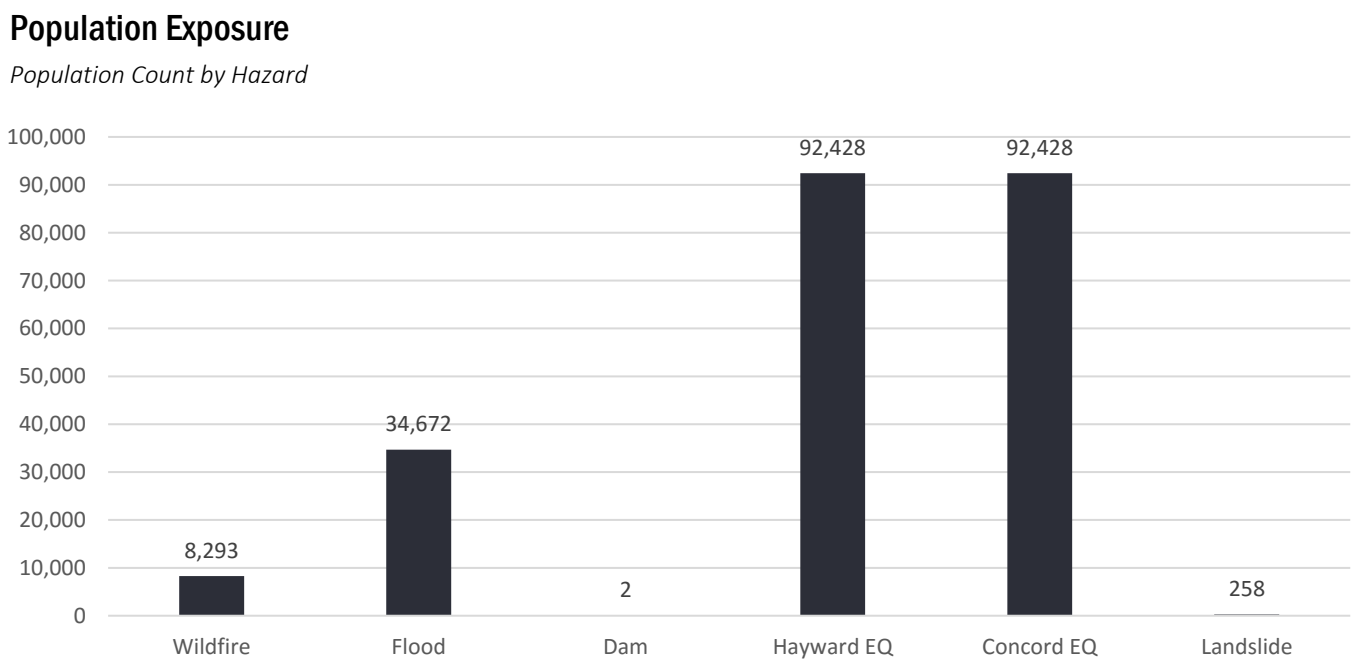
5.12.8 Summary of Spatial Hazards

Hazards with spatial components can be evaluated with side-by-side comparison. At-risk populations, critical infrastructure, improved parcels, and loss results for each hazard category are provided in this summary section. The side-by-side comparison allows officials to evaluate the impacts of potential hazards to determine what hazards to direct energy and financial resource for mitigation activities.

5.12.8.1 Population

Table 5-39 exhibits the amount of Vacaville residents living within wildfire, flood, dam, earthquake and landslide hazard areas. Earthquake has the largest spatial footprint and could potentially affect more than people within the City. However, the casualties to the population may not be as severe as alluded to by the number of people affected by earthquake scenarios described previously. Though the at-risk population is more than 92,000 people, the potential for casualties is somewhat minimized due to date of building construction and type of structures within Vacaville. For detailed vulnerabilities assessment information on affected populations, see the individual hazard specific sections presented previously in this section.

Table 5-39: Population at Risk by Hazard Category



To aid in summarizing estimated injury and deaths related to both earthquake scenarios, the Hazus earthquake software was used to model the estimated injury levels to the population within each census track. The estimated injuries are divided into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The Hazus modeling effort provides casualty estimates for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximized, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximized and 5:00 PM represents peak commute time. Table 5-40 provides the casualty estimates. Only one table is provided for the two earthquake scenarios, as the estimated casualties are the same for each.

Table 5-40: Casualty Estimates for Earthquake

Casualty Estimates

Casualties per Time of Day and Building Type, by EQ Scenario

	Hayward Rodgers Creek EQ				Concord Green Valley EQ			
	Casualty Estimates by Level & Time				*Casualty Estimates by Level & Time*			
Time of Day	Level 1	Level 2	Level 3	Level 4	Level 1	Level 2	Level 3	Level 4
2:00 AM	5	0	0	0	29	3	0	0
Commercial	0	0	-	-	0	0	0	0
Commuting	-	-	-	-	-	-	-	-
Educational	-	-	-	-	-	-	-	-
Hotel	-	-	-	-	-	-	-	-
Industrial	0	0	-	-	1	0	0	0
Other Residential	2	0	0	0	11	1	0	0
Single Family	3	0	-	-	17	1	0	0
2:00 PM	8	1	0	0	42	6	1	1
Commercial	4	0	0	0	24	4	0	1
Commuting	-	-	-	-	-	-	-	-
Educational	1	0	0	0	7	1	0	0
Hotel	-	-	-	-	-	-	-	-
Industrial	1	0	0	0	4	1	0	0
Other Residential	1	0	0	0	4	0	0	0
Single Family	1	0	-	-	3	0	0	0
5:00 PM	6	1	0	0	41	6	1	1
Commercial	3	0	0	0	17	3	0	0
Commuting	-	-	-	-	-	-	-	-
Educational	0	0	-	-	1	0	0	0
Hotel	-	-	-	-	-	-	-	-
Industrial	1	0	-	0	3	0	0	0
Other Residential	1	0	0	0	4	1	0	0
Single Family	1	0	-	-	17	3	0	0
Total	19	2	0	0	113	15	1	2

In addition, Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The Hazus model estimates 88 households to be displaced due to the earthquake. Of these, 66 people (out of a total population of 394,542) are estimated to seek temporary refuge in public shelters.

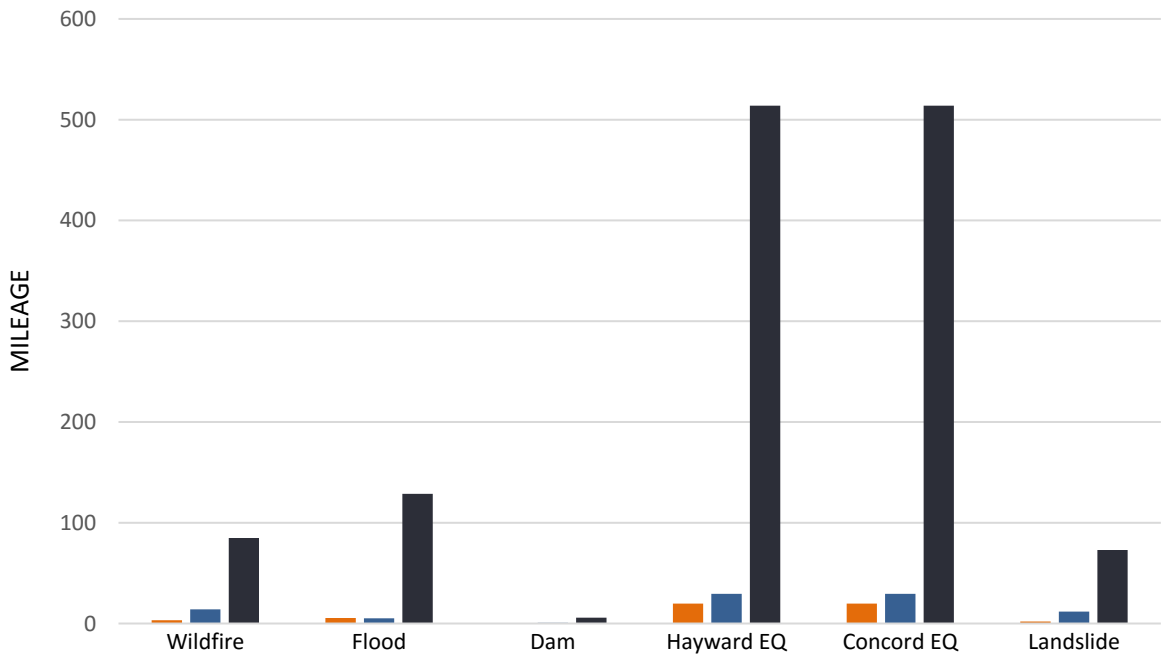
Note: The planning team did not estimate or summarize casualties for the other spatial hazards described in this section.

5.12.8.2 Critical Infrastructure Summary

Critical infrastructure exposure by hazard comparison is provided in Figure 5-42 and Figure 5-43. Figure 5-42 provides a summary of at-risk utilities and transportation routes by miles for each hazard. Figure 5-43 provides a summary of at-risk critical infrastructure points for each hazard. Critical infrastructure points include fire stations, schools, transportation points such as highway bridges, utility points such as communication towers, and facilities that contain HAZMat. For detailed vulnerabilities assessment information on critical infrastructure, see the individual hazard specific sections presented previously in this section.

Critical Infrastructure Exposure

Linear Mileage by Type and Hazard

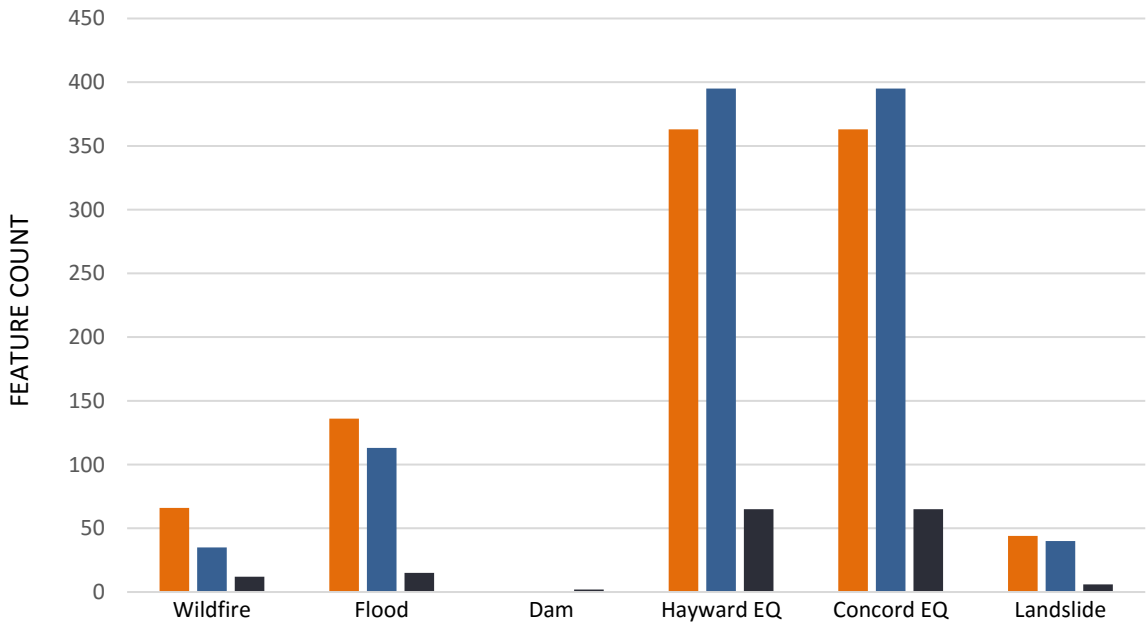


	Wildfire	Flood	Dam	Hayward EQ	Concord EQ	Landslide
Natural Gas Pipeline	3.3	5.5	0.4	19.8	19.8	2.0
Electric Transmission Line	14.0	5.1	0.8	29.5	29.5	11.9
Transportation	85.0	128.7	5.8	514.0	514.0	73.0

Figure 5-42: Miles of Critical Infrastructure Summary by Hazard

Critical Infrastructure Exposure

Facility Count by Type and Hazard



	Wildfire	Flood	Dam	Hayward EQ	Concord EQ	Landslide
Essential Facilities	66	136	0	363	363	44
High Potential Loss Facilities	35	113	0	395	395	40
Transportation & Lifeline	12	15	2	65	65	6

Figure 5-43: Critical Infrastructure Points Summary by Hazard

5.12.8.3 Parcel Exposure

Critical infrastructure exposure by hazard comparison is provided in Figure 5-44 and Figure 5-45. Figure 5-44 provides a summary of at-risk parcels by hazard. Figure 5-45 provides a summary of at-risk structure and content value based on the parcel information by hazard. For detailed vulnerabilities assessment information see the individual hazard specific sections presented previously in this section.

Parcel Count

Parcel Count by Hazard Zone

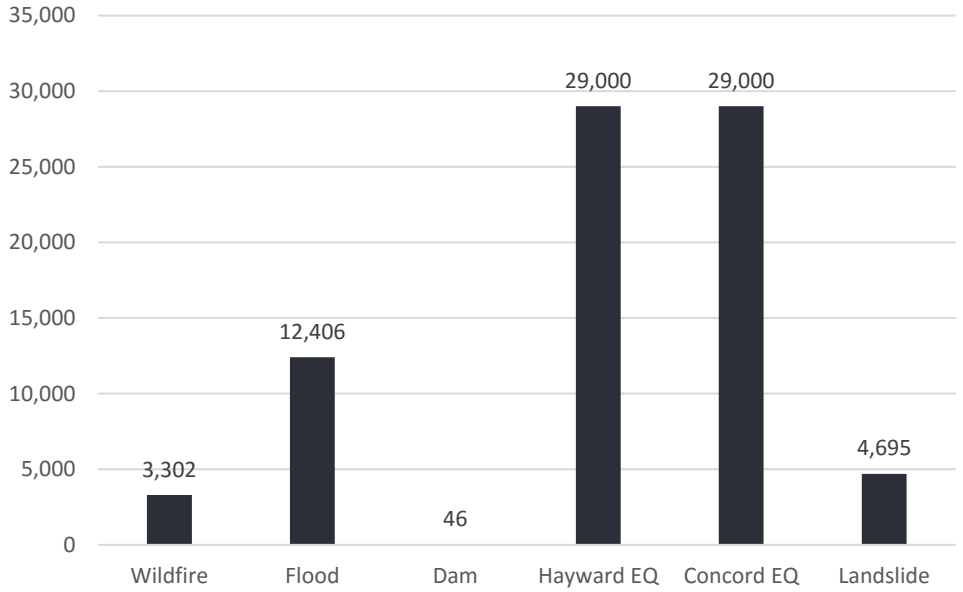
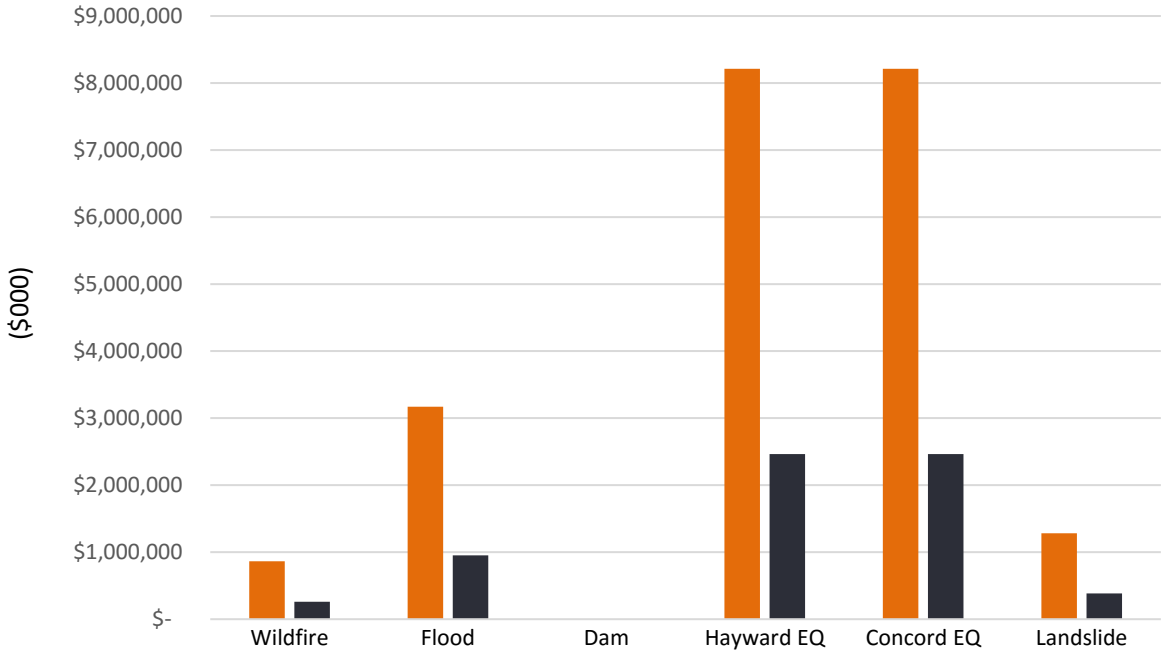


Figure 5-44: Parcels at Risk by Hazard Category

Parcel Replacement Cost Exposure

Parcel Structure & Content Replacement Count by Hazard



	Wildfire	Flood	Dam	Hayward EQ	Concord EQ	Landslide
Structure Replacement Cost ($000)	$864,518	$3,171,505	$28	$8,213,436	$8,213,436	$1,282,179
Content Replacement Cost ($000)	$259,357	$951,452	$8	$2,464,032	$2,464,032	$384,654

Figure 5-45: Parcels Value at Risk by Hazard Category

5.12.8.4 Hazus Loss Estimation Summary

Hazus loss estimation summaries are provided in Figure 5-46. For detailed vulnerabilities assessment information on loss estimation, see the individual hazard specific sections presented previously in this section.

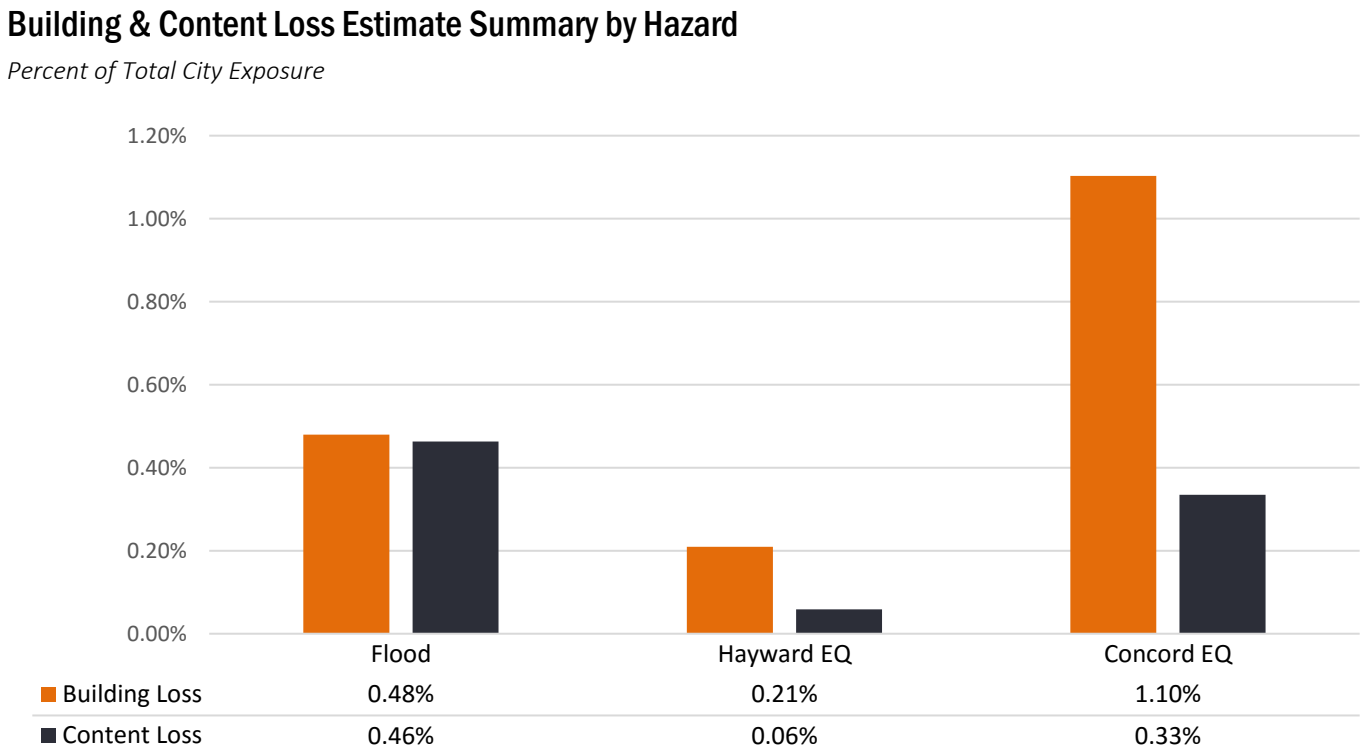


Figure 5-46: Building & Content Loss Estimate Summary by Hazard

Note: Building and Content Loss Estimates are related to the hazards that the FEMA Hazus software can accommodate with current hazard modules. Current Hazus modules include earthquake and Flood. Dam Failure loss estimation was treated similar to the flood analysis and does not account for velocity and associated debris.

Section 6. Mitigation Strategy

The intent of the mitigation strategy is to provide the City of Vacaville with a guidebook to future hazard mitigation administration. The mitigation strategy is intended to reduce vulnerabilities outlined in the previous section with a prescription of policies and physical projects. This will help City staff to achieve compatibility with existing planning mechanisms, and ensures that mitigation activities provide specific roles and resources for implementation success.

6.1 Planning Process for Setting Hazard Mitigation Goals and Objectives

The mitigation strategy represents the key outcomes of the Vacaville LHMP planning process. The hazard mitigation planning process conducted by the Planning Committee is a typical problem-solving methodology:

- Estimate the impacts the problem could cause (*See Section 5, Vulnerability Assessment*);
- Describe the problem (*See Section 6.2, Problem Statements*);
- Assess what safeguards and resources exist that could potentially lessen those impacts (See Section, *6.3 Capability Assessment,*);
- Develop Goals and Objectives with current capabilities to address the problems (*See Section 6.4.1 Goals and Objectives*)
- Using this information, determine what can be done, and select those actions that are appropriate for the community (*See Section 6.4.3.2, Mitigation Action Matrix*).

6.2 Identifying the Problem

As part of the mitigation actions identification process, the HMP Planning Committee identified issues and/or weaknesses as a result of the risk assessment and vulnerability analysis. By combining common issues and weaknesses developed by the Planning Committee, the realm of resources needed for mitigating each can be understood. Community issues and weaknesses are presented by individual hazard in Table 6-1.

Table 6-1: Flood Problem Statements

Problem Description	Problem Type	Action No.
1. **Drainage conveyance in Flood Prone Areas.**	Infrastructure	FL 1.1
2. **Flood risk in the Ulatis Creek tributary (Creek Walk, I-80, Corp Yard, Aegean Way)**	Infrastructure	FL 1.1
3. **Flood risk in Alamo Creek tributary (Southwood, Tulare, Peabody, Beelard)**	Infrastructure	FL 1.1
4. **Water rescue situations caused by flooded streets, creeks, and houses.**	Education	FL 1.3
5. **Alamo and Ulatis Creeks unable to accommodate storm runoff within the City during high intensity and/or long duration rainfall.**	Infrastructure	FL 1.1, FL 1.4, FL 1.5
6. **Demand for shelter facilities during / after flood events.**	Vulnerable population	FL 1.2

7. **Maintenance in tributaries and creeks; Erosion, debris, falling trees, evasive species and beaver dams.**	Maintenance	FL 1.4
8. **Senior Apt. complexes & notifications in flood zones for functional need populations.**	Vulnerable population	FL 1.2
9. **Vehicle accidents that increase due to flooded streets and highway section throughout city.**	Education	FL 1.1, FL 1.3
10. **Additional impervious surface within new development**	Policy Enforcement	FL 1.5, FL 1.6
11. **Lot Coverage/Impervious surface on existing lots; homeowners conducting unpermitted improvements to lots.**	Policy Enforcement	FL 1.5

Table 6-2: Wildfire Problem Statements

Problem Description	Problem Type	Action No.
1. **City open spaces and vegetative fuels backing up to resident's property / homes near or within wildland interface.**	Maintenance Policy	WF 1.1
2. **Demand for shelters during evacuations; identifying coordinating ample space at evacuation centers.**	Vulnerable Population	WF 1.3, WF 1.4
3. **Vegetation fuels in fire prone areas.**	Fuel Management	WF 1.1
4. **Notifications on use of tools and gas powered equipment before 10am to reduce fire danger.**	Public Education and Notification	EH 1.1
5. **Fire department access to open space areas and interface for resources / incident management.**	Access	WF 1.2
6. **Repair of burned slopes; Landslide / mudslides / slope stabilization after a fire.**	Maintenance Policy	WF 1.6
7. **Lack of public notice to areas of extreme fire danger.**	Public Education and Notification	WF 1.5
8. **Impact to critical infrastructure during and after fire; communication,**	Maintenance Policy	WF 1.1

Problem Description	Problem Type	Action No.
water pump stations, sewer lift stations, etc.		
9. **Poor local air quality affecting vulnerable groups.**	Public Education and Notification	WF 1.3

Table 6-3: Earthquake Hazard Problem Statements

Problem Description	Problem Type	Action No.
1. **At risk lifeline infrastructure from ground shaking; water / waste water, gas, and communication services.** ***Primary water source is Berryessa via concrete (Putah So.) canal, secondary source is wells - 1600' deep wells. Service interruption likely due to damage at both "sources" and the secondary water distribution systems; backup infrastructure for fire suppression capabilities i.e. water supply.***	Infrastructure	EQ 1.1
2. **Structural adequacy of city buildings / facilities; public facility infrastructure i.e. fire stations with earthquake damage risk.**	Infrastructure	EQ 1.1
3. **Lack of public notice & support of earthquake risk in the City of Vacaville.**	Public Education and Notification	EQ 1.2
4. **ID of buildings (city & other) in need of retrofit work; lack of City staff to evaluate local residential homes. E.g. Dry rot deterioration of wood framing members at locations**	Manpower	EQ 1.3
5. **ID of hazardous waste areas & retrofit at those structures.**	Manpower	EQ 1.3
6. **Retrofit Unreinforced Masonry (URM) buildings prior to event.** ***Currently there is no local mandatory requirement to retrofit URM buildings; E.g. 1900 era URM residential structures in downtown area.***	Infrastructure	EQ 1.3, EQ 1.2

Problem Description	Problem Type	Action No.
7. **Damage to roadways & transportation infrastructure e.g. major roadway crossings and bridges; providing transportation around bridges that maybe damaged & unsafe to drive over / under.**	Infrastructure	EQ 1.1
8. **What about evacuation shelters as with other hazards? Displaced residents, etc…**	Vulnerable Population	EQ 1.2

Table 6-4: Drought Hazard Problem Statements

Problem Description	Problem Type	Action No.
1. **Impacts from increased fire activity and magnitude of fires based on stressed vegetation / fuels.**	Increased Fuel Loads	DR 1.2
2. **Maintaining water quality in the distribution system.**	Infrastructure / Operation	DR 1.4
3. **Public Address; what more can be done to plan for drought events?**	Public Education and Notification	DR 1.3
4. **Providing water to city facilities especially parks. Need for exemption of drought restrictions.**	Policy	DR 1.1
5. **Expense to replace landscaping that has died due to drought restrictions.**	Damage	DR 1.1
6. **Low-water use standards for new development.**	Policy	DR 1.3
7. **Mandating drought tolerant construction; similar to earthquake and flood.**	Policy	DR 1.3
8. **Tree hazards / damage to stressed trees - falling limbs, falling trees, etc.**	Damage	DR 1.2
9. **Lack of ground water recharge in localized area.**	Infrastructure / Operation	DR 1.3
10. **Lack of reclaimed water system to augment consumption of treated / potable water.**	Infrastructure / Operation	DR 1.1

Table 6-5: Dam Failure Problem Statements

Problem Description	Problem Type	Action No.
1. All three dams have different owners.	Operation/ Communication	DF-1
2. Training and exercising of evacuation plans in the vicinity of high-hazard or significant hazard dams.	Public Education and Notification	DF-1
3. When reviewing proposals for new development in dam inundation areas, consider risks from potential dam failure.	Policy	Df-1
4. Ensure property owners are aware of their flood risk and the importance of flood insurance.	Public Education and Notification	DF-1
5. Lack of Inundation Zones and EAPs for smaller dams, E.g. Lagoon and Bascherini flood control structures.	Operation/ Communications	DF-1
6. Maintenance of older dams.	Maintenance	DF-1

Table 6-6: Extreme Heat Problem Statements

roblem escription	roblemype	ction o.
1. Residents without access to Air Conditioned environments; breakdown of existing cooling systems; loss of PG&E power to residential units.	Public Safety	EH 1.1, EH 1.3, EH 1.4
2. Buckling of concrete infrastructure; median curbs, sidewalks, etc.	Infrastructure	EH 1.2
3. Absence of notifications for "cooling stations".	Public Education	EH 1.3
4. Power demand to run HVAC in buildings; power failure or "rolling brown outs"	Infrastructure	EH 1.1
5. Impacts to elderly and homeless populations susceptible to heat; providing cooling centers	Vulnerable Populations	EH 1.3, EH 1.4
6. Lack of "cooling stations" located logistically across Vacaville.	Infrastructure	EH 1.4
7. Providing access / transportation to cooling centers.	Infrastructure	EH 1.4
8. Persons working outside during extreme heat events: construction, maintenance, etc; need more information regarding precautions to take for high heat.	Public Education	EH 1.3,
9. Lack of adequately sealed homes and insulation in housing stock.	Infrastructure	EH 1.1
10. Notifications to known areas of extreme fire danger (due to slope & vegetation). Increased fire danger as a result of high heat day = low humidity.	Public Education	EH 1.1, EH 1.3

Table 6-7: Landslide Problem Statements

Problem Description	Problem Type	Action No.
1. **Wildfire can cause higher risk of landslides or mudslides.**	Operation	WF 1.6
2. **Dying vegetation due to sudden oak death, drought, or land development increases the risk of landslides.**	Damage	LS 1.1
3. **Transportation infrastructure at risk.**	Infrastructure	LS 1.2
4. **Southwestern residential neighborhoods in high risk area (over 25% grade)**	Vulnerable Populations/ Public Education	LS 1.1, LS 1.3

6.3 Capabilities Assessment

The mitigation strategy includes an assessment of the City's planning and regulatory, administrative/technical, fiscal, and political capabilities to augment known issues and weaknesses from identified natural hazards.

6.3.1 Local Planning and Regulatory Mitigation Capabilities

The information in Table 6-2 is used to construct mitigation actions aligned with existing planning and regulatory capabilities of the City. Planning and regulatory tools typically used by local jurisdictions to implement hazard mitigation activities are building codes, zoning regulations, floodplain management policies, and other municipal planning documents.

Table 6-8: Planning and Regulatory Mitigation Capabilities Summary

Hazard	Plan/Program/ Regulation	Responsible Agency	Comments
Multi-Hazard	Vacaville / 2010 California Building Codes	Building Dept.	The City adopts the latest edition of the California Building Codes. The California Building codes protect buildings to the extent possible from natural occurring hazards. California Residential Code California Code of Regulations, Title 24, Part 2.5. California Building Code California Code of Regulations, Title 24, Part 2, Volumes 1 and 2
Multi-Hazard	Vacaville Municipal Code	Community Development Dept.	City of Vacaville has adopted Division II of Chapter 1, Chapter 34, and Appendices B, C, F, G, H, I and J of the California Building Code and Division II of Part 1 of Chapter 1 and Appendix E of the California Residential Code.
Multi-Hazard	On-Call Professional Services Contract	Public Works Dept.	Professional Services on-call contracts are in place for Water and Wastewater, Surveying and Geotechnical design and technical services.

Hazard	Plan/Program/ Regulation	Responsible Agency	Comments
Multi-Hazard	City of Vacaville General Plan Safety Element	Community Development Dept.	General Plan Safety Element Recently Updated.
Multi-Hazard	Vacaville Capital Improvement Program	Public Works Dept.	This can be used to catalog and fund capital related hazard mitigation projects throughout the city.
Drought	Urban Water Management Plan (UWMP)	Utilities Dept.	An UWMP may help define water delivery and water security. 2010 Urban Water Management Plan Update http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Vacaville,%20City%20of/2010%20UWMP_20110714.pdf Update Due July 1st 2016.
Drought	Municipal Code Chapter ***13.20***	Community Development Dept. and Utilities Dept.	Municipal Code Chapter 13.20 WATER CONSERVATION IN NORMAL, DROUGHT AND EMERGENCY CONDITION addresses drought. Updated in 11/18/2014; based upon four different conditions of response.
Drought	2010 California Drought Contingency Plan And City of Vacaville Drought Contingency Plan	California Dept. of Water Resources City of Vacaville	Section VI provides an overview of drought preparedness strategies from the California Water Plan Update (see separate entry). Section VII provides a brief description of local, utility, and State agency drought response roles. Situation and assessment reports will be distributed to appropriate agencies and will be posted on the DWR Drought website (www.water.ca.gov/drought).
Flood	Flood Resistant Construction	Community Development Dept.	Appendix G of the 2013 California Building Codes stipulates existing Flood Resistant Construction standards.
Flood	NFIP Administration	Public Works Dept.	NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. As a participating member of the NFIP, the City is dedicated to protecting homes of more than 60 policies currently in force.

Hazard	Plan/Program/ Regulation	Responsible Agency	Comments
Flood	NFIP CRS	Public Works Dept.	The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary program created by FEMA which began in late 1989 with the first communities entering the program in 1990. The CRS program provides reduced flood insurance premiums for policyholders in communities that go above and beyond the base requirements of the NFIP which also helps to better protect residents from the effects of damaging floods.
Flood	Floodplain Regulations	Public Works Dept.	
Flood	Central Valley Flood Protection Plan	California Dept. of Water Resources (DWR)	***State legislative requirements give the City local planning responsibilities for floodplain management (e.g., general plans, zoning ordinances, development agreements, tentative maps, and other actions). Government Codes of particular importance to hazard mitigation planning are:*** Government Code 65302 & Government Code 8685.9

6.3.2 Administrative and Technical Capabilities

provides a summary of administrative and technical capabilities organized by staff type and department. It is important to understand current administrative and technical capabilities before developing mitigation activities.

Table 6-9: City Administrative and Technical Mitigation Capabilities

Staff/Personnel Resources	Dept. / Agency	Comments
Planners (with land use / land development knowledge)	Vacaville Community Development Dept.	
Planners or engineers (with natural and/or human caused hazards knowledge)	Public Works Dept., Utilities Dept., Community Development	Fire Prevention can assist as well.
Engineers or professionals trained in building and/or infrastructure construction practices (includes building inspectors)	Public Works Dept. Utilities Dept. Community Development Dept.	

Staff/Personnel Resources	Dept. / Agency	Comments
Floodplain Management	Public Works	City Engineer is the Floodplain Administration
Land / Building surveyors	N/A	City contracts survey services.
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program	Vacaville Admin Services	One employee, city contracts GIS services.
Grant writers or fiscal staff to handle large/complex grants	Community Development Dept. Public Works Dept. Fire Dept.	Numerous types of federal, state, local, and private grants have been administered by City staff.
Construction Equipment	Vacaville Public Works Dept.	Public Works owns and maintains large pieces of equipment available for construction and moving and removal of earthen material.
Emergency Management Personnel	Vacaville Police Dept. Vacaville Fire Dept.	State Office of Emergency Services Access Mobile Emergency Personnel Cooling Center Coordination
Care and Sheltering	City Community Services Dept. Regional Red Cross Personal	Care and sheltering during extreme heat conditions, will provide sheltering and support services for fire victims.
Weather Surveying	National Weather Service Weather Watchers	SKYWARN Weather Spotters Spotter training classes are by the National Weather Service (NWS). Volunteers attending these classes to become weather spotter for the NWS.

6.3.3 Fiscal Capabilities

This section identifies the financial tools or resources that the City could potentially use to help fund mitigation activities. Fiscal capabilities include City-specific as well as state and federal resources.

6.3.3.1 Local Fiscal Resources

provides summary local fiscal capabilities. As indicated in Table 6-4, there are a number of governmental funds and revenue raising activities that can be allocated for hazard mitigation activities.

Table 6-10: Fiscal Capabilities Table

Financial Resources	Dept. / Agency	Comments
General Fund Revenue	Vacaville City Council	No dedicated line items for hazard mitigation. Budget is just balanced meeting mandated reserves and operating costs.
Utility Funds	Vacaville City Council / Vacaville Utilities Dept.	Positive fund balance which will be used to fund loan payments in the coming years. Waste Water Fund has positive balance. Water has 8 Mil. Deficit.
Successor Agency and Housing Services.	Vacaville City Council / Vacaville Housing Dept.	N/A
Capital Improvements Program	Vacaville City Council / Vacaville Public Works	Approximately $ 25.2 Million approved in 2015/2016 CIP Budget
State and County Community Development Dept. Block Grants (CDBG)	California Dept. of Housing and Community Development Dept. (HCD)	Programs Include: Community Development (CD) Economic Development (ED) Disaster Recovery Initiative (DRI) Neighborhood Stabilization Program (NSP) Approximately $2 Million approved by city for 2014/15.
Home Investments Partnership Program	California Dept. of Housing and Community Development	City is a non-entitlement city and must apply competitively for grant funds.

Source: City's Annual Financial Report, Fiscal Year 2014. Adopted June 24, 2014

6.3.3.2 State and Federal Fiscal Resources

To augment local resources, Table 6-9 provides a list of potential funding programs and resources provided by state and federal agencies and programs which can be used for local hazard mitigation activities.

Table 6-11: Potential Funding Programs/Grants from State and Federal Agencies

Agency / Grant Name	Potential Programs/Grants
California DWR Proposition 50/84: **Integrated Regional Water Management (IRWM) Program.**	***DWR has a number of IRWM grant program funding opportunities. Current IRWM grant programs include planning, implementation, and stormwater flood management.*** http://www.water.ca.gov/irwm/grants/index.cfm Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act, which provides $1,000,000,000 (P.R.C. §75001-75130) for IRWM Planning and Implementation. CA Dept. of Water Resources' Flood Emergency Response Projects are posted on the webpage at: http://www.water.ca.gov/floodmgmt/hafoo/fob/floodER/
California Housing and Community Development (HCD) Emergency Solutions Grant (ESG) Program	***To fund projects that serve homeless individuals and families with supportive services, emergency shelter/transitional housing, assisting persons at risk of becoming homeless with homelessness prevention assistance, and providing permanent housing to the homeless population. The Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act of 2009 places new emphasis on assisting people to quickly regain stability in permanent housing after experiencing a housing crisis and/or homelessness.*** http://www.hcd.ca.gov/fa/esg/index.html
CalTrans Division of Local Assistance / Safe Routes to School Program	California Dept. of Transportation. Federal funding administered via Caltrans. Local 10% match is the minimum requirement. http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm
California State Office of Historic Preservation (OHP) / Statewide Historic Preservation Plan:	Local Government**;** OHP's Local Government Unit (LGU) offers guidance and assistance to city and county governments to preserve historic properties including damage from natural hazards.
U.S. Dept. of Energy / Energy Efficiency and Conservation Block Grant Program	***Provides funding for weatherization of structures and development of building codes/ordinances to ensure energy efficiency and restoration of older homes.*** http://www1.eere.energy.gov/wip/eecbg.html
Dept. of Homeland Security (DHS) / FEMA Grants	For more information on current grants visit: http://www.fema.gov/grants

Agency / Grant Name	Potential Programs/Grants
California Emergency Management Agency (Cal EMA) / Proposition 1B Grants Programs	The Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006, approved by the voters as Proposition 1B at the November 7, 2006 general election, authorizes the issuance of nineteen billion nine hundred twenty five million dollars ($19,925,000,000) in general obligation bonds for specified purposes, including grants for transit system safety, security, and disaster response projects. http://www.calema.ca.gov/EMS-HS-HazMat/Pages/Emergency-Management-Homeland-Security-and-Hazard-Mitigation-Grant-Programs.aspx
California Proposition 1: the Water Bond (AB 1471)	Authorize $7.545 billion in general obligation bonds for state water supply infrastructure projects, such as public water system improvements, surface and groundwater storage, drinking water protection, water recycling and advanced water treatment technology, water supply management and conveyance, wastewater treatment, drought relief, emergency water supplies, and ecosystem and watershed protection and restoration. The State Water Resources Control Board (State Water Board) will administer Proposition 1 funds for five programs. The estimated implementation schedule for each is outlined in Five Categories: ▪ Small Community Wastewater ▪ Water Recycling ▪ Drinking Water ▪ Stormwater ▪ Groundwater Sustainability http://www.waterboards.ca.gov/water_issues/programs/grants_loans/proposition1.shtml
Assistance to Firefighters Grant Program (AFG); Fire Prevention and Safety (FP&S)	The primary goal of the FP&S Grants is to enhance the safety of the public and firefighters with respect to fire and fire-related hazards. The Grant Programs Directorate administers the FP&S Grants as part of the AFG Program. FP&S Grants are offered to support projects in two activity areas: 1). Fire Prevention and Safety (FP&S) Activity Activities designed to reach high-risk target groups and mitigate the incidence of death and injuries caused by fire and fire-related hazards. 2). Research and Development (R&D) Activity To learn more about how to prepare to apply for a project under this activity, please see the FP&S Research and Development Grant Application Get Ready Guide. https://www.fema.gov/fire-prevention-safety-grants FY 14 Awards: https://www.fema.gov/fire-prevention-safety-grants-award-year-2014

6.4 Mitigation Goals, Objectives and Actions

Goals and objectives discussed in this section help describe what actions should occur, using increasingly narrow descriptors. Long-term goals are developed which can be accomplished by objectives. To achieve the stated objectives "mitigation actions" provide specific measurable descriptors on how to accomplish the objective. The goals, objectives, and actions form the basis for the development of a Mitigation Action Strategy and specific mitigation projects to be considered for implementation.

The process consists of 1) setting goals and objectives, 2) considering mitigation alternatives, 3) identifying strategies or "actions", and 4) developing a prioritized action plan resulting in a mitigation strategy.

6.4.1 Goals and Objectives

The HMP Planning Committee discussed goals and objectives for this plan update at distinct points in the planning process. In December (Planning Committee Meeting #4), the Planning Committee discussed the results of the risk assessment and the identified issues/weaknesses to be addressed by Mitigation Actions. During that time the HMP Planning Committee opted to develop a new set of goals and objectives as a result of the risk analysis and community priorities. More details of this particular meeting are provided in Appendix B. The following goals and objectives have been developed as part of this planning effort:

ALL HAZARD GOAL: Maximize the use of mitigation actions to prevent losses from natural hazards identified in the LHMP.

- ***ALL HAZARD OBJECTIVE 1: Continuously improve hazard assessments***
- ***ALL HAZARD OBJECTIVE 2: Evaluate and improve ability to alert and warn residents of natural hazard risk.***
- ***ALL HAZARD OBJECTIVE 3: Support mitigation planning in all City Operations.***
- ***ALL HAZAD OBJECTIVE 4: Explore ways to increase the City's capability to provide mitigation opportunities for residents.***

6.4.2 Considering Mitigation Alternatives

During December 2015, the HMP Planning Committee participated in the development and review of mitigation actions with a wide range of alternatives. To narrow mitigation alternatives for inclusion, FEMA's six broad categories of mitigation alternatives were used. Each FEMA category is described below. The HMP Planning Committee developed several mitigation alternatives for implementation under each mitigation category.

PREVENTION (PRV):

Preventative activities are intended to keep hazard problems from getting worse, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are built. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- Planning and zoning ordinances;
- Building codes;
- Open space preservation;
- Floodplain regulations;

- Stormwater management regulations;
- Drainage system maintenance;
- Capital improvements programming; and
- Riverine / fault zone setbacks.

PRV ALTERNATIVES:

1) Evaluate the City's regulations that manage flood risk and consider additional standards to help prevent flood problems from increasing. These include:
    - Additional local regulations for manufactured homes.
    - Changes in zoning ordinance to designate special land uses for floodprone areas
    - Enhanced subdivision regulations
    - Enhanced stormwater regulations to reduce stormwater runoff, especially for new development
    - Other additional higher standards in the flood management code
    - Implement policies/standards for addressing 200-year flood protection standard

2) Consider additional policies and regulations to enhance the preservation of Open Space in floodprone and wild land fire high risk areas

3) Training for City Staff:

    - Provide Certified Floodplain Manager training and certification to staff

PROPERTY PROTECTION (PPRO):

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Building elevation;
- Critical facilities protection;
- Retrofitting (e.g., wind proofing, flood proofing, seismic design techniques, etc.);
- Safe rooms, shutters, shatter-resistant glass; and
- Insurance.

PPRO ALTERNATIVES:

1) Establish a program to evaluate RL and floodprone properties for implementation of property protection measures.
2) Consider promoting and supporting voluntary property protection measures through several activities, ranging from financial incentives to full funding.
3) Promote flood insurance for floodprone properties with a focus on the SFHA and properties with historical flooding areas
4) Evaluate publically owned facilities and critical facilities for property protection measures, including flood insurance

PUBLIC EDUCATION AND AWARENESS (PE&A):

Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach projects including neighborhood and community outreach;
- Speaker series / demonstration events;
- Hazard mapping;
- Real estate disclosures;
- Materials Library;
- School children educational programs; and
- Hazard expositions.

PE&A ALTERNATIVES:

1) Enhancing the City's Public Information Program to include both the public and private sectors.

2) Education and outreach measures to ensure the community understands **their** role in protecting **themselves** in a disaster event.

    - Safety precautions for all types of hazards, but especially floods, earthquakes, wildfires, and drought.
    - Knowing where emergency evacuation routes and shelters are located.
    - Family and emergency preparedness measures.
    - Mitigation measures for residents at the home

3) Enhance public outreach program to include all hazards. Appropriate ways to spread information are:
    - Websites and social media
    - Mailings to everyone, in utility bills or otherwise
    - News releases or newspaper articles
    - Newsletters
    - Displays, particularly at special events
    - Handouts, flyers and other materials, which can be distributed at special events and presentations

NATURAL RESOURCE PROTECTION (NRP):

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes, and sand dunes. Parks, recreation, or conservation agencies and organizations often implement these protective measures. Examples include:

- Floodplain protection
- Watershed management;
- Vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.);
- Erosion and sediment control;
- Wetland and habitat preservation and restoration;

NRP ALTERNATIVES:

1) Inform City Council about the hazard mitigation benefits of restoring rivers, wetlands and other natural areas.
2) Develop restoration and protection techniques floodplains, landslide areas and high risk wild land fire areas.
3) Enhance public education and outreach efforts to inform the public about the need to protect streams and wetlands from dumping and inappropriate development and the relevant codes and regulations.

EMERGENCY SERVICES (ES):

Although not typically considered a "mitigation" technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning systems;
- Construction of evacuation routes;
- Sandbag staging for flood protection; and
- Installing temporary shutters on buildings for wind protection.

ES ALTERNATIVES:

1) Consider StormReady certification.
2) Provide alert and notification to residents for flood risk
3) Evacuate and shelter populations displaced due to flooding.
4) Training for City Staff

STRUCTURAL PROJECTS (SP):

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Stormwater diversions / detention / retention infrastructure;
- Utility Upgrades
- Seismic Retrofits
- New Construction Standards

SP ALTERNATIVES:

1) The City has previously constructed flood control and drainage facilities that move storm and flood waters more efficiently and reduced potential for overbank flooding. The City should identify and prioritize additional projects in the City.
2) The City should continue to implement regional drainage improvement projects to reduce stormwater runoff and the potential for flooding along local drainages.

6.4.3 Mitigation Action Development

Based upon planning committee priorities, risk assessment results, and mitigation alternatives, mitigation actions were developed. Most importantly, the newly developed mitigation actions acknowledge updated risk assessment information outlined in Section 5. Mitigation actions presented in Table 6-10 establish 21 possible mitigation actions. Some mitigation actions support ongoing City activities, while other actions are intended to be completed when funding is available. Regardless, mitigation actions will be part of an annual review, as described in Section 7.

Table 6-12: Mitigation Action Abbreviated List

Action No.	Specific Mitigation Action	Mitigation Type
FL 1.1	Identify project candidates and sources of funding to improve drainage conveyance, and/or mitigate peak flow in local tributaries.	SP
FL 1.2	Evacuate and shelter populations displaced due to flooding.	ES
FL 1.3	Provide alert and notification to residents for flood risk	PE&A
FL 1.4	Increase use of technology and the data developed during the preparation LHMP to improve upon operational efficiency and effectiveness in maintaining drainage areas.	PRV
FL 1.5	Develop ordinance for new development code enforcement for alterations and additions to insure added runoff as a result is mitigated.	PRV
WF 1.1	Fuel management and fuel reduction in open space, creeks, around critical facilities, and urban / wildland interface areas.	NRP
WF 1.2	Maintain and improve access to fire prone areas.	ES
WF 1.3	Provide ample space for vulnerable populations at evacuation centers.	ES
WF 1.4	Improve and enforce weed abatement policies throughout city.	PRV
EH 1.1	Help educate the citizens of Vacaville of ways/programs to reduce electrical demand at commercial and resident's homes during high heat events.	PP
EH 1.2	Upgrade concrete and asphalt infrastructure to mitigate damage from high heat conditions	SP
EH 1.3	Provide alert, notification and cooling center information to residents during high heat conditions.	PE&A
EH 1.4	Provide improved cooling center infrastructure for residents.	ES
EQ 1.1	Upgrade and improve essential facilities to withstand anticipated ground shaking within the city.	PP
EQ 1.2	Improve public education programs and practices to residents for earthquake risk.	PE&A
EQ 1.3	Improve earthquake risk evaluation for infrastructure and residential homes	PP
DR 1.1	Develop reclaimed water system as secondary delivery system.	SP
DR 1.2	Reduce fire risk by clearing drought-damaged vegetation	NRP
DR 1.3	Maintain existing and adopt new water use ordinances as needed and educate public to such	PRV
DR 1.4	Develop operational procedures to maintain water quality in distribution system	PRV

Note: As a living document, project descriptions and actions in Table 6-6 will be modified to reflect current conditions over time.

6.4.3.1 Mitigation Costs

Cost effectiveness of each measure was a primary consideration when developing mitigation actions. Because mitigation is an investment to reduce future damages, it is important to select measures for which the reduced damages over the life of the measure are likely to be greater than the project cost. For structural projects, the level of cost effectiveness is primarily based on the likelihood of damages occurring in the future, the severity of the damages when they occur, and the level of effectiveness of the selected measure.

While detailed analysis was not conducted during the mitigation action development process, these factors were of primary concern when selecting measures. For measures that do not result in a quantifiable reduction of damages, such as public education and outreach, the relationship of the probable future benefits and the cost of each measure was considered when developing the mitigation actions. Costs are made available in individual Implementation Plans described in Section 7.

6.4.4 Prioritization of Mitigation Actions

Common failures of a mitigation plan involve the prioritization of mitigation action for future implementation. Implementing the identified mitigation actions in Table 6-12 can be overwhelming for any community, especially with limited staffing and fiscal resources. To ensure that the City of Vacaville's LHMP reflects a reality of what the City can do with its available resources, mitigation actions are prioritized with public input, risk factor scores, and HMP Planning Committee agreement. This method assists the City to direct resources appropriately during particular planning windows.

6.4.4.1 Public Input

To be completed.

6.4.4.2 Goal, Objective, and Mitigation Action Matrix

Based upon the City's capabilities, Table 6-13 shows primary objectives and corresponding mitigation actions selected for further implementation and development during the next planning cycle. Table 6-8 provides details for each mitigation action with mitigation action descriptions, FEMA mitigation category, responsible party, and timeframe. Implementation Action Plans for each action number highlighted in Table 6-13 are shown in Section 7.7.

Table 6-13: Goal, Objective, and Mitigation Action Matrix

Hazard	RF Factor	Action No.	Action Description	Primary Action
Flooding	2.9	FL 1.1	Identify project candidates and sources of funding to improve drainage conveyance, and/or mitigate peak flow in local tributaries.	Y
Flooding	2.9	FL 1.2	Evacuate and shelter populations displaced due to flooding.	
Flooding	2.9	FL 1.3	Provide alert and notification to residents for flood risk	
Flooding	2.9	FL 1.4	Increase use of technology and the data developed during the preparation LHMP to improve upon operational efficiency and effectiveness in maintaining drainage areas.	Y
Flooding	2.9	FL 1.5	Develop ordinance for new development code enforcement for alterations and additions	
Wildfire	2.7	WF 1.1	Increase fuel management and fuel reduction in open space, creeks, around critical facilities, and urban / wildland interface areas.	Y
Wildfire	2.7	WF 1.2	Maintain and improve access to fire prone areas.	Y
Wildfire	2.7	WF 1.3	Provide ample space for vulnerable populations at evacuation centers.	
Wildfire	2.7	WF 1.4	Improve and enforce weed abatement policies throughout city.	
Extreme Heat	2.6	EH 1.1	Help educate the citizens of Vacaville of ways/programs to reduce electrical demand at commercial and resident's homes during high heat events.	
Extreme Heat	2.6	EH 1.2	Upgrade concrete and asphalt infrastructure to mitigate damage from high heat conditions	
Extreme Heat	2.6	EH 1.3	Provide alert, notification and cooling center information to residents during high heat conditions.	
Extreme Heat	2.6	EH 1.4	Provide improved cooling center infrastructure for residents.	
Earthquake	2.5	EQ 1.1	Upgrade and improve essential facilities to withstand anticipated ground shaking within the city.	Y
Earthquake	2.5	EQ 1.2	Improve public education programs and practices to residents for earthquake risk.	
Earthquake	2.5	EQ 1.3	Improve earthquake risk evaluation for infrastructure and residential homes	
Drought	2.2	DR 1.1	Develop reclaimed water system as secondary delivery system.	Y
Drought	2.2	DR 1.2	Reduce fire risk by clearing drought-damaged vegetation	
Drought	2.2	DR 1.3	Maintain existing and adopt new water use ordinances as needed and educate public to such	
Drought	2.2	DR 1.4	Develop operational procedures to maintain water quality on distribution system	

Risk Factor Conclusion	
HIGH RISK (2.6 – 4.0)	Flooding, Wildfire, Extreme Heat
MODERATE RISK (2.0 – 2.5)	Earthquake, Drought
LOW RISK (0.1 – 2.0)	Slope Failure, Dam Failure

Table 6-14: 2016-2021 Prioritized Mitigation Strategy

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
FL 1.1	**Identify project candidates and sources of funding to improve drainage conveyance, and/or mitigate peak flow in local tributaries.**	Ulatis System Drainage Study, which recommended a number of storm drainage improvements in Vacaville, including new detention basins and channel improvements. The City also maintains the Storm Drainage Master Plan, which identifies storm drainage deficiencies and improvements needed to address existing localized flooding problems. The Storm Drainage Master Plan identifies regional detention basins to mitigate the increase in runoff from new development. New development is required to provide 100-year level flood protection within the proposed development area and ensure that developed areas are not adversely impacted. **Possible Implementation Measures:** • Construct Alamo Creek detention Basin's as reflected in the approved HMP Application • Increase channel capacity within the City (i.e. – Peabody Road bridge @ Alamo Creek) • Construct detention basins identified in the General Plan Safety element and Storm Drainage Master plan. detention basins include: o Ulatis Basin o Ulatis/Florence Basin o Alamo Basin o Laguna Basin o North Horse Basin #2 o Pine Tree Basin	Public Works	SP	3-15 YEARS	Y, See Section 7 for implementation plan.
FL 1.2	**Evacuate and shelter populations displaced due to flooding.**	Development of a flood risk database can provide information on demand when needed most. Electronic mapping will allow the city to be able to accurately predict future losses based on possible events. **Possible Implementation Measures:** ▪ Using GIS map populations that are at risk of flooding. ▪ Use depth grid data from 2016 Hazard Mitigation Plan to continually understand possible flood depth in certain high risk areas. ▪ Use Hazus loss information to assess risk amount of damage and population at risk ▪ Regularly calculating and document the amount of flood-prone property and residences at each ▪ Based upon flood exposure analysis in each areas develop sheltering demand ▪ Based upon flood exposure analysis develop rally points and transfer pickup points for at risk populations. ▪ Consider implementing StormReady certification.	Fire Dept..	ES	1-3 YEARS	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
FL 1.3	**Provide alert and notification to residents for flood risk**	Public education, outreach alert and notification is one of the most efficient and cost effective methods of improving a community's resilience to a flood hazard. Citizens who fully understand the dangers they face are more likely to undertake mitigation actions and be more invested in protecting themselves against future hazards. **Possible Implementation Measures:** ▪ Hazard mapping services for residents and development professionals. Mapping service can include establishing and publicizing a user-friendly, publicly-accessible repository for inquirers to obtain Flood Insurance Rate Maps and other information about flood risk mapping. ▪ Distribution of flood protection safety pamphlets or brochures to the owners of flood-prone property. ▪ Education for citizens about safety during flood conditions, including the dangers flood water contamination and dangers of drainage systems. ▪ Using outreach activities to facilitate technical assistance programs to address measures citizens can take or facilitate funding for mitigation measures and annually notifying the owners of high risk properties of Flood Mitigation Assistance funding. ▪ Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance. ▪ Education about securing debris, propane tanks, yard items, or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters. ▪ Asking residents to help keep storm drains clear of debris during storms (not to rely solely on City of Vacavilles Public Works). ▪ Use GIS database of functional needs populations to provide specialized outreach campaign.	PIO Fire Dept.	PE&A	3-5 YEARS	
FL 1.4	**Increase use of technology and the data developed during the preparation of this LHMP to improve upon operational efficiency and effectiveness in maintaining drainage areas.**	The City of Vacaville's storm water system is critical to moving large volumes of water out of the city in the event of powerful storms. Accurately cataloging and recording problem areas, areas of mitigation interest and annual maintenance needs will allow the City to keep this critical system operating at its maximum efficiency. The City will routinely maintain storm water channels, inlets and outfalls for vegetation build up or evasive species, trash and debris, silt and gravel build up, and erosion or bank failure, structural damage and vandalism. **Possible Implementation Measures:** ▪ Update and maintain GIS database and mapping system to include information on various infrastructure and systems/areas that are of benefit in pre-planning for emergencies or mitigation. Data can include: drainage inlets, culvert diameter, lengths material, invert elevations, crossings etc. ▪ Develop an inventory of drainage channels that require annual maintenance. This includes maintenance conducted by the Californian Conservation Corps and other partner agencies. ▪ Creating and maintaining a record of this flood channel maintenance activity will provide true operational need and budgets required to implement drainage clearing program across the city. ▪ Develop and maintain drainage maintenance public information pamphlet / tri-fold or other outreach media to inform residence of allowable drainage / tributary maintenance processes. ▪ ***Develop a "Maintain-a-Drain" campaign, similar to that of the City of Oakland, encouraging private businesses and residents to keep storm drains in their neighborhood free of debris.*** ▪ ***Balance the need for the smooth flow of storm waters versus the need to maintain wildlife habitat by developing and implementing a comprehensive Streambed Vegetation Management Plan that ensures the efficacy of flood control efforts, mitigates wildfires and maintains the viability of living river.***	Public Works	PRV	3-5 YEARS	Y, See Section 7 for implementation plan.

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		2010 Strategy: Enforce provisions under creek protection, stormwater management, and discharge control ordinances designed to keep watercourses free of obstructions and to protect drainage facilities to conform with the Regional Water Quality Control Board's Best Management Practices. *2010 Strategy. Within areas of the creek channel owned and maintained by the City of Vacaville, develop an approach and locations for various watercourse bank protection strategies, including for example, (1) an assessment of banks to inventory areas that appear prone to failure, (2) bank stabilization, including installation of rip rap, or whatever regulatory agencies allow (3) stream bed depth management using dredging, and (4) removal of out-of-date coffer dams in rivers and tributary streams*				
FL 1.5	**Develop ordinance for new development code enforcement for alterations and additions.**	In urban areas like Vacaville, flood problems are intensified because new homes and other structures, and new streets, driveways, parking lots, and other paved areas decrease the amount of open land available to absorb rainfall and runoff, thus increasing the volume of water that must be carried away by waterways. Typical violations occur when private property owners or developers begin clearing vegetation on slopes, have large equipment on site that is altering the landform and/or impacting existing drainage conditions, and/or when soil is being deposited or excavated on site. The City of Vacaville requires property owners to obtain a permits prior to conducting major construction activity including paving of driveways or other areas of flat work improvements. Strengthening code enforcement of grading / land improvement ordinances will help the City reduce the effects of slope failure due to non-permitted construction. Examples of Code Enforcement can include: **Possible Implementation Measures:** ▪ Fines and Penalties ▪ Reporting Program for Violations *Strategy No. 43 Conduct a watershed analysis at least once every ten years unless there is a major development in the watershed or a major change in the Land Use Element of the General Plan of the cities or counties within the watershed.*	Public Works Community Development	PRV	3-5 Years	
FL 1.6	**Flood Plain Regulation Improvements and Education**	As emphasized by the NFIP Community Rating System (CRS), prevention measures are the most important category of mitigation measures that should be considered in reducing current and future flood losses in a community. The City will evaluate regulations that manage flood risk and consider additional higher standards that exceed the minimum requirements of the NFIP to help prevent flood problems from increasing. These include: ▪ Additional local regulations for manufactured homes. ▪ Changes in zoning ordinance to designate special land uses for floodprone areas ▪ Enhanced subdivision regulations ▪ Other additional higher standards in the flood management code ▪ Additional policies and regulations to enhance the preservation of Open Space in floodprone areas ▪ Development of Policies/standards for addressing 200-year flood protection standard ▪ Provide Certified Floodplain Manager training and certification to staff	Public Works Building Dept.	PRV	5-10 YRS	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
WF 1.1	**Increase fuel management and fuel reduction in open space, creeks, around critical facilities, and urban / wildland interface areas.**	Fuel reduction projects and vegetation treatments have been proven as a means of mitigating wildfire hazards, to lessen catastrophic fire and its threat to public and firefighter safety, and damage to property. Developing a systematic vegetation / fuel management program for high risk areas including fuel breaks, thinning, pruning, landscape modifications near open space, creeks and critical facilities will drastically reduce damage for wildland fires. **Possible Implementation Measures:** ▪ Clearing or thinning of (a) non-fire resistive vegetation within 30 feet of access and evacuation roads and routes to critical facilities, or (b) all non-native species (such as eucalyptus and pine, but not necessarily oaks) within 30 feet of access and evacuation roads and routes to critical facilities. ▪ Maintain fire roads and/or public right-of-way roads and keep them passable at all times. ▪ For new development, require a buffer zone between residential properties and wildfire hazard areas. ▪ Increase funding for City of Vacaville weed abatement program	Fire Dept.	NRP	1-3 YEARS	Y, See Section 7 for implementation plan.
WF 1.2	**Maintain and improve access to fire prone areas.**	Appropriate access for firefighting services is a necessary aspect of developing in a fire prone area. California Fire Code (CFC), California Vehicle Code (CVC) dictate standards for emergency access in communities across California. See: http://www.unidocs.org/fire/un-096.pdf Chapter 14.20.29 of the Vacaville Municipal Code contains the development Standards for new construction adjacent to open space lands where wildfire is a threat. In neighborhoods developed before the City adopted Chapter 14.20.290, emergency access during wildfire events can be a challenge. Access roads can include the perimeter road and the internal road system of a subdivision, as well as public roads in rural-residential subdivisions. The public road system in a fire prone area should provide alternative access or egress for fire-fighters and residents during a grass fire emergency if part of the road system is cut by fire. As a general rule, subdivision applications proposing lots will require fire / emergency access roads that comply with the provisions of a public road outlined in the code above. **Possible Implementation Measures:** ▪ Insure proper egress, gate improvements and surface improvements at dead end roads, and other wildland access locations.	Fire Dept.	ES	1-3 YEARS	Y, See Section 7 for implementation plan.
WF 1.3	**Provide ample space and or care for vulnerable populations at evacuation centers.**	California law sets the responsibility for emergency care and shelter at the local level. As per the Health and Safety Code Section 34070 – 34072, local government is to provide or contract with recognized community organizations to make emergency or temporary shelter available for people made homeless by a natural disaster or other emergency. California's State Emergency Plan and Standardized Emergency Management System puts local government at the first level of response for meeting the disaster needs of people in its jurisdiction. People seeking care and shelter immediately after a disaster will look first to local government for assistance. The American Red Cross is a partner with local government in helping to fulfill government's legal responsibility of providing care and shelter for its citizens in a disaster. The partnership requires that local government and the American Red Cross work cooperatively during the preparedness phase to clarify roles and responsibilities (as outlined below). The local jurisdiction may also work in cooperation with other volunteer disaster assistance organizations to provide disaster relief. However, in a major disaster where there is widespread damage, the national resources of the Red Cross may not fully mobilize until five days after the event. Until such time that the Red Cross arrives on the scene, local government will manage, coordinate, and run all shelter operations.	Community Services American Red Cross	ES	5-10 YEARS	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		Possible Implementation Measures: ▪ Designate a City Care and Shelter Coordinator ▪ Develop a Statement of Understanding with the American Red Cross ▪ Identify and Survey Shelter Facilities ▪ Ensure that Agreements are in Place ▪ Train Staff to Operate Disaster Shelters ▪ Provide Care and Shelter Services				
WF 1.4	**Evaluate and modify as needed weed abatement policies and enforcement throughout City.**	Vacaville has adopted a Weeds and Rubbish Abatement Ordinance (Vacaville Municipal Code, Chapter 8.04), requiring the removal of dry vegetation, weeds, rubbish, and other fire hazards. Code Enforcement conducts Weed Abatement inspection(s) to ensure all dry vegetation, weeds, rubbish and other fire hazards have been removed from property. The City has the authority to abate the violations at the property owner's expense. This may include administrative fines, citations, costs and expenses, and may become a lien or special assessment upon the property. See more information on the weed abatement program here: http://www.ci.vacaville.ca.us/modules/showdocument.aspx?documentid=4595 In may be cost prohibitive for residents to comply with this code. The city has a significant population of senior, low income, and disabled residents who are not physically or financially capable of creating and maintaining the legally mandated clearances around their homes, nor are many of the residents aware of the extreme dangers they face while living in the Wildland Urban Interface. The city will develop a program to assist low income, senior, disabled, and deployed residents with clearing small debris and ladder fuels from around their homes (defensible space), through completing the work for those residents. For the residents who do not fall under the aforementioned circumstances, the City may assist those residents with removing piles of small debris already piled by the resident. **Possible Implementation Measures:** ▪ Using HUD Section 8 program administered by Solano County, coordinate annual housing inspections to perform defensible space consultations. ▪ The city may assist needy property owners with chipping projects. These involve cut and stacked vegetation resulting from mitigation projects. Chippers may need to be acquired through rental service or other means. ▪ Chipping/biomass collection assistance is limited to projects that support the overall hazard mitigation plan and show a benefit to the entire community. ▪ Visit properties with weed abatement issues and discuss methods to bring property up to code as a technical assistance partner.	Fire Dept.	PRV	3-5 YEARS	
WF 1.5	**Develop public education and notification for wildfire in areas of extreme fire danger.**	Use free materials from https://www.usfa.fema.gov/prevention/ to: • Help your fire department increase community awareness about preventing home fires • Work with the news media to get fire prevention messages into news stories • Learn about the latest research on fire detection, suppression and notification systems.	Public Information Officer, Fire Department			

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
WF 1.6	**Repair burned sloped; landslides/ mudslides/slope stabilization after a fire.**	1. Identify the Issues and Concerns 2. Develop Goals and Objectives 3. Perform Post-Fire Hazard Evaluation 4. Develop Best Management Practice (BMP) Selection Criteria 5. Nominate and Evaluate Alternatives 6. Screen and Select Alternatives 7. Design the Hazard Mitigation Plan (comprehensive plans for a given area designed to address the short-term mitigation of geologic, erosion, and flood hazards caused by or exacerbated by the fire) 8. Implement the Plan 9. Operations and Maintenance	Public Works			
EQ 1.1	**Upgrade and improve essential facilities to withstand anticipated ground shaking within the city.**	Essential facilities are those facilities and parts of a community's infrastructure that must remain operational or can be restored quickly after an earthquake for a community to respond effectively. Fire stations, police stations, ambulance services, and emergency/City operation centers must have the ability to provide immediate response during an earthquake or other disaster. Those existing essential facilities which are identified as being potentially non-operable after an earthquake must be strengthened and their equipment secured so they will function after an earthquake. The overall impact and cost of a disaster is strongly influenced by how long it takes to recover. The time needed to recover depends on the level of damage sustained by essential facility buildings, the availability of utilities, and how quickly the City can return to fully functioning status. **Possible Implementation Measures:** • Development of a seismic retrofit program based upon 2015 Risk Assessment; *Include "areas subject to high ground shaking, earthquake-induced ground failure, and surface fault rupture" in the list of criteria used for determining a replacement schedule for pipelines (along with importance, age, type of construction material, size, condition, and maintenance or repair history).* • Helping local government decision-makers by providing estimates of potential losses due to earthquake hazards i.e.what happens if the buildings collapses on fire trucks. • Estimate seismic upgrade costs, and develop benefit-cost models for upgrading City essential facilities. • Determine what needs to be done to bring each facility up to an acceptable level. • Determine funding streams/grants available to perform needed upgrades. • Determine responsibility and schedule for remedial action. • *Install earthquake-resistant connections when pipes enter and exit bridges and work with bridge owners to encourage retrofit of these structures.* • *Install specially-engineered pipelines in areas subject to faulting, liquefaction, earthquake-induced landsliding, or other earthquake hazard.* • *Expedite the funding and retrofit of seismically- deficient city- and county-owned bridges and road structures by working with Caltrans and other appropriate governmental agencies.*	Public Works Community Development.	PP	5-10 Years	Y, See Section 7 for implementation plan.
EQ 1.2	**Improve public education programs and practices to residents for earthquake risk.**	Public education and outreach programs are an efficient and cost-effective way to promote meaningful changes within a community. A Program for Public Information (PPI) for earthquake awareness and mitigation could significantly reduce injury and property damage to earthquake. Use a suite of partnerships, activities, and products to educate the public about earthquake science and motivating homeowners to become prepared for earthquakes.	PIO Fire Department	PE&A	5-10 Years	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		Possible Implementation Measures: ▪ Earthquake month public education program: *http://www.calema.ca.gov/NewsandMedia/Pages/Current%20News%20and%20Events/Earthquake-Preparedness.aspx* ▪ *http://www.shakeout.org/* Participate in 'The Great Shake Out' Statewide Drill ▪ Earthquake insurance education information ▪ *Earthquake Country Alliance*: Public-private partnership led by SCEC ▪ *Great ShakeOut Earthquake Drills:* Coordinated globally by SCEC ▪ *ECA EPI center (Education and Public Information Center) Network*: Museums, Parks, Libraries and other venues for learning about earthquakes ▪ *Putting Down Roots in Earthquake Country:* Booklets for many regions for learning about earthquake hazards and safety recommendations) ▪ *Recent earthquakes*	Community Development.			
EQ 1.3	**Improve earthquake risk evaluation for high occupancy structures and residential homes**	Most property damage caused by earthquakes ends up being handled and paid for by the homeowner or renter. As a homeowner or renter, you can significantly reduce risk of damage to your home by fixing a number of known and common weaknesses, including interior falling hazards. There are no guarantees of safety during earthquakes, but properly constructed and strengthened homes are far less likely to collapse or be damaged during earthquakes. A "Home" within the City boundaries includes single family residences, duplexes, triplexes, four-plexes, and mobile homes. **Possible Implementation Measures:** ▪ City consultation services for compliance to local building codes to ensure that homes meet current seismic safety standards. ▪ Conduct appropriate employee training and support continued education to ensure enforcement of building codes and construction standards, as well as identification of typical design inadequacies of housing and recommended improvements. ▪ Identify and work toward tying down mobile homes used as year-round permanent residences using an appropriate cost-sharing basis (for example, 75% grant, 25% owner). ▪ Provide financial incentives to owners of single-family homes to retrofit if those retrofits comply with Plan Set A or IEBC 2006 in addition to that provided by existing state law State law that makes such retrofits exempt from increases in property taxes. ▪ Failure of a high-occupancy structure can result in death and injuries. Seismic design is particularly important when the occupancy is involuntary, or when the occupants are in some way disabled, such as nursing homes and adult care facilities. Unlike essential facilities necessary for emergency response, high-occupancy buildings do not have to function after an earthquake, however, it is critical that they do not collapse completely or catch on fire. **Possible Implementation Measures:** • Inventory non-ductile concrete, tilt-up concrete (such as converted lofts), and other privately- owned potentially structurally vulnerable residential buildings.	PIO Community Development.	PP	5-10 Years	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		• As required by State law, require private owners to inform all existing tenants (commercial and residential) that they may need to be prepared to live/work elsewhere following an earthquake even if the building has been retrofitted, because it has probably been retrofitted to a life-safety standard, not to a standard that will allow occupancy following major earthquakes. ▪ Potentially hazardous buildings (including City multi-family residential units and functional care) should be individually evaluated by a structural engineer and, if found hazardous, strengthened under hazardous building abatement program. ▪ Determine what needs to be done to bring each facility up to an acceptable level. ▪ Determine funding streams/grants available to perform needed upgrades ▪ Determine responsibility and schedule for remedial action. ▪				
DR 1.1	**Develop plans and funding sources to implement a reclaimed water system as secondary delivery system.**	Wastewater reclamation and reuse is the practice of treating and managing wastewater to produce water of suitable quality for beneficial uses. All nonpotable uses of water can be supplied with properly treated reclaimed wastewater of less than drinking water quality. In the City of Vacaville a full-service utility may be able provide irrigation and non-potable water at lower cost than potable water. While preserving and extending the raw water supply for potable purposes, a previously untapped resource can be used to great benefit. **Possible Implementation Measures:** • Goals and Objects for reclaimed water system • Initiate a Public Awareness Program. • Recommend to the regulating authorities a rate methodology and the requirements for an ordinance that would require mandatory use of reclaimed water for certain types of customers. • Review and adopt policies, procedures and regulations for reclaimed water. • In areas where this does not already take place, investigate restricting water deliveries for non-potable use in areas where reclaimed water might be available in the future. • Complete and submit a Water Reclamation System Master Plan to the State regulatory authority for approval. Resolve possible jurisdiction issues. • Begin construction of reclaimed water facilities that will provide the greatest benefit to the system at the lowest cost, and develop managerial or accounting systems to account for the reclaimed water utility	Utilities Department	SP	5-10 Years	Y, See Section 7 for implementation plan.
DR 1.2	**Reduce fire risk by clearing drought-damaged vegetation.**	In the prolonged absence of precipitation, vegetative growth compounds and dead fuels accumulate. This biomass – in the form of multi-layered vegetative canopies – can carry flames from the surface where dead branchwood burns up into the tree crowns. In drought years, when vegetation dries, these "ladder fuels" contribute to severe, high-intensity wildland fires. **Possible Implementation Measures:** ▪ Develop maintenance program and business processes during Drought / Summer seasons ▪ Develop standards / fire scape landscaping for city open space areas and ROWs o http://www.lvmwd.com/home/showdocument?id=711		NRP	3-5 Years	
DR 1.3	**Maintain existing and adopt new water use ordinances as needed and educate public to such.**	Public education and outreach programs are an efficient and cost-effective way to promote meaningful changes within a community. **Possible Implementation Measures:**	Community Services Utilities Deparment	PRV	5-10 Years	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		▪ Information on low or no-flow water fixtures and their benefit (Fixtures labeled with EPA WaterSense certification). ▪ Promote the use of drought-resistant landscaping features. ▪ Promote the use of covers on swimming pools to reduce evaporation and the need to refill. ▪ Promote the use of hot water on-demand fixtures that not only reduce water consumption, but will also reduce costs to the homeowner. Use showcase city projects as outreach example on low water use native plant treatment. ▪ Implement state law which requires the replacement of fixtures with building permit issuance (water efficient section in the Muni Code). ▪ Promote the use of low water use / natives plants in small and large development projects.				
DF 1	**Determine inundation zones and develop an emergency action plan for each dam within the City of Vacaville.**	Pursuant to Government Code Section 8589.4, which is commonly referred to as the Potential Flooding - Dam Inundation Act (the "PFDI Act"), **inundation maps must be prepared, delivered and approved by the OES**. These maps show areas of potential flooding in the event of sudden or total failure of any dam, the failure of which would result in death or personal injury. The PFDI Act requires the local governmental organization, utility, or owner of a designated dam to submit: **one map** which delineates potential flood zones that could result in the event of dam failure when the reservoir is at full capacity, *OR* **three maps** which delineate potential flood zones that could result in the event of dam failure when the reservoir is at full capacity, at median-storage level, and at normally low-storage level.				
EH 1.1	**Help educate the citizens of Vacaville of ways/programs to reduce electrical demand at commercial and resident's homes during high heat events.**	Extreme heat occurrences can often have a greater impact on those people who have older homes and equipment not capable of responding to the demands in 100-plus degree days. By using preexisting rebate programs the City will encourage residents to take mitigation actions in preparation of high temperature days/seasons. The *Energy Upgrade California* rebate program can assist homeowners with rebates for making improvements to their homes. The rebates can be as high as $4500 depending on the changes made to the home. These changes will not only make the home more energy efficient, but should also serve to make it able to better withstand extreme temperatures. Energy Upgrade California homepage: *https://energyupgradeca.org/your_energy_page0.* At the state level, California has a plan for managing heat wave related stresses on communities in its Electric Power Disruption Toolkit, which was issued in 2001 and can be found on the OES website (http://www.oes.ca.gov) under Plans and Publications. **Possible Implementation Actions:** • Making residents aware of privately funded rebate programs available for home improvements	City Manager	PP	5-10 Years	
EH 1.2	**Maintain concrete and asphalt infrastructure to mitigate damage from high heat conditions.**	Heat causes materials to expand. When concrete slabs expand beyond the space in the joints they press against each other, causing the surface to buckle at the joint or in a weak spot within the slab. There's no set temperature at which buckles happen, the risk is higher when temperatures reach above 90 degrees. Because asphalt is more elastic than concrete, it's less prone to buckling, however, asphalt will heave when it's covering an older concrete road bed or under pressure from adjacent concrete. Most concrete roadway and sidewalk infrastructure is equipped with "expansion joints" that are designed to mitigate contraction and expansion due to changing weather conditions, but years of wear and lack of expansion joint	Public Works Dept. Community Development	SP	3-5 Years	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		maintenance will make certain areas of extreme heat exposure vulnerable to failure. When joints are saturated with dirt and debris, it will leave little to no room for concrete panels to expand. The "buckling" occurs as a result of the inability of the joints to function properly and eventually requires maintenance or replacement. **Possible Implementation Actions:** • Identify and monitor areas of potential buckling to ensure safety for drivers. Changes to building codes and development ordnances can be a very effective way to address concrete and asphalt failure due to extreme heat. The City of Vacaville can use building codes and development standards to ensure new and retrofit construction will follow guidelines meant to reduce the heat island effect. Actions can include: ▪ Requiring the installation of trees around large asphalted areas in order to offset the heat created from the reflection off of the pavement. ▪ Providing tree shaded walk ways for pedestrians. The US EPA has published a guidebook for reducing the heat island effect with a variety of strategies outlined and described within here: *http://www.epa.gov/hiri/resources/pdf/TreesandVegCompendium.pdf*				
EH 1.3	**Provide alert, notification and cooling center information to residents during high heat conditions.**	Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. At the state level, California has Flood Contingency Plan for Excessive Heat Emergencies April 2008. http://www.arb.ca.gov/cc/ab32publichealth/meetings/042010/contintency_plan.pdf **Possible Implementation Actions:** • Develop Seasonal Readiness Program to prepare staff on alerts and notification for public warning Readiness Program may include the following actions: • Initial notification of key stakeholders • Review of existing plans, procedures and resources • Verification of use/availability of key facilities • Updating / validating notification processes • Initiating awareness campaigns. • Orientation and training to plans and procedures	PIO Fire Dept.	PE&A	5-10 Years	
EH 1.4	**Provide improved cooling center infrastructure for residents.**	Cooling centers are generally called for when high temperatures persist in an area, and residents are unable to cope with them. The elderly and the young are particularly sensitive to extreme temperatures. In addition, older homes are less likely to be properly insulated and offer protection for inhabitants from the heat. In these cases, the City may seek to set up cooling centers as a method of counteracting the effects of extreme heat. In order to ensure the operation of these centers, backup power is critical, especially if brownouts are causing the need. Funding the purchase and installation of backup power supplies (generators) at identified cooling centers throughout the City will help area residents escape the effects of extreme temperatures. **Possible Implementation Actions:** • Identify current Red Cross Cooling Centers in the Region • Insure Red Cross Cooling Centers provide adequate capacity for local residence	Public Works Dept. Community Services	ES	3-15 Years	

Action No.	ACTION	DESCRIPTION / BACKGROUND	RESPONSIBLE PARTY	ACTION TYPE	TIME FRAME	IMPLEMENTATION PLAN
		• Develop list of additional local cooling centers within the city boundaries • Insure additional cooling centers have adequate HVAC capacity and back up power supply / generation				
LS 1.1	**Replant deep-rooted vegetation on bare slopes.**	Vegetative cover, root depth, and root strength affect the extent to which landslides occur. Slope failures are much less common with deep-rooted vegetation than with grasses, and with dry soils than with soils that have been saturated by winter storms or overwatering. Deep rooted plants pump water out of the soil, leaving it free to absorb winter rains. **Possible Implementation Actions:** • Plant deep rooted vegetation such as California lilac, toyon, oak trees and sugar bush on hillsides.	Public Works Department			
LS 1.2	**Continue to perform earth/slope stabilization near landslide/rockslide/mudslide hazard zones, such as I-80.**	The stability of a slope can be improved through excavation, the use of reinforcements, drainage techniques, and applying vegetation. **Possible Implementation Actions:** • Identify high hazard road ways and evacuation routes • Use reinforcements, drainage techniques, and vegetation to protect the roadways. • Use rock sheds/shelters over roadways with limited space.	Public Works Department			
LS 1.3	**Encourage homeowners in high landslide hazard areas to plant native trees and shrubbery.**	Where there is a residual hazard of sloughing after construction of engineered slopes, grading design often includes a debris bench with adequate maintenance access and drainage facilities. These benches intercept mud, water and rock at the toe of the engineered slope, before it can reach the travel lanes of local roads or damage improvements on private lots. **Possible Implementation Actions:** • Require contour rounding and revegetation to preserve natural qualities of sloping terrains • Mitigate the artificial appearance of engineered slopes, • Control erosion. • Encourage the use of native trees and shrubbery in revegetation areas.	Community Development			

Section 7. Plan Implementation and Maintenance

As a living document it is important that this plan becomes a tool in the City's resources to ensure reductions in possible damage from a natural hazard event. This section discusses plan adoption, implementation, monitoring, evaluating, and updating the HMP. Plan implementation and maintenance procedures will ensure that the HMP remains relevant and continues to address the changing environment in the City. This section describes the incorporation of the HMP into existing City planning mechanisms, and how the city staff will continue to engage the public.

7.1 Plan Adoption

To comply with DMA 2000, the City Council has officially adopted the 2016 City of Vacaville LHMP. The adoption of the 2016 LHMP recognizes the City's commitment to reducing the impacts of natural hazards within the city limits. A copy of the 2016 LHMP adoption resolution is included in Appendix A.

7.2 Implementation

Over time, Implementation Strategies will become more detailed and the City's mitigation planners will work to provide more detail for priority mitigation actions. In conjunction with the progress report processes outlined in Section 7.4.2 implementation strategy worksheets provided in Appendix D, will be extremely useful as a plan of record tool for updates. Each implementation strategy worksheet provides individual steps and resources need to complete each mitigation action. The following provides several options to consider when developing implementation strategies in the future:

- **Use processes that already exist;** initial strategy is to take advantage of tools and procedures identified in the capability assessment in Section 6. By using planning mechanisms already in use and familiar to City departments and organizations, it will give the planning implementation phase a strong initial boost, especially if a mitigation strategy calls for expanding existing programs, or creating new programs or processes at a later date. Section 6 provides more information on existing planning mechanisms.

- **Updated work plans, policies, or procedures**; hazard mitigation concepts and activities can help integrate the 2016 LHMP into daily operations. These changes can include how major development projects and subdivision reviews are addressed in hazard prone areas or ensure that hazard mitigation concerns are considered in the approval of major capital improvement projects.

- **Job descriptions;** working with department or agency heads to revise job descriptions of government staff to include mitigation-related duties could further institutionalize hazard mitigation. This change would not necessarily result in great financial expenditures or programmatic changes.

7.3 Future Participation

The City of Vacaville LHMP Planning Committee, established for this update, will become a permanent advisory body to administer and coordinate the implementation and maintenance of the 2016 LHMP. The Public Works Department will lead the 2016 LHMP plan development and updates and all associated LHMP maintenance requirements. On an annual basis, the LHMP Planning Committee will report to the City Council and the public on the status of plan implementation and mitigation opportunities in the City. Other duties include reviewing and promoting mitigation opportunities, informing and soliciting input from the public and developing grant applications for hazard mitigation assistance.

7.4 Monitoring, Evaluating, and Updating the HMP

This section describes the schedule and process for monitoring, evaluating, and updating the 2016 LHMP.

7.4.1 Schedule

Monitoring the progress of the mitigation actions will be on-going throughout the five-year period between the adoption of the 2016 LHMP and the next update effort. The LHMP Planning Committee will meet on an annual basis to monitor the status of the implementation of mitigation actions and develop updates as necessary.

The LHMP Planning Committee should meet two months prior to the City budget process to prepare an evaluation report on the success and failures of the 2016 LHMP and provide formal budget request for approval by the City at a later date.

The LHMP will be updated every five years, as required by DMA 2000. The update process will begin at least one year prior to the expiration of the 2016 LHMP. However, should a significant disaster occur within the City, the LHMP Planning Committee will reconvene within 30 days of the disaster to review and update the HMP as appropriate. The City Council will adopt written updates to the LHMP as a DMA 2000 requirement.

7.4.2 Process

The LHMP Planning Committee will coordinate with responsible agencies/organizations identified for each mitigation action. These responsible agencies/organizations will monitor and evaluate the progress made on the implementation of mitigation actions and report to the LHMP Planning Committee on an annual basis. Working with the HMP Planning Committee, these responsible agencies/organizations will be asked to assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate. A LHMP Mitigation Action Progress Report worksheet, provided in Appendix D developed as part of this LHMP to assist mitigation project managers in reporting on the status and assessing the effectiveness of the mitigation actions.

Information culled from the mitigation leads or “champions” will be used to monitor mitigation actions and annual evaluation of the LHMP. The following questions will be considered as criteria for evaluating the effectiveness of the LHMP:

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the HMP?
- Should additional local resources be committed to address identified hazards?

An Annual LHMP Review Questionnaire worksheet, provided in Appendix D, has been developed as part of this LHMP to provide guidance to the HMP Planning Committee on what should be included in the evaluation. Future updates to the HMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise during monitoring and evaluating the LHMP, which require changes to the risk assessment, mitigation

strategy and other components of the LHMP, will be incorporated into the next update of the 2016 LHMP in 2021. The questions identified above would remain valid during the preparation of the 2021 updated.

7.5 Incorporation into Existing Planning Mechanisms

An important implementation mechanism is to incorporate the recommendation and underlying principles of the LHMP into community planning and development such as capital improvement budgeting, building and zoning codes, general plans and regional plans. Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of the jurisdiction attempting to implement risk reducing actions. The integration of a variety of City departments on the LHMP Planning Committee provides an opportunity for constant and pervasive efforts to network, identify, and highlight mitigation activities and opportunities at all levels of government. This collaborative effort is also important to monitor funding opportunities which can be leveraged to implement the mitigation actions. HMP mitigation planners will actively incorporate information from include:

- **City Building / Development Codes and Zoning Ordinances:** The 2016 LHMP will provide information to enable the City to make decisions on appropriate building/development codes and ordinances. Appropriate building codes and ordinances can increase the City's resilience against natural disasters.
- **City of Vacaville General Plan:** The 2016 LHMP will provide information that can be incorporated into the Land Use and Public Safety Elements during the next general plan update. Specific risk and vulnerability information from the City of Vacaville LHMP will assist to identify areas where development may be at risk to potential hazards.
- **Urban Water Management Plan (UWMP):** The 2016 LHMP highlights drought areas of concern. Suitable mitigation actions from the LHMP can be included in the UWMP.
- Fire Department Business Processes:

7.6 Continued Public Involvement

During the five-year update cycle (2016-2021), City staff will involve the public using public workshops and meetings. Information on upcoming public events related to the LHMP or solicitation for comments will be announced via newspapers, mailings, and on the City website (www.vacavillehazards.com). An electronic copy of the current LHMP document will be accessible through the City website, with a hard copy available for review at the City of Vacaville Public Works Department. The LHMP Planning Committee will, as much as practicable, incorporate the following concepts into its public outreach strategy to ensure continued public involvement in the LHMP planning process:

- Collaborate with Solano County on hazard mitigation efforts
- Work with public service clubs, i.e., Lions, Rotary, and other NGOs(non-government organizations)
- Collaborate with faith based organizations
- Create story ideas for media outlets, such as newspapers, local radio, and TV
- Distribute emails and postcards/mailers to City residents about hazard mitigation updates
- Post meeting announcements at coffee houses, grocery stores, libraries, etc.

- Educate and collaborate with insurance companies.
  - Piggy back on other existing local community meetings
  - Distribute information through K-12 schools
  - Continue to use the City website as a distribution point of hazard mitigation information

7.7 2014 HMP Mitigation Action Implementation Plans

7.7.1 Action FL 1.1:

Mitigation Action Implementation Plan	
Action FL 1.1: Construct infrastructure to improve drainage conveyance, and/or mitigate peak flow in local tributaries.	
Implementing Agencies	
Lead Agency (ies):	Public Works Dept.
Roles and Responsibilities:	Project Management / Compliance with State and Federal Standards.
Support Agency (ies):	Utilities Dept.
Roles and Responsibilities:	Survey, Drainage Studies
Preliminary Identified Tasks: Community Development Dept.	
1. Review Ulatis System Drainage Study Recommendation / Improvement Projects	
2. Review Storm Drainage Master Plan Recommendations / Improvement Projects	
3. Develop a list of priority projects based upon LHMP Vulnerability Analysis.	
4. Develop Cost Estimates and Preliminary Engineering Studies on Priority Projects	
5. Develop funding programs for each project	
Implementation Costs	
Estimated Capital Costs:	Dependent upon engineering studies.
Estimated Maintenance Costs:	
Implementation Resources	
Financial Resources (Funding):	California DWR Proposition 50/84: Integrated Regional Water Management (IRWM) Program. California Proposition 1: the Water Bond (AB 1471)
Technical Assistance Resources:	
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Vehicles	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

7.7.2 Action FL 1.4:

Mitigation Action Implementation Plan	
Action FL 1.4: Develop and improve upon operation procedures and policies to maintain drainage areas.	
Implementing Agencies	
Lead Agency (ies):	Public Works
Roles and Responsibilities:	Project Management / Cost Estimating / Large Equipment Mobilization and Operation
Support Agency (ies):	Admin Services
Roles and Responsibilities:	GIS Support
Preliminary Identified Tasks: Public Works Dept.	
1. Update and maintain GIS database and mapping system to include information on various infrastructure and systems/areas that are of benefit in pre-planning for emergencies or mitigation. Data can include: drainage inlets, culvert diameter, lengths material, invert elevations, crossings etc.	
2. Develop an inventory of drainage channels that require annual maintenance. This includes maintenance conducted by the Californian Conservation Corps and other partner agencies.	
3. Creating and maintaining a record of this flood channel maintenance activity will provide true operational need and budgets required to implement drainage clearing program across the city.	
4. Develop and maintain drainage maintenance public information pamphlet / tri-fold or other outreach media to inform residence of allowable drainage / tributary maintenance processes.	
Implementation Costs	
Estimated Capital Costs:	Startup Costs of $5,000 (Staff Time)
Estimated Project Costs:	
Implementation Resources	
Financial Resources (Funding):	City General Fund
Technical Assistance Resources:	
Required Equipment, Vehicles, and Supplies	
Water Pressure Testing Equipment	
Seismic Engineer	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

7.7.3 Action WF 1.1:

Mitigation Action Implementation Plan	
Action WF 1.1: Increase fuel management and fuel reduction in open space, creeks, around critical facilities, and urban / wildland interface areas.	
Implementing Agencies	
Lead Agency (ies):	Fire Department
Roles and Responsibilities:	Project Management / Grant Writing
Support Agency (ies):	
Roles and Responsibilities:	
Preliminary Identified Tasks: Fire Department	
1. Clearing or thinning of (a) non-fire resistive vegetation within 30 feet of access and evacuation roads and routes to critical facilities, or (b) all non-native species (such as eucalyptus and pine, but not necessarily oaks) within 30 feet of access and evacuation roads and routes to critical facilities.	
2. Maintain fire roads and/or public right-of-way roads and keep them passable at all times.	
3. For new development, require a buffer zone between residential properties and wildfire hazard areas.	
4. Increase funding for City of Vacaville weed abatement program	
Implementation Costs	
Estimated Capital Costs:	Startup costs of $5,000 to cover staff time
Estimated Maintenance Costs:	Annual costs of $5,000-$10,000 depending on scope of outreach
Implementation Resources	
Financial Resources (Funding):	General Fund
Technical Assistance Resources:	
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Graphics Support	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

7.7.4 Action WF 1.2:

Mitigation Action Implementation Plan	
Action WF 1.2: Maintain and improve access to fire prone areas.	
Implementing Agencies	
Lead Agency (ies):	Fire Department
Roles and Responsibilities:	Identification of project scope and prioritization
Support Agency (ies):	
Roles and Responsibilities:	Supplies equipment, labor and other assistance
Preliminary Identified Tasks: Fire Department	
1. Develop inventory of access points and roads	
2. Prioritize Access Points and Roads with risk assessment information provide in 2016 LHMP	
3. Develop maintenance and capital improvement plan for each access point and roadway	
4. Develop funding mechanisms.	
Implementation Costs	
Estimated Capital Costs:	Initial Startup Costs pilot project $20,000
Estimated Maintenance Costs:	Annual Costs TBD
Implementation Resources	
Financial Resources (Funding):	City General Fund, Grant Programs
Technical Assistance Resources:	Public Works / GIS
Required Equipment, Vehicles, and Supplies	
Chipper (leased / borrowed)	
Large Equipment	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

7.7.5 Action EQ 1.1:

Mitigation Action Implementation Plan	
Action EQ 1.1: Upgrade and improve essential facilities to withstand anticipated ground shaking within the city.	
Implementing Agencies	
Lead Agency (ies):	Public Works
Roles and Responsibilities of Lead Agency (ies):	Project Management
Support Agency (ies):	Building Dept.
Roles and Responsibilities of Support Agency (ies):	Inspection Services
Preliminary Identified Tasks: Public Works	
1. Develop list of at risk building with information from 2016 LHMP.	
2. Helping local government decision-makers by providing estimates of potential losses due to earthquake hazards i.e. what happens if the buildings collapses on fire trucks.	
3. Estimate seismic upgrade costs, and develop benefit-cost models for upgrading City essential facilities.	
4. Determine what needs to be done to bring each facility up to an acceptable level.	
5. Determine funding streams/grants available to perform needed upgrades.	
6. Determine responsibility and schedule for remedial action.	
Implementation Costs	
Estimated Capital Costs:	$50,000 for study
Estimated Maintenance **Costs:**	N/A
Implementation Resources	
Financial Resources (Funding):	PDM
Technical Assistance Resources:	California Earthquake Alliance
Required Equipment, Vehicles, and Supplies	
Meeting Space	
Office Supplies	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

7.7.6 Action DR 1.1:

Mitigation Action Implementation Plan	
Action DR 1.1: Develop reclaimed water system as secondary delivery system.	
Implementing Agencies	
Lead Agency (ies):	Utilities Department
Roles and Responsibilities	Project Management
Support Agency (ies):	Public Works, Admin Services
Roles and Responsibilities:	Cost Estimation, GIS
Preliminary Identified Tasks: Utilities Department	
1. Goals and Objects for reclaimed water system.	
2. Expand Non-potable / recycled water opportunities	
3. Develop water reuse study complete with a public awareness program.	
4. Recommend to the regulating authorities a rate methodology and the requirements for an ordinance that would require mandatory use of reclaimed water for certain types of customers.	
5. Review and adopt policies, procedures and regulations for reclaimed water.	
6. In areas where this does not already take place, investigate restricting water deliveries for non-potable use in areas where reclaimed water might be available in the future.	
7. Complete and submit a water reclamation system master plan or study to the State regulatory authority for approval. Resolve possible jurisdiction issues.	
8. Begin construction of reclaimed water facilities that will provide the greatest benefit to the system at the lowest cost, and develop managerial or accounting systems to account for the reclaimed water utility	
Implementation Costs	
Estimated Capital Costs:	$100,000 for Study and public outreach
Estimated Maintenance Costs:	N/A
Implementation Resources	
Financial Resources (Funding):	
Technical Assistance Resources:	
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Website Maintenance	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

Appendix A City Adoption Resolution

City Resolution to be Inserted Here…

Appendix B Planning Process Documentation

B.1 Planning Committee Meetings Documentation

B.2 Public Notices and Press Releases

B.3 Public Open House Documentation

B.4 Survey

B.5 Website

B.1 Planning Committee Meetings Documentation

Meeting Agenda:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Internal Project Management Kick-Off Meeting

Tuesday, July 7, 2015, 10:00 a.m. – 12:00 p.m.

City of Vacaville, Public Works Building

- **Welcome and Introductions**
  - Team Roster, Org Chart and POCs
  - Project Reporting
- **Project Overview / Scope and Milestones**
  - Mitigation Defined
  - Planning Process
  - SOW / Major Project Components
  - Objectives
- **Project Timeline / Schedule**
  - Meeting Tempo
- **Outreach Strategy**
  - Planning Committee
  - Outreach Planning
  - Website
- **Risk Assessment Prep**
  - Data Acquisition
- **Next Steps**
- **Wrap Up**

Sign-in:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Internal Project Management Kick-Off Meeting

Tuesday, July 7, 2015, 10:00 a.m. – 12:00 p.m.

City of Vacaville, Public Works Building

NAME	PHONE	EMAIL
Brian Greer	(925) 642 - 3649	brian @dynamicplanning.co
Ethan Mobley	(510) 253 - 0054	ethan @dynamicplanning.co
Barten Brierley	(707) 449-5361	barten.brierley @cityofvacaville.com
MARK MAZZAFERRO	(707) 449 5371	mark.mazzaferro @cityofvacaville.com
Steve Hartwig	(707) 449 5145	steve.hartwig @cityofvacaville.com
RICARDO CASTILLO	(916) 845 8158	ricardo.castillo @caloes.ca.gov
	( ) -	@
	( ) -	@
	( ) -	@
On the phone	( ) -	@
Shawn Cunningham	( ) -	@
	( ) -	@
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2016 Local Hazard Mitigation Plan Update

City of Vacaville

Internal Kick-Off Meeting

July 7, 2015

CITY OF VACAVILLE LHMP

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Agenda

- Welcome and Introductions
- Mitigation Planning Defined
- Background
- Local Hazard Mitigation Planning Process
- Overall Objectives
- Project Schedule
- Today's Tasks / Accomplishments
- Next Steps

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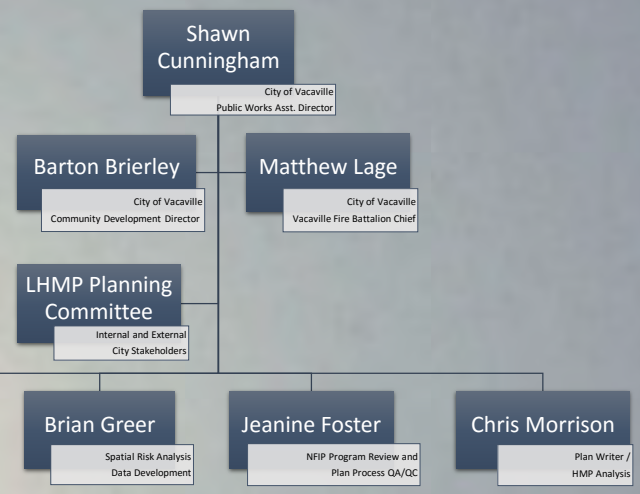
Team Org Chart



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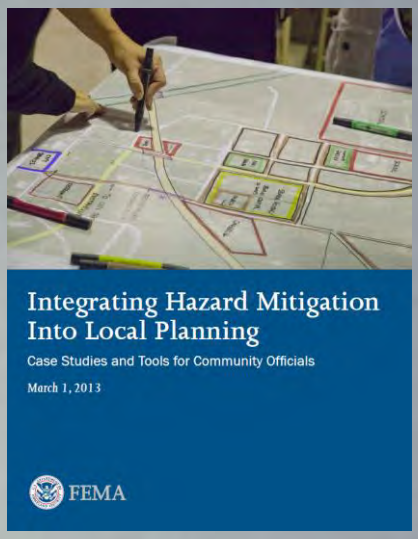
The know how!

- National and Regional Hazard mitigation know how!
- Our team members have managed and authored:
  - Local mitigation planning process updates
  - State mitigation planning process updates
  - Assisted with FEMA's "Integrating Hazard Mitigation Into Local Planning"
  - Solano **County's 2010 Multi-**Hazard Mitigation Plan Update



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Hazard Mitigation Defined

- What is Hazard Mitigation?
  - Hazard mitigation is sustained action taken to reduce or eliminate long-term risk to life and property resulting from natural hazards. What is a Mitigation Plan?
  - Recognition of potential hazards and actions to curb possible effects
  - Includes Hazard Identification and Risk Assessment (HIRA)
  - Solidifies Mitigation Strategy
  - Provides Planning Process Documentation for State and Feds
- Why have a Mitigation Plan?
  - Results in saved lives, reduced injuries, reduced property damages, and protection for the environment
  - Ensures staff and public consensus toward common goal
  - Focuses efforts and limited resources
  - Must have "approved plan" for Hazard Mitigation Program Grant access.
  - Augment local capital improvement funding!
  - California is disaster prone!

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Background

- Disaster Mitigation Act (DMA) 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance.
- FEMA requires an update every 5 years!
- City of Vacaville's "Third" hazard mitigation plan update.
  - 2005 Conducted by Association of Bay Area Governments (ABAG)
  - 2010 Conducted by ABAG (Adopted June 2011)
  - 84 Current Mitigation Actions
- Current Planning Effort backed by Hazard Mitigation Grant Program (HMGP), through the California Governor's Office of Emergency Services (OES)

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MHP Process and Components
Planning Process

The planning process is predefined by federal regulations. The requirements and procedures for State, Tribal and Local Mitigation Plans are found in the Code of Federal Regulations (CFR) at:

Title 44, Chapter 1, Part 201 (44 CFR Part 201)

DMA (44 CFR 201.6)	Common Name
(1) Organize Resources	
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

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FEMA How to Components
Planning Process

Organize Resources
- Build Planning Team
- Develop Public Outreach Strategy
- Review and Incorporate Existing Plans, Studies, Reports, and other technical data/ information

Assess Risks
- Identify/Profile Hazards
- Assess Vulnerabilities

Develop Mitigation Plan
- Identify Goals
- Develop Capabilities Assessment
- Review past/current mitigation measures
- Identify new mitigation measures

Draft Plan
- Background Information
- Plan Maintenance
- Document Authority and References

Plan Review/Revision
- Review Final Draft with Planning Committee and Public

Plan Adoption/Submittal
- Prepare Crosswalk for Submittal to FEMA Region IX and Cal EMA

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Scope of Work

Planning process

- TASK 1: PROJECT MANAGEMENT
  - Maintain a critical path method schedule
  - Monthly progress reports
  - Meeting Documentation and Support
- TASK 2: PLANNING, RESOURCE ASSESSMENT & OUTREACH
  - Stakeholder Organization
  - Meeting Facilitation
  - Develop & Implement Public Outreach Strategy
  - Present at two Council Study Sessions at initial outreach and prior to OES submittal
- TASK 3: COMMUNITY CAPABILITIES & RISK ASSESSMENT
  - Community Capabilities
    - Resource Inventory
    - Infrastructure Inventory
    - NFIP Program Review
- TASK 3 CONT.:
  - Risk Assessment & Vulnerability Analysis
    - Develop Hazard Profiles
    - Repetitive Loss Structure Review
    - Hazus Level 2 Risk Assessment
    - City Parcel Based Exposure
    - Population Exposure Analysis
    - Data Visualization and Mapping
- TASK 4: DEVELOP MITIGATION ACTIONS & STRATEGY
  - Mitigation Goals and Policy Review
  - Develop Overall Implementation Strategy
  - Develop Mitigation Implementation Plans
- TASK 5: PREPARE DRAFT HAZARD MITIGATION PLAN
  - Develop Admin Draft / Planning Process Documentation
  - Socialize and Circulate Plan to Public
  - Finalize and submit update plan to Cal OES and FEMA
  - Plan Adoption Support

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Beyond Compliance!

Planning Process

- City-specific with detailed implementation guidance
- Competitive edge for Pre-Disaster and Post-Disaster Hazard Mitigation Grant Funding
- Community-driven, transparent, and collaborative planning process that is fully documented
- Legitimacy for City decision-making!
- Integrated with other City and Regional planning mechanisms
  - Open channels of interdepartmental and interagency communication
  - Capitalize on all available hazard mitigation and risk reduction implementation opportunities
- Public education and awareness
- Communicate risks to your residence

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Planning Process Highlights!

COMMUNITY CAPABILITIES & RISK ASSESSMENT

- Detailed hazard profiles specifically aimed at risk and actual vulnerability within the city.
- Repetitive loss structure review with field work to identify problem!
- Hazus level 2 risk assessment.
- City parcel based exposure analysis.
- City infrastructure exposure analysis.
- Population exposure analysis.
- Data visualization and mapping.
- NFIP program review.

DEVELOP MITIGATION ACTIONS & STRATEGY

- Mitigation goals and policy review and refresh from 2010 ABAG Plan.
- Develop Overall Implementation Strategy based upon public input, planning committee consensus and actual risk!
- Develop Mitigation Implementation Plans based upon available resources and grant opportunities.

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Primary Objectives

- Setting the expectations and define mitigation planning and actions.
- Mitigate the identified risk.
- This is not a response document!
- Create umbrella document with a set prescribed mitigation actions.
- Remain Flexible; Implementation will change over time based upon resources, grants and other leveraging.
- Develop something useful for the public and the City!

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Setting the Expectation!

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Simple Problem Solving

- Define Hazards
- Estimate the impacts
- Describe the problem
- Develop Goals and Objectives to address problem
- Assess resources to accomplish goals
- Determine what can be done with a set of prescribed mitigation actions
- Many solutions for one problem, resources and actions will determine success!

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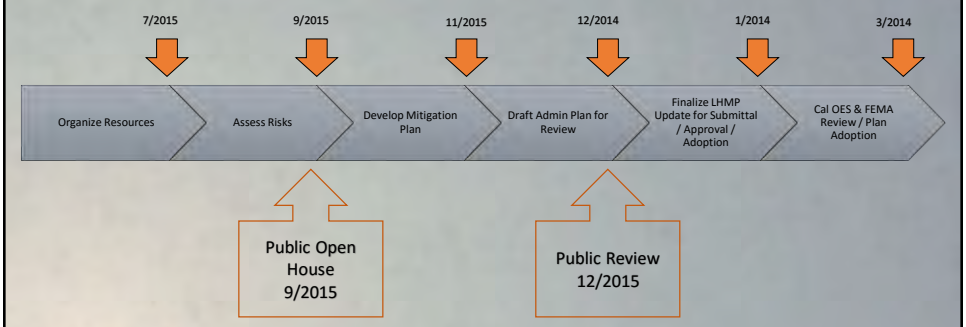
Schedule



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Today's Goals and Accomplishments

- Establish proposed LHMP Planning Committee membership
- Discuss Current and Past Mitigation Planning Documents and Projects.
  - Peabody Bridge over Alamo Creek
  - Laguna Creek Detention Basin 2010
- Gather intel on critical documents / studies/ data required for LHMP development
- Begin brainstorming City-specific enhancements for Public Outreach Strategy
- Confirm date and location for Planning Committee Kick-Off meeting tentatively scheduled for End of July 2015
- Establish City Council / Planning Commission Joint Study Session Tempo

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Next Steps (3 Week Window)

- Outreach
  - Prepare (e)mailing list and invitations for proposed LHMP Planning Committee members
  - Prepare for Planning Committee Kick-off Meeting
    - Location
    - Possible Field Trip to Hazard Mitigation Project
  - Establish / develop content for website
  - Develop Outreach Printed Material
    - Post Cards / Door Hangers / Utility Stuffer
    - 11x17 Poster Hanger

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Next Steps (3 Week Window)

- Risk Assessment
  - Develop information on local hazards based upon passed profiles and Solano County Plan
  - Develop building / Parcel inventory
  - Develop Critical Infrastructure Inventory (Linear & Points)
  - Develop hazard information in spatial Software
  - Setup Hazus Risk Modeling Software
  - Define Repetitive Loss Areas

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Back Ups

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List of Planning Committee Meetings

- 2-3 HRS in Length.
- Facilitated and Structured
- Information from meetings used to curtail and customize plan
- Required component in the update / planning process

Planning Committee Meeting #1	**Part 1:** Welcome and Introductions Project Overview LHMP Process and Components Project Timeline Questions and Answer Session **Part 2:** Resources Public Outreach Strategy Next Steps
Planning Committee Meeting #2	**Part 1:** Hazard Overview and Draft Risk Assessment Outcomes Community Asset Inventory Review **Part 2:** Review of Vulnerability Assessment Group Analysis, Risk Factor Development
Planning Committee Meeting #3	**Part 1:** Identify Draft Problem Statements Goals and Objectives Exercise (introduction) **Part 2:** Finalize Goals and Objectives Develop Capabilities
Planning Committee Meeting #4	**Part 1:** Review and Prioritize Draft Mitigation Actions **Part 2:** Develop Implementation Plans

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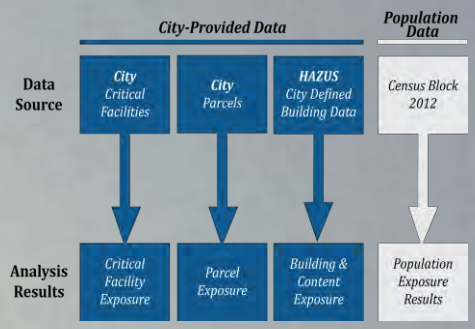
Risk Assessment

Planning Process

- Develop Population Profiles
- Develop Critical Infrastructure Inventory
- Summarize Vulnerable Assets (Life and Property)
- Estimate Losses
  - Hazus Analysis
  - GIS layering technique for other hazards
- Develop Risk Factor for Profiled Hazards



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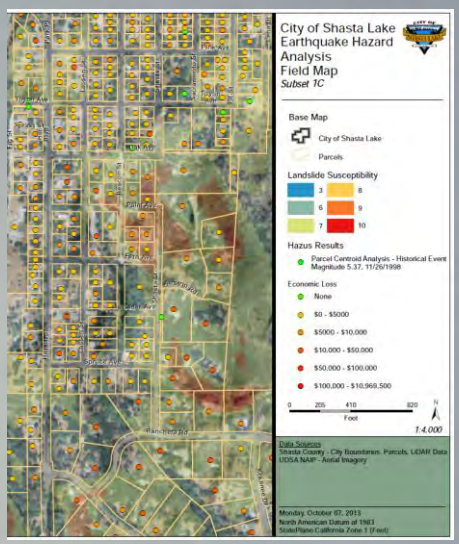
Risk Assessment

Planning Process

- Define severity zones and map.
- Develop earthquake scenario(s).
- Risk Assessment with loss estimation at the parcel level.
- Target High Loss Areas and field verify with rapid screening.
- Define the problem.



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NFIP Participation

- AS OF 04/30/2015
- Policies in Force: 1,354
- Insurance in Force: $364,999,300
  - The coverage amount for policies in force.
- Written Premium in Force: $911,342
  - The premium paid for policies in force.

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NFIP Claim Data

- From Jan 1, 1978 through 04/30/2015
- Total Losses: 97
- Closed Losses: 72
- Open Losses: 0
- CWOP Losses: 25
- Total Payments: $ 2,476,200.92

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NFIP Claims in Comparison

- Sept. 2013 Colorado Flooding Claims: 1,731
- Losses Paid: $67,875,025
- Avg. Loss: $39,211

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Water Utilities

- The City of Vacaville obtains water from three different sources.
  - Water from Lake Berryessa is transported through the Putah South Canal (PSC) to provide 28% of the City's water.
  - Sacramento Delta river water from the North Bay Aquaduct (NBA) provides an additional 35%, and
  - Groundwater from 10 deep wells makes up the remaining 37%.

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Meeting Minutes:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Internal Project Management Kick-Off Meeting

Tuesday, July 7, 2015, 10:00 a.m. – 12:00 p.m.

City of Vacaville, Public Works Building

PRESENT:

Ethan Mobley – Dynamic Planning + Science

Brian Greer- Dynamic Planning + Science

Ricardo Castillo – CalOES

Steve Hartwig

Barton Brierley

Mark Mazzaferro

Shawn Cunningham (via conference call)

Project Summary

The Local Hazard Mitigation Plan (LHMP) addresses the major natural hazards within the boundaries of the City of Vacaville. Natural disasters cause death and injuries and significant damage to our communities, businesses, public infrastructure, and environment. Impacts of these damages result in the displacement of people and tremendous costs due to response and recovery dollars, economic loss and burden. The City of Vacaville LHMP is an effort undertaken by the City Staff to mitigate the effects of natural hazards and return to "the norm" earlier with lessened impacts.

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. While natural disasters cannot be prevented from occurring, the effects of natural disasters can be reduced or eliminated through a well- organized public education and awareness effort, preparedness activities and mitigation actions.

Meeting Summary:

This meeting was the formal kick-off with City Staff to develop the 2016 LHMP for the City of Vacaville. The meeting was convened to inform key City Staff of Planning process and organize resources for future plan development activities. It was facilitated by Shawn Cunningham, City of Vacaville Public Works, and Ethan Mobley, a hazard mitigation consultant, from Dynamic Planning + Science. Mr. Cunningham opened the meeting and introduced the background and history of the project to date. Participants introduced themselves and their agency/position.

Mr. Mobley led discussions on definitions of hazard mitigation, the HMP process and components, and project timelines. Mr. Mobley discussed planning resources and the public outreach process and HMP advertisement opportunities with City Staff.

The group discussed likely Planning Committee make up.

Planning Committee Dept. / Members	E-Mail
City Public Works	
Steve Hartwig	Steve.Hartwig@cityofvacaville.com
Shawn Cunningham	Shawn.Cunningham@cityofvacaville.com
Tim Burke (NFIP)	
Pat Kinney (Maintenance)	
City Planning	
Barton Brierley	Barton.Brierley@cityofvacaville.com
Jay Salazar (Building Official)	
City Fire	
Ron Karlen	Ron.Karlen@cityofvacaville.com
Matt Lage	Matthew.Lage@cityofvacaville.com
Jill Childers (potentially)	
City Utilities	
Steve Sawyer	
Jeff Cooley (potentially)	
City Administration	
Mark Mazzaferro (PIO/CM)	Mark.Mazzaferro@cityofvacaville.com
Curt Corbett (GIS)	
Partner Agencies	
Solano County Water Agency (SCWA)	David Oketa's Replacement
Solano County Resource Management (Bill Emlin, DPW?)	
Solano Irrigation District (potentially)	
Cal OES	
Ricardo Castillo	Ricardo.Castillo@CalOES.ca.gov,
Victoria LaMar-Haas	Victoria.LaMar-Haas@CalOES.ca.gov

The group discussed likely Stakeholders:

- Solano Irrigation District (if not on Planning Committee)
- Vacaville Chamber of Commerce
- Vacaville and Travis Unified School Districts
- Solano County Office of Emergency Services
- Local News – Reporter, Daily Republic, KUIC
- Faith Based and Service Organizations
- Solano County Land Trust
- Citizens

The Planning Committee will be the core group leading the LHMP effort and will meet at least via conference call regularly (exact recurrence not decided upon). The Stakeholder group will be critical to the success of the process and quality of the HMP. This group will be convened to provide input at major milestones through workshops, and will be given drafts for review and comment.

Future Meeting Dates:

The following dates were decided upon:

August 20, 2015 @ 10:00 a.m. ~ 12:00 p.m. – First Planning Committee meeting

September 17, 2015 @ 10:00 a.m. – 12:00 p.m. –Second Planning Committee Meeting

September 17, 2015 @ 3:00 p.m. ~ 7:00 p.m. –Stakeholder / Community Drop In Open House

Action Items:

- Develop / Finalize Outreach Information for Planning Committee Invite
- Finalize Planning Committee List
- Follow up with Curt Corbett to obtain GIS Files
- Obtain new County Assessor's Data
- Coordinate development of Website for Project information and events
- Develop printed media for outreach efforts (Poster / Flyers)
- Reach out to Ace Hardware for possible partnership
- Reach out to local agencies for future open house event
- Coordinate Thumb Drives for next meeting / material updates
- Coordinate Field Trip for Planning Committee Meeting #2

City of Vacaville, Public Information Office

@markmazzaferro

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Create a Page

City of Vacaville, Public Information Office
August 20, 2015 ·

Mark your calendars! Sept. 17, 2015 the City will be hosting a Local Hazard Mitigation Plan Open House! Residents will learn how to protect your home and family from a natural disaster. There will be pizza, prizes and more! http://bit.ly/1UVU06Y

> City of Vacaville, CA : Event Calendar (All In One) : Hazard Mitigation Open House
>
> Attend a free open house event on natural disasters threats in our area! Learn what you can do to protect your home and family from the effects of wildfire, flooding, earthquake and other natural hazards.
>
> CITYOFVACAVILLE.COM

Like | Comment | Share

Kristina Bell, Rubicon Csmr and 2 others

hazard mitigation plan

Meeting Agenda:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Planning Committee Meeting #1

Thursday, August 20, 2015, 10:00 a.m. – 12:00 p.m.

City of Vacaville, Public Works Building

- Part I (50 MINS)
  - Welcome and Introductions
  - Mitigation Planning Defined
  - Background
  - Local Hazard Mitigation Planning Process
  - Overall Objectives
  - Project Schedule
- Break 10 MINS
- Part II (60 MINS)
  - Hazard Identification and Risk Assessment (HIRA) process
  - Local Hazard Initial Review
  - Critical Infrastructure / Essential Facility Review
  - Hazus Earthquake Scenario Development
  - Next Steps
  - Wrap UP

2015-16 Local Hazard Mitigation Plan Update

City of Vacaville

Planning Committee Meeting #1

August 20th, 2015

CITY OF VACAVILLE LHMP

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Agenda

- Part I
  - Welcome and Introductions
  - Mitigation Planning Defined
  - Background
  - Local Hazard Mitigation Planning Process
  - Overall Objectives
  - Project Schedule
- Part II
  - Hazard Identification and Risk Assessment (HIRA) process
  - Local Hazard Initial Review
  - Critical Infrastructure / Essential Facility Review
  - Hazus Earthquake Scenario Development
  - Next Steps

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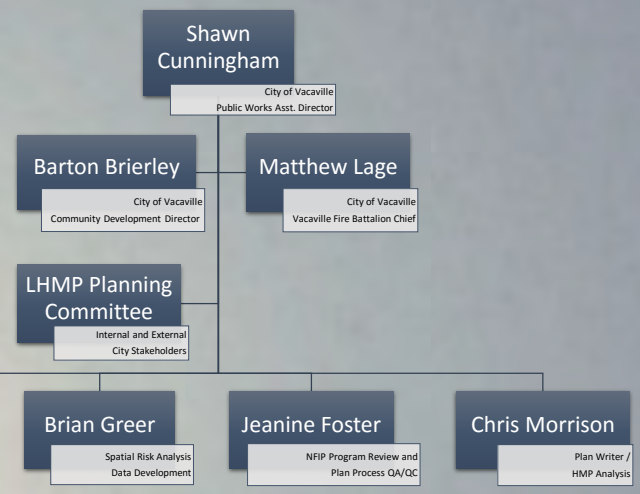
Team Org Chart



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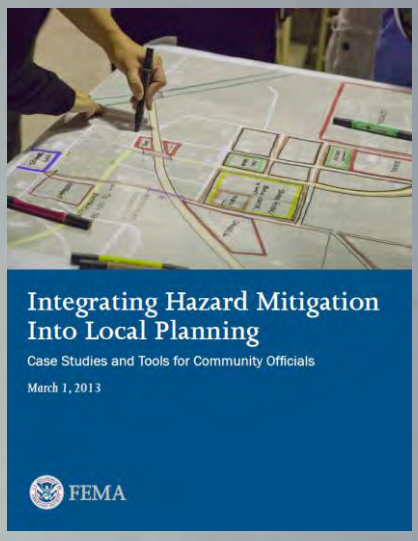
The know how!

- National and Regional Hazard mitigation know how!
- Our team members have managed and authored:
  - Local mitigation planning process updates
  - State mitigation planning process updates
  - Assisted with FEMA's "Integrating Hazard Mitigation Into Local Planning"
  - Solano **County's 2010 Multi-**Hazard Mitigation Plan Update



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PART I

- Mitigation Planning Defined
- Background
- Local Hazard Mitigation Planning Process
- Overall Objectives
- Project Schedule

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Hazard Mitigation Defined

- What is Hazard Mitigation?
  - Hazard mitigation is sustained action taken to reduce or eliminate long-term risk to life and property resulting from natural hazards. What is a Mitigation Plan?
  - Recognition of potential hazards and actions to curb possible effects
  - Includes Hazard Identification and Risk Assessment (HIRA)
  - Solidifies Mitigation Strategy
  - Provides Planning Process Documentation for State and Feds
- Why have a Mitigation Plan?
  - Results in saved lives, reduced injuries, reduced property damages, and protection for the environment
  - Ensures staff and public consensus toward common goal
  - Focuses efforts and limited resources
  - Must have "approved plan" for Hazard Mitigation Program Grant access.
  - Augment local capital improvement funding!
  - California is disaster prone!

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Background

- Disaster Mitigation Act (DMA) 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance.
- FEMA requires an update every 5 years!
- City of Vacaville's "Third" hazard mitigation plan update.
  - 2005 Conducted by Association of Bay Area Governments (ABAG)
  - 2010 Conducted by ABAG (Adopted June 2011)
  - 84 Current Mitigation Actions
- Current Planning Effort backed by Hazard Mitigation Grant Program (HMGP), through the California Governor's Office of Emergency Services (OES)

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MHP Process and Components
Planning Process

The planning process is predefined by federal regulations. The requirements and procedures for State, Tribal and Local Mitigation Plans are found in the Code of Federal Regulations (CFR) at:

Title 44, Chapter 1, Part 201 (44 CFR Part 201)

DMA (44 CFR 201.6)	Common Name
(1) Organize Resources	
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

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FEMA How to Components
Planning Process

Organize Resources
- Build Planning Team
- Develop Public Outreach Strategy
- Review and Incorporate Existing Plans, Studies, Reports, and other technical data/ information

Assess Risks
- Identify/Profile Hazards
- Assess Vulnerabilities

Develop Mitigation Plan
- Identify Goals
- Develop Capabilities Assessment
- Review past/current mitigation measures
- Identify new mitigation measures

Draft Plan
- Background Information
- Plan Maintenance
- Document Authority and References

Plan Review/Revision
- Review Final Draft with Planning Committee and Public

Plan Adoption/Submittal
- Prepare Crosswalk for Submittal to FEMA Region IX and Cal EMA

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Scope of Work
Planning process

- TASK 1: PROJECT MANAGEMENT
  - Maintain a critical path method schedule
  - Monthly progress reports
  - Meeting Documentation and Support
- TASK 2: PLANNING, RESOURCE ASSESSMENT & OUTREACH
  - Stakeholder Organization
  - Meeting Facilitation
  - Develop & Implement Public Outreach Strategy
  - Present at two Council Study Sessions at initial outreach and prior to OES submittal
- TASK 3: COMMUNITY CAPABILITIES & RISK ASSESSMENT
  - Community Capabilities
    - Resource Inventory
    - Infrastructure Inventory
    - NFIP Program Review
- TASK 3 CONT.:
  - Risk Assessment & Vulnerability Analysis
    - Develop Hazard Profiles
    - Repetitive Loss Structure Review
    - Hazus Level 2 Risk Assessment
    - City Parcel Based Exposure
    - Population Exposure Analysis
    - Data Visualization and Mapping
- TASK 4: DEVELOP MITIGATION ACTIONS & STRATEGY
  - Mitigation Goals and Policy Review
  - Develop Overall Implementation Strategy
  - Develop Mitigation Implementation Plans
- TASK 5: PREPARE DRAFT HAZARD MITIGATION PLAN
  - Develop Admin Draft / Planning Process Documentation
  - Socialize and Circulate Plan to Public
  - Finalize and submit update plan to Cal OES and FEMA
  - Plan Adoption Support

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Beyond Compliance!

Planning Process

- Detailed implementation guidance
- Competitive edge for Pre-Disaster and Post-Disaster Hazard Mitigation Grant Funding
- Community-driven, transparent, and collaborative planning process that is fully documented
- Legitimacy for City decision-making!
- Integrated with other City and Regional planning mechanisms
- Public education and awareness tools (5 year period)
- Communicate risks to your residence

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Planning Process Highlights!

COMMUNITY CAPABILITIES & RISK ASSESSMENT

- Detailed hazard profiles specifically aimed at risk and actual vulnerability within the city.
- NFIP program review.
- Repetitive loss structure review with field work to identify problem!
- Hazus level 2 risk assessment.
- City parcel based exposure analysis.
- City critical facility exposure analysis.
- Population exposure analysis.

MITIGATION ACTIONS & STRATEGY

- Completely revamped from 2010 Plan.
- Implementation Strategy based upon public input, planning committee consensus and actual risk!
- Develop Mitigation Implementation Plans based upon available resources and grant opportunities.

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Primary Objectives

- Setting the expectations and define mitigation planning and actions.
- Mitigate the identified risk.
- This is not a response document!
- Create umbrella document with a set prescribed mitigation actions.
- Remain Flexible; Implementation will change over time based upon resources, grants and other leveraging.
- Develop something useful for the public and the City!

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Setting the Expectation!

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List of Planning Committee Meetings

- 2-3 HRS in Length.
- Facilitated and Structured
- Information from meetings used to curtail and customize plan
- Required component in the update / planning process

Planning Committee Meeting #1	**Part 1:** Welcome and Introductions Project Overview LHMP Process and Components Project Timeline Questions and Answer Session **Part 2:** Resources Public Outreach Strategy Next Steps
Planning Committee Meeting #2	**Part 1:** Hazard Overview and Draft Risk Assessment Outcomes Community Asset Inventory Review **Part 2:** Review of Vulnerability Assessment Group Analysis, Risk Factor Development
Planning Committee Meeting #3	**Part 1:** Identify Draft Problem Statements Goals and Objectives Exercise (introduction) **Part 2:** Finalize Goals and Objectives Develop Capabilities
Planning Committee Meeting #4	**Part 1:** Review and Prioritize Draft Mitigation Actions **Part 2:** Develop Implementation Plans

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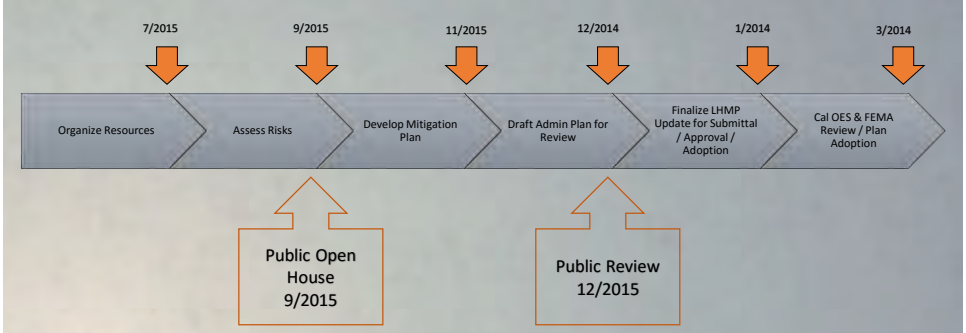
Schedule



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Next Steps (4 Week Window)

- Outreach
  - Final Prep for Public Open House
    - Hazard Stations
    - Confirm Piggy Back Stations
  - Prepare for Planning Committee Meeting #2
    - Possible Field Trip to Hazard Mitigation Project
  - Finalize and post content for website
  - Finalize Outreach Printed Material
    - Post Cards / Door Hangers / Utility Stuffer
    - 11x17 Poster Hanger

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Next Steps (4 Week Window)

- Risk Assessment
  - Finalize information on local hazards based upon passed profiles and Solano County Plan
  - Develop building / Parcel inventory
  - Finalize Critical Infrastructure Inventory
  - Run Hazus Risk Modeling
  - Define Repetitive Loss Areas

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PART II

- Hazard Identification and Risk Assessment (HIRA) process
- Local Hazard Initial Review
- Critical Infrastructure / Essential Facility Review
- Hazus Earthquake Scenario Development
- Next Steps

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Today's Goals and Accomplishments

- Validate Critical Facilities / Essential Facilities
- Choose Earthquake Modeling Scenario
- Gather intel on data required for HIRA

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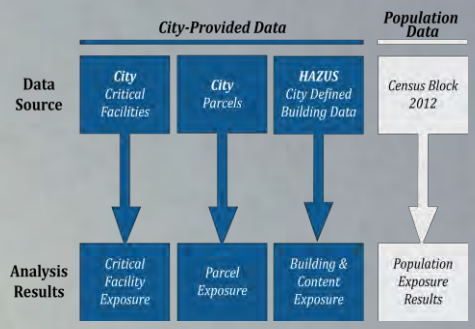
Risk Assessment

Planning Process

- Develop Population Profiles
- Develop Critical Infrastructure Inventory
- Summarize Vulnerable Assets (Life and Property)
- Estimate Losses
  - Hazus Analysis
  - GIS layering technique for other hazards
- Develop Risk Factor for Profiled Hazards



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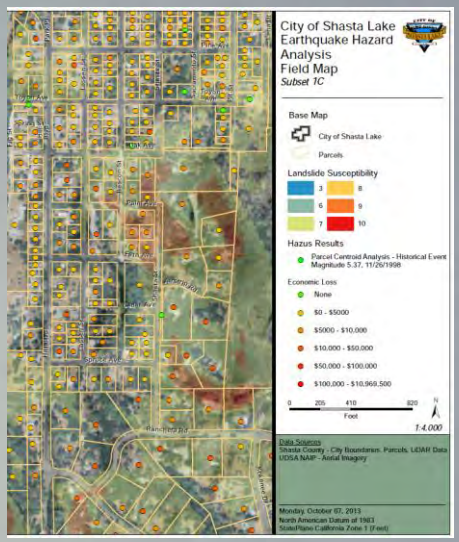
Risk Assessment

Planning Process

- Define severity zones and map.
- Develop earthquake scenario(s).
- Risk Assessment with loss estimation at the parcel level.
- Target High Loss Areas and field verify with rapid screening.
- Define the problem.



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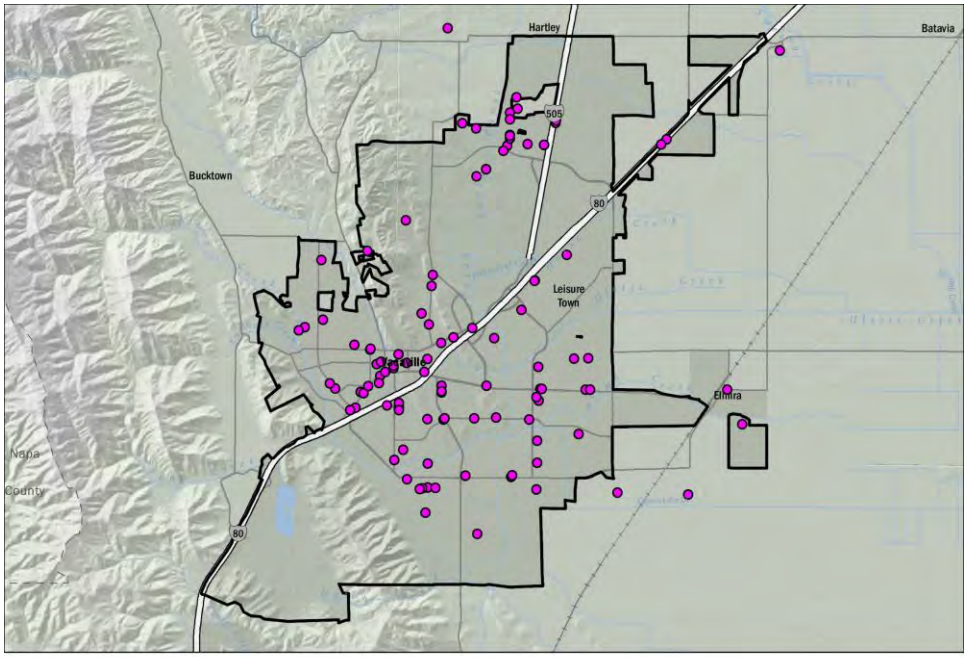
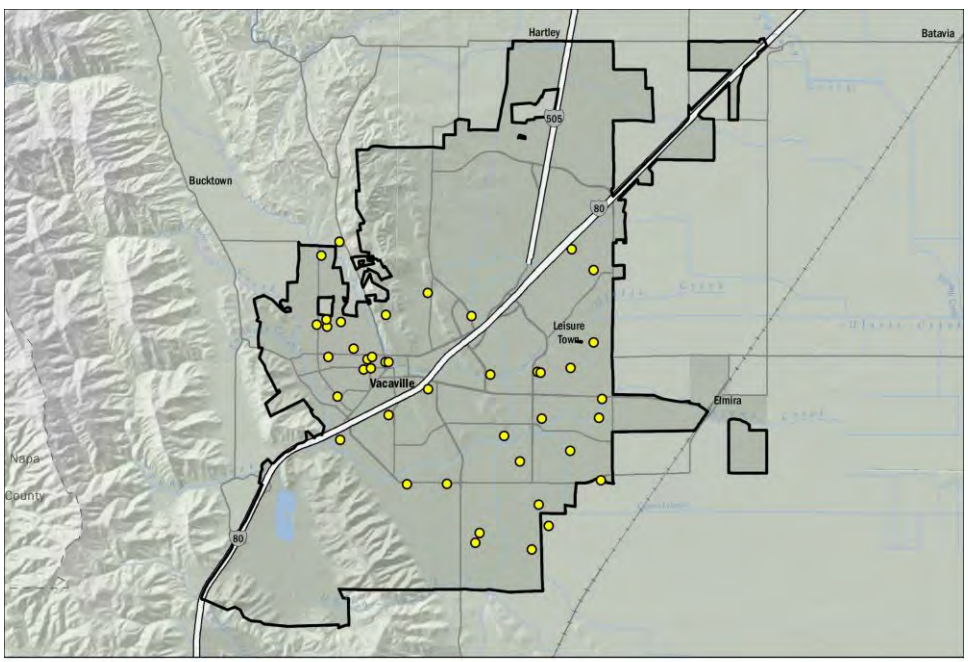


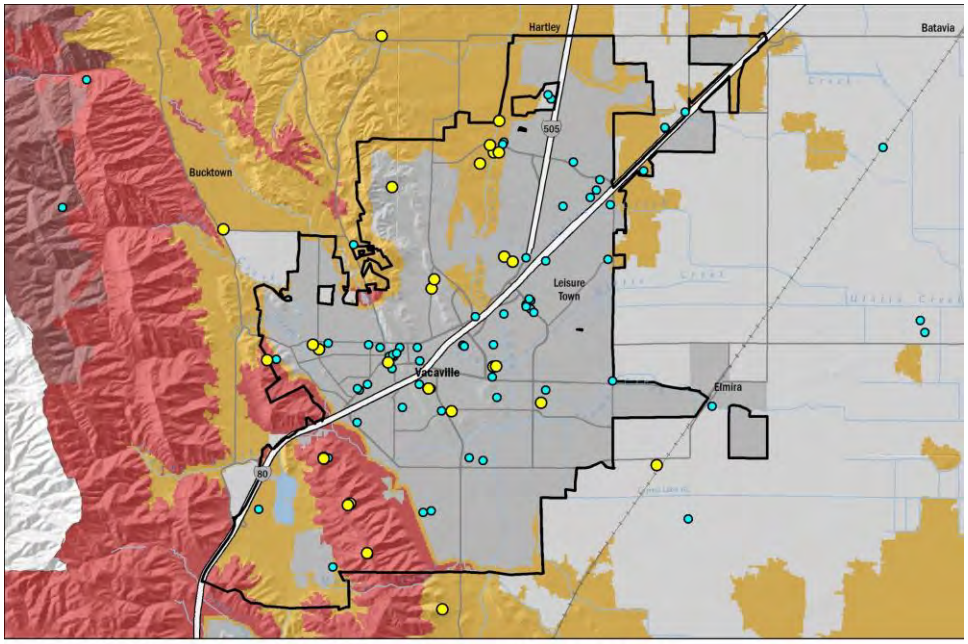
FACILITIES/INFRASTRUCTURE

● Critical Facilities



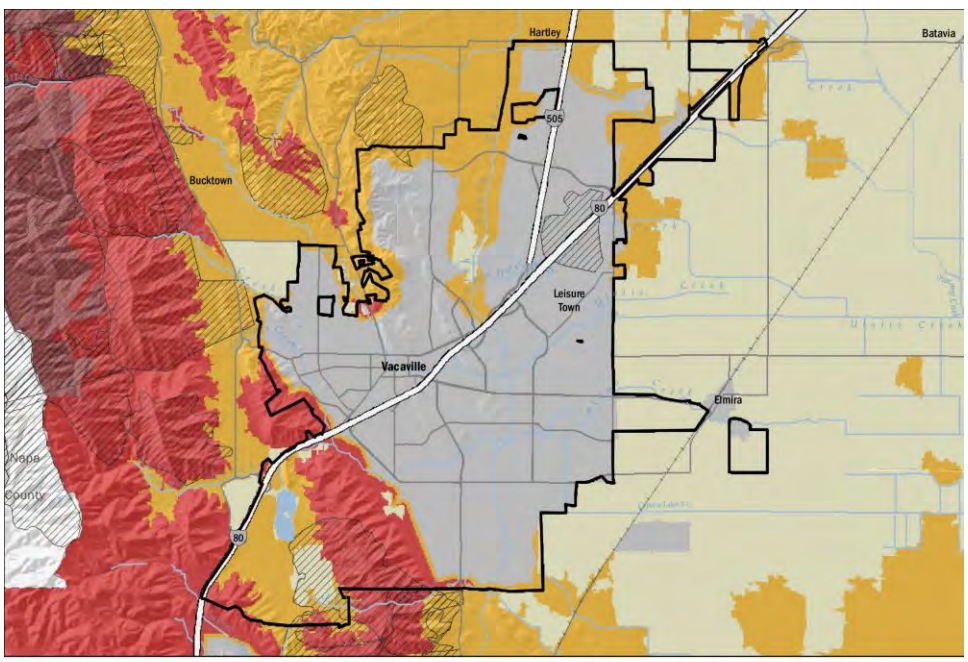
FACILITIES/INFRASTRUCTURE

○ Gathering Facilities



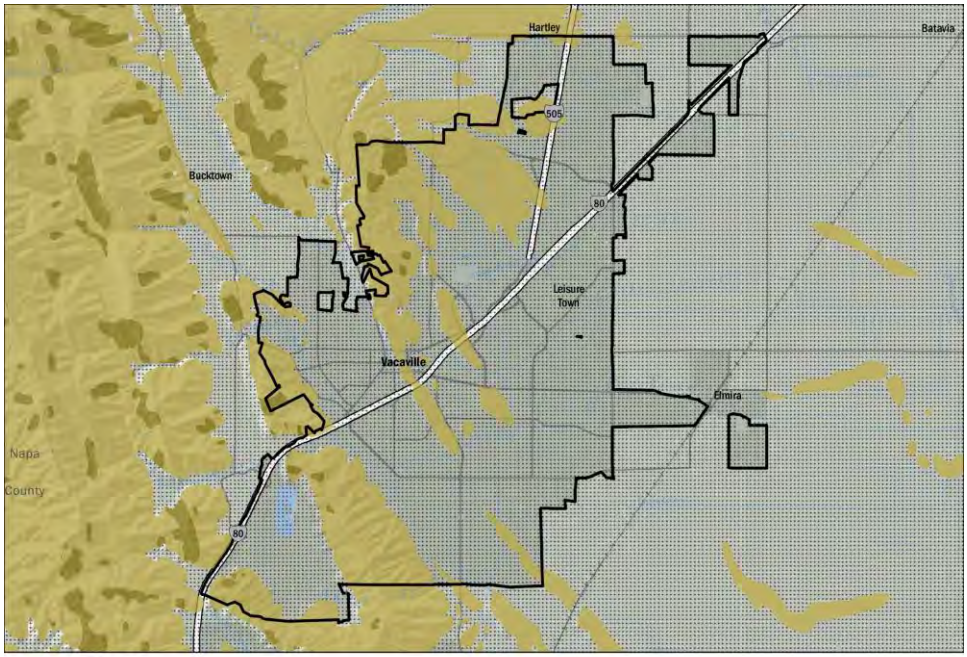
COMM POINTS + FIRE SEVERITY

Antenna Structure Registration | Permitted Tranmission Points | Very High | High | Moderate



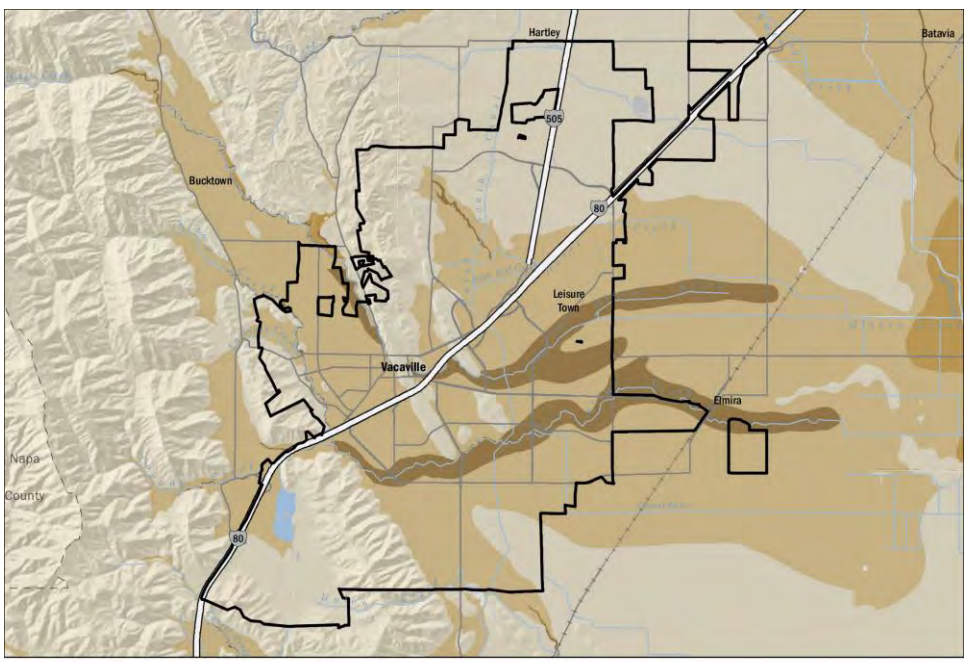
FIRE SEVERITY | FIRE PERIMETERS

Historic Fires | Very High | High | Moderate | Non-Wildland/Non-Urban | Urban Unzoned



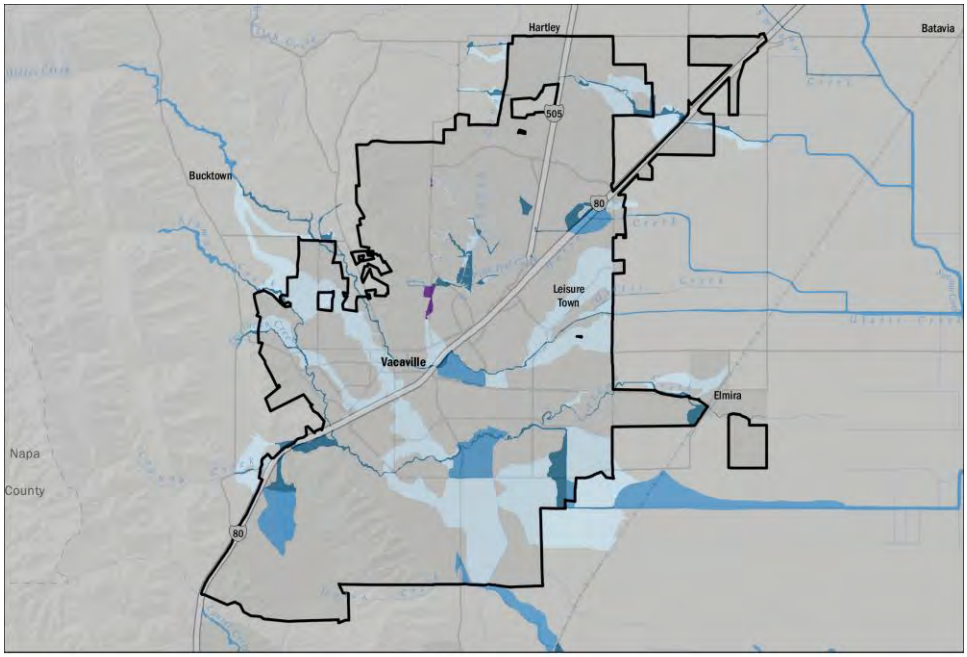
LANDSLIDE SUSCEPTIBILITY

mostly landslide | few landslides | surficial deposits



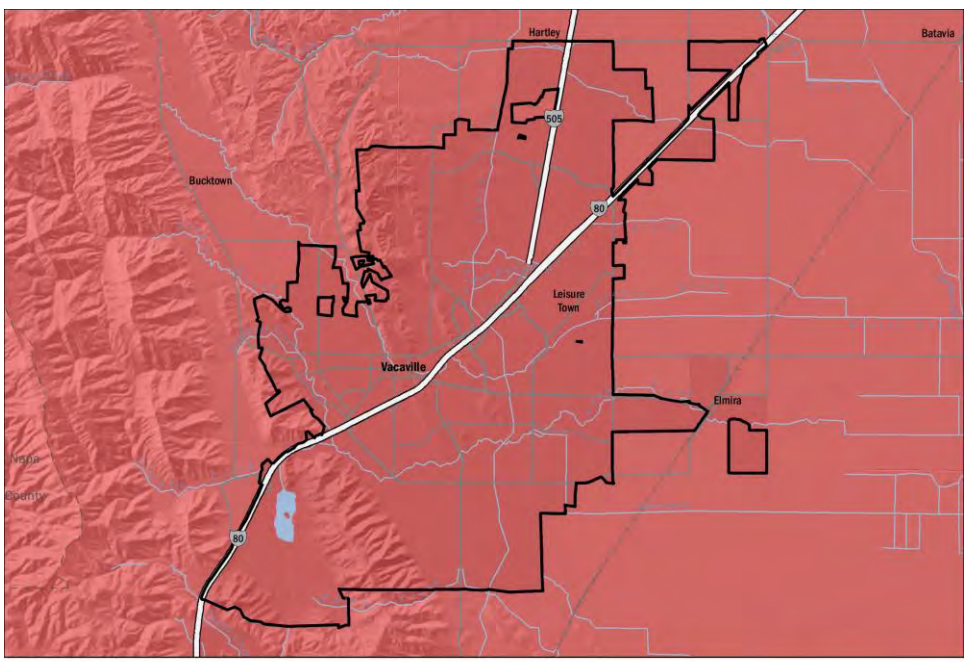
LIQUEFACTION SUSCEPTIBILITY

Very High | High | Moderate | Low | Very Low



FEMA FLOOD ZONES

A | AE | AO | X500 | X



DROUGHT INTENSITY

Extreme Drought

EXERCISE

Hazard Prioritization

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EXERCISE

EQ SCENARIOS DEVELOPMENT

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The following is an abbreviated description of the levels of Modified Mercalli intensity.

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

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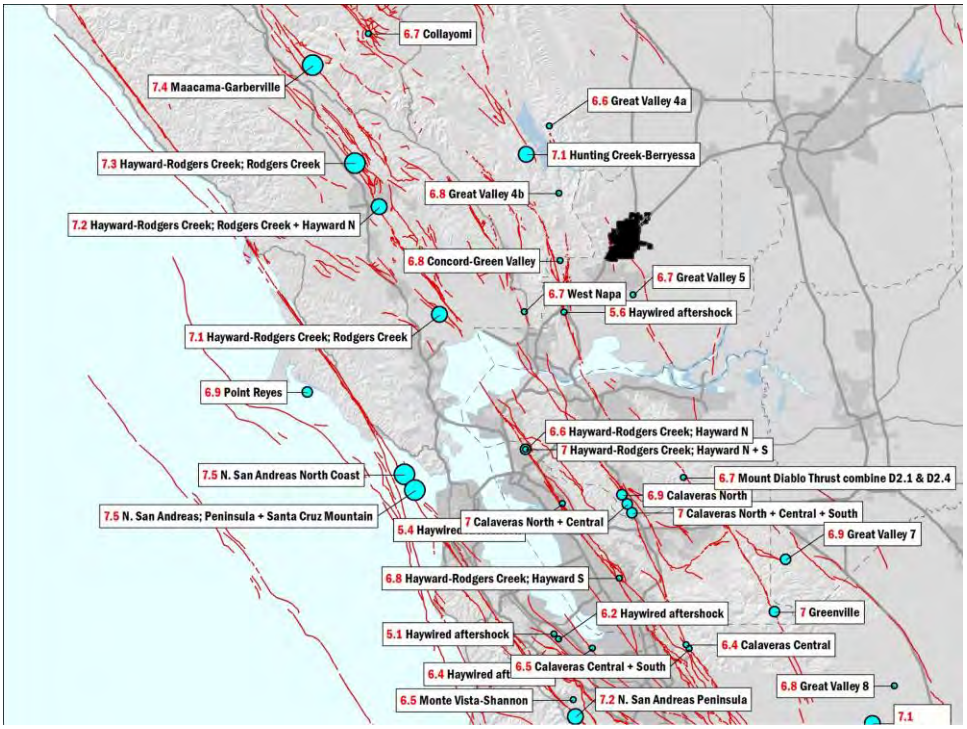
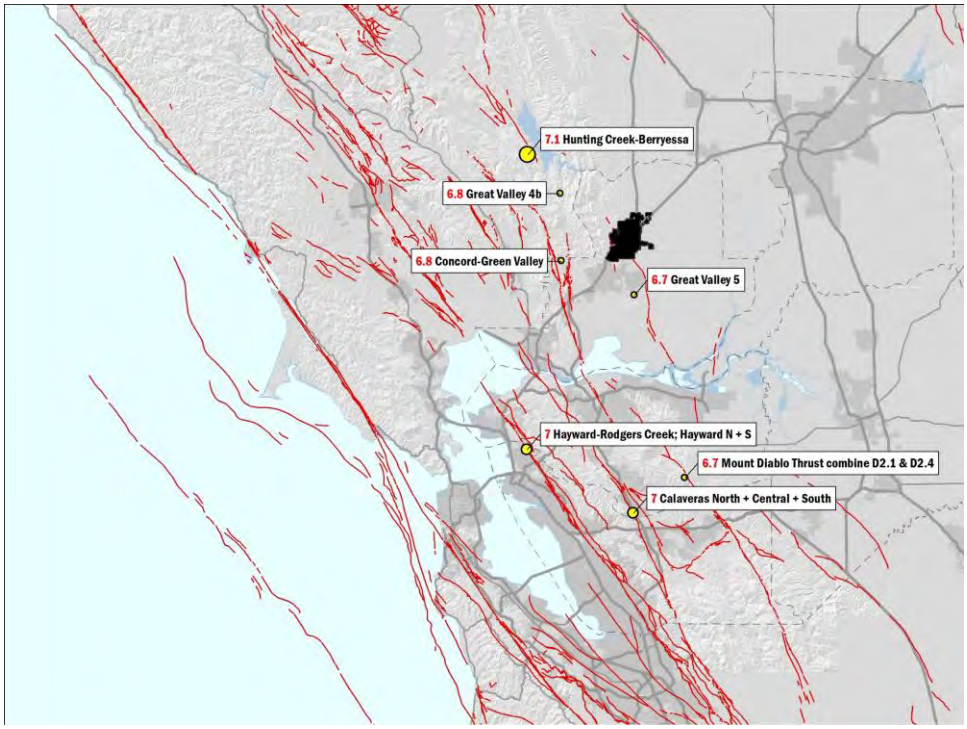
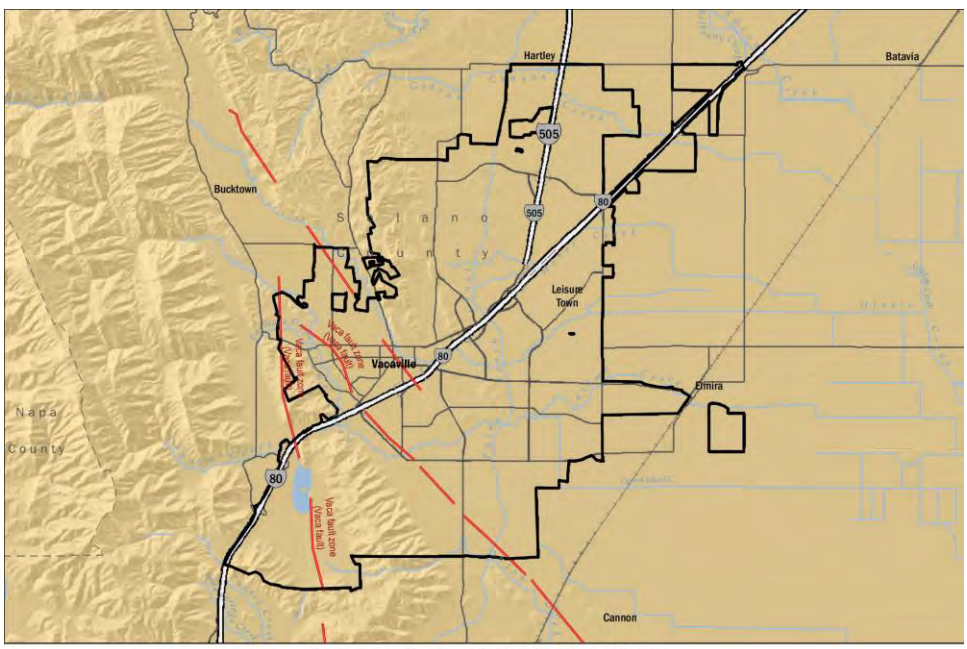


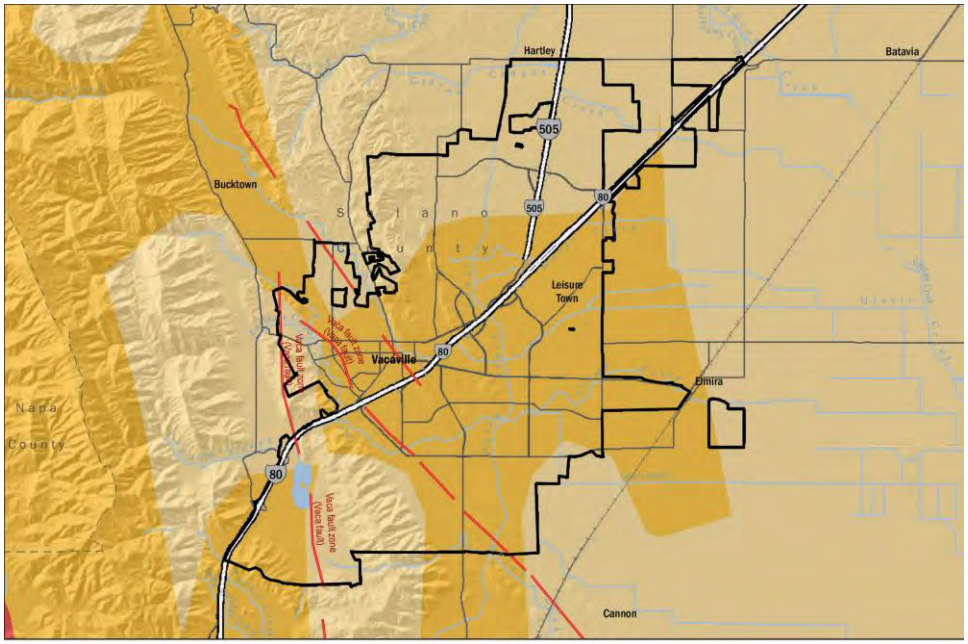




Scenario: Calaveras North + Central + South

PROJECTED GROUND SHAKING

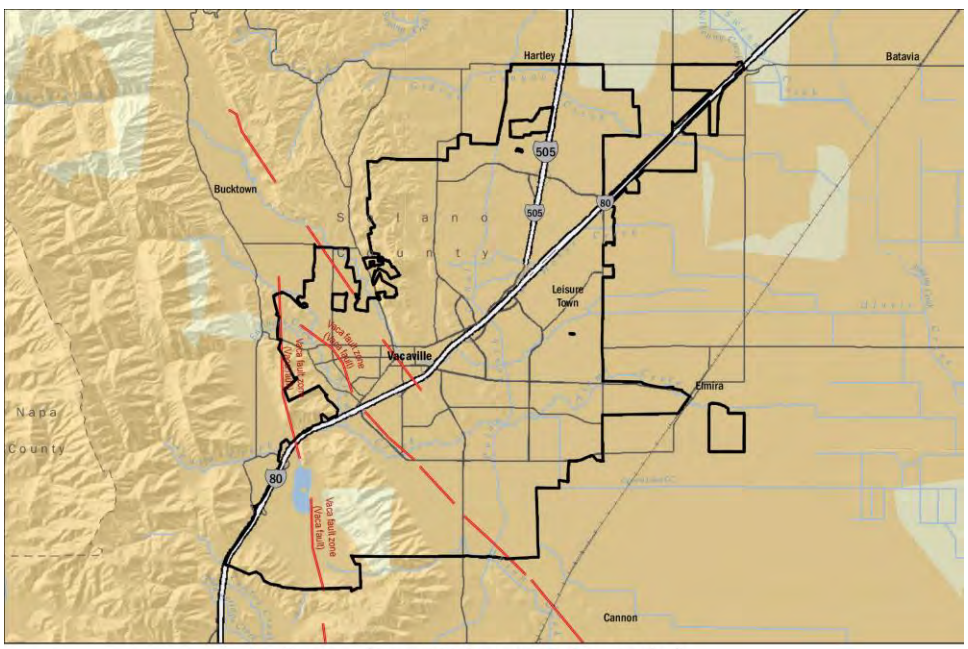
MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Concord-Green Valley

PROJECTED GROUND SHAKING

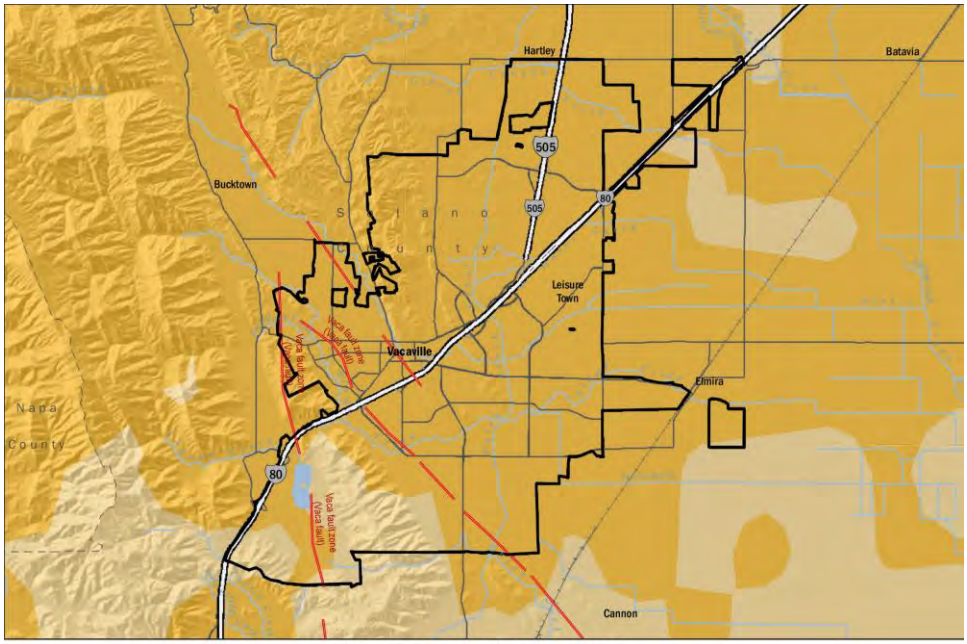
MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Hayward-Rodgers Creek; Hayward N + S

PROJECTED GROUND SHAKING

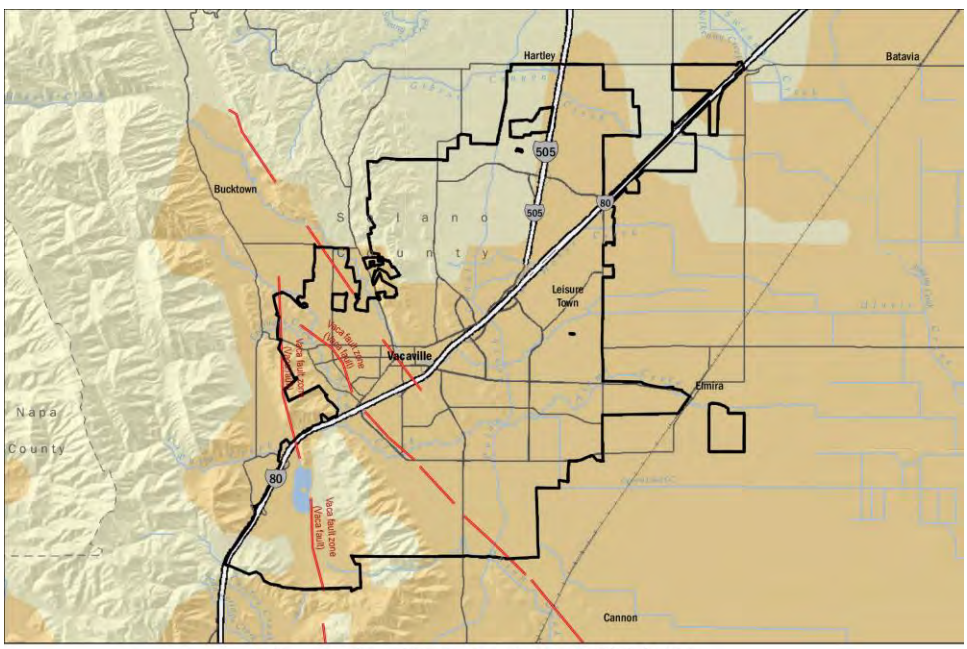
MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Hunting Creek-Berryessa

PROJECTED GROUND SHAKING

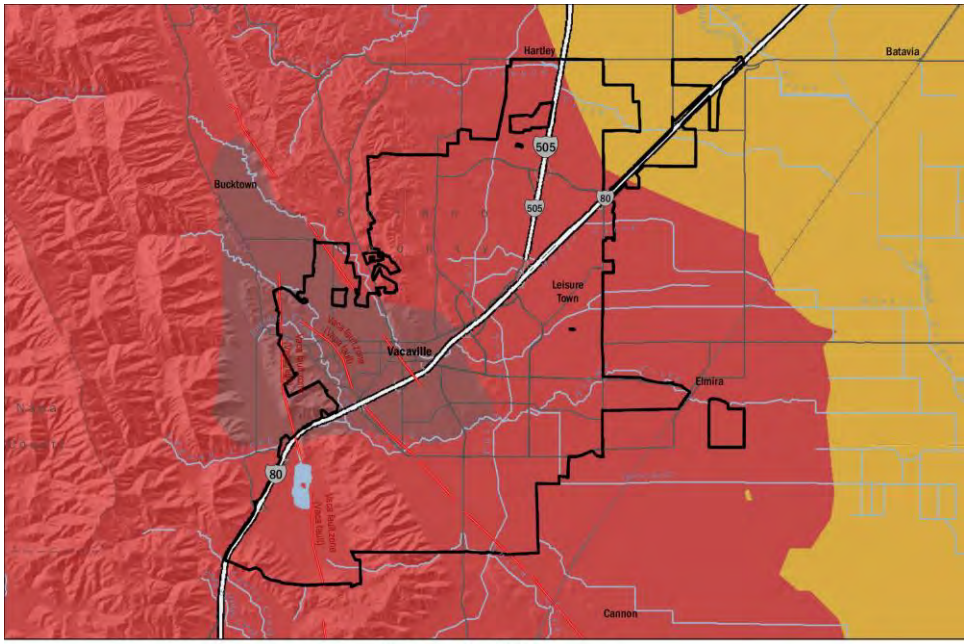
MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Mount Diablo Thrust combine D2.1 & D2.4

PROJECTED GROUND SHAKING

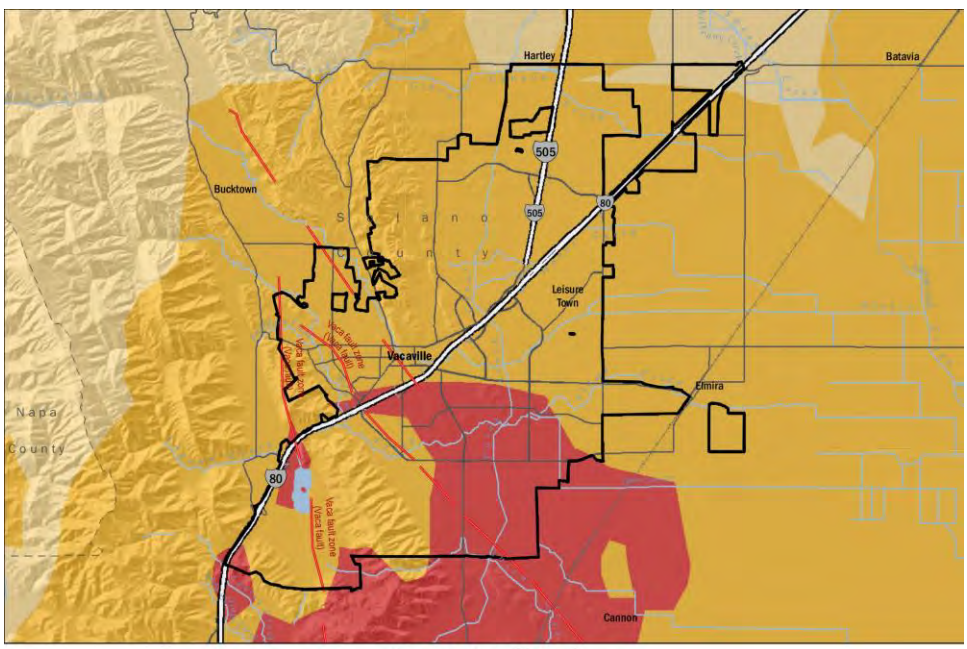
MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Great Valley 4b

PROJECTED GROUND SHAKING

MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Great Valley 5

PROJECTED GROUND SHAKING

MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent

Meeting Minutes:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Internal Project Management Kick-Off Meeting

Tuesday, July 7, 2015, 10:00 a.m. – 12:00 p.m.

City of Vacaville, Public Works Building

PRESENT:

Ethan Mobley – Dynamic Planning + Science

Brian Greer- Dynamic Planning + Science

Ricardo Castillo – CalOES

Steve Hartwig

Barton Brierley

Mark Mazzaferro

Shawn Cunningham (via conference call)

Project Summary

The Local Hazard Mitigation Plan (LHMP) addresses the major natural hazards within the boundaries of the City of Vacaville. Natural disasters cause death and injuries and significant damage to our communities, businesses, public infrastructure, and environment. Impacts of these damages result in the displacement of people and tremendous costs due to response and recovery dollars, economic loss and burden. The City of Vacaville LHMP is an effort undertaken by the City Staff to mitigate the effects of natural hazards and return to "the norm" earlier with lessened impacts.

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. While natural disasters cannot be prevented from occurring, the effects of natural disasters can be reduced or eliminated through a well organized public education and awareness effort, preparedness activities and mitigation actions.

Meeting Summary:

This meeting was the formal kick-off with City Staff to develop the 2016 LHMP for the City of Vacaville. The meeting was convened to inform key City Staff of Planning process and organize resources for future plan development activities. It was facilitated by Shawn Cunningham, City of Vacaville Public Works, and Ethan Mobley, a hazard mitigation consultant, from Dynamic Planning + Science. Mr. Cunningham opened the meeting and introduced the background and history of the project to date. Participants introduced themselves and their agency/position.

Mr. Mobley led discussions on definitions of hazard mitigation, the HMP process and components, and project timelines. Mr. Mobley discussed planning resources and the public outreach process and HMP advertisement opportunities with City Staff.

The group discussed likely Planning Committee make up.

Planning Committee Dept. / Members	E-Mail
City Public Works	
Steve Hartwig	Steve.Hartwig@cityofvacaville.com
Shawn Cunningham	Shawn.Cunningham@cityofvacaville.com
Tim Burke (NFIP)	
Pat Kinney (Maintenance)	
City Planning	
Barton Brierley	Barton.Brierley@cityofvacaville.com
Jay Salazar (Building Official)	
City Fire	
Ron Karlen	Ron.Karlen@cityofvacaville.com
Matt Lage	Matthew.Lage@cityofvacaville.com
Jill Childers (potentially)	
City Utilities	
Steve Sawyer	
Jeff Cooley (potentially)	
City Administration	
Mark Mazzaferro (PIO/CM)	Mark.Mazzaferro@cityofvacaville.com
Curt Corbett (GIS)	
Partner Agencies	
Solano County Water Agency (SCWA)	David Oketa's Replacement
Solano County Resource Management (Bill Emlin, DPW?)	
Solano Irrigation District (potentially)	
Cal OES	
Ricardo Castillo	Ricardo.Castillo@CalOES.ca.gov,
Victoria LaMar-Haas	Victoria.LaMar-Haas@CalOES.ca.gov

The group discussed likely Stakeholders:

- Solano Irrigation District (if not on Planning Committee)
- Vacaville Chamber of Commerce
- Vacaville and Travis Unified School Districts
- Solano County Office of Emergency Services
- Local News – Reporter, Daily Republic, KUIC
- Faith Based and Service Organizations
- Solano County Land Trust
- Citizens

The Planning Committee will be the core group leading the LHMP effort and will meet at least via conference call regularly (exact recurrence not decided upon). The Stakeholder group will be critical to the success of the process and quality of the HMP. This group will be convened to provide input at major milestones through workshops, and will be given drafts for review and comment.

Future Meeting Dates:

The following dates were decided upon:

August 20, 2015 @ 10:00 ~ 12:00 – First Planning Committee meeting

September 17, 2015 @ 3:00 ~ 7:00 – First Stakeholder/Community Outreach Workshop

Action Items:

- Develop / Finalize Outreach Information for Planning Committee Invite
- Finalize Planning Committee List
- Follow up with Curt Corbett to obtain GIS Files
- Obtain new County Assessor's Data
- Coordinate development of Website for Project information and events
- Develop printed media for outreach efforts (Poster / Flyers)
- Reach out to Ace Hardware for possible partnership
- Reach out to local agencies for future open house event
- Coordinate Thumb Drives for next meeting / material updates
- Coordinate Field Trip for Planning Committee Meeting #2

CITY OF VACAVILLE

SINGLE JURISDICTION LOCAL HAZARD MITIGATION PLAN

HAZARD RANKING

Rank these hazards by placing your 10 dots on specific hazards. You may place up to 2 dots per hazard.

EARTHQUAKE

LIQUEFACTION

DAM FAILURE ?

~~DELTA LEVEE FAILURE~~

~~DROUGHT~~

~~EROSION~~

FLOODING

LANDSLIDES

~~SEA LEVEL RISE/CLIMATE CHANGE~~

WILDFIRE

EXTREME HEAT

~~FREEZE~~

~~SEVERE WEATHER AND STORMS~~

OTHER

OTHER

SIGN-IN

Planning Committee Meeting #2

Thursday, October 1, 2015
9:00 a.m. - 11:00 a.m.

650 Merchant Street
Vacaville, CA 95688
www.vacavillehazards.com

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TIM BURKE	tim.burke@ " "
STEVE HARTWIG	steve.hartwig@ " "
Jay Salazar	Jay.Salazar@cityofvacaville.com.
PATRICK KINNEY	PATRICK.KINNEY@ " "
Ron Karkn	ron.Karkn@ " " "

2015-16 Local Hazard Mitigation Plan Update

City of Vacaville

Planning Committee Meeting #2

Oct 1st, 2015

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Agenda

- Part 1:
  - Draft Risk Assessment Outcomes
- Part 2:
  - Risk Factor Development
  - Problem Statements Exercise

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FEMA How to Components
Planning Process

Organize Resources
- Build Planning Team
- Develop Public Outreach Strategy
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Draft Plan
- Background Information
- Plan Maintenance
- Document Authority and References

Plan Review/Revision
- Review Final Draft with Planning Committee and Public

Plan Adoption/Submittal
- Prepare Crosswalk for Submittal to FEMA Region IX and Cal EMA

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Next Steps (4 Week Window)

- Finalize Risk Assessment
- Finalize Hazard Profiles
- Review Mitigation Actions from 2010
- Finalize NFIP Program Review

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Today's Goals and Accomplishments

- Validate Critical / Essential Facilities Exposure
- Develop Risk Factors for each profiled hazards
- Develop Problem Statements for each hazard

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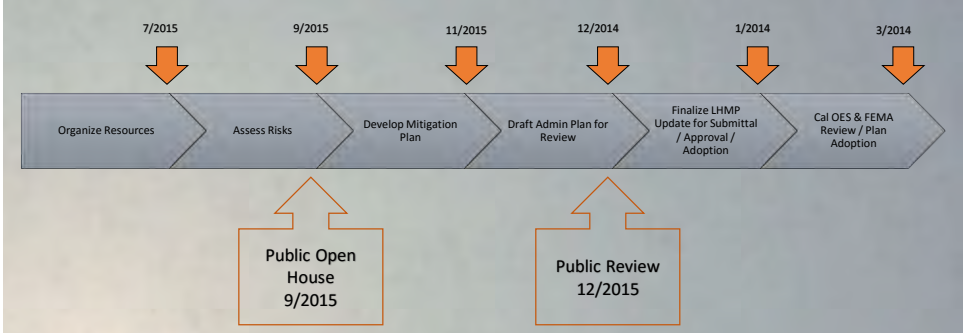
Schedule



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PART I

- Draft Risk Assessment Outcomes

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Risk Assessment Historical Occurrences

Federal natural disasters:

- ***17 natural disasters declared in Solano County, greater than the US average of 12 per county.***
- ***Major Disasters (Presidential) Declared: 14***
- ***Emergencies Declared: 2***
- ***Fire Management Assistance: 1***
- ***17 State Declarations from 1950 to 2015***

(Note: Some incidents may have not effected the City of Vacaville but had impacts in the County).

Fed Disasters by Type

Flood	11
Storms	7
Landslides	3
Winter Storms	3
Fire	2
Mudslides	2
Drought	1
Freeze	1
Heavy Rain	1
Hurricane (Katrina)	1
Tornado	1
Total	**33**

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Potential Hazards

Hazards	City of Vacaville General Plan	ABAG 2010 MHMP	City of Vacaville Annex to ABAG 2010 MHMP	2013 CA State HMP	Preliminary Hazards to address in MHMP Update
Earth Movements					
Earthquake/Seismic Shaking	■	■	■	■	■
Faulting				■	■
Liquefaction	■	■		■	■
Dam Failure		■		■	■
Levee Failure				■	
Drought				■	■
Erosion		■		■	
Flooding	■	■	■	■	■
Landslides	■ Under earthquake	■	■	■	■
Sea Level Rise/Climate Change		■		■	■
Tsunami		■		■	
Wildfire	■	■	■	■	■
Shrink-Swell					
Coastal Flooding				■	
Extreme Heat				■	■
Freeze				■	
Severe Weather and Storms				■	
Avalanche				■	
Volcano				■	

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Risk Assessment: Vacaville Vulnerable Populations

Census Bureau Data:

- ***Population 2014 est: 95,865***
- ***Population 2010: 92,428***
- ***21,535 people (23.3%) under 18 years of age or younger (2010)***
- ***9,705 people (6.9%) who were 65 years of age or older (2010)***
- ***Approx. 30,749 households***
- ***2,564 households have someone living alone 65 years of age or older (2010)***
- ***10,078 households have children under the age of 18 living in them (2010)***
- ***9.8% of residents living in poverty in 2013***

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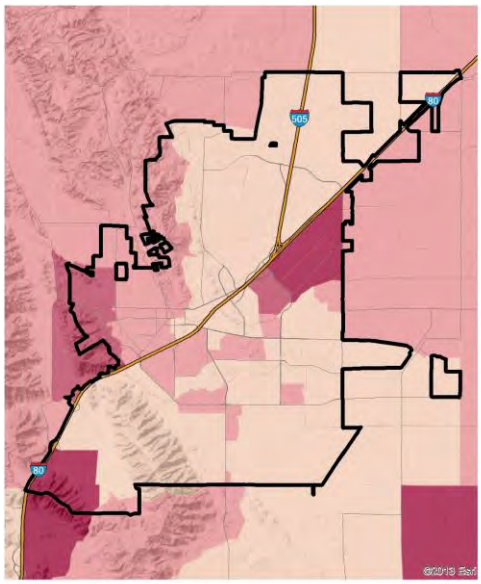
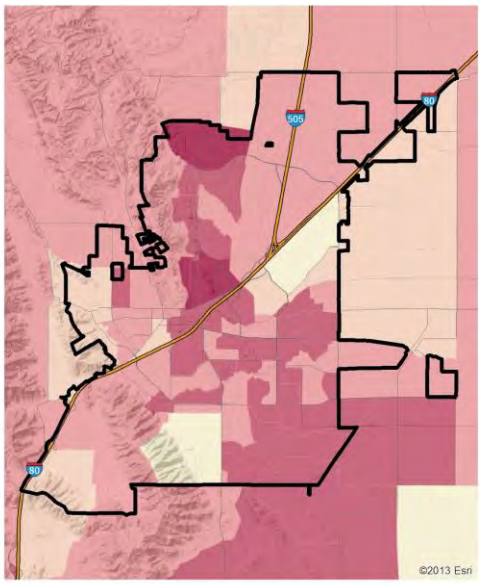


Block Groups

2012 % Population 65+ Years Old (Esri)

- 27.1% or more
- 19.1% to 27%
- 10.1% to 19% (US Avg: 13.5%)
- 2.1% to 10%
- 2% or less
- No population



Block Groups

2012 % Population < 18 Years Old (Esri)

- 33.1% or more
- 26.1% to 33%
- 20.1% to 26% (US Avg: 23.6%)
- 13.1% to 20%
- 13% or less
- No population

Risk Assessment: Lawndale Population in Group Quarters

People in group quarters in Vacaville in 2010:

- ***7,810 people in state prisons***
- ***171 people in nursing facilities/skilled-nursing facilities***
- ***18 people in group homes intended for adults***
- ***7 people in other non-institutional facilities***
- ***4 people in group homes for juveniles (non-correctional)***
- ***4 people in in-patient hospice facilities***
- ***4 people in emergency and transitional shelters (with sleeping facilities) for people experiencing homelessness***
- ***4 people in workers' group living quarters and job corps centers***

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Risk Assessment: Vacaville Income and Housing Data

2012 U.S. Census Income Data:

- ***Housing Units (2010): 32,814***
- ***Avg. Persons per Household: 2.75***
- ***Median income for a household in the city was $73,582***
- ***Estimated median house or condo value in 2012: $269,500***
- ***Median monthly housing costs: $1,507***
- ***Ownership Rate: 61.9%***
- ***Housing density: 1,059 houses/condos per square mile***
- ***Median year house/condo built: 1982***
- ***Median year apartment built: 1980***

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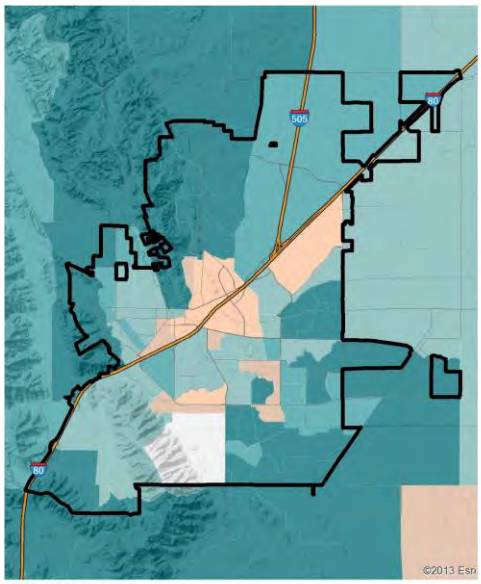
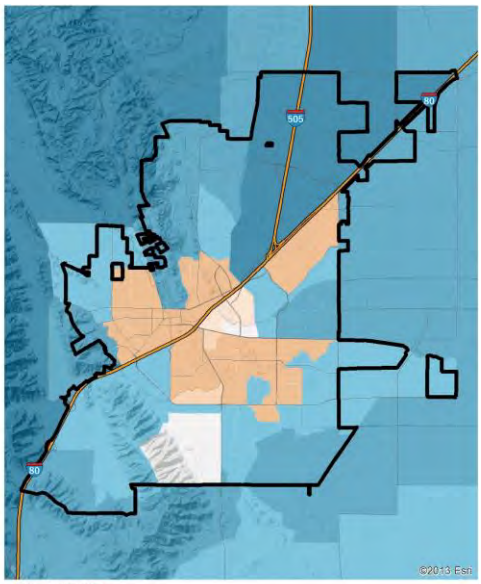


Block Groups

2012 Median Household Income (Esri)

- More than $82,000
- $68,001 to $82,000
- $53,001 to $68,000
- $39,001 to $53,000 (US median: $50,157)
- $24,001 to $39,000
- $24,000 or less
- No households



Block Groups

2012 Median Home Value (Esri)

- More than $348,000
- $274,001 to $348,000
- $200,001 to $274,000
- $127,001 to $200,000 (US median: $167,749)
- $53,001 to $127,000
- $53,000 or less
- No homes

Hazard Overview

Potential Hazards Identified in Hazard Mitigation Plan:

- **Flooding**
- **Dam Failure**
- **Earthquake / Liquefaction**
- **Extreme Heat**
- **Wildfire**
- **Landslides**
- **Drought**

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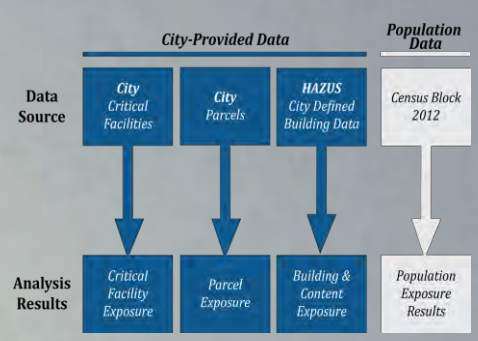
Risk Assessment

Planning Process

- Develop Population Profiles
- Develop Critical Infrastructure Inventory
- Summarize Vulnerable Assets (Life and Property)
- Estimate Losses
  - Hazus Analysis
  - GIS layering technique for other hazards
- Develop Risk Factor for Profiled Hazards



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Flooding Hazard

- A majority of the flood risk within Vacaville is specifically subject to inundation as a result of heavy rainfall and resulting stream and drainage canal overflows.
- The major creeks that flow through Vacaville are largely in their natural state and alignment, except at the eastern edge of the city where flood control channels have been constructed.
- The natural, unaltered portions of the creeks generally do not have adequate flow capacity to convey a 100-year storm event, which is a storm that has a 1 percent chance of occurring in any given year.
- In addition, there is not adequate capacity in some areas to accommodate a 10-year storm event, which is a storm that has a 10 percent chance of occurring in any given year. Occasionally, overbank flows in Vacaville have resulted in flooding of residential properties, road blockages, and traffic disruptions.

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Flooding Hazard

11 State or Federal emergency proclamations / declarations in Solano County (1953-2015)

- The major stream courses within the city include:
- Alamo Creek, including its tributaries Laguna Creek and Encinosa Creek
- Ulatis Creek
- Horse Creek, including its tributary Pine Tree Creek
- Gibson Canyon Creek
- Over 4,300 acers of delineated flood zone within Vacaville.

Flood Hazard Type	Sum of Square Miles	Sum of Acres
100-Year	**1.70**	**1,085.30**
A	0.90	573.51
AE	0.76	489.25
AO	0.04	22.54
500 year	**5.07**	**3,246.96**
Shaded X	5.07	3,246.96
Grand Total	**6.77**	**4,332.26**

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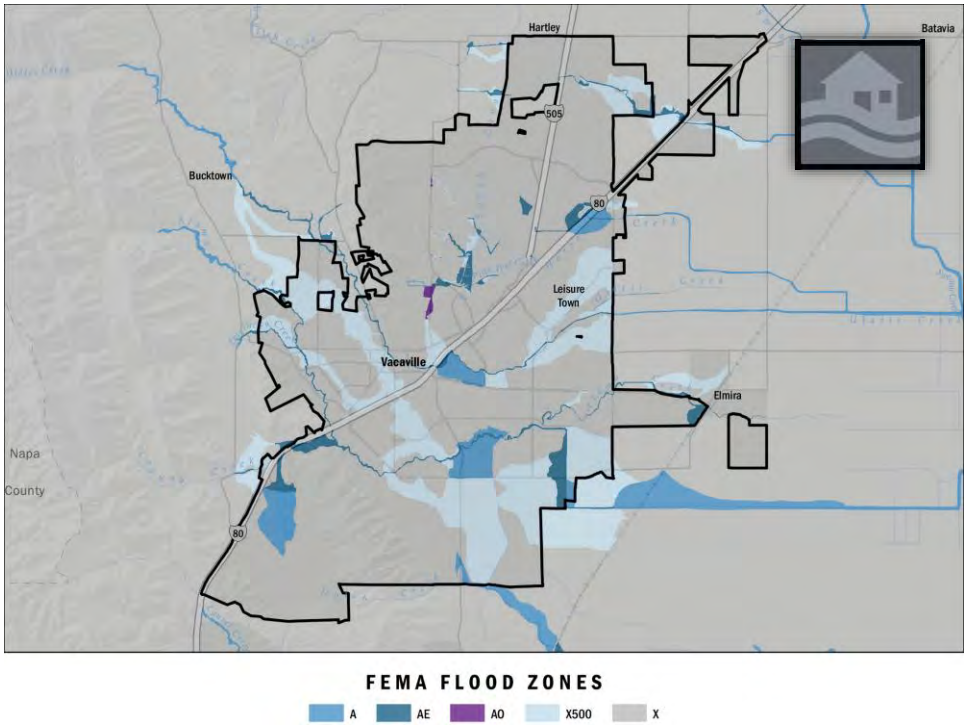

Flood Exposure Analysis

Parcels Value

Hazard Class	Sum of Weighted Value	% City Value
100-year Flood	$ 346,001,346	1.92%
500-year Flood	$ 2,822,095,145	15.66%
N/A	$ 14,850,806,191	82.42%
Grand Total	$ 18,018,902,682	

Population

Hazard Class	Sum of Weighted Pop.	% City Population
100-year Flood	7,286	7.68%
500-year Flood	27,386	28.88%
N/A	60,149	63.43%
Grand Total	94,821	

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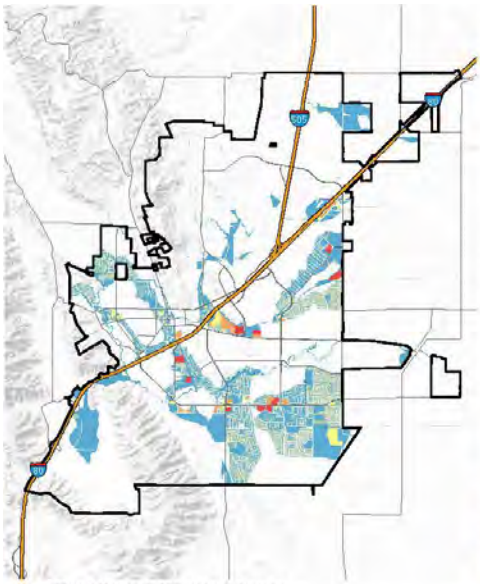
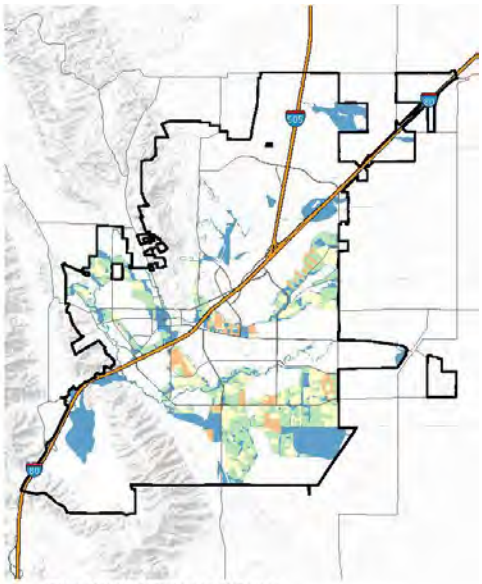


Flood Hazard; 100-year, 500-year

Weighted Improvement Value Exposure ($ by Parcel)

- 0 - 149,999
- 150,000 - 999,999
- 1,000,000 - 2,499,999
- 2,500,000 - 7,499,999
- 7,500,000 +



Flood Hazard; 100-year, 500-year

Weighted Population Exposure (by Census Block, 2010)

- 0 - 23
- 24 - 77
- 78 - 196
- 197 - 612
- 613 - 2,132

Earthquake Hazard

- Vaca-Kirby Hills Fault system is the only fault system that passes through the Vacaville Planning Area.
- The Vaca Fault has not experienced displacement within the past 11,700 years, and there is no evidence for displacement along the Kirby Hills Fault during the last 700,000 years. properties, road blockages, and traffic disruptions.
- The Rogers Creek Fault, part of the Hayward Fault System, lies roughly 24 miles to the southwest of Vacaville and has an estimated 16 percent probability of producing a magnitude 6.7 or greater earthquake prior to 2036.
- The Green Valley Fault system, which lies 12 miles to the southwest of Vacaville, has been active within the past 200 years, USGS estimates the probability of a magnitude 6.7 or greater earthquake along this fault prior to 2036 to be only 3 percent
- Vacaville-area historical earthquake activity is near California state average. It is 746% greater than the overall U.S. average.

Vacaville, Calif. Local 1245 members helped restore power and patch up gas leaks after Sunday's earthquake.
Photos credits: Local 1245.

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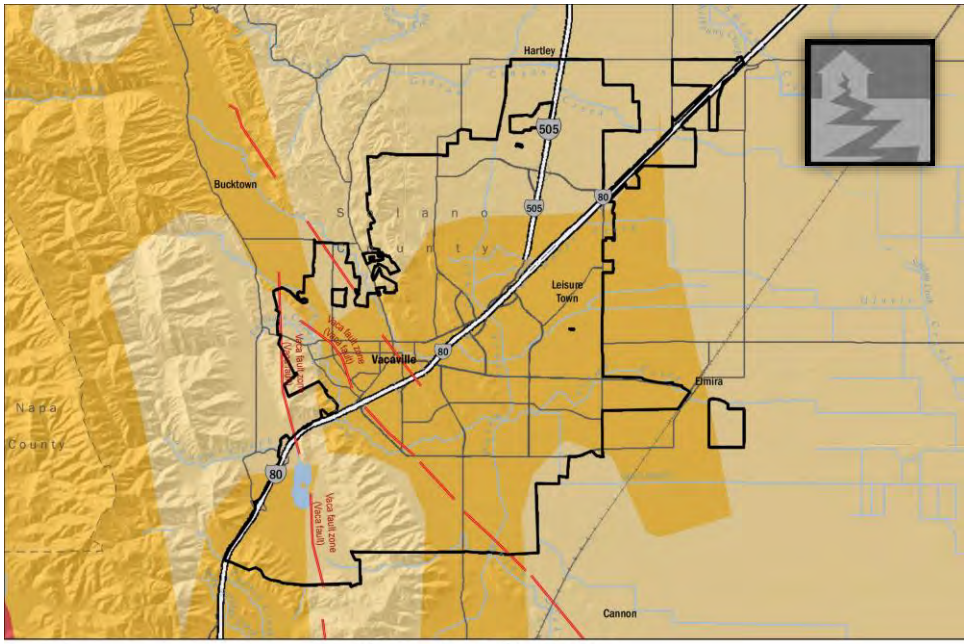
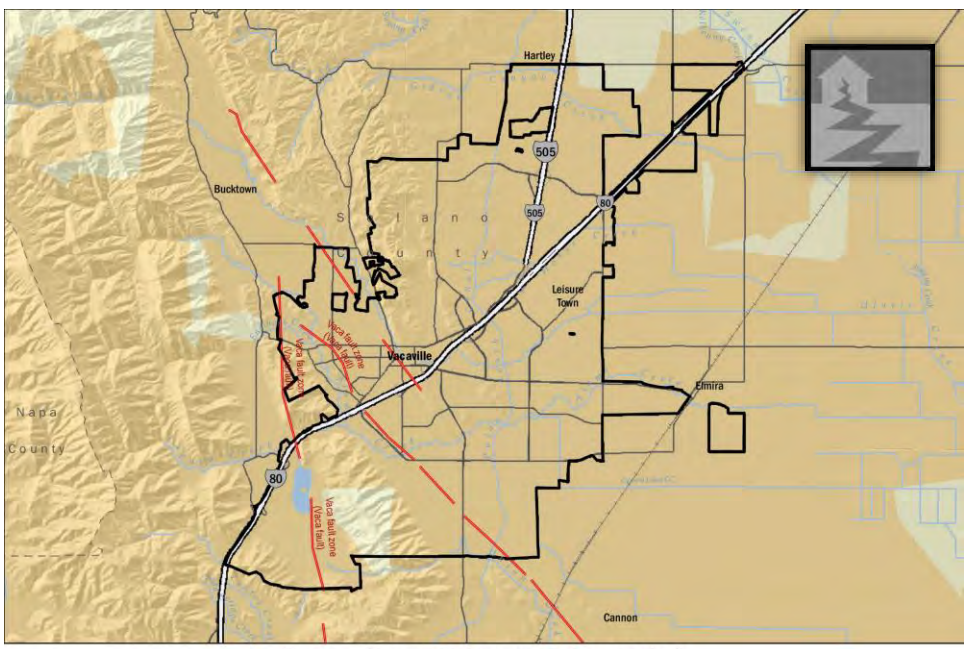


Scenario: Concord-Green Valley

PROJECTED GROUND SHAKING

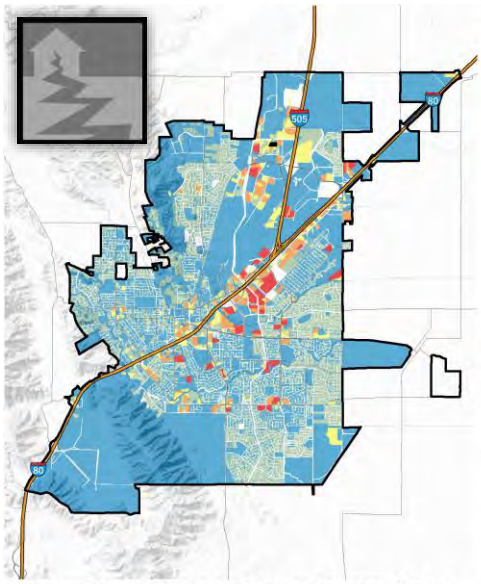
MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



Scenario: Hayward-Rodgers Creek; Hayward N + S

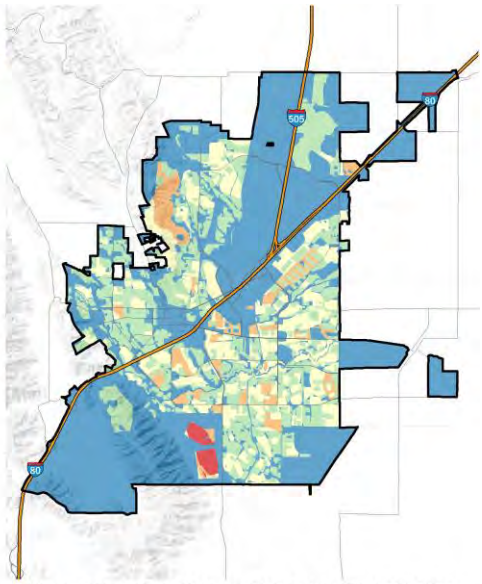
PROJECTED GROUND SHAKING

MMI 6 - Moderate | MMI 7 - Strong | MMI 8 - Very Strong | MMI 9 - Violent | MMI 10 - Very Violent



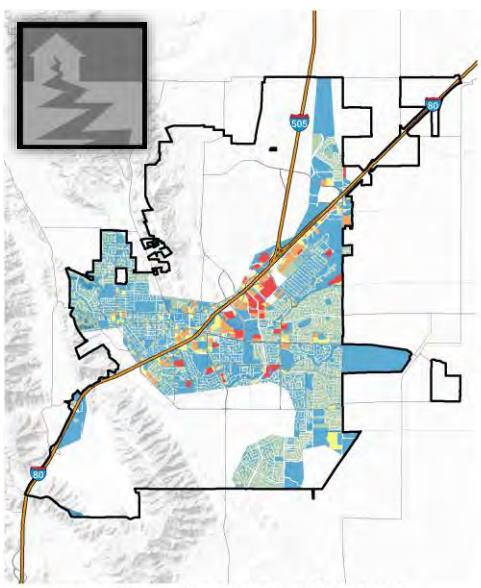
Concord Green Valley Scenario; Strong, Very Strong Shaking
Weighted Improvement Value Exposure ($ by Parcel)

- 0 - 149,999
- 150,000 - 999,999
- 1,000,000 - 2,499,999
- 2,500,000 - 7,499,999
- 7,500,000 +



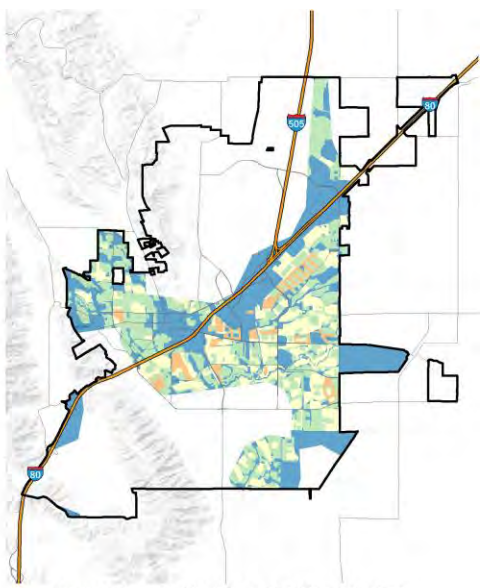
Concord Green Valley Scenario; Strong, Very Strong Shaking
Weighted Population Exposure (by Census Block, 2010)

- 0 - 23
- 24 - 77
- 78 - 196
- 197 - 612
- 613 - 2,132



Hayward Rodgers Creek Scenario; Strong Shaking
Weighted Improvement Value Exposure ($ by Parcel)

- 0 - 149,999
- 150,000 - 999,999
- 1,000,000 - 2,499,999
- 2,500,000 - 7,499,999
- 7,500,000 +



Hayward Rodgers Creek Scenario; Strong Shaking
Weighted Population Exposure (by Census Block, 2010)

- 0 - 23
- 24 - 77
- 78 - 196
- 197 - 612
- 613 - 2,132

Earthquake Exposure Analysis

Parcels Value

Hayward RC Shake

Hazard Class	Sum of Weighted Value	% City Value
V (Moderate)	$4,860,452,245	26.97%
VI (Strong)	$13,065,988,865	72.51%
N/A	$92,461,571	0.51%
Grand Total	$ 18,018,902,682	

Concord GV Shake

Hazard Class	Sum of Weighted Value	% City Value
VI (Strong)	$ 17,648,862,522	97.95%
VII (Very Strong)	$ 277,578,588	1.54%
N/A	$92,461,571	0.51%
Grand Total	$ 18,018,902,682	

Population

Hayward RC Shake

Hazard Class	Sum of Weighted Pop.	% City Population
V (Moderate)	37,999	40.07%
VI (Strong)	54,429	57.40%
(blank)	2,393	2.52%
Grand Total	94,821	

Concord GV Shake

Hazard Class	Sum of Weighted Pop.	% City Population
VI (Strong)	90,554	95.50%
VII (Very Strong)	1,874	1.98%
N/A	2,393	2.52%
Grand Total	94,821	

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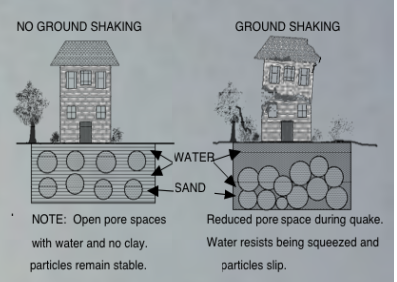
Liquefaction

- Liquefaction occurs when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness.
- Liquefied soils behave like a liquid and are responsible for tremendous damage in an earthquake. For example, it can cause buildings to collapse, pipes to leak, and roads to buckle.
- Vacaville is generally characterized by areas of very low, low, and moderate risk of liquefaction.
- There are some areas with a high and very high risk of liquefaction in Vacaville due to the underlying soil types or other geologic features.
- Along and adjacent to Vacaville's major water ways, Ulatis and Alamo Creeks, high and very high levels of liquefaction susceptibility exist.
- These creek corridors cross through the community and include central areas of the City.



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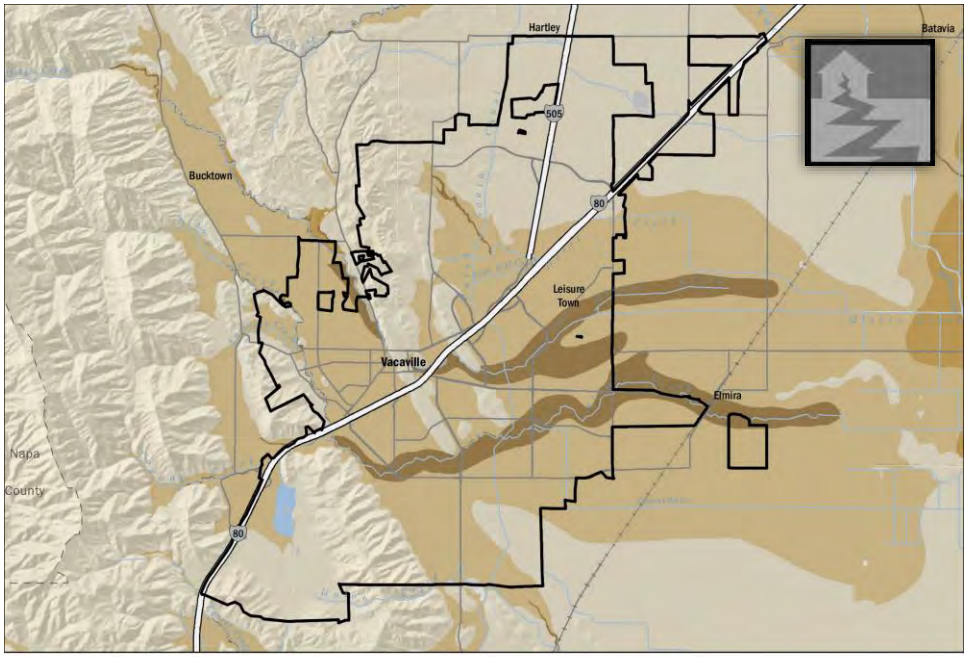

LIQUEFACTION SUSCEPTIBILITY

Very High | High | Moderate | Low | Very Low

Liquefaction Exposure Analysis

Parcels Value

Hazard Class	Sum of Weighted Value	% City Value
Very High	$ 1,035,821,204	0.01%
High	$ 1,155,665	10.25%
Moderate	$ 13,749,953,368	76.31%
Low	$ 1,847,316,834	5.75%
Very Low	$ 1,286,717,209	7.14%
Water	$ 5,476,830	0.03%
N/A	$ 92,461,571	0.51%
Grand Total	$ 18,018,902,682	

Population

Hazard Class	Sum of Weighted Pop.	% of City Population
Very High	15,219	16.05%
High	10	0.01%
Moderate	59,301	62.54%
Low	5,425	5.72%
Very Low	12,447	13.13%
Water	27	0.03%
N/A	2,393	2.52%
Grand Total	94,821	

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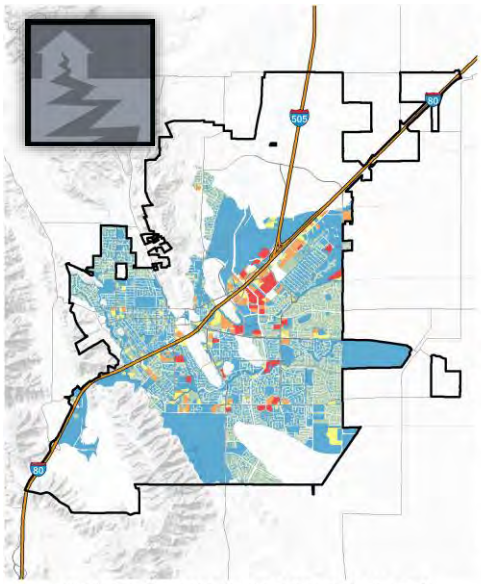
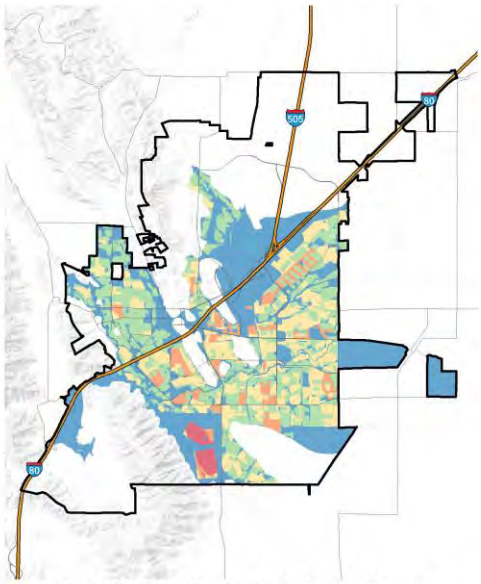


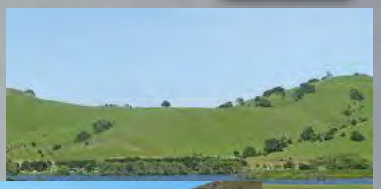
Liquefaction Susceptibility; Very High, High, Moderate
Weighted Improvement Value Exposure ($ by Parcel)
- 0 - 149,999
- 150,000 - 999,999
- 1,000,000 - 2,499,999
- 2,500,000 - 7,499,999
- 7,500,000 +

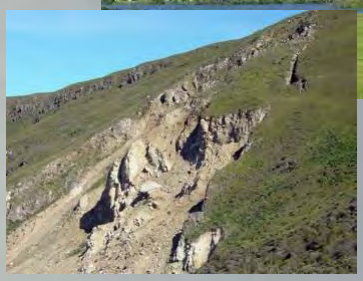


Liquefaction Susceptibility; Very High, High, Moderate
Weighted Population Exposure (by Census Block, 2010)
- 0 - 23
- 24 - 77
- 78 - 196
- 197 - 612
- 613 - 2,132

Land Slides

- Landslides occur when the force pulling the material on the slope in a downward direction under gravitational influence exceeds the strength of the earth materials that compose the slope.
- Strength of rock and soil, steepness of slope, and weight of the hillside material all play an important role in the stability of hillside areas.
- Because portions of western Vacaville include the foothills of the Vaca Mountains, there is a potential for landslides throughout this area.
- Landslides often accompany other natural hazard events, such as earthquakes, flooding, and wildfire.





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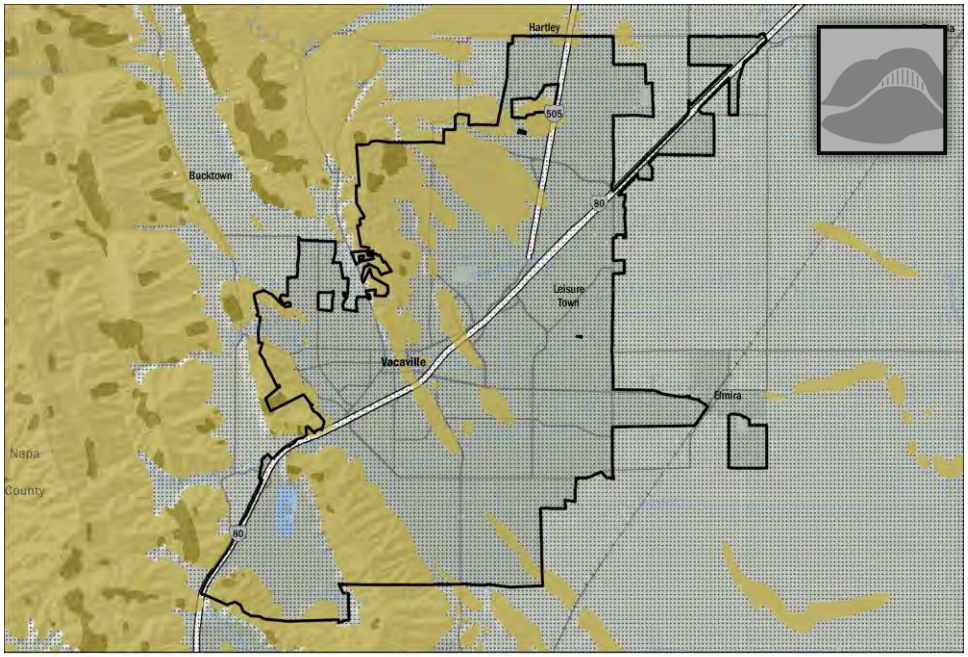

LANDSLIDE SUSCEPTIBILITY

mostly landslide | few landslides | surficial deposits

Landslide Exposure Analysis

Parcel Value

Hazard Class	Sum of Weighted Value	% City Value
Few Landslides	$ 1,240,856,339	6.89%
Mostly Landslide	$ 8,349,013	0.05%
Surficial Deposits	$ 16,674,544,324	92.54%
N/A	$ 95,153,005	0.53%
Grand Total	$ 18,018,902,682	

Population

Hazard Class	Sum of Weighted Pop.	% of City Population
Mostly Landslide	258	0.27%
Few Landslides	11,238	11.85%
Surficial Deposits	80,857	85.27%
N/A	2,468	2.60%
Grand Total	94,821	

MOSTLY LANDSLIDES
Consists of mapped landslides, intervening areas typically narrower than 1500 feet, and narrow borders around landslides; defined by drawing envelopes around groups of mapped landslides.

MANY LANDSLIDES
Consists of mapped landslides and more extensive intervening areas that in 'Mostly Landslides'; defined by excluding areas free of mapped landslides; outer boundaries are quadrangle and county limits to the areas in which this unit was defined.

FEW LANDSLIDES
Contains few, if any, large mapped landslides, but locally contains scattered small landslides and questionably identified larger landslides; defined in most of the region by excluding groups of mapped landslides but defined directly in areas containing the 'Many Landslides' unit by drawing envelopes around areas free of mapped landslides.

SURFICIAL DEPOSITS
Areas of gentile slope at low elevation that have little or no potential for the formation of slumps, translational slides, or earth flow except along stream banks and terrace margins; defined by the distribution of surficial deposits.

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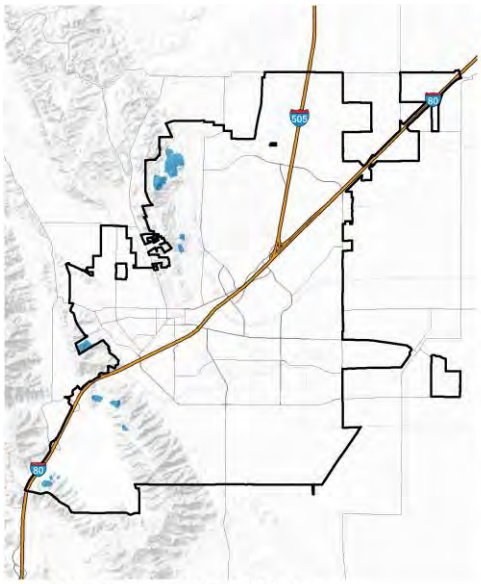
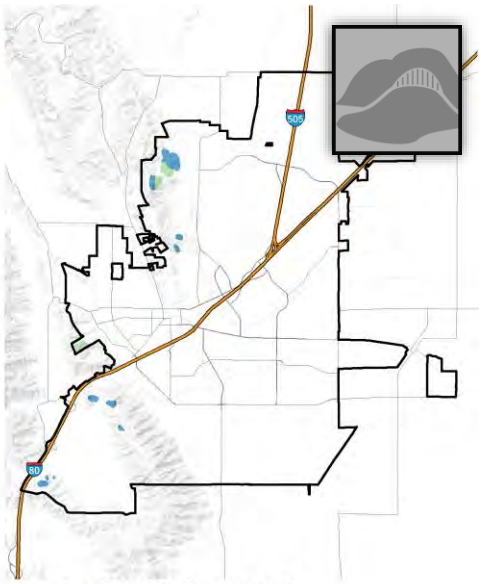


Landslide Hazard; Mostly Landslide

Weighted Improvement Value Exposure ($ by Parcel)

- 0 - 149,999
- 150,000 - 999,999
- 1,000,000 - 2,499,999
- 2,500,000 - 7,499,999
- 7,500,000 +



Landslide Hazard; Mostly Landslide

Weighted Population Exposure (by Census Block, 2010)

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Wildfire Hazards

- A Wildfire event is an unwanted wildland fire including unauthorized human-caused fires, escaped wildfire use events, escaped prescribed wildfire projects, and all other wildfires.
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Wildfire History

- Major Wildfires in the Vacaville Area Include:
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The below table provides records from a Cal FIRE maintained database of wildfire perimeters in the Vacaville Area.

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1992	Cement Fire
1999	Browns
2004	Cement

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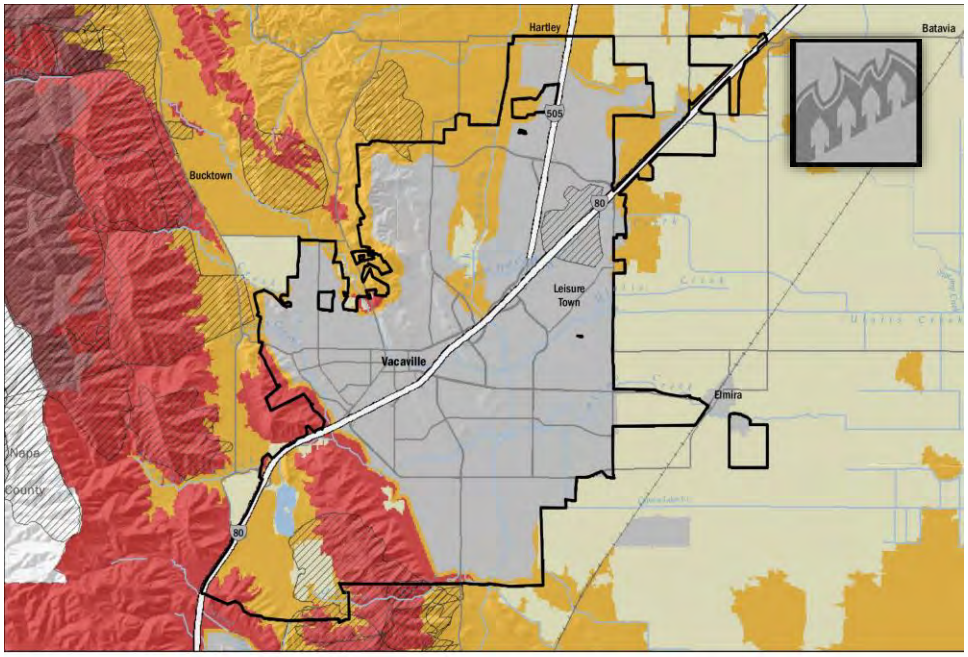

FIRE SEVERITY | FIRE PERIMETERS

Historic Fires | Very High | High | Moderate | Non-Wildland/Non-Urban | Urban Unzoned

Wildfire Exposure Analysis

Parcel Value

Hazard Class	Sum of Weighted Value	% City Value
High	$ 166,614,183	0.92%
Moderate	$ 2,428,033,041	13.47%
Non-Wildland/Non-Urban	$ 277,501,903	1.54%
Urban Unzoned	$ 15,054,291,985	83.55%
(blank)	$ 92,461,571	0.51%
Grand Total	$ 18,018,902,682	

Population

Hazard Class	Sum of Weighted Pop	% of City Population
High	2,051	2.16%
Moderate	6,242	6.58%
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Urban Unzoned	81,998	86.48%
N/A	2,393	2.52%
Grand Total	94,821	

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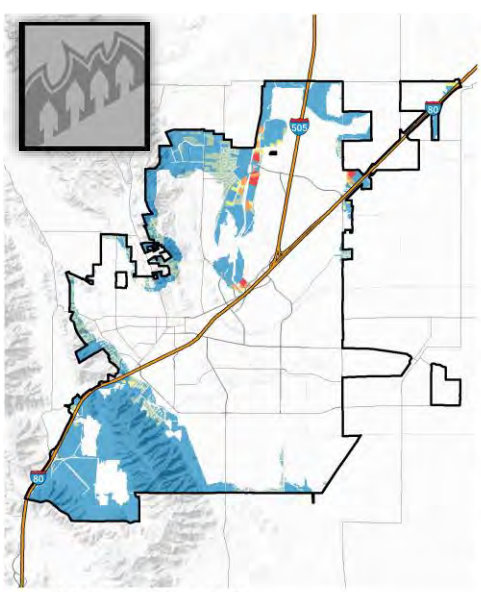

Fire Hazard; High, Moderate
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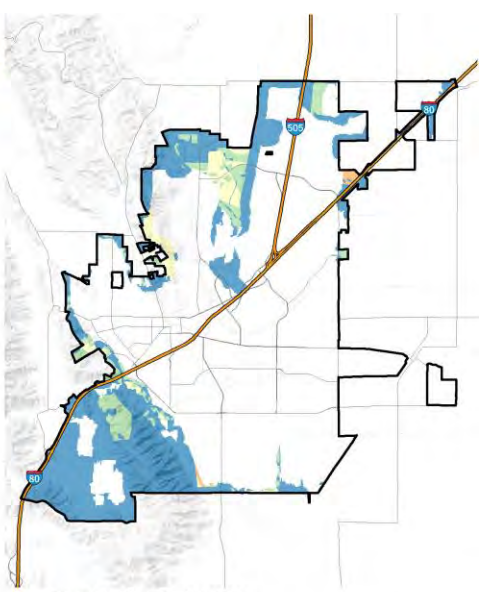

Fire Hazard; High, Moderate
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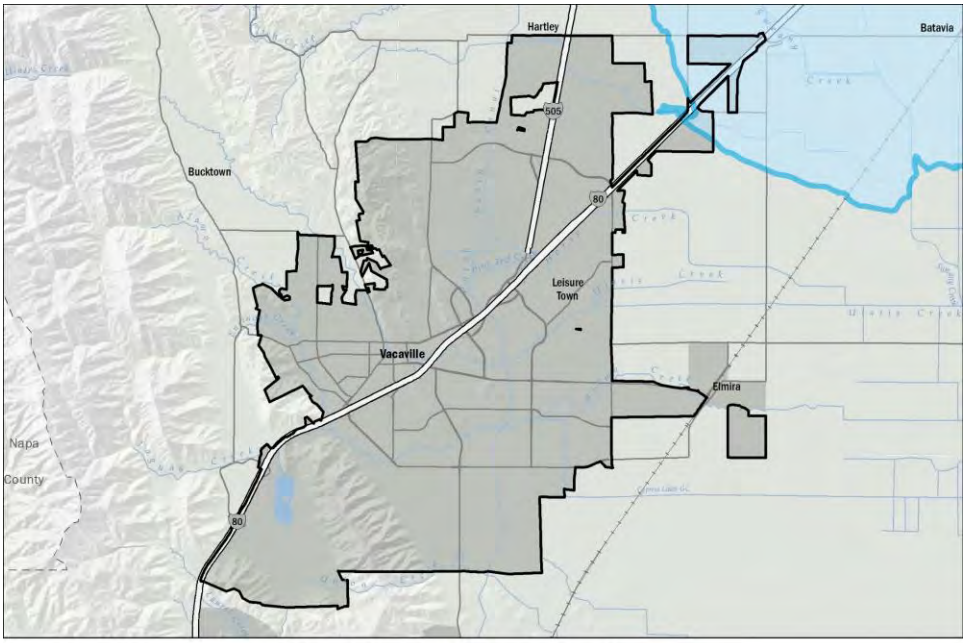

DAM FAILURE INUNDATION HAZARD

Monticello Dam

Dam Failure Exposure Analysis

Parcel Value

Hazard Class	Sum of Weighted Value	% City Value
Monticello	$ 1,767,182	0.01%
N/A	$ 18,017,135,500	99.99%
Grand Total	$ 18,018,902,682	

Population

Hazard Class	Sum of Weighted Pop	% of City Population
Monticello	2	0.00%
N/A	94,819	100%
Grand Total	94,821	

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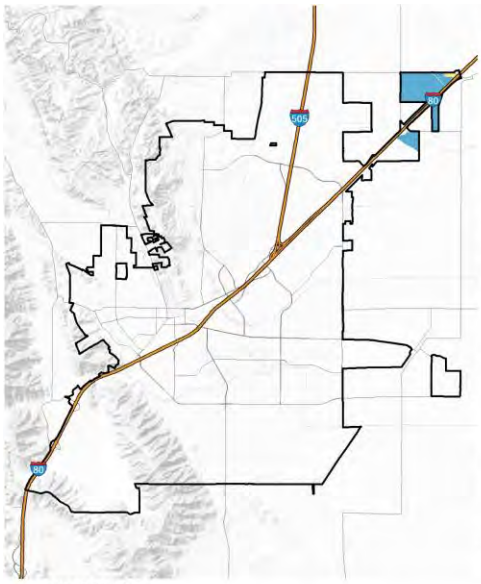

Dam Failure
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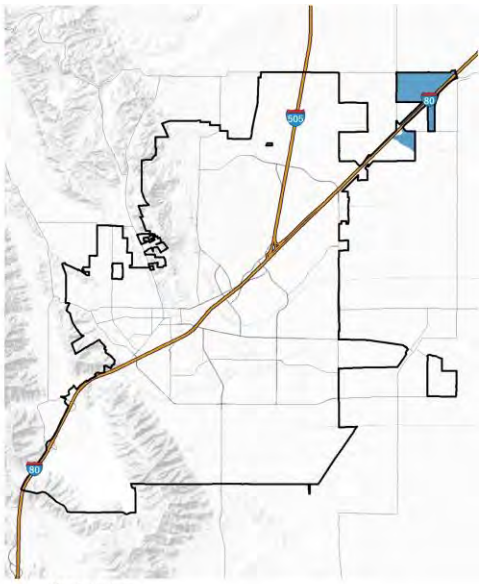

Dam Failure
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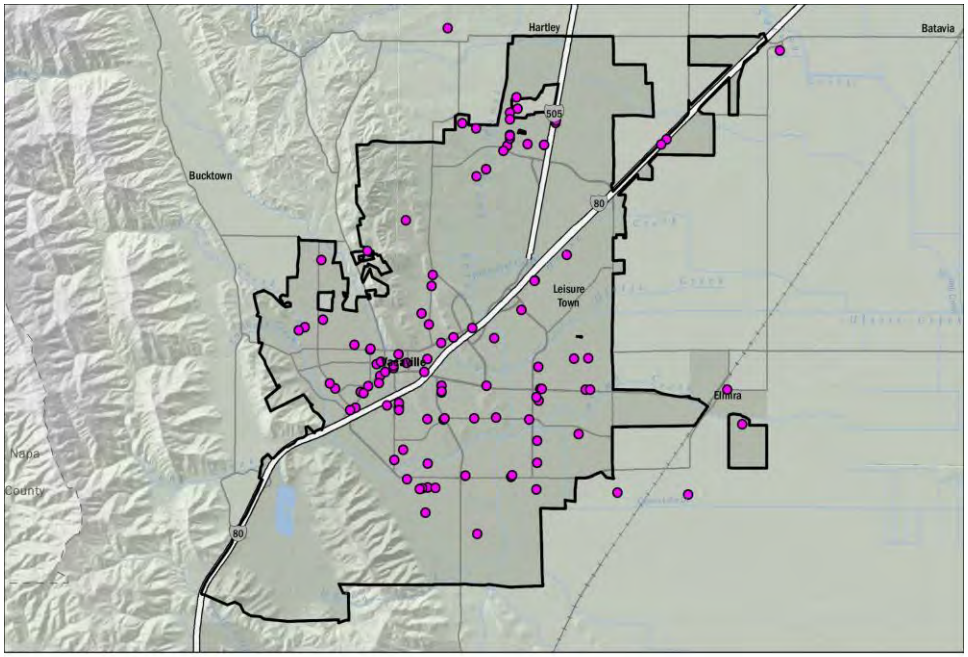
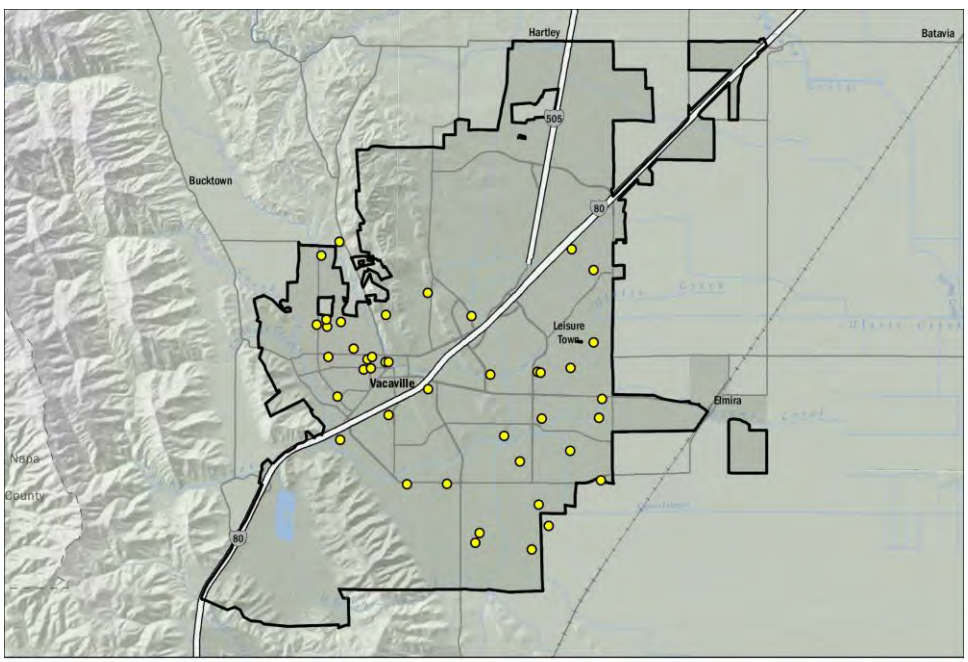


FACILITIES/INFRASTRUCTURE

● Critical Facilities



FACILITIES/INFRASTRUCTURE

○ Gathering Facilities

PART II

Hazard Risk Factor Exercise

Problem Statement Exercise

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EXERCISE

Hazard Risk Factor Exercise

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EXERCISE

Problem Statement Exercise

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Meeting Agenda:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Planning Committee Meeting #3

Thursday, November 5th, 2015, 9:00 a.m. – 11:00 a.m.

- Part I (60 MINS)
  - Problem Statement Review
  - Capabilities Assessment / Problem Statement Crosswalk
- Part II (60 MINS)
  - Mitigation Action Review / Problem Statement Crosswalk
  - Mitigation Reporting

NOTES

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VACAVILLE

SIGN-IN

Planning Committee Meeting #3

Thursday, November 4, 2015
9:00 a.m. - 11:00 a.m.
650 Merchant Street
Vacaville, CA 95688
www.vacavillehazards.com

NAME	EMAIL
Brian Greer	brian@dynamicplanning.co
Ethan Mobley	ethan@dynamicplanning.co
Jill Childers	jill.childers@cityofvacaville.com
Brian McLean	brian.mclean@cityofvacaville.com
TIM BURKE	tim.burke@cityofvacaville.com
SHAWN CUNNINGHAM	SHAWN.CUNNINGHAM@CITYOFVACAVILLE.COM
Matt Lage	Matthew.Lage@cityofvacaville.com
JAY SALAZAR	Jay.Salazar@cityofvacaville.com
FRED BUDERI	Fred.Buderi@cityofvacaville.com
JEFF BARICH	JBARICH@SCWA2.COM #2
PAT KINNEY	PATRICK.KINNEY@CITYOFVACAVILLE.COM

2015-16 Local Hazard Mitigation Plan Update

City of Vacaville

Planning Committee Meeting #3

Nov 5th, 2015

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Agenda

- Part 1:
  - Capabilities Assessment
  - Goal and Objectives Development
- Part 2:
  - Capabilities Assessment

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FEMA How to Components
Planning Process

Organize Resources
- Build Planning Team
- Develop Public Outreach Strategy
- Review and Incorporate Existing Plans, Studies, Reports, and other technical data/ information

Assess Risks
- Identify/Profile Hazards
- Assess Vulnerabilities

Develop Mitigation Plan
- Identify Goals
- Develop Capabilities Assessment
- Review past/current mitigation measures
- Identify new mitigation measures

Draft Plan
- Background Information
- Plan Maintenance
- Document Authority and References

Plan Review/Revision
- Review Final Draft with Planning Committee and Public

Plan Adoption/Submittal
- Prepare Crosswalk for Submittal to FEMA Region IX and Cal EMA

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Next Steps (4 Week Window)

- Finalize Risk Assessment (Need City Data)
- Finalize Hazard Profiles
- Finalize NFIP Program Review (Need City Data)

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Today's Goals and Accomplishments

- Validate Essential Facilities Exposure
- Develop Goals and Objects

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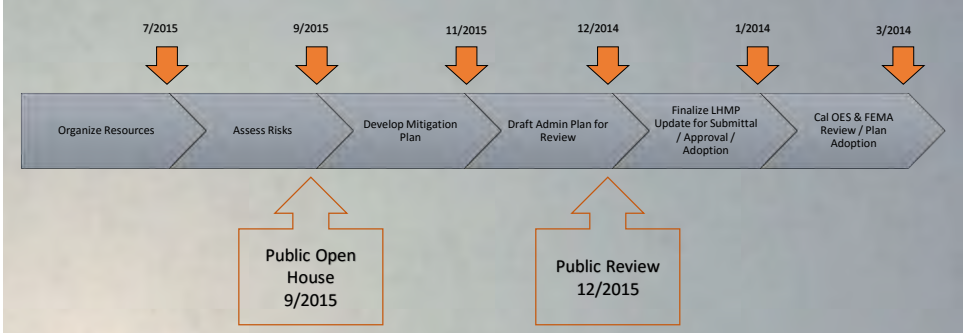
Schedule



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PART I

- Review Problem Statements

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Hazard Overview

Potential Hazards Identified in Hazard Mitigation Plan:

- **Flooding**
- **Dam Failure**
- **Earthquake / Liquefaction**
- **Extreme Heat**
- **Wildfire**
- **Landslides**
- **Drought**

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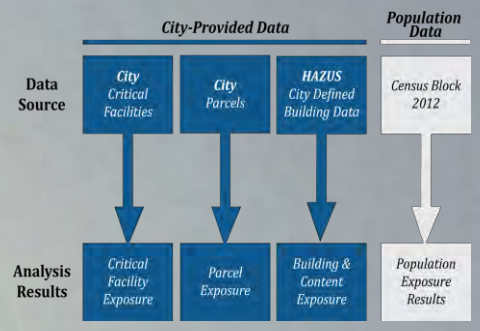
Risk Assessment

Planning Process

- Develop Population Profiles
- Develop Critical Infrastructure Inventory
- Summarize Vulnerable Assets (Life and Property)
- Estimate Losses
  - Hazus Analysis
  - GIS layering technique for other hazards
- Develop Risk Factor for Profiled Hazards



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Mitigation Action Planning

Process for Setting Hazard Mitigation Goals and Objectives

- The mitigation strategy represents the key outcomes of the 2015 HMP planning process. The hazard mitigation planning process conducted by the Planning Committee is a typical problem-solving methodology:
  - Estimate the impacts the problem could cause;
  - Describe the problem;
  - Assess what safeguards and resources exist that could potentially lessen those impacts;
  - Develop Goals and Objectives with current capabilities to address problem;
  - Using this information, determine what, if anything, can be done, and select those actions that are appropriate for the community.

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Flooding Hazard Problem Statements

- A majority of the flood risk within Vacaville is specifically subject to inundation as a result of heavy rainfall and resulting stream and drainage canal overflows.
- The major creeks that flow through Vacaville are largely in their natural state and alignment, except at the eastern edge of the city where flood control channels have been constructed.
- The natural, unaltered portions of the creeks generally do not have adequate flow capacity to convey a 100-year storm event, which is a storm that has a 1 percent chance of occurring in any given year.
- In addition, there is not adequate capacity in some areas to accommodate a 10-year storm event, which is a storm that has a 10 percent chance of occurring in any given year. Occasionally, overbank flows in Vacaville have resulted in flooding of residential properties, road blockages, and traffic disruptions.

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Earthquake Hazard

- Vaca-Kirby Hills Fault system is the only fault system that passes through the Vacaville Planning Area.
- The Vaca Fault has not experienced displacement within the past 11,700 years, and there is no evidence for displacement along the Kirby Hills Fault during the last 700,000 years. properties, road blockages, and traffic disruptions.
- The Rogers Creek Fault, part of the Hayward Fault System, lies roughly 24 miles to the southwest of Vacaville and has an estimated 16 percent probability of producing a magnitude 6.7 or greater earthquake prior to 2036.
- The Green Valley Fault system, which lies 12 miles to the southwest of Vacaville, has been active within the past 200 years, USGS estimates the probability of a magnitude 6.7 or greater earthquake along this fault prior to 2036 to be only 3 percent
- Vacaville-area historical earthquake activity is near California state average. It is 746% greater than the overall U.S. average.

Vacaville, Calif. Local 1245 members helped restore power and patch up gas leaks after Sunday's earthquake.
Photos credits: Local 1245.

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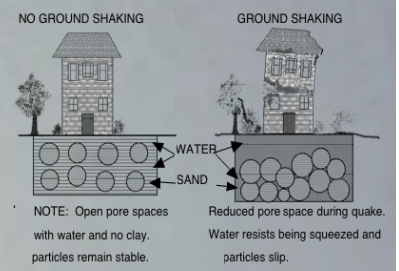
Liquefaction

- Liquefaction occurs when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness.
- Liquefied soils behave like a liquid and are responsible for tremendous damage in an earthquake. For example, it can cause buildings to collapse, pipes to leak, and roads to buckle.
- Vacaville is generally characterized by areas of very low, low, and moderate risk of liquefaction.
- There are some areas with a high and very high risk of liquefaction in Vacaville due to the underlying soil types or other geologic features.
- Along and adjacent to Vacaville's major water ways, Ulatis and Alamo Creeks, high and very high levels of liquefaction susceptibility exist.
- These creek corridors cross through the community and include central areas of the City.



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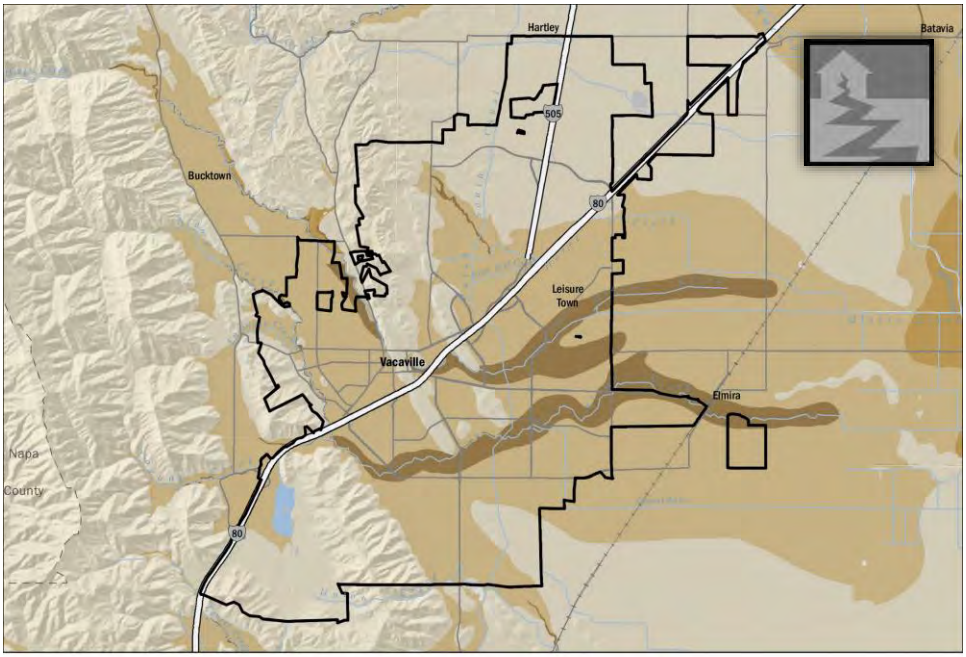
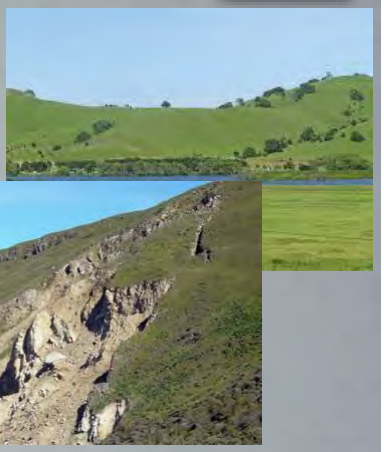


LIQUEFACTION SUSCEPTIBILITY

Very High | High | Moderate | Low | Very Low

Land Slides

- Landslides occur when the force pulling the material on the slope in a downward direction under gravitational influence exceeds the strength of the earth materials that compose the slope.
- Strength of rock and soil, steepness of slope, and weight of the hillside material all play an important role in the stability of hillside areas.
- Because portions of western Vacaville include the foothills of the Vaca Mountains, there is a potential for landslides throughout this area.
- Landslides often accompany other natural hazard events, such as earthquakes, flooding, and wildfire.



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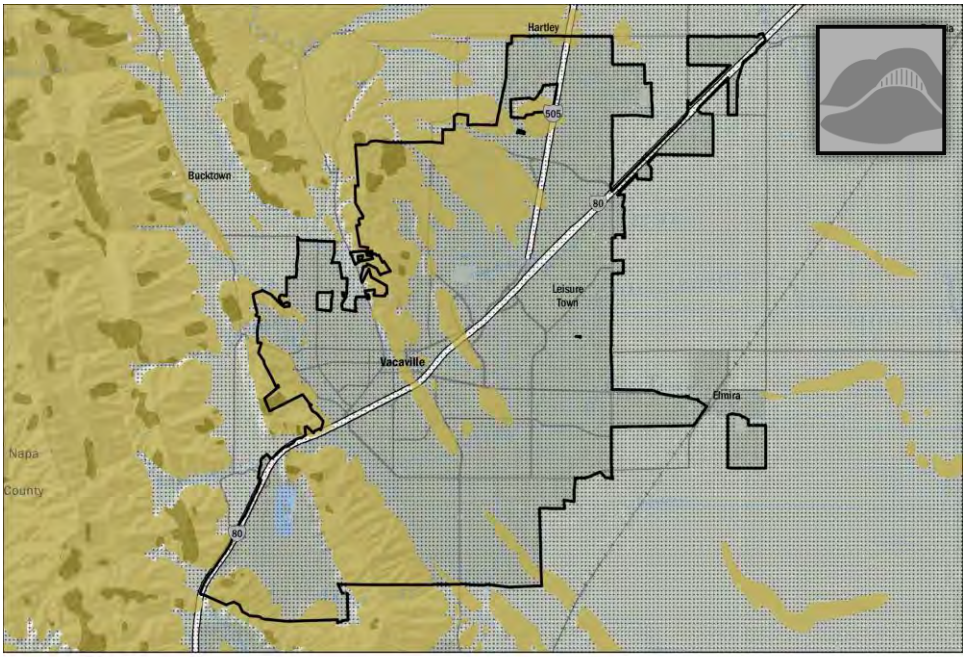

LANDSLIDE SUSCEPTIBILITY

mostly landslide | few landslides | surficial deposits

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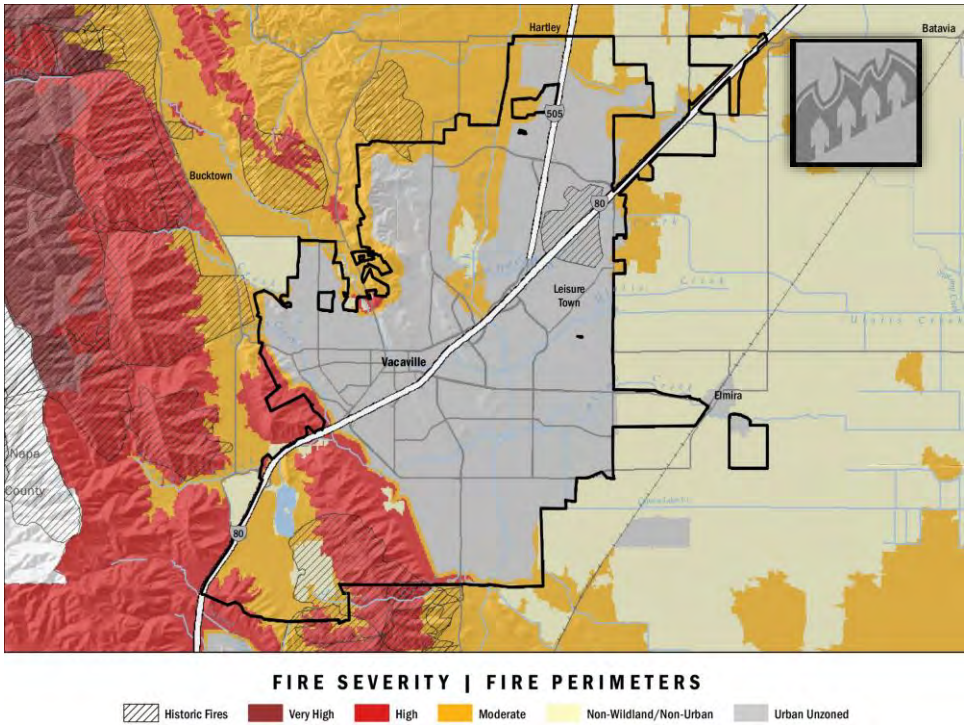

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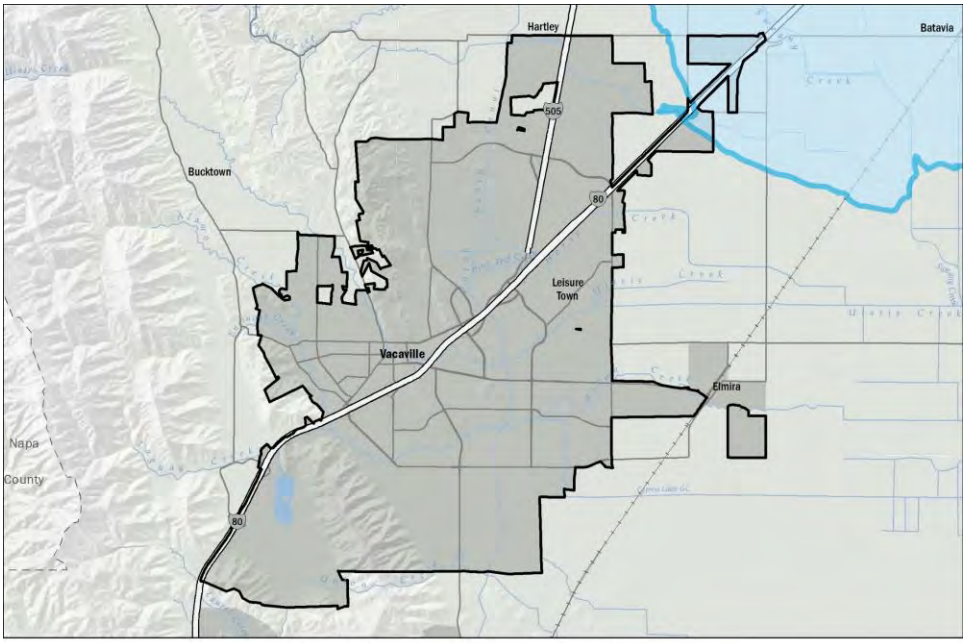
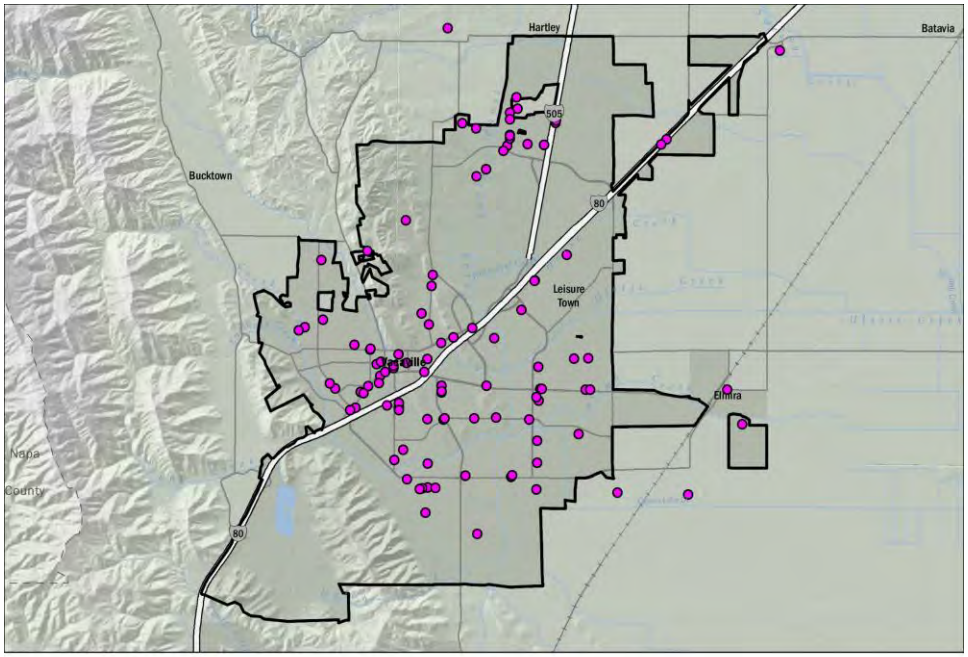


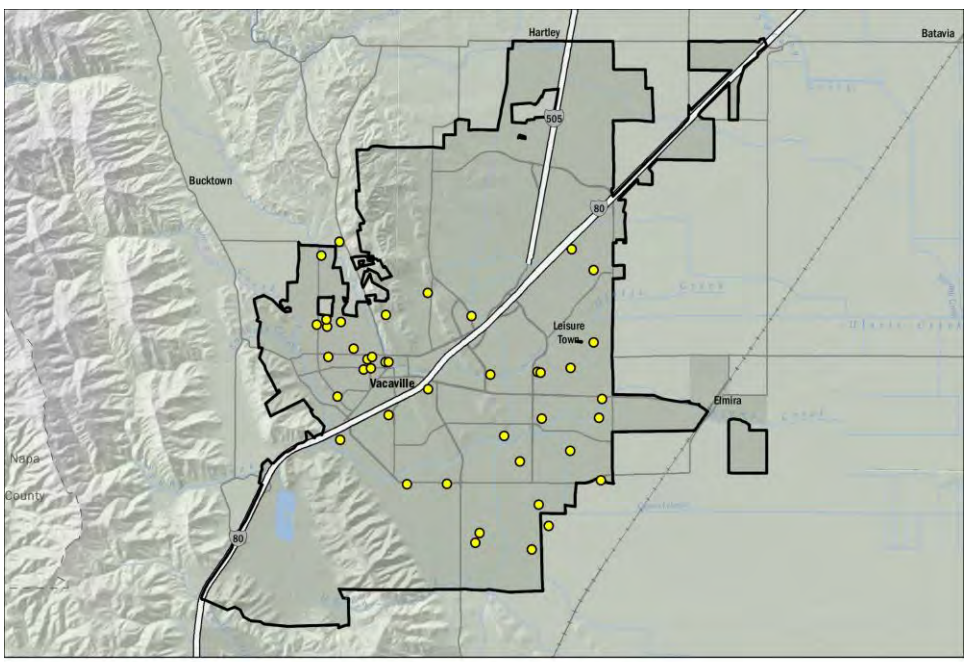
DAM FAILURE INUNDATION HAZARD

Monticello Dam



FACILITIES/INFRASTRUCTURE

● Critical Facilities



FACILITIES/INFRASTRUCTURE

○ Gathering Facilities

PART II

Hazard Risk Factor Exercise

Problem Statement Exercise

CITY OF VACAVILLE
LHMP

Dynamic Planning + Science
Foster Morrison

EXERCISE

Hazard Risk Factor Exercise

CITY OF VACAVILLE
LHMP

Dynamic Planning + Science
Foster Morrison

EXERCISE

Problem Statement Exercise

CITY OF VACAVILLE
LHMP

Dynamic Planning + Science

Foster Morrison

Meeting Agenda:

Local Hazard Mitigation Plan (LHMP) 2015-2016 Update

Planning Committee Meeting #4

Monday, December 7th, 2015, 9:00 a.m. – 11:00 a.m.

- Meeting Objectives
  - Review Problem Statements and Objectives (Now Mitigation Actions)
  - Review Critical Facilities List and Maps
  - Review Capabilities Assessment
  - Review Mitigation Actions
  - Prioritize Mitigation Actions

NOTES

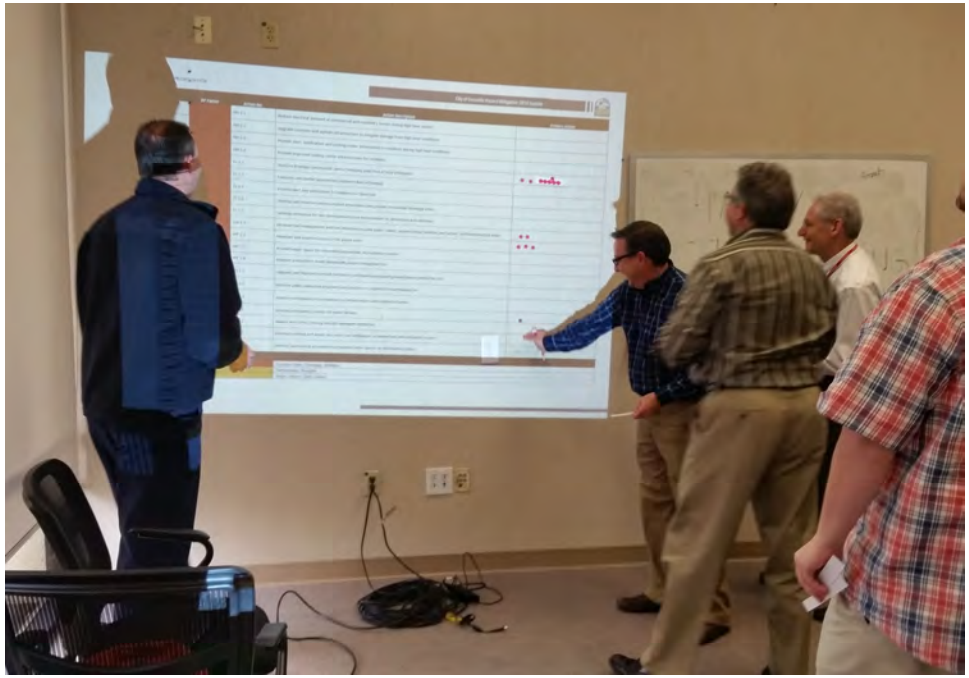
SIGN-IN

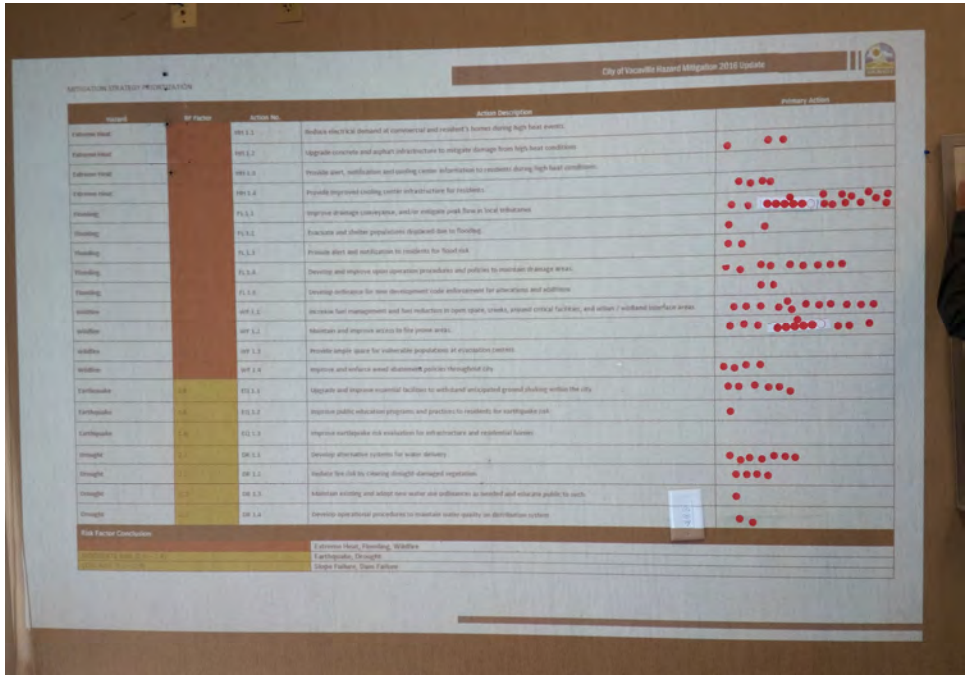
Planning Committee Meeting #4

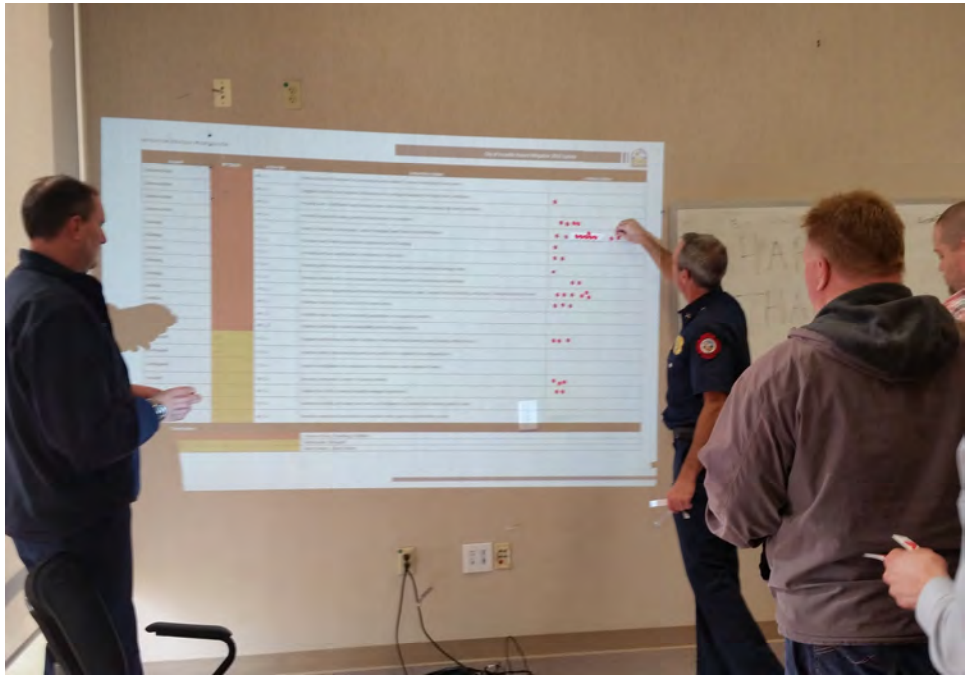
Monday, December 7, 2015
9:00 a.m. - 11:00 a.m.

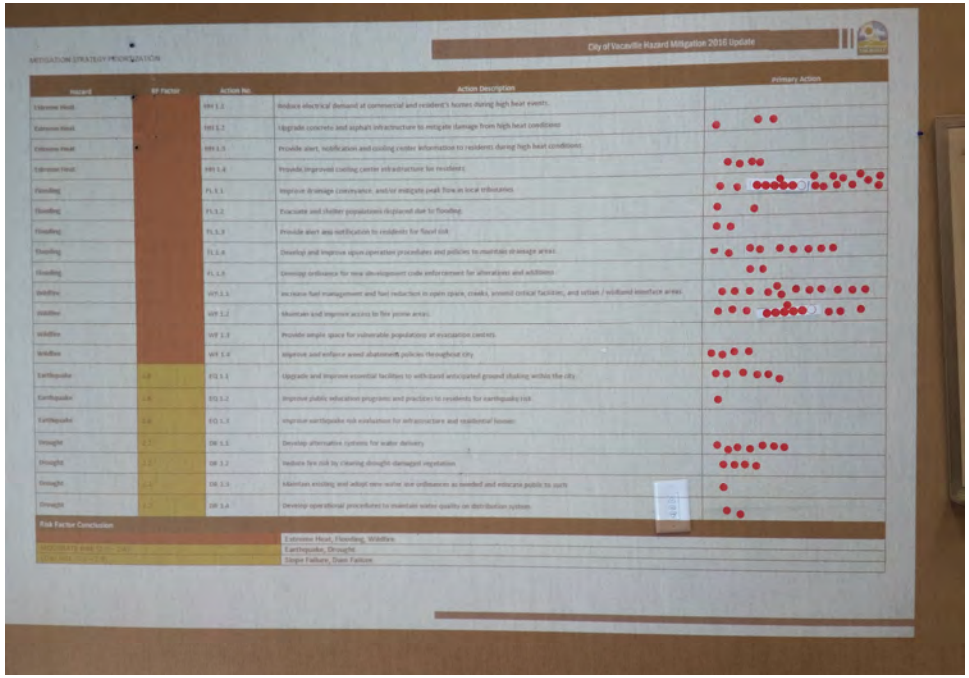
650 Merchant Street
Vacaville, CA 95688
www.vacavillehazards.com

NAME	EMAIL




City of Vacaville Hazard Mitigation 2016 Update
MITIGATION STRATEGY PRIORITIZATION
Hazard
RF Factor
Action No.
Action Description
Primary Action
Risk Factor Conclusion
Extreme Heat, Flooding, Wildfire
Earthquake, Drought
Slope Failure, Dam Failure




City of Vacaville Hazard Mitigation 2016 Update
MITIGATION STRATEGY PRIORITIZATION
Hazard
RP Factor
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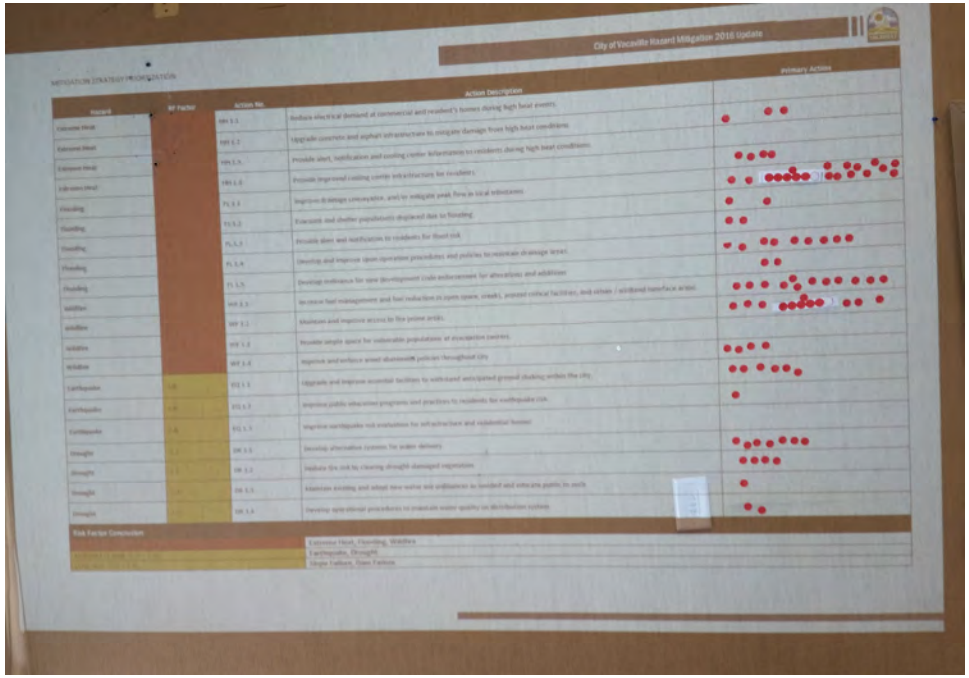
City of Vacaville Hazard Mitigation 2016 Update
MITIGATION STRATEGY PRIORITIZATION
Hazard
RP Factor
Action No.
Action Description
Primary Action
Risk Factor Conclusion
Extreme Heat, Flooding, Wildfire
Earthquake, Drought
Slope Failure, Dam Failure

B.2 Public Notices and Press Releases

City of Vacaville, Public Information Office

@markmazzaferro

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- Reviews
- Likes
- Videos
- Events
- **Posts**

Create a Page

City of Vacaville, Public Information Office
August 20, 2015 ·

Mark your calendars! Sept. 17, 2015 the City will be hosting a Local Hazard Mitigation Plan Open House! Residents will learn how to protect your home and family from a natural disaster. There will be pizza, prizes and more! http://bit.ly/1UVU06Y

> City of Vacaville, CA : Event Calendar (All In One) : Hazard Mitigation Open House
>
> Attend a free open house event on natural disasters threats in our area! Learn what you can do to protect your home and family from the effects of wildfire, flooding, earthquake and other natural hazards.
>
> CITYOFVACAVILLE.COM

Like | Comment | Share

Kristina Bell, Rubicon Csmr and 2 others

hazard mitigation plan

EVENT LIST VIEW

Share & Bookmark Font Size: [+] Feedback Print

Hazard Mitigation Open House

Protect your home from natural disasters!

Date: 9/17/2015 3:00 PM - 7:00 PM
Cost: Free
Location: Ulatis Community Center
1000 Ulatis Drive
Vacaville, California 95687

Add to my Calendar

Attend a free open house event on natural disasters threats in our area! Learn what you can do to protect your home and family from the effects of wildfire, flooding, earthquake and other natural hazards.

Pizza and soft drinks! Give-aways! Bring historic disaster photos, get a reward!

This outreach effort is coordinated by the City of Vacaville Hazard Mitigation Planning Committee. For more information on the Local Hazard Mitigation Plan Update effort, click here.

B.3 Public Open House Documentation

PROTECT YOUR HOME FROM NATURAL DISASTERS!

Attend a free open house event on natural disaster threats in your area.

Learn what you can do to protect your home and family from the effects of wildfire, flooding, earthquake, and other hazards…

Tell us your thoughts on local hazards!

Tell us what incentives will help us protect your home!

HAZARD MITIGATION PUBLIC OPEN HOUSE

September 17, 2015
Drop in anytime between:
3:00 PM till 7:00 PM

Ulatis Community Center
1000 Ulatis Drive Vacaville, CA 95688¬

PIZZA & SOFT DRINKS!

GIVE-A-WAYS!

BRING HISTORIC DISASTER PHOTOS,
GET A REWARD!

This outreach effort is coordinated by the City of Vacaville Hazard Mitigation Planning Committee. Learn more about resources and the city's planning efforts to reduce risk in your area by visiting the LOCAL HAZARD MITIGATION QUICK LINK at:

www.vacavillehazards.com

Brought to you by:

VACAVILLE

City of Vacaville
Public Works Department

Cal OES
GOVERNOR'S OFFICE OF EMERGENCY SERVICES

Cal OES Hazard Mitigation
Planning Division

HAZARD MITIGATION PUBLIC OPEN HOUSE

September 17, 2015
Drop in anytime between:
3:00 PM till 7:00 PM

Ulatis Community Center
1000 Ulatis Drive Vacaville, CA 95688¬

Brought to you by:

City of Vacaville Public Works Department

Cal OES Hazard Mitigation Planning Division

PROTECT YOUR HOME FROM NATURAL DISASTERS!

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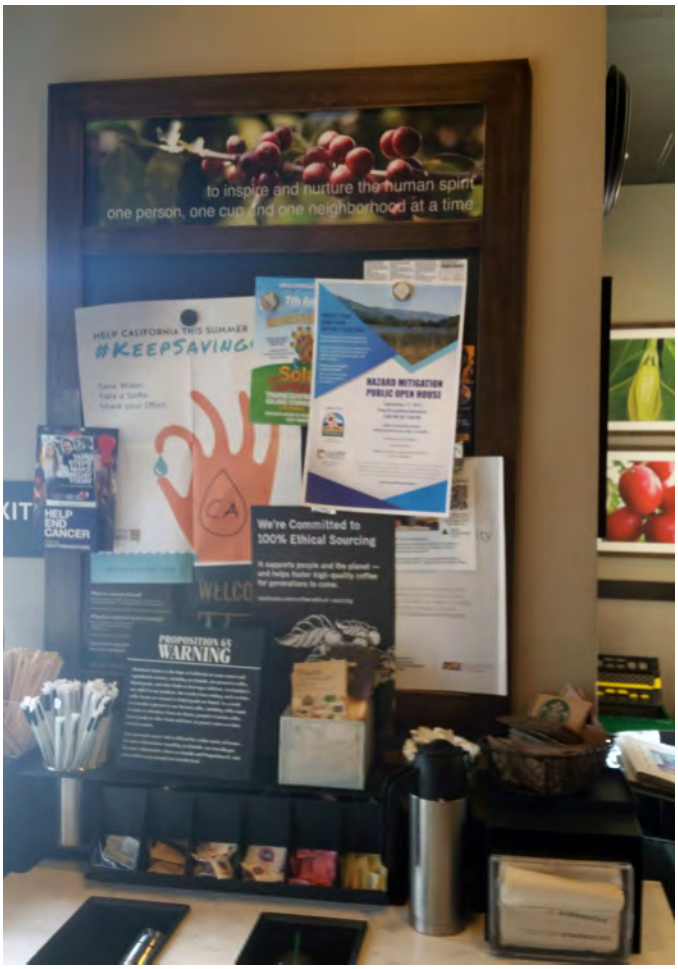
Learn what you can do to protect your home and family from the effects of wildfire, flooding, earthquake, and other hazards…

Tell us your thoughts on local hazards!
Tell us what incentives will help us protect your home.

PIZZA & SOFT DRINKS!
GIVE-A-WAYS!
BRING HISTORIC DISASTER PHOTOS, GET A REWARD!

PRESORTED
FIRST CLASS MAIL
U.S. POSTAGE
PAID
CITY STATE
PERMIT #

This outreach effort is coordinated by the City of Vacaville Hazard Mitigation Planning Committee. Learn more about resources and the city's planning efforts to reduce risk in your area by visiting the LOCAL HAZARD MITIGATION QUICK LINK at:
www.vacavillehazards.com


to inspire and nurture the human spirit
one person, one cup and one neighborhood at a time
HELP CALIFORNIA THIS SUMMER
#KEEPSAVING
HAZARD MITIGATION
PUBLIC OPEN HOUSE
We're Committed to
100% Ethical Sourcing
HELP
END
CANCER
WELCO
PROPOSITION 65
WARNING

HAZARD MITIGATION
PUBLIC OPEN HOUSE
STIMULATEN
Black Tea
Black Tea
Black Tea

CVS/pharmacy
STORE HOURS
Rx HOURS
Monday 8:00 - 10:00 8:00 - 8:00
Tuesday 8:00 - 10:00 8:00 - 8:00
Wednesday 8:00 - 10:00 8:00 - 8:00
Thursday 8:00 - 10:00 8:00 - 8:00
Friday 8:00 - 10:00 8:00 - 8:00
Saturday 8:00 - 10:00 9:00 - 6:00
Sunday 8:00 - 10:00 10:00 - 6:00
STORE MANAGER
Tim Bailey
HAZARD MITIGATION
PUBLIC OPEN HOUSE
VISA
$3

Call us: 510-253-0054 | 970-323-4331 Email us: ethan@dynamicplanning.co (https://www.twitter.com/bgcarto) (https://www.linkedin.com/in/ethan-mobley-789b7b27)

Dynamic Planning + Science (http://dynamicplanning.co)

City of Vacavile - HMP Public Open House

DESIGN (HTTP://DYNAMICPLANNING.CO/CATEGORY/DESIGN/) GIS (HTTP://DYNAMICPLANNING.CO/CATEGORY/GIS/) OUTREACH (HTTP://DYNAMICPLANNING.CO/CATEGORY/OUTREACH/) PLANNING (HTTP://DYNAMICPLANNING.CO/CATEGORY/PLANNING/)

Brian Greer (http://dynamicplanning.co/author/brian/) December 18,2015

0 Comments (http://dynamicplanning.co/planning/city-of-vacavile-hmp-public-open-house/#respond)

Our public open house for the City of Vacaville's Hazard Mitigation Plan back in September update went great. Here's a recap of what we produced for the meeting and a quick walk through of the night.

We created a lot of material for this workshop in-house from way-finding signage, to large-format hazard map posters, to custom raffle and comment boxes.

We posted this way-finding signage to help get the meeting attendees in the door.

(http://dynamicplanning.co/wp-content/uploads/2015/12/Directional-01.png)

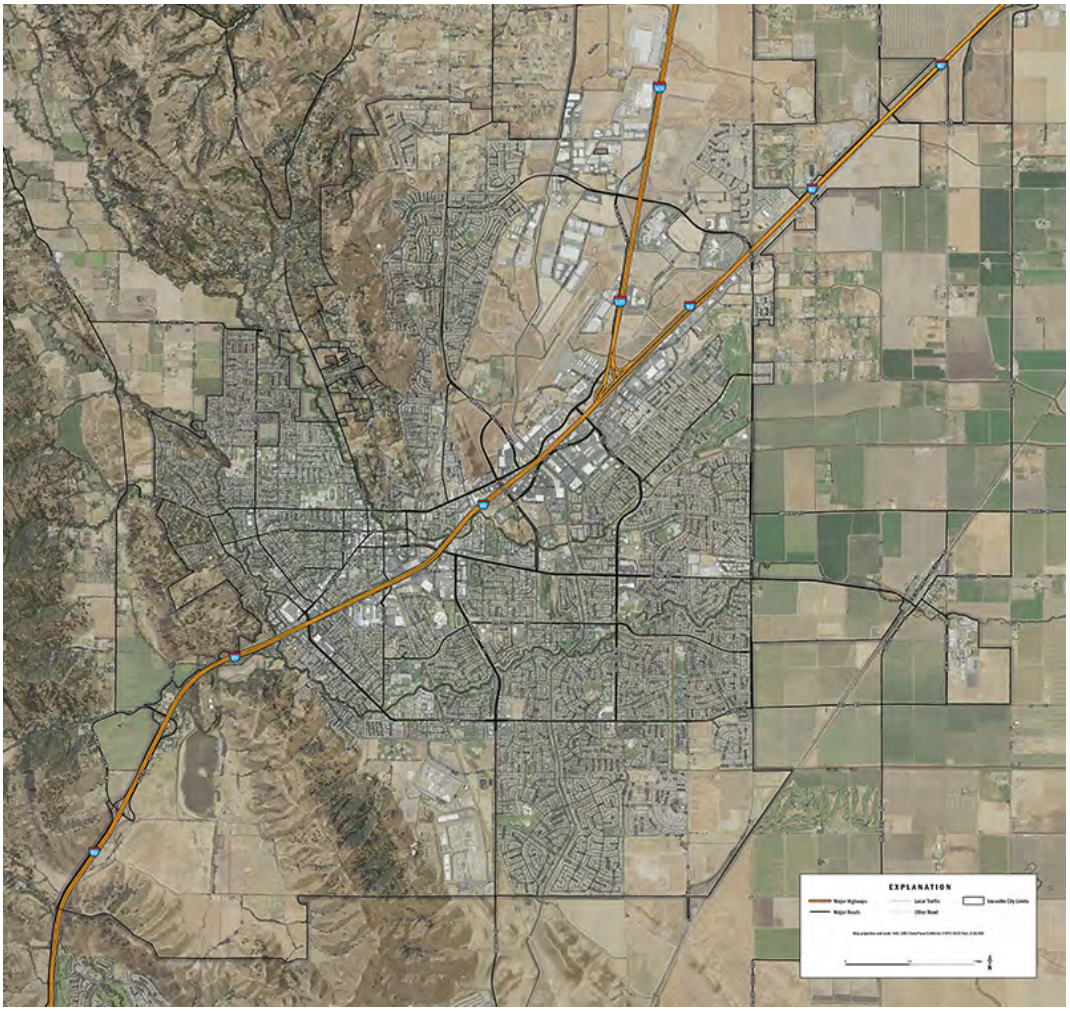
(http://dynamicplanning.co/wp-content/uploads/2015/12/Directional-02.png)

Once attendees got in the door, they were greeting by Dynamic Planning + Science's Christina Greer. Christina outlined the process and helped guests get signed in, got them each a raffle ticket, and oriented them to the meeting layout.

(http://dynamicplanning.co/wp-content/uploads/2015/12/DSC06368.jpg)

The next step after signing in is to visit the aerial map of Vacaville, grab a sticker and place it on your house. This exercise helped guests orient themselves their location within Vacaville and improve the impact of the hazard maps at the other stations.

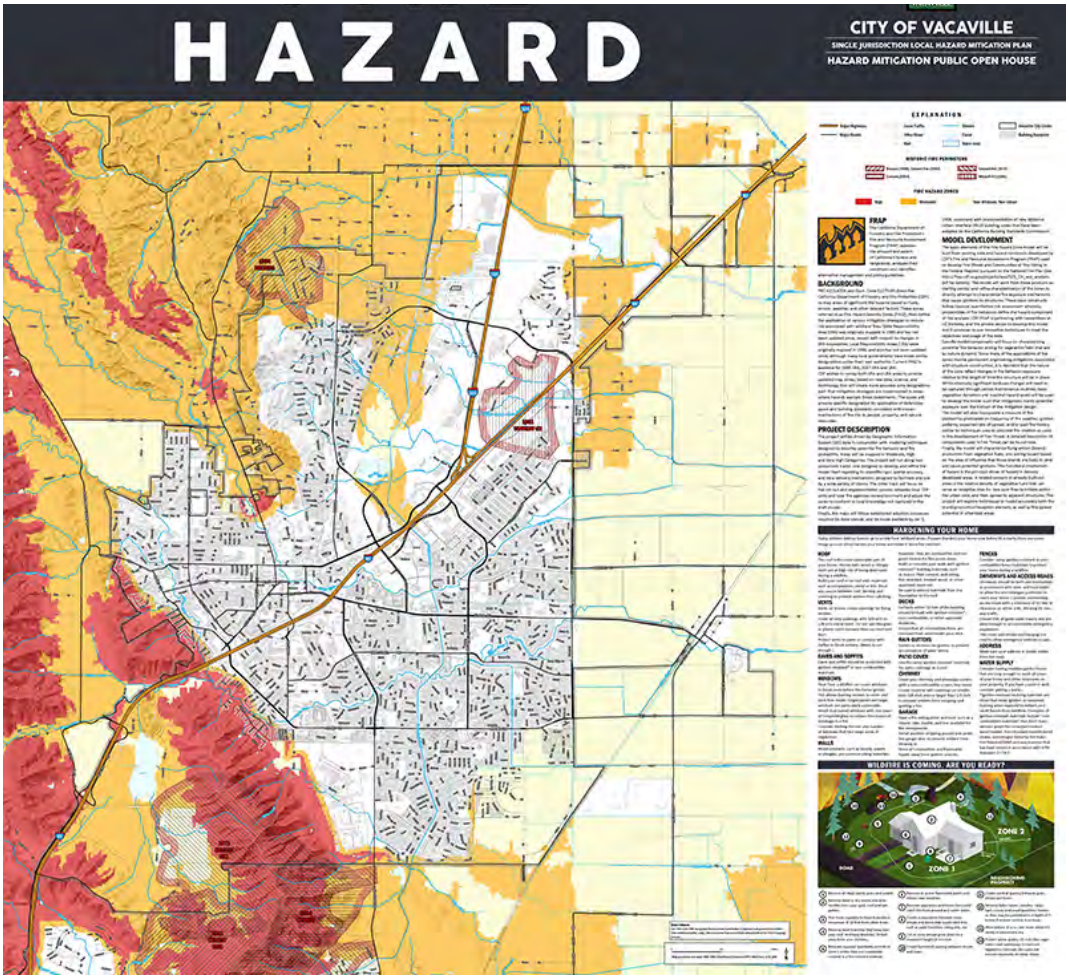
(http://dynamicplanning.co/wp-content/uploads/2015/12/DSC06370.jpg)



(http://dynamicplanning.co/wp-content/uploads/2015/12/VOH__Page_1.jpg)

(http://dynamicplanning.co/wp-content/uploads/2015/12/DSC06364.jpg)

After orienting themselves (and grabbing some pizza), attendees traveled through the room, visiting each hazard station, reading each map and visiting with our project team and City of Vacaville staff expert in each hazard subject.



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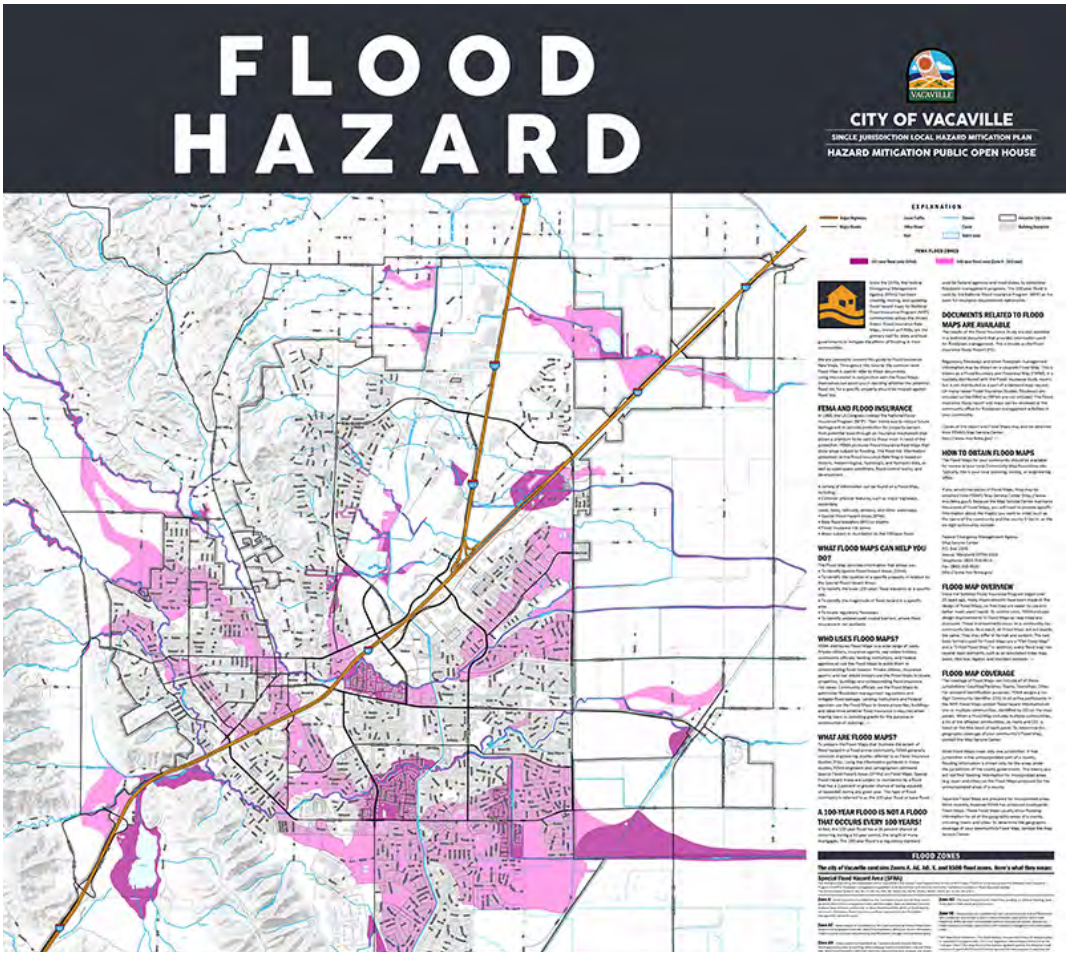


(http://dynamicplanning.co/wp-

content/uploads/2015/12/VOH__Page_5.jpg)

City of Vacaville's Tim Burke explaining the regulatory flood zones to a couple locals.

(http://dynamicplanning.co/wp-

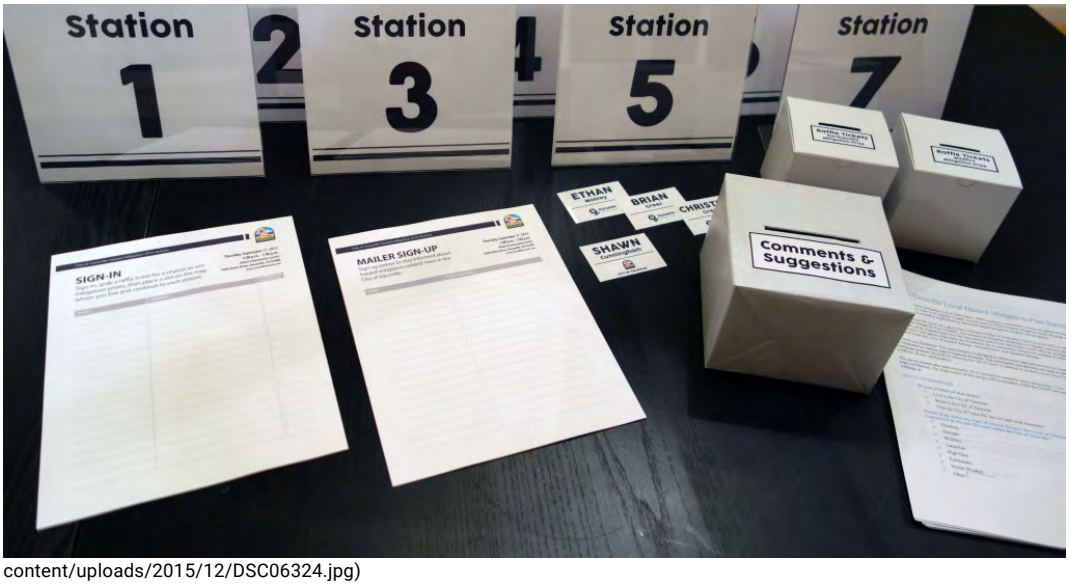
content/uploads/2015/12/DSC06350.jpg)

Dynamic Planning + Science owner Ethan Mobley, alongside City of Vacaville's Fire Battalian Chief, Matt Lage, explaining earthquake hazard in the city.

(http://dynamicplanning.co/wp-

content/uploads/2015/12/DSC06345.jpg)

After making their way through the hazard stations, each visitor went through the final station and put their raffle ticket in the box shown below, visitors were also asked to submit any feedback, and share their own hazard-related Vacaville images.



(http://dynamicplanning.co/wp-content/uploads/2015/12/DSC06324.jpg)

A couple examples of some of the historical photos brought in by attendees.

(http://dynamicplanning.co/wp-content/uploads/2015/12/DSC06359.jpg)

After the meeting was over, we pulled the raffle tickets and personally delivered the prizes!

(http://dynamicplanning.co/wp-

content/uploads/2015/12/DSC06385.jpg)

(http://dynamicplanning.co/wp-

content/uploads/2015/12/DSC06384.jpg)

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December 18,2015

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HAPPY HOLIDAYS! (HTTP://DYNAMICPLANNING.CO/DESIGN/MERRY-CHRISTMAS/)

December 18,2015

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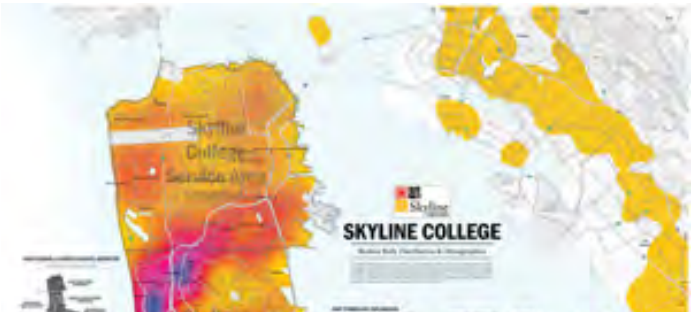
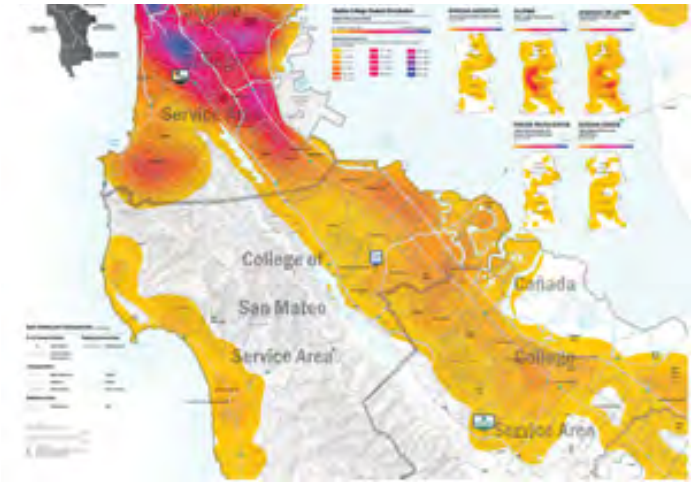




(http://dynamicplanning.co/projects/skyline-college-mapping/)

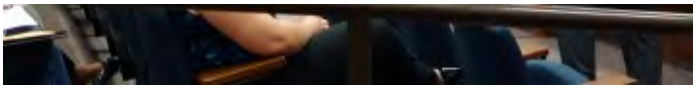
Skyline College Mapping (http://dynamicplanning.co/projects/skyline-college-mapping/)

Brian Greer (http://dynamicplanning.co/author/brian/)

(http://dynamicplanning.co/planning/apa-2016/)

APA 2016 (http://dynamicplanning.co/planning/apa-2016/)

Ethan Mobley (http://dynamicplanning.co/author/ethan/)



(http://dynamicplanning.co/projects/san-bernardino-hazard-mitigation-plan/)

San Bernardino Hazard Mit... (http://dynamicplanning.co/projects/san-bernardino-hazard-mitigation-plan/)

Brian Greer (http://dynamicplanning.co/author/brian/)

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July 8, 2016

San Bernardino Hazar... (http://dynamicplanning.co/projects/san-bernardino-hazard-mitigation-plan/)

June 25, 2016

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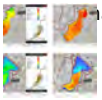
CCC Flood Safety Pla... (http://dynamicplanning.co/projects/ccc-flood-safety-plan-maps/)

March 29, 2016



Sacramento County Fl... (http://dynamicplanning.co/projects/sacramento-county-flood-maps/)

March 29, 2016

Dynamic Planning + Science (http://dynamicplanning.co)

California: 1901 Harrison St, Suite 1100 Oakland (https://goo.gl/maps/3xJ5JvdvHWR2)
Colorado: 19235 HWY 550 Montrose (https://goo.gl/maps/XrN9ph3Tj7s)

510-253-0054 | 970-323-4331

ethan@dynamicplanning.co (mailto:ethan@dynamicplanning.co)

CONTACT US

Name

Email

Message

SEND MESSAGE

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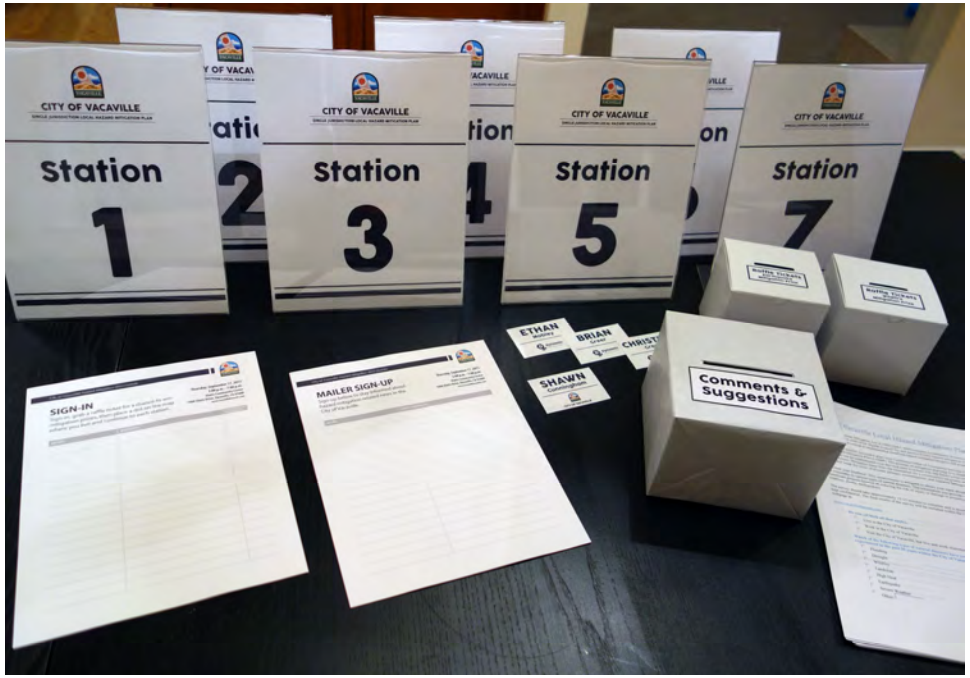

CITY OF VACAVILLE
Station 1
Station 3
Station 5
Station 7
SIGN-IN
MAILER SIGN-UP
Comments & suggestions

CITY OF VACAVILLE

Su mejor defensa contra terremotos
City of Vacaville Hazard Mitigation 2016 Update
CONGRATS NOE!!
You won an earthquake mitigation raffle prize!
Thank you for your attendance and interest in mitigating Vacaville's natural hazards.
Brought to you by
Dynamic
• Easy peel and press
• No holes or damage to furniture
• Straps are hidden from view
Secure furniture from

VACAVILLE
CITY OF VACAVILLE
SINGLE JURISDICTION LOCAL HAZARD MITIGATION PLAN
Station 1
CITY OF VACAVILLE
Station 3
Station 5

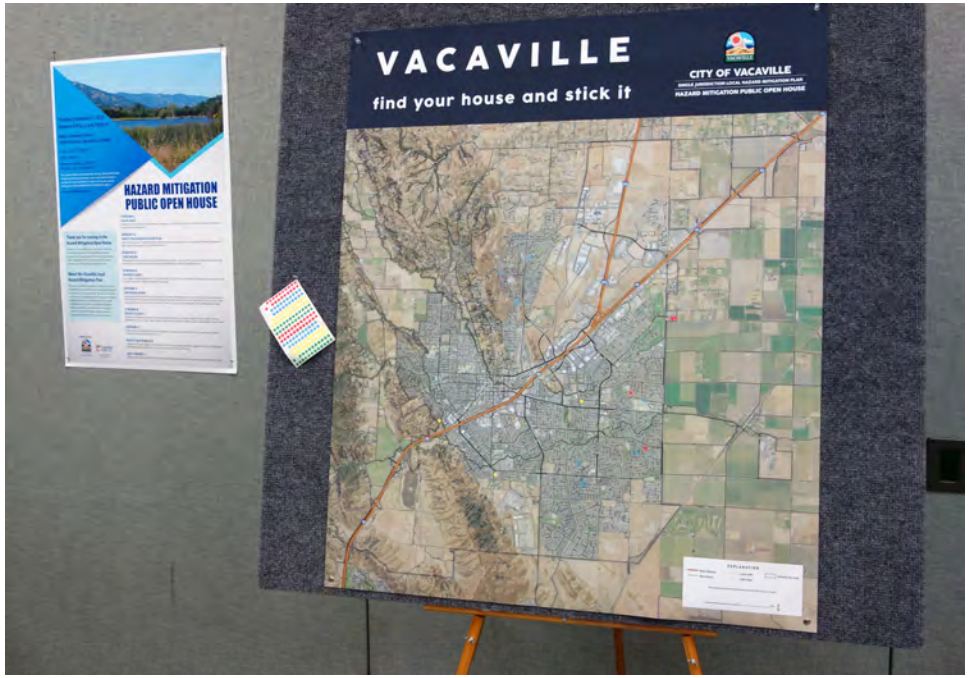
LIQUEFACTION
HAZARD

FLOOD
HAZARD

HAZARD
ward-Rodgers Creek Event
LIQUEFACTION
HAZARD

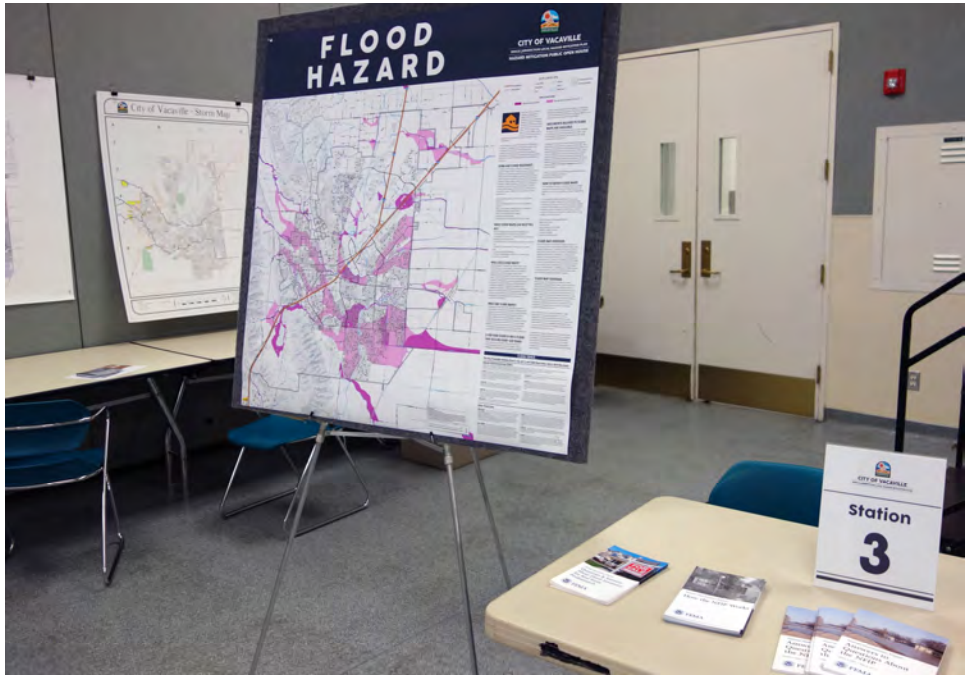
FLOOD
HAZARD

WATER HEATER


VACAVILLE
find your house and stick it
CITY OF VACAVILLE
HAZARD MITIGATION PUBLIC OPEN HOUSE
HAZARD MITIGATION
PUBLIC OPEN HOUSE

HAZARD
M7.1 Hayward-Rodgers Creek Event
EARTHQUAKE HAZARD
M6.6 Concord Southern Green Valley
CITY OF VACAVILLE
Station
5

City of Vacaville Hazard Mitigation 2014 Update
CONGRATS LAURA!!
You won a wildfire mitigation raffle prize!
Thank you for your attendance and interest in mitigating Vacaville's natural hazards.
Dynamic
FISKARS
Extendable
2x more cutting power


FLOOD HAZARD
CITY OF VACAVILLE
City of Vacaville - Storm Map
Station
3

CONGRATS LAURA!!
FISKARS
QUICK STRAP 50 DELUXE
Water Heater Restraints
CONGRATS MARSHA!!
CONGRATS NOE!!

B.4 Survey

City of Vacaville Local Hazard Mitigation Plan Survey

The Federal Disaster Mitigation Act of 2000 (DMA 2000) requires a community to have an approved hazard mitigation plan in order to be eligible to apply for and receive FEMA hazard mitigation funds. Receipt of FEMA funding is critical to implementing identified hazard mitigation projects and programs.

The City of Vacaville received a grant from California Office of Emergency Services (Cal OES) to prepare a Local Hazard Mitigation Plan (LHMP). The purpose of mitigation planning is to identify policies and to take actions that can be implemented over the long term to reduce risk and future losses when an emergency or disaster occurs. Mitigation plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage.

We need your feedback! This questionnaire is designed to obtain your input about areas in Vacaville that may be vulnerable to various types of natural disasters. The information you provide will help us identify and coordinate projects focused on reducing the risk of injury or damage to property from future hazard events (e.g. wildfires, floods, earthquakes).

The survey should take approximately 12-15 minutes to complete and is anonymous. Your information will be kept confidential. The final results of the survey will be included within the LHMP and posted on the City's webpage at:

www.vacavillehazards.com

Do you...(Check all that apply).

- ☐ Live in the City of Vacaville
- ☐ Work in the City of Vacaville
- ☐ Visit the City of Vacaville, but live and work elsewhere

Which of the following types of natural disasters have you or someone in your household experienced in the past 20 years within the City of Vacaville?

- ☐ Flooding
- ☐ Drought
- ☐ Wildfire
- ☐ Landslide
- ☐ High Heat
- ☐ Earthquake
- ☐ Severe Weather
- ☐ Other: _____

What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.

	Very likely	Likely	Somewhat Likely	Not Likely at all
Drought	○	○	○	○
Earthquake	○	○	○	○
Wildfire	○	○	○	○
Liquefaction	○	○	○	○
Flood	○	○	○	○
Landslide/Mudflow	○	○	○	○
Severe Weather	○	○	○	○
High Heat	○	○	○	○

Please indicate how you feel about the following statement:
Information about the risks from natural hazards is readily available and easy to locate.

- ○ Strongly Disagree
- ○ Somewhat Disagree
- ○ Neither Agree nor Disagree
- ○ Somewhat Agree
- ○ Strongly Agree

Please indicate how you feel about the following statement:
It is my responsibility to educate myself and take actions that will reduce my exposure to the risks from natural hazards.

- ○ Strongly Disagree
- ○ Somewhat Disagree
- ○ Neither Agree nor Disagree
- ○ Somewhat Agree
- ○ Strongly Agree

Please indicate how you feel about the following statement:
It is the responsibility of government (local, state and federal) to provide education and programs that promote citizen actions that will reduce exposure to the risks from natural hazards.

- ○ Strongly Disagree
- ○ Somewhat Disagree
- ○ Neither Agree nor Disagree
- ○ Somewhat Agree
- ○ Strongly Agree

How much money would you be willing to spend at one time to protect your home or business from natural hazards? (For example, by flood proofing a basement, performing seismic upgrades, or doing dry weed abatement for fire risk)

The answers will help City staff to find applicable hazard mitigation grant programs requiring local funding match.

- ○ Not willing to spend money on this
- ○ Less than $250
- ○ $250 - $499
- ○ $500 - $1,000
- ○ More than $1,000
- ○ Not Sure

How much money would you be willing to spend each year to protect your home or business from natural hazards in the form of flood and/or earthquake insurance?

The answers will help City staff to find applicable hazard mitigation grant programs requiring local funding match.

- ○ Not willing to spend money on this
- ○ Less than $250
- ○ $250 - $499
- ○ $500 - $1,000
- ○ More than $1,000
- ○ Not Sure

Which of the following incentives would encourage you to protect your home against natural hazards? (Check all that apply)

- ☐ Insurance premium discount
- ☐ Mortgage discount or Low Interest Loan
- ☐ Financial assistance for property upgrades or equipment
- ☐ "Rebate" program
- ☐ Technical assistance
- ☐ Labor assistance
- ☐ Grant funding that requires “cost share”
- ☐ Building permit fee reduction or waiver
- ☐ Property tax break or incentive
- ☐ Financial assistance for equipment
- ☐ Other: _____

What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville? (Please check ONE answer for each statement). This information will assess community beliefs on developing hazard mitigation programs and strategies.

	High Priority	Medium Priority	Low Priority
Retrofit and strengthen essential facilities such as police and fire facilities, schools and hospitals.			
Retrofit infrastructure such as roads, bridges, drainage facilities, water supply, waste water and power supply facilities.			
Fund projects such as flood walls, drainage improvements, fuel breaks, and bank stabilization projects.			
Strengthen codes and regulations to include higher standards in hazard areas.			
Assist vulnerable property owners with securing funding for mitigation / property protection.			
Provide better public information about risk, and the exposure to hazards within City of Vacaville.			
Carry out projects to restore the natural environments capacity to absorb the impacts from natural hazards.			
Acquire emergency generators for essential government facilities and buildings identified as care and shelters.			

Do you own or rent your home or business?

- Own
- Rent

Is your home or business located in or near a FEMA designated floodplain?

- Yes
- No
- Not Sure

Do you have flood insurance?

- Yes
- No
- Not Sure
- Other:

Is your home or business located near an earthquake fault?

- ○ Yes
- ○ No
- ○ Not Sure
- ○ Other: _____

Do you have earthquake insurance?

- ○ Yes
- ○ No
- ○ Not Sure
- ○ Other: _____

To the best of your knowledge, does your homeowner's, renter's, or general insurance policy provide coverage for damage from natural hazards?

- ○ Yes
- ○ No
- ○ Not Sure
- ○ Do not have property insurance

Have you ever had problems obtaining homeowner's or renter's insurance due to risks from natural hazards?

- ○ Yes
- ○ No
- ○ Not Sure
- ○ Never tried obtaining hazard insurance

When you moved into your home, did you consider the impact a natural hazard event could have on your home?

- ○ Yes
- ○ No
- ○ Not Sure

Was the presence of a natural hazard risk zone (for example, wild fire area or flood zone) disclosed to you by a real estate agent, seller or landlord before you purchased or moved into your home?

- ○ Yes
- ○ No
- ○ Not Sure

Would natural hazard real estate disclosures or risk information influence your decision on where to buy or rent a home?

- ○ Yes
- ○ No
- ○ Not Sure

Thank you again for completing the survey!!!! Please provide any additional comments that you may have regarding hazard mitigation and community protection against natural disasters.

emobleymb@gmail.com

Edit this form

19 responses

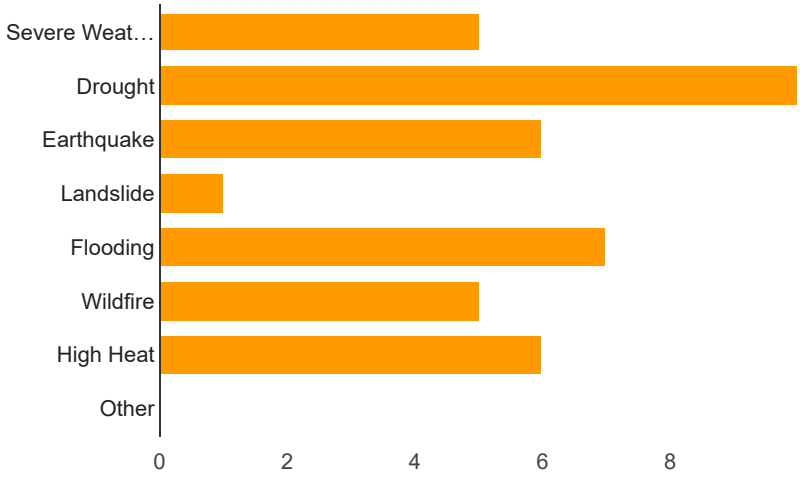
View all responses

Summary

Do you...(Check all that apply).

Live in the City of Vacaville	**18**	94.7%
Work in the City of Vacaville	**4**	21.1%
Visit the City of Vacaville, but live and work elsewhere	**0**	0%

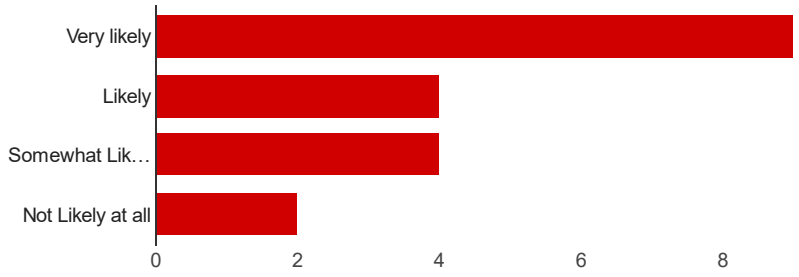
Which of the following types of natural disasters have you or someone in your household experienced in the past 20 years within the City of Vacaville?



Severe Weather	**5**	29.4%
Drought	**10**	58.8%
Earthquake	**6**	35.3%
Landslide	**1**	5.9%

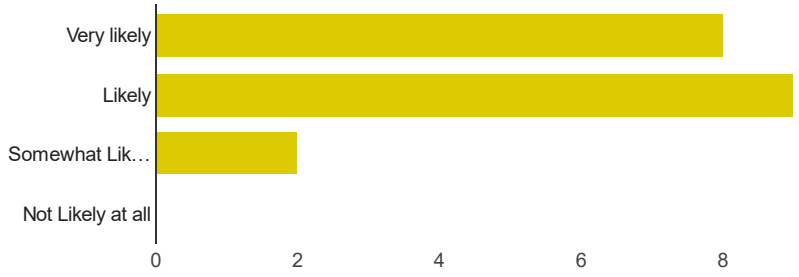
Flooding	**7**	41.2%
Wildfire	**5**	29.4%
High Heat	**6**	35.3%
Other	**0**	0%

Drought [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



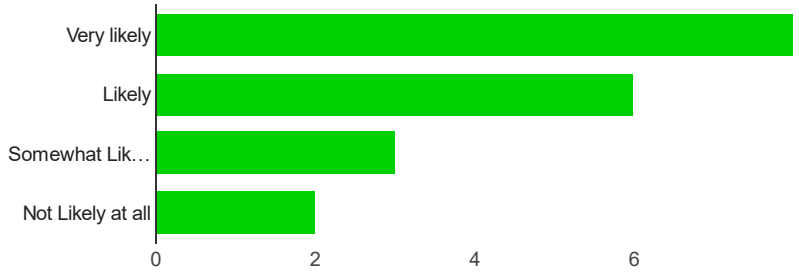
Very likely	**9**	47.4%
Likely	**4**	21.1%
Somewhat Likely	**4**	21.1%
Not Likely at all	**2**	10.5%

Earthquake [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



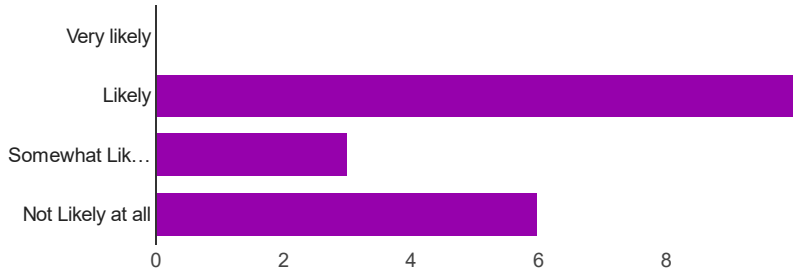
Very likely	**8**	42.1%
Likely	**9**	47.4%
Somewhat Likely	**2**	10.5%
Not Likely at all	**0**	0%

Wildfire [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



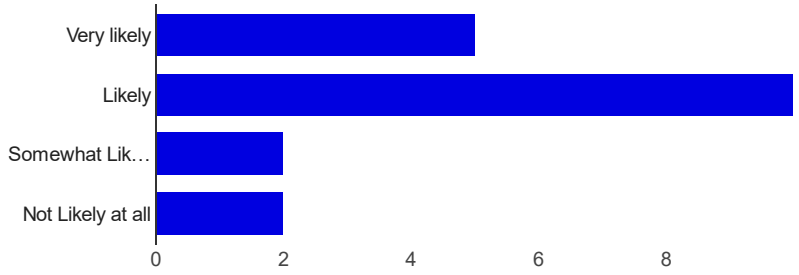
Very likely	**8**	42.1%
Likely	**6**	31.6%
Somewhat Likely	**3**	15.8%
Not Likely at all	**2**	10.5%

Liquefaction [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



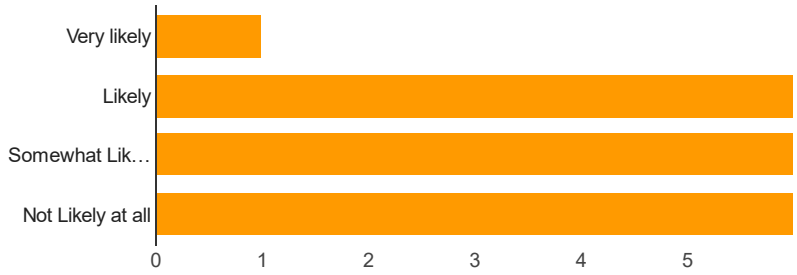
Very likely	**0**	0%
Likely	**10**	52.6%
Somewhat Likely	**3**	15.8%
Not Likely at all	**6**	31.6%

Flood [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



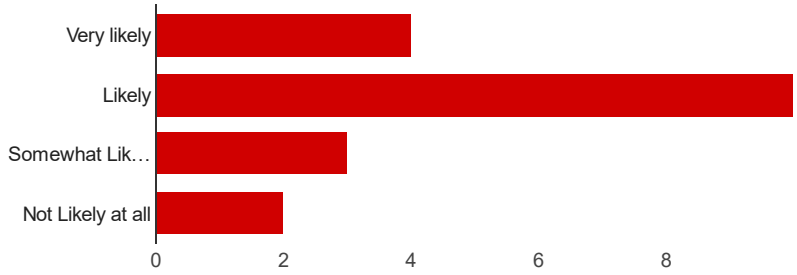
Very likely	**5**	26.3%
Likely	**10**	52.6%
Somewhat Likely	**2**	10.5%
Not Likely at all	**2**	10.5%

Landslide/Mudflow [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



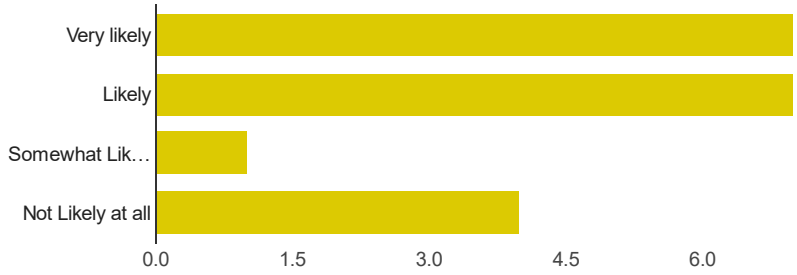
Very likely	**1**	5.3%
Likely	**6**	31.6%
Somewhat Likely	**6**	31.6%
Not Likely at all	**6**	31.6%

Severe Weather [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



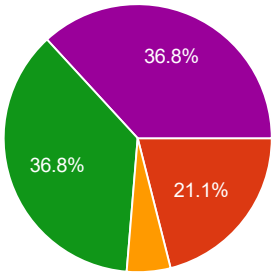
Very likely	**4**	21.1%
Likely	**10**	52.6%
Somewhat Likely	**3**	15.8%
Not Likely at all	**2**	10.5%

High Heat [What do you believe is the likelihood that these natural hazards will cause damage buildings or harm residents to the City of Vacaville? Please check ONE response for each hazard.]



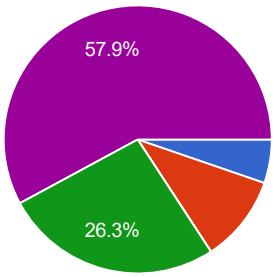
Very likely	**7**	36.8%
Likely	**7**	36.8%
Somewhat Likely	**1**	5.3%
Not Likely at all	**4**	21.1%

Please indicate how you feel about the following statement:



Strongly Disagree	**0**	0%
Somewhat Disagree	**4**	21.1%
Neither Agree nor Disagree	**1**	5.3%
Somewhat Agree	**7**	36.8%
Strongly Agree	**7**	36.8%

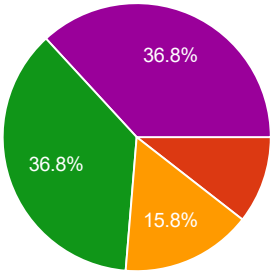
Please indicate how you feel about the following statement:



Strongly Disagree	**1**	5.3%
Somewhat Disagree	**2**	10.5%

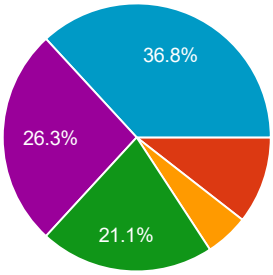
Neither Agree nor Disagree	**0**	0%
Somewhat Agree	**5**	26.3%
Strongly Agree	**11**	57.9%

Please indicate how you feel about the following statement:



Strongly Disagree	**0**	0%
Somewhat Disagree	**2**	10.5%
Neither Agree nor Disagree	**3**	15.8%
Somewhat Agree	**7**	36.8%
Strongly Agree	**7**	36.8%

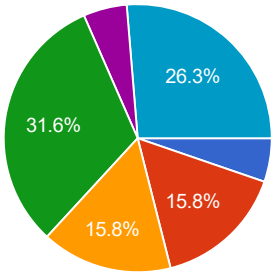
How much money would you be willing to spend at one time to protect your home or business from natural hazards? (For example, by flood proofing a basement, performing seismic upgrades, or doing dry weed abatement for fire risk)



Not willing to spend money on this	**0**	0%
Less than $250	**2**	10.5%
$250 - $499	**1**	5.3%
$500 - $1,000	**4**	21.1%
More than $1,000	**5**	26.3%
Not Sure	**7**	36.8%

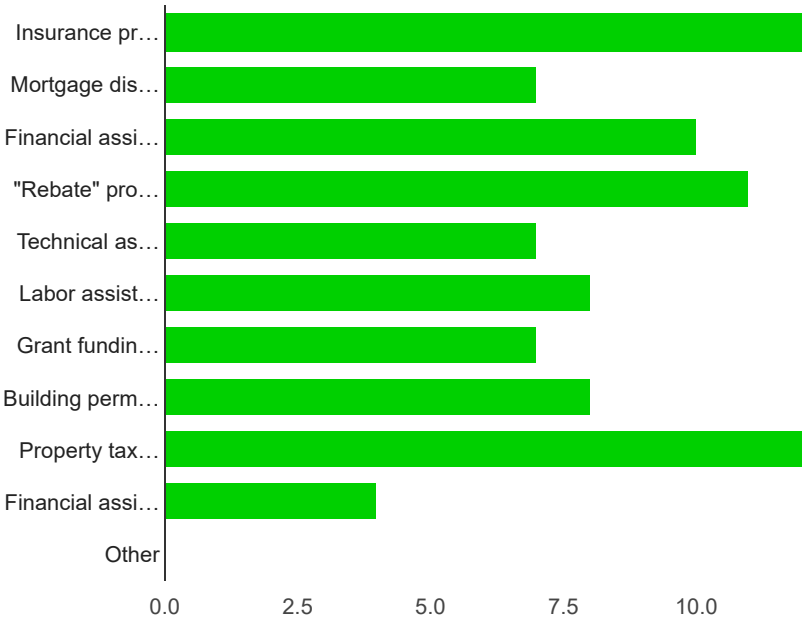
How much money would you be willing to spend each year to protect your home

or business from natural hazards in the form of flood and/or earthquake insurance?



Not willing to spend money on this	**1**	5.3%
Less than $250	**3**	15.8%
$250 - $499	**3**	15.8%
$500 - $1,000	**6**	31.6%
More than $1,000	**1**	5.3%
Not Sure	**5**	26.3%

Which of the following incentives would encourage you to protect your home against natural hazards? (Check all that apply)



Insurance premium discount	**12**	63.2%
Mortgage discount or Low Interest Loan	**7**	36.8%
Financial assistance for property upgrades or equipment	**10**	52.6%
"Rebate" program	**11**	57.9%

Technical assistance	**7**	36.8%
Labor assistance	**8**	42.1%
Grant funding that requires “cost share”	**7**	36.8%
Building permit fee reduction or waiver	**8**	42.1%
Property tax break or incentive	**12**	63.2%
Financial assistance for equipment	**4**	21.1%
Other	**0**	0%

Retrofit and strengthen essential facilities such as police and fire facilities, schools and hospitals. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]

High Priority	**13**	68.4%
Medium Priority	**5**	26.3%
Low Priority	**1**	5.3%

Retrofit infrastructure such as roads, bridges, drainage facilities, water supply, waste water and power supply facilities. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]

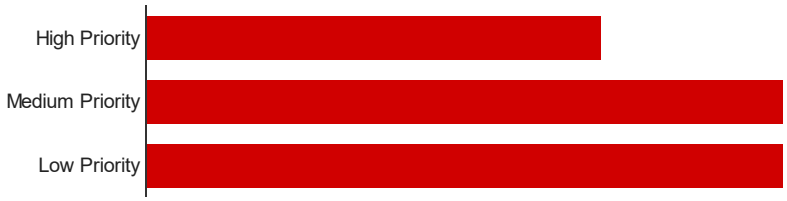
High Priority	**18**	94.7%
Medium Priority	**1**	5.3%
Low Priority	**0**	0%

Fund projects such as flood walls, drainage improvements, fuel breaks, and bank stabilization projects. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage

and disruption from hazard events within the City of Vacaville?]

High Priority	**12**	63.2%
Medium Priority	**5**	26.3%
Low Priority	**2**	10.5%

Strengthen codes and regulations to include higher standards in hazard areas. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]



High Priority	**5**	26.3%
Medium Priority	**7**	36.8%
Low Priority	**7**	36.8%

Assist vulnerable property owners with securing funding for mitigation / property protection. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]

High Priority	**5**	26.3%
Medium Priority	**8**	42.1%
Low Priority	**6**	31.6%

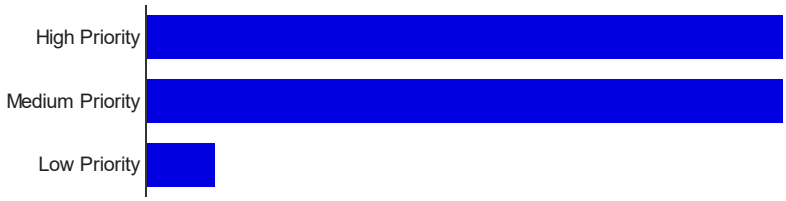
Provide better public information about risk, and the exposure to hazards within City of Vacaville. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]

High Priority	**6**	31.6%
Medium Priority	**11**	57.9%
Low Priority	**2**	10.5%

Carry out projects to restore the natural environments capacity to absorb the impacts from natural hazards. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]

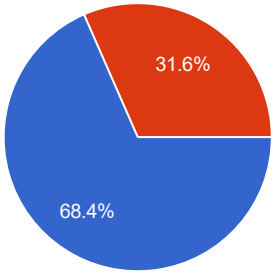
High Priority	**11**	57.9%
Medium Priority	**6**	31.6%
Low Priority	**2**	10.5%

Acquire emergency generators for essential government facilities and buildings identified as care and shelters. [What protection methods do you believe the City, County, State or Federal agencies should be using in order to reduce damage and disruption from hazard events within the City of Vacaville?]



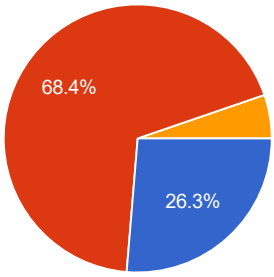
High Priority	**9**	47.4%
Medium Priority	**9**	47.4%
Low Priority	**1**	5.3%

Do you own or rent your home or business?



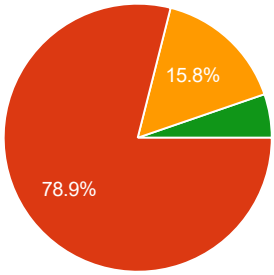
Own	**13**	68.4%
Rent	**6**	31.6%

Is your home or business located in or near a FEMA designated floodplain?



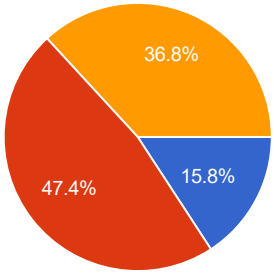
Yes	**5**	26.3%
No	**13**	68.4%
Not Sure	**1**	5.3%

Do you have flood insurance?



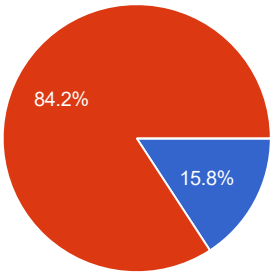
Yes	**0**	0%
No	**15**	78.9%
Not Sure	**3**	15.8%
Other	**1**	5.3%

Is your home or business located near an earthquake fault?



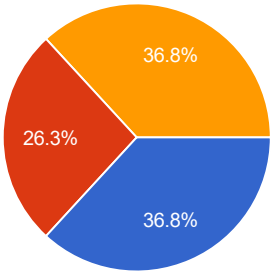
Yes	**3**	15.8%
No	**9**	47.4%
Not Sure	**7**	36.8%
Other	**0**	0%

Do you have earthquake insurance?



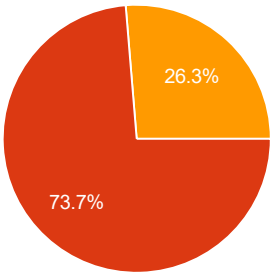
Yes	**3**	15.8%
No	**16**	84.2%
Not Sure	**0**	0%
Other	**0**	0%

To the best of your knowledge, does your homeowner's, renter's, or general insurance policy provide coverage for damage from natural hazards?



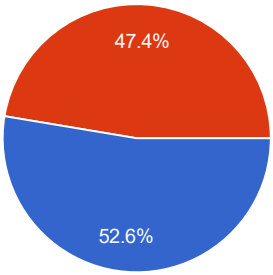
Yes	**7**	36.8%
No	**5**	26.3%
Not Sure	**7**	36.8%
Do not have property insurance	**0**	0%

Have you ever had problems obtaining homeowner's or renter's insurance due to risks from natural hazards?



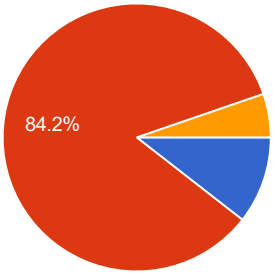
Yes	**0**	0%
No	**14**	73.7%
Not Sure	**5**	26.3%
Never tried obtaining hazard insurance	**0**	0%

When you moved into your home, did you consider the impact a natural hazard event could have on your home?



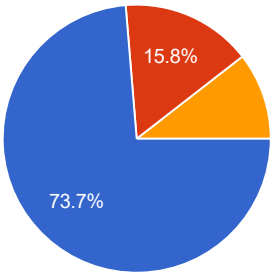
Yes	**10**	52.6%
No	**9**	47.4%
Not Sure	**0**	0%

Was the presence of a natural hazard risk zone (for example, wild fire area or flood zone) disclosed to you by a real estate agent, seller or landlord before you purchased or moved into your home?



Yes	**2**	10.5%
No	**16**	84.2%
Not Sure	**1**	5.3%

Would natural hazard real estate disclosures or risk information influence your decision on where to buy or rent a home?



Yes	**14**	73.7%
No	**3**	15.8%
Not Sure	**2**	10.5%

Thank you again for completing the survey!!!! Please provide any additional comments that you may have regarding hazard mitigation and community protection against natural disasters.

Xoom test

Test survey

Thanks for all the timely information and greatly appreciate the efforts of everyone here this evening.

Good luck to us all!!!

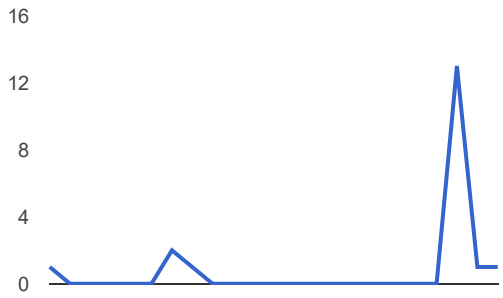
City officials = use your power/influence to get water storage (reservoirs/dams).

Why bother? City allows new construction next to rail lines. Fails to clear drainages (Beaver

Dam Vanden and Leisure Town). Storm channels look like ‘05/’06. We’re setting ourselves up for a disaster rather than mitigating.

Work in Vacaville. Do not live in Vacaville.

Number of daily responses



hazards and mitigation actions.

- Natural Resource Protection – Identify the benefits of the indigenous and natural functions of the area to take advantage of the protection it provides, reduce effects of hazards & improve quality of environment.
- Emergency Services – Actions taken to ensure continuity of emergency services.
- Structural Projects – Manmade structures or improvements to control hazards.

Common mitigation actions developed by communities include the following:

- Retrofitting of structures & design of new construction, such as elevating or floodproofing a home or building.
- Enforcement of building codes, floodplain management codes and environmental regulations.
- Public safety measures such as continual maintenance of roadways, culverts and drainage ditches.
- Acquisition of relocation of structures, such as purchasing buildings located in a floodplain.
- Acquisition of hazard prone lands in their undeveloped state to ensure they remain so.
- Protecting critical facilities and infrastructure from future hazard events.
- Mitigation, disaster recovery and Continuity of Operations (COOP) planning.
- Development and distribution of outreach materials related to hazard mitigation.
- Deployment of warning systems.

Hazard Mitigation Breaks the Cycle

With inflation and the cost of materials on the rise, constant reconstruction is a continued strain on already stressed City budgets. Hazard mitigation planning and related grant funding break the expensive cycle of damage and reconstruction by taking a long-term view of better community and land-use planning, of which citizen action is central and necessary.

What Are the Benefits?

- Reduces the loss of life, property, essential services, critical facilities and economic hardship.
- Reduces short-term and long-term recovery and reconstruction costs.
- Increases cooperation and communication within the community through the planning process.
- Increases potential for state and federal funding for pre-disaster and recovery projects within the City

What Types of Mitigation Techniques Can Be Utilized?

Hazard mitigation actions are commonly broken into six different categories:

- Prevention – Keep hazard risk from getting worse.
- Property Protection – Modify existing development subject to hazard risk.
- Public Education & Awareness – Inform people about potential hazards and mitigation actions.
- Natural Resource Protection – Identify the benefits of the indigenous and natural functions of the area to take advantage of the protection it provides, reduce effects of hazards & improve quality of environment.
- Emergency Services – Actions taken to ensure continuity of emergency services.
- Structural Projects – Manmade structures or improvements to control hazards.

Common mitigation actions developed by communities include the following:

- Retrofitting of structures & design of new construction, such as elevating or floodproofing a home or building.
- Enforcement of building codes, floodplain management codes and environmental regulations.

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Departments » Public Works » Local Hazard Mitigation Plan » What is Hazard Mitigation?

WHAT IS HAZARD MITIGATION?

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What is Hazard Mitigation?

The term Hazard Mitigation describes actions that communities can take to help reduce or eliminate long-term risks caused by natural disasters. Natural Hazards in the City of Vacaville can include flooding, wildfire, landslides, earthquake, and drought. During the planning process, prioritization will be given to the hazards within the City that are most likely to occur.

Hazard mitigation planning and projects can create a safer City by reducing loss of life and property damage associated with future disasters. Each dollar spent on mitigation can save the City an average of four dollars!

As we plan for new development and improvements to existing infrastructure, mitigation can and should be an important component of the planning effort. That extra resiliency will help citizens bounce back from that worst case flood, fire or storm more quickly.

Mitigation activities can be developed before a disaster occurs, however after a disaster, hazard mitigation assessment and planning is an essential activity to prevent disaster amnesia. Oftentimes after disasters, repairs and reconstruction are completed in such a way as to simply restore damaged property to pre-disaster conditions.

These efforts may "get things back the norm", but the replication of pre-disaster conditions may result in a repetitive cycle of damage and reconstruction. Hazard mitigation planning in the City of Vacaville can break this repetitive cycle by producing less vulnerable conditions through post-disaster repairs and disaster-smart reconstruction.

- Norcal Incident Coordination

FEMA Resources

- Federal Emergency Management Agency - Mitigation
- Federal Emergency Management Agency - Hazard Mitigation Assistance
- Mitigation Planning "How-To" Guides
- Mitigation Fact Sheets
- Mitigation Grant Programs
- Sustainability in Mitigation Planning
- Federal Partners
- Federal Emergency Management Agency - Region IX
- Federal Emergency Management Agency
- Ready.gov
- FEMA Are You Ready

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Vacaville, CA 95688
Phone (707) 449-5100
Fax (707) 449-5149

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Departments » Public Works » Local Hazard Mitigation Plan » Resources

RESOURCES

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Hazard Mitigation Guidance

- Federal Emergency Management Agency - 386-1: Getting Started
- Federal Emergency Management Agency - 386-2: Understanding Your Risks
- Federal Emergency Management Agency - 386-3: Developing the Mitigation Plan
- Federal Emergency Management Agency - 386-4: Bringing the Plan to Life
- Federal Emergency Management Agency - State Multi-Hazard Mitigation Planning Guidance
- Federal Emergency Management Agency - Disaster Act of 2000

Cal OES Resources

- Fire
- Flood
- Earth Movement (Landslide)
- Seismic (Earthquake, Tsunami)
- Other Hazards

Additional California Resources

- California Department of Forestry and Fire Protection
- California Department of Water Resources
- California Department of Water Resources - Division of Safety of Dams
- California Emergency Management Agency
- California Fire Alliance
- Caltrans Highway Information
- American Red Cross of Northeastern California
- Norcal Incident Coordination

FEMA Resources

Large regional incidents have affected the City. Most recently, fires effected parts of the City on July 4th, 2015. The fire, fueled by winds that reached up to 40 mph, quickly spread, burning more than 300 acres in a couple of hours. Flames threatened between 200 to 300 homes overnight and voluntary evacuations were in place for several neighborhoods. Fire crews were able to make progress and the fire was 50 percent contained the following day. Luckily no homes were lost due to response and proper mitigation efforts by home owners.

Hazard Profiling

The LHMP Planning Team worked with the City departments and other jurisdictions to re-establish profiles for the 2016 Hazard Mitigation Plan. Hazard profiles provide a standardized method to explain each hazard in terms of:

- Definition
- Regulations / Policies
- Location/Extent
- Magnitude/Severity
- Probability of Future Occurrences

During the hazard profiling process we review and assess existing plans, studies, other technical reports, and create hazard maps with newly acquired data and share them with stakeholders and the public to determine if the hazards identified are still valid. The HMP Planning Team will update the hazard profiles to reflect any new hazard events since 2006 and provide information in a FEMA preferred / required hazard profile format.

Draft Hazard Profiles Coming Soon!

- Reviews/provides comments on plan drafts
- Coordinates/participates in public input process

Feel free to explore Planning Team Meeting Content below!
Planning Committee Meetings (LINK)

Consultant Support
The City solicited support from Dynamic Planning + Science and Foster Morrison to facilitate the LHMP Update planning process and the development of the LHMP Update document. The LHMP Update Project Team, as shown below, consists of a variety of professionals acting as extensions of City staff to assist in the planning effort.

- Ethan Mobley, AICP, Project Manager
- Brian Greer, GIS / Data Visualization
- Chris Morrison, Senior Planner
- Jeanine Foster, National Flood Insurance Program (NFIP) Specialist

Documents and Resources
As part of Step 1 – Organizing the Resources, the Project Teams review and incorporates relevant studies, plans, and reports along with an identification of resources which can be leveraged for purposes of hazard mitigation planning. Please click the links below to explore documents and resources which have been used to date.

Documents (Link)
Resources (Link)

Risk Assessment
In accordance with FEMA requirements, this step of the Hazard Mitigation Plan (LHMP) planning process identifies the natural hazards affecting the City and assesses the vulnerability from the identified hazards. Results from this phase in the planning process will form the foundation for the subsequent mitigation actions for reducing risk and potential losses in the City of Vacaville.

Hazard Identification
The citywide risk assessment begins with the identification of hazards which could potentially affect the City. During the plan update process we re-establish information about prevalent natural hazards and prepare a preliminary list of hazards based upon the City's 2010 LHMP, stakeholder input, and other documentation. The preliminary hazard list of for 2016 LHMP Update includes:

- Flooding
- Wildfire
- Drought
- Extreme Heat
- Dam Failure
- Geo Hazards (Earthquakes and Landslides)

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PLANNING TEAM

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This step involves the formation of the LHMP Update Project Team, which includes the formation of a LHMP Planning Committee. The LHMP Planning Team consists of local emergency managers, health officials, fire department staff, planning staff, as well as other stakeholders in the community. In addition to interested residents, the following agencies and departments are involved or supporting LHMP Update process:

- City of Vacaville Public Works
- City of Vacaville Planning Department
- City of Vacaville Fire Department
- City of Vacaville Police Department
- City of Vacaville GIS Department
- City of Vacaville Utilities Department
- City of Fairfield Planning Department
- Solano County Water Agency
- California Office of Emergency Services (Cal OES)
- City of Dixon Fire Department
- Solano County OES
- FEMA Publication Division
- California Earthquake Alliance
- Association of Bay Area Governments

Planning Committee

In addition to stakeholder input, a LHMP Planning Committee is used to guide the process and ensure the mitigation plan meets the goals of the City and the State and Federal Hazard Mitigation Plan requirements. The Planning Committee:

- Attends/actively participates in a series of structured coordination meetings
- Assists in the collection of valuable local information and other requested data
- Makes decisions on plan process and content
- Identifies mitigation actions for the LHMP

and other interested parties).

STEP 2: Assess Risks

Location and geographic extent of natural and human-made hazards that can affect the City along with their impacts and future probability is identified. Scientific and anecdotal evidence of past events is collected and evaluated the losses the community has sustained and hazards are ranked high to low.

STEP 3: Develop and Draft the Mitigation Plan

City capabilities in emergency management, the National Flood Insurance Program (NFIP), planning and regulatory authority, administrative and technical knowledge, finances, and politics are assessed.

STEP 4: Draft Plan

Existing goals, objectives, and actions and are evaluated and updated as needed. The MHMP Planning Team defines appropriate mitigation techniques, and chooses and prioritizes mitigation actions and projects in the Mitigation Action Plan.

STEP 5: Plan Review/Revision

The MHMP Update is a living document that must be regularly reviewed, updated, and maintained. A schedule including responsible parties or agencies involved with monitoring, evaluating, and updating the plan during its five-year cycle is prepared. A process for integrating the updated Mitigation Strategy into existing plans and reports should be outlined and a plan for continued public outreach and participation must also be determined.

STEP 6: Plan Adoption/Submittal

The Draft MHMP Update is made available for public comment then submitted to the California Emergency Management Agency and the Federal Emergency Management Agency for review and approval. Once the MHMP Update has been determined to meet all state and federal requirements and receives official approval it should be adopted by the City.

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PLANNING PROCESS

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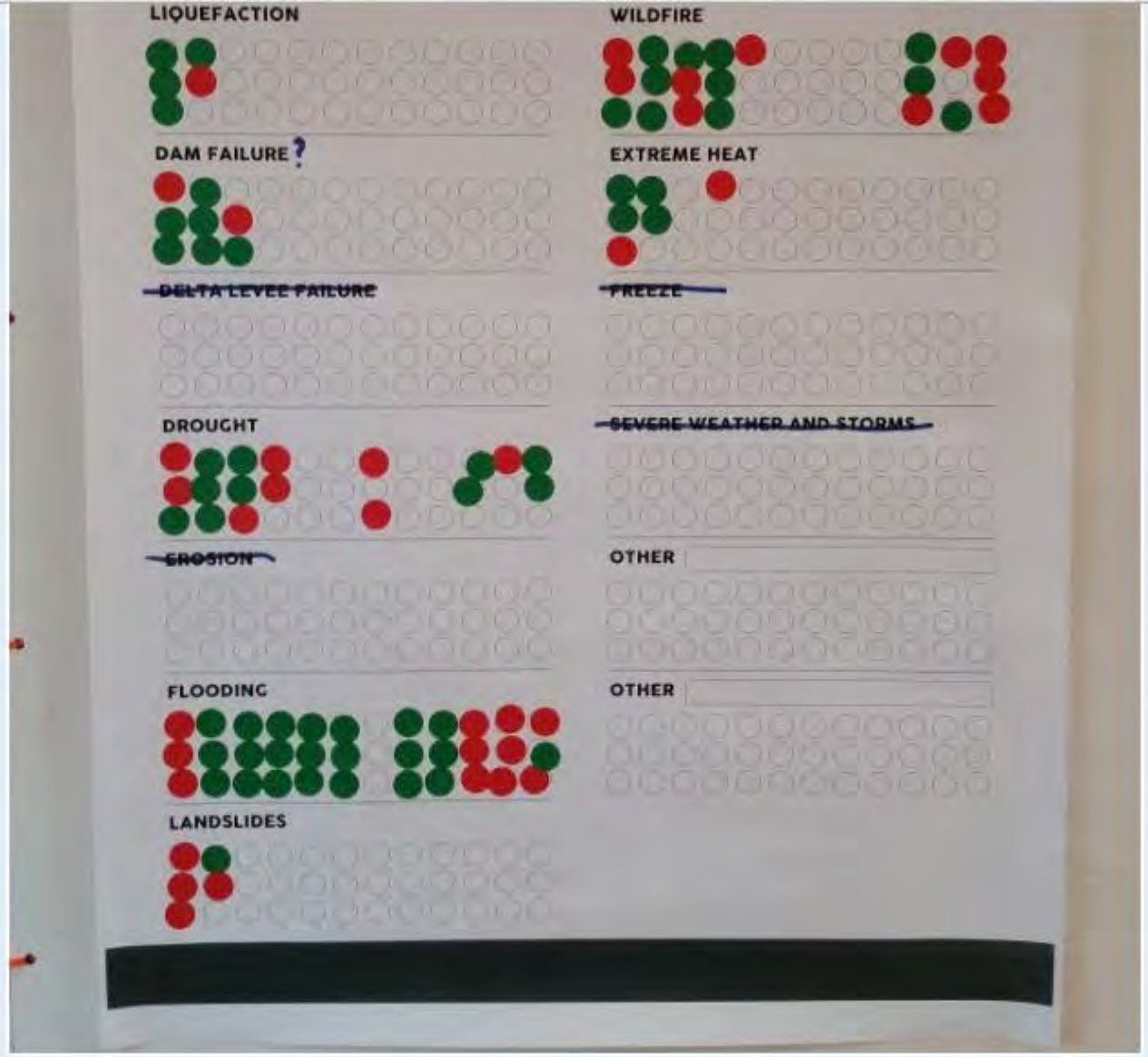
How is the Multi-Hazard Mitigation Plan Update Process Completed?

Local officials develop and adopt mitigation plans to meet the requirements of the Stafford Act. The Multi-Hazard Mitigation Planning Guidance provides the official guidance on these requirements and procedures for approval of hazard mitigation plans. The core steps in the graphic below show the process to complete a mitigation plan.

STEP 1: Organize Resources

Relevant studies, plans, and reports are collected along with communications resources that allow the public to be involved throughout the planning process. A MHMP Planning Team is "built" that consists of local emergency management, planning staff, residents, business, property owners, and tenants in the floodplain and other known hazard areas, as well as other stakeholders in the community (such as business leaders, civic groups, academia, non-profit organizations, major employers and other interested parties).

STEP 2: Assess Risks


LIQUEFACTION
WILDFIRE
DAM FAILURE ?
EXTREME HEAT
DELTA LEVEE FAILURE
FREEZE
DROUGHT
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OTHER
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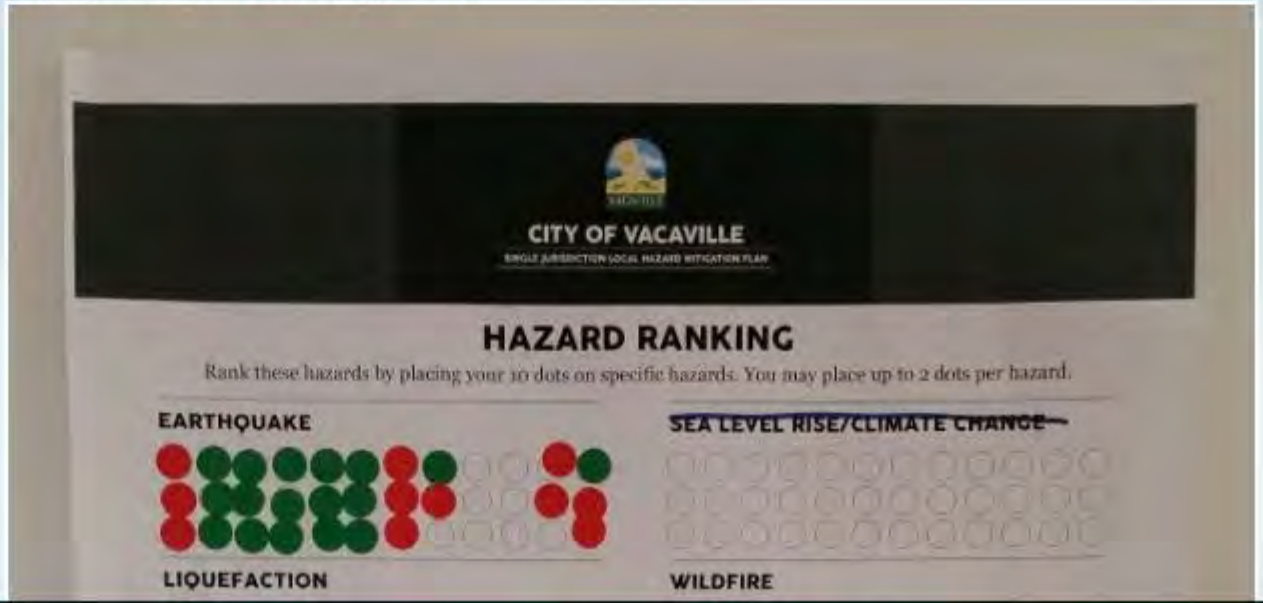
PLANNING COMMITTEE MEETING #1

2015-16 Local Hazard Mitigation Plan Update
City of Vacaville
Planning Committee Meeting #1
August 20, 2015
10 a.m. – Noon

Meeting Links:
Agenda
Power Point (PDF)

Hazard Prioritization Exercise Outcomes



Contact Us

Comments and questions may be submitted to Shawn.Cunningham@cityofvacaville.com

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Standard Specifications & Drawings

Traffic and Transportation

Water, Sewer, Storm Drains

Public Works FAQ

Contact us

PROTECT YOUR HOME FROM NATURAL DISASTERS!

Attend a free open house event on natural disaster threats in your area.

Learn what you can do to protect your home and family from the effects of wildfire, flooding, earthquake, and other hazards…

Tell us your thoughts on local hazards!

Tell us what incentives will help us protect your home!

HAZARD MITIGATION PUBLIC OPEN HOUSE

September 17, 2015
Drop in anytime between:
3:00 PM till 7:00 PM

Ulatis Community Center
1000 Ulatis Drive Vacaville, CA 95688

PIZZA & SOFT DRINKS!

GIVE-A-WAYS!

BRING HISTORIC DISASTER PHOTOS, GET A REWARD!

This outreach effort is coordinated by the City of Vacaville Hazard Mitigation Planning Committee. Learn more about resources and the city's planning efforts to reduce risk in your area by visiting the LOCAL HAZARD MITIGATION QUICK LINK at:

www.vacavillehazards.com

Brought to you by:

VACAVILLE

City of Vacaville
Public Works Department

Cal OES
GOVERNOR'S OFFICE OF EMERGENCY SERVICES

Cal OES Hazard Mitigation Planning Division

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HOW CAN I GET INVOLVED?

When can I get involved?

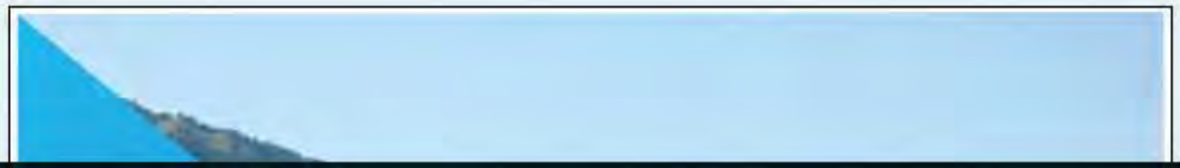
Public participation in the process is important because it helps raise awareness of the hazards in the City of Vacaville and the actions needed to mitigate those hazards. By participating in the process you will be taking time to consider the hazards in our community, the impact of those hazards on life and property, actions that need to be taken to reduce that impact, and the priority those actions should take. The LHMP Planning Committee will consider all input from the public and integrate it into the plan where appropriate. Opportunities for the community to provide input, ask questions, and review/comment on draft documents will be provided throughout the planning process. Your comments, questions, ideas, and concerns will have a significant role in the plan's preparation.

Take this quick survey

This survey will help the LHMP Planning Committee better understand the community's concerns about natural hazards and to identify policies, programs and projects that can help lessen the impact of future hazard events. Completing the survey provides you the opportunity to share your opinions and participate in the mitigation planning process. To begin the survey, click here!

Attend the Community Workshop/Learning Event

A public open house event will be held on Thursday, September 17, 2015 between 3 p.m. and 7 p.m. at the Ulatis Community Center located at 1000 Ulatis Drive, Vacaville, CA. This will provide you with an opportunity to learn more about the LHMP, review the progress achieved to date, share your opinions and concerns regarding natural hazards, ask questions and to provide feedback. Everyone is encouraged to attend. See poster below.



The plan will also include easy to use forms the LHMP Planning Committee can use to document their annual meetings, review the LHMP each year, and documents changes made to mitigation actions, and/ or public outreach completed.

Appendices will include all documentation compiled to support the planning process throughout. Once all sections are completed, The LHMP Planning Team will compile the plan into an Administrative Draft LHMP and submit to the LHMP Planning Committee for review. After the two-week City Review Period, the LHMP Planning Team will incorporate any comments to prepare the Public Review Draft.

Plan Review and Revision

Once the Public Review Draft is completed, it will be available for public review and comment through the City Hazard Mitigation Website and hard copies will be made available at Libraries and other venues.

After the public review and comment period, the Planning Team will compile all comments received on the Public Review Draft for inclusion as an Appendix item and revise the LHMP, as necessary. The LHMP Planning Team will finalize the LHMP and complete the new FEMA Plan Review Tool Reference Document and submit the plan to Cal OES for State review and approval. Once approved at the State level, Cal OES will provide the submittal to FEMA Region IX requesting federal approval.

Important to Note: The state and federal approval process could take more than 60 Days depending on availability of review staff.

Plan Adoption and Submittal

Once Cal OES and FEMA approval is received, the LHMP Planning Team will prepare the final LHMP for review by the City and will complete any resulting revisions required and prepare the Final LHMP adoption. After LHMP adoption, the City's consultant will compile supporting documentation (e.g., official resolution) as part of the Final Draft to be distributed to Planning Committee members, as well as all required local, state, and Federal agencies.
Important to Note: City of Vacaville staff must update the LHMP within five years of the previous plan approval date to maintain access to all hazard mitigation grant streams.

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Departments » Public Works » Local Hazard Mitigation Plan » Draft Plan

DRAFT PLAN

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Once the Risk Assessment and mitigation strategy is updated, the LHMP Planning Team will update all information, data, and associated narratives into an Administrative Draft LHMP and will prepare all sections in accordance with DMA 2000, FEMA's 44 CFR Part 201 and 206, and any new LHMP Guidance from Cal OES hazard mitigation reviewers. Plan Sections will include:

- Introduction
  - Community Profile
  - Geography/Environment
  - Community Facts
  - Population and Demographics
  - Land Use/Development Trends
- What's New
- Planning Process
- Risk Assessment
- Mitigation Strategy
- Plan Maintenance

To assist the City with future plan maintenance and implementation activities the LHMP Planning Team will review monitoring, evaluation, and updating activities undertaken since the approval of the 2010 LHMP and incorporate this information into section of the document called **"What's New."**

The **LHMP Planning Process Section** will be updated to include the review and analysis of the previous 2010 LHMP, the LHMP Planning Committee and public involvement results, and review/incorporation of previous studies, plans, technical documents, distribution list of LHMP recipients etc.

The **Risk Assessment and Mitigation Strategy** sections will be updated to include new analysis, updated mitigation measures that reflect current problems and the City's capabilities to address those problems.
The **Plan Maintenance Section** will include new maintenance procedures for scheduled monitoring, evaluating, and updating the HMP based upon stakeholder engagement and defined reporting roles.

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ABOUT THE PROJECT

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What is the Purpose?

The purpose of the current FY2015 -16 planning process is to update the City's existing local hazard mitigation plan (LHMP) last updated in 2010. The LHMP will be updated by using the most current information and data, conducting a thorough vulnerability analysis, and revising community priorities and subsequent mitigation actions.

Objectives:

- Provide the public opportunities throughout the plan development and drafting process to provide input, taking special care to make the plan and outcome relevant to the impacted community.
- Update the risk assessment using the most recent disaster data and information.
- Update hazard mitigation goals, objectives and actions as they relate to reducing loss of life and property from natural and human-made hazards.
- Obtain state and federal approval of the updated plan.

What is a Multi-Hazard Mitigation Plan?

The plan is an official statement of the City's hazards, vulnerability analysis, and mitigation strategy. The result of a collaborative multi-agency and citizen planning process. As a living document, it guides implementation activities to achieve the greatest reduction of vulnerability, which results in saved lives, reduced injuries, reduced property damages, and protection for the environment.

Why have a Multi-Hazard Mitigation Plan?

To ensure public consensus through a planning process on mitigation actions that best suit the community. Allows communities to focus efforts and limited resources on the most highly desirable mitigation projects. The City of Vacaville must have a State and federally approved plan to apply for and receive mitigation grants. These grants can augment local mitigation activities already underway and future planned activities too. Ultimately, these actions reduce vulnerability and communities are able to recover more quickly from disasters.

B.5 Website

Appendix C DWR General Safety Plan Element Review Crosswalk

General Plan Safety Element Review Crosswalk

C

CENTRAL VALLEY FLOOD PROTECTION BOARD
GENERAL PLAN SAFETY ELEMENT REVIEW CROSSWALK

The General Plan Safety Element Review Crosswalk is based on the currently effective requirements of Government Code Section 65302.7, which state each city and county within the boundaries of the Sacramento-San Joaquin Drainage District (SSJDD) must submit the draft safety element, or draft amendment to the safety element, to the Central Valley Flood Protection Board (CVFPB) for review 90 days prior to element adoption. The CVFPB then has 60 days to review the safety element and provide written recommendations for changes regarding:

1. Uses of land and policies in areas subjected to flooding that will protect life, property, and natural resources from unreasonable risks associated with flooding.
2. Methods and strategies for flood risk reduction and protection within areas subjected to flooding.

Each city and county must consider the Board's recommendations prior to the adoption of the draft safety element. If the legislative body determines not to accept all or some of the recommendations, findings must be made in writing to the Board that states the reasons why. If the Board's recommendations are not available within 60 days, action can be taken by the local jurisdiction without the recommendations devoid of penalty; however, if recommendations are submitted after the 60 days, the local governing body must consider the recommendations at the next time the jurisdiction considers amendments to the safety element.

Consultation with the Central Valley Flood Protection Board

Prior to preparation or revision of the safety element cities and counties must consult with the CVFPB based on the currently effective requirements of Government Code Section 65302(g)(5). The purpose of the consultation with the CVFPB is to assist with guidance related to areas subject to flooding and to direct jurisdictions to the most current relevant technical information available regarding flood risk reduction and protection. It is recommended that cities and counties consult with the CVFPB through written communication, phone calls, and/or electronic communication at http://www.cvfpb.ca.gov/.

PART 1 – INSTRUCTIONS

Please fill out the application information below under Part 2, along with the checklist requirements within Part 3, Sections I and II "jurisdictions to fill out" columns and return, along with the draft safety element to:

Central Valley Flood Protection Board (CVFPB), Encroachment Control & Land Use Section
3310 El Camino Avenue, Room 151
Sacramento, California 95821

PART 2 – APPLICATION INFORMATION

Jurisdiction to Fill Out			
Jurisdiction:	**Mailing Address:**		
Jurisdiction Contact/Title:	**Phone Number:**	**E-mail Address:**	**Date of draft safety element:**
CVFPB Use Only			
CVFPB Reviewer/Title:		**CVFPB Receipt Date:**	

PART 3 – CHECKLIST OF REQUIREMENTS

Government Code Section 65302(g) includes 2007 State flood risk management legislative direction to local jurisdictions to review and revise the general plan safety element to identify new information regarding flood hazards. For guidance regarding how to respond to the specific requirements under Section I and II below, reference the Department of Water Resources' *Handbook for Implementing California Flood Legislation into Local Land Use Planning* at http://www.water.ca.gov/floodmgmt/ or http://www.water.ca.gov/LocalFloodRiskPlanning/.

This Review Crosswalk serves as a typical checklist that is required by the CVFPB and other agencies; however, the CVFPB and other agencies may ask for more information in addition to this checklist.

Items to Consider before Filling out the Review Crosswalk

Cities and counties are required to submit the draft general plan safety element or draft general plan safety element amendments to the CVFPB only if the bottom two conditions apply:

1. Is the city or county located within Sacramento-San Joaquin Drainage District? If yes, continue with the Review Crosswalk.
2. Is it a draft general plan safety element or draft general plan safety element amendment? If yes, continue with the Review Crosswalk.

Scoring System

The scoring system for the Review Crosswalk is based on the review of the safety element requirements under Sections I and II below and the resulting findings from the CVFPB if the requirements have been "met" or "not met."

Section I: Identification of Flood Hazard Information

Jurisdiction to Fill Out			CVFPB Use Only		
				Score	
Safety elements must identify information regarding flood hazards per GC 65302(g)(2)(A)	**Jurisdiction's Notes for CVFPB Reviewer**	**Location in the Safety Element/ Page #**	**Board Reviewer's Comments**	✓ MET	✓ NOT MET
i. Does the new or updated safety element include flood hazard zones, as identified by FEMA?		Page_____		☐	☐

Jurisdiction to Fill Out			CVFPB Use Only		
Safety elements must identify information regarding flood hazards per GC 65302(g)(2)(A)	Jurisdiction's Notes for CVFPB Reviewer	Location in the Safety Element/ Page #	Board Reviewer's Comments	Score ✓ MET	Score ✓ NOT MET
ii. Does the new or updated safety element include National Flood Insurance Program (NFIP) maps, published by FEMA?		Page_____		❑	❑
iii. Does the new or updated safety element contain information about flood hazards available from the U.S. Army Corps of Engineers including the Corps Sacramento and San Joaquin River Basins Comprehensive Study?		Page_____		❑	❑
iv. Does the new or updated safety element include dam failure inundation maps, available from CalEMA (prepared pursuant to GC Section 8589.5)?		Page_____		❑	❑

Jurisdiction to Fill Out			CVFPB Use Only		
				Score	
Safety elements must identify information regarding flood hazards per GC 65302(g)(2)(A)	**Jurisdiction's Notes for CVFPB Reviewer**	**Location in the Safety Element/ Page #**	**Board Reviewer's Comments**	✓ MET	✓ NOT MET
v. Does the new or updated safety element include designated floodway maps, available from the CVFPB?		Page_____		❑	❑
vi. Does the new or updated safety element include Awareness Floodplain Mapping Program maps and 200-year flood plain maps, available from DWR?		Page_____		❑	❑
vii. Does the new or updated safety element include maps of levee flood protection zones (LFPZs), available from DWR?		Page_____		❑	❑

Jurisdiction to Fill Out			CVFPB Use Only		
Safety elements must identify information regarding flood hazards per GC 65302(g)(2)(A)	Jurisdiction's Notes for CVFPB Reviewer	Location in the Safety Element/ Page #	Board Reviewer's Comments	Score ✓ MET	Score ✓ NOT MET
viii. Does the new or updated safety element include areas subject to inundation in the event of the failure of project or nonproject levees or floodwalls (contact DWR for assistance, if needed)?		Page_____		☐	☐
ix. Does the new or updated safety element include historical data on flooding including locally prepared maps of areas that are subject to flooding, areas that are vulnerable to flooding after wildfires, and sites that have been repeatedly damaged by flooding, varies by Jurisdiction (contact DWR for assistance, if needed)?		Page_____		☐	☐

Jurisdiction to Fill Out			CVFPB Use Only		
Safety elements must identify information regarding flood hazards per GC 65302(g)(2)(A)	**Jurisdiction's Notes for CVFPB Reviewer**	**Location in the Safety Element/ Page #**	**Board Reviewer's Comments**	**Score** ✓ MET	**Score** ✓ NOT MET
x. Does the new or updated safety element include existing and planned development in flood hazard zones, including structures, roads, utilities, and essential public facilities, varies by jurisdiction (contact DWR for assistance, if needed)?		Page_____		❑	❑
xi. Does the new or updated safety element include reference to local, state, and federal agencies with responsibility for flood protection, including special districts and local offices of emergency services?		Page_____		❑	❑

Section II: Protection of the Community from the Unreasonable Risks of Flooding

Jurisdiction to Fill Out					CVFPB Use Only		
Based on the above information in Section I, safety elements must establish a set of comprehensive goals, policies, and feasible implementation measures under GC 65302(g)(2)(B) and 65302(g)(2)(C)	**Jurisdiction's Notes for CVFPB Reviewer**	**Location in the Safety Element/Page #**			**Board Reviewer's Comments**	**Score**	
		✓ **Goal**	✓ **Policy**	✓ **Imp. Measure**		✓ **MET**	✓ **NOT MET**
Do the new or updated safety element goals, policies, and implementation measures accomplish the following:							
I. Avoid or minimize the risks of flooding to new development?		Page_____					
		❑	❑	❑		❑	❑
II. Part a: Evaluate whether new development should be located in flood hazard zones?		Page_____					
		❑	❑	❑		❑	❑

Jurisdiction to Fill Out					CVFPB Use Only		
Based on the above information in Section I, safety elements must establish a set of comprehensive goals, policies, and feasible implementation measures under GC 65302(g)(2)(B) and 65302(g)(2)(C)	**Jurisdiction's Notes for CVFPB Reviewer**	**Location in the Safety Element/Page #**			**Board Reviewer's Comments**	**Score**	
		✓ Goal	**✓ Policy**	**✓ Imp. Measure**		**✓ MET**	**✓ NOT MET**
Do the new or updated safety element goals, policies, and implementation measures accomplish the following:							
II. Part b: Identify construction methods or other methods to minimize damage if new development is located in flood hazard zones?		Page_____					
		❑	❑	❑		❑	❑
III. Maintain the structural and operational integrity of essential public facilities during flooding?		Page_____					
		❑	❑	❑		❑	❑

Jurisdiction to Fill Out					CVFPB Use Only		
Based on the above information in Section I, safety elements must establish a set of comprehensive goals, policies, and feasible implementation measures under GC 65302(g)(2)(B) and 65302(g)(2)(C)	Jurisdiction's Notes for CVFPB Reviewer	Location in the Safety Element/Page #			Board Reviewer's Comments	Score	
		✓ Goal	✓ Policy	✓ Imp. Measure		✓ MET	✓ NOT MET
Do the new or updated safety element goals, policies, and implementation measures accomplish the following:							
IV. Locate, when feasible, new essential public facilities outside of flood hazard zones (including hospitals and health care facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities) or identify construction methods or other methods to minimize damage if these facilities are located in flood hazard zones?		Page_____				❑	❑
		❑	❑	❑			

Jurisdiction to Fill Out					CVFPB Use Only		
Based on the above information in Section I, safety elements must establish a set of comprehensive goals, policies, and feasible implementation measures under GC 65302(g)(2)(B) and 65302(g)(2)(C)	Jurisdiction's Notes for CVFPB Reviewer	Location in the Safety Element/Page #			Board Reviewer's Comments	Score	
		✓ Goal	✓ Policy	✓ Imp. Measure		✓ MET	✓ NOT MET
Do the new or updated safety element goals, policies, and implementation measures accomplish the following:							
V. Establish cooperative working relationships among public agencies with responsibility for flood protection?		Page_____				❑	❑
		❑	❑	❑			

Section III – Additional Considerations and Information the Central Valley Flood Protection Board Recommends Including

- Identify evacuation routes in the event of floods or dam failure inundations.
- If the city or county is vulnerable with inundation by more than one dam failure, delineate each dam inundation area resulting from each dam failure.
- The safety element and/or land use element must mention that if any project, including the modification of an existing project, falls within the jurisdiction regulated by the CVFPB, the city or county must apply for an encroachment permit from the Board. The Board exercises jurisdiction over the levee cross-section, the waterward area between project levees, a 10-foot-wide strip adjacent to the landside levee toe, within 30 feet of the top of the banks of unleveed project channels, and within designated floodways adopted by the Board. Activities outside of these limits which could adversely affect flood control projects are also under Board jurisdiction.
- Include a plan that differentiates the existing and planned development areas, and also includes flood hazard zones (associated with the above Section I, "x").
- Include geographic information systems (GIS) electronic mapping that layers floodplain mapping information, land use designations, safety evacuation routes, natural features, dam failure inundation, and other applicable flood risk management information on one figure at a minimum scale of 11x17 format.

CVFPB Use Only	
Section I Req. Met: _____/11	Section II Req. Met: _____/6
Section I Req. Not Met: _____/11	Section II Req. Not Met: _____/6

CVFPB Use Only
Comments:

Appendix D Plan Maintenance

D.1 Blank Mitigation Action Implementation Plans

D.2 Blank Mitigation Action Reporting Forms

D.3 Blank Annual HMP Review Questionnaires

D.1 Blank Mitigation Action Implementation Plans

Mitigation Action Implementation Plan	
Action x.x.x	
Implementing Agencies	
Lead Agency (ies):	
Roles and Responsibilities:	
Support Agency (ies):	.
Roles and Responsibilities:	
Preliminary Identified Tasks:	
1.	
2.	
3.	
Implementation Costs	
Estimated Capital Costs:	
Estimated Maintenance Costs:	
Implementation Resources	
Financial Resources (Funding):	
Technical Assistance Resources:	
Required Equipment, Vehicles, and Supplies	
Office Supplies	
Vehicles	
Implementation Timeframe	
Estimated Mitigation Action Start Date:	
Estimated Mitigation Action Completion Date:	

D.2 Blank Mitigation Action Reporting Forms

Progress Report Period:_____ to _____

(date) (date)

Project Title:_____ Project ID#_____

Responsible
Agency:_____

Address:_____

City:_____

Contact Person:_____

Phone#: _____ Email address:_____

List Supporting Agencies and Contacts:_____

Total Project Cost:_____

Funding Source:_____

Anticipated Cost Overrun/Underrun:_____

Date of Project Approval:_____ Start date of the project:_____

Anticipated completion date: _____

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase):_____

Milestones	Completed (✓)	Projected Date of Completion

MHMP Goal Addressed: _____

Indicator of Success:_____

Project Status:

□ Project on schedule □ Cost unchanged

□ Project completed □ Cost overrun*

□ Project delayed*

*explain _____

□ Project cancelled*

*explain _____

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

B. What successes have you encountered, if any?

C. What obstacles, problems, or delays have you encountered, if any?

D. How was each problem resolved?

E. Based on the past experiences (successes and obstacles), what changes, if any, need to be made to ensure completion?

Next Steps: What are the next step(s) to be accomplished over the next reporting period?

Other Comments:

D.3 Blank Annual HMP Review Questionnaires

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS
PLANNING PROCESS	Have there been local staffing changes that would warrant inviting different members to the planning team?			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done more efficiently?			
	Are there any representatives of essential organizations who have not fully participated in the planning and implementation of actions? If so, can someone else from this organization commit to the implementation team?			
	Has the Steering Committee undertaken any public outreach activities regarding the MHMP or implementation of mitigation actions?			
HAZARD PROFILES	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this MHMP and should be?			
	Are additional maps/data or new hazards studies available? If so, what have they revealed?			
VULNERABILITY ANALYSIS	Do any new critical facilities or infrastructure need to be added to the asset lists?			
	How will the vulnerability analysis be affected by additional maps/data or new hazard studies?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
	Has the vulnerability analysis changed as a result of the implementation of mitigation actions?			
MITIGATION STRATEGY	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?			
	Is the goal still applicable?			
	Should new mitigation actions be added to the Mitigation Action Plan?			
	During implementation of the mitigation actions, what has proven effective? What has proven not effective?			

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS
	Do existing mitigation actions listed in the Mitigation Action Plan need to be reprioritized deleted, or revised?			
	Are the mitigation actions listed in the Mitigation Action Plan appropriate for available resources?			
PLANNING MECHANISMS	Has the Mitigation Action plan been incorporated into existing planning mechanisms? If yes, please list what other planning mechanisms and in what way.			
	Has the Mitigation Action plan incorporated existing planning mechanisms? If yes, please list these existing planning mechanisms and what elements were incorporated and how.			