Local Hazard Mitigation Plan

November 2015

Funded by CDBG

U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

November 16, 2015

Francie Sullivan
Mayor
City of Redding
777 Cypress Avenue
Redding, CA 96001

Dear Mayor Sullivan:

We have completed our review of the *City of Redding Local Hazard Mitigation Plan,* officially adopted by the City of Redding, CA on September 16, 2014 and found the Plan to be in conformance with Title 44 Code of Federal Regulations (CFR) Part 201.6 *Local Mitigation Plans.*

The approval of this Plan ensures the City of Redding's continued eligibility for project grants under FEMA's hazard mitigation assistance programs, including Hazard Mitigation Grant Program, Pre-Disaster Mitigation and Flood Mitigation Assistance grant programs. All requests for funding, however, will be evaluated individually according to the specific eligibility, and other requirements of the particular program under which applications are submitted. Approved mitigation plans may be eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Additional information regarding the CRS can be found at *www.fema.gov/business/nfip/crs.shtm* or through your local floodplain manager.

FEMA's approval of the *City of Redding Local Hazard Mitigation Plan* is for a period of five years, effective starting the date of this letter. Prior to November 16, 2020, the City of Redding is required to review and revise its Plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval in order to continue to be eligible for mitigation project grant funding.

If you have any questions regarding the planning or review processes, please contact Phillip Wang, Hazard Mitigation Planner at (510) 627-7753, or by email at phillip.wang@fema.dhs.gov.

Sincerely,

Jeffrey D. Lusk
Division Director
Mitigation Division
FEMA Region IX

Enclosure

cc: Lily Toy, Associate Planner, City of Redding
Marcia Sully, State Hazard Mitigation Officer
Jose Lara, Chief, Hazard Mitigation Planning

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1.0 INTRODUCTION

People and property in Redding are at risk from a variety of hazards that have the potential for causing widespread loss of lives and damage to property, infrastructure, and the environment. Hazards are part of the world around us. Natural occurrences such as wildland fires, floods, winter storms, and earthquakes are inevitable and are natural phenomena which we cannot control. The occurrence of a natural hazard can result in damages and hardships for an entire community for many years following the event.

Disasters result when the man-made environment, such as buildings and infrastructure, take place in areas subject to forces of nature. The frequency of disasters is rising at a substantial rate due to the fact that more and more people have chosen to live and work in locations that put them at risk.

The purpose of hazard mitigation is to implement and sustain actions that reduce vulnerability and risk from hazards or reduce the severity of the effects of hazards on people and property. Mitigation actions are both short-term and long-term activities which reduce the cause or occurrence of hazards; reduce exposure to hazards; or reduce effects of hazards through various means, including preparedness, response, and recovery measures. Effective mitigation actions will also reduce the adverse impact and cost of future disasters.

The City of Redding Local Hazard Mitigation Plan includes resources and information to assist in planning for hazards. The plan provides a list of actions that may assist the City of Redding in reducing risk and preventing loss from future hazard events. The actions address hazards, as well as specific activities for, Wildland Fire, Flood, Hazardous Material, Severe Winter Weather, Earthquakes, Utility Disruption, Aviation Disaster, Chemical, Biological, Radiological, Nuclear, Explosives (CBRNE), Dam Overflow or Failure, and Volcanic issues.

2.0 ACKNOWLEDGMENTS

Mayor and City Council
Francie Sullivan, Mayor
Missy McArthur, Vice Mayor
Gary Cadd
Kristen Schreder
Brent Weaver

City of Redding Hazard Mitigation Project Team Leader
Lily Toy, Associate Planner

City of Redding Hazard Mitigation Project Team
Butch Brown, Police Lieutenant
Devon Hedemark, Information Technology Supervisor
Steve Hiner, Plan Check Engineer
Steven Kincaid, GIS Analyst
Marty Wayne, Project Coordinator

City of Redding Staff
Airports
Rod Dinger, Support Services Director
Redding Electric Utility
Marvin Briggs, Electric Manager

Advisory Committee Members
California Transportation District
American Medical Response
American Red Cross – Three Rivers Chapter
Shasta County Office of Education
Shasta County Public Health Emergency Preparedness Coordinator

City of Redding Staff – Past Contributors
Barry Bratton, Assistant Airports Manager
Kevin Burke, GIS Senior Analyst
Steve Craig, Wastewater Utility Manager
Paul Cummings, Electric Program Supervisor
Jim Hamilton, Development Services Director
Brian King, Electric Program Supervisor
Kevin Kreitman, Fire Chief
Linda Pepin, Management Analyst II
Mike Robertson, Water Utility Manager
Terri Thesken, Senior Planner
Mike Warren, City Manager
Steve Wood, System Analyst/Programmer

3.0 OFFICIAL RECORD OF ADOPTION

This section provides a general and comprehensive view of the Disaster Mitigation Act of 2000. This includes a review of the federal requirements, City adoption, and supporting documentation.

3.1 Disaster Mitigation Act 2000 Requirements

The Disaster Mitigation Act of 2000 (DMA 2000), commonly known as the 2000 Stafford Act amendments, was approved by Congress on October 10, 2000. On October 30, 2000, the President signed the bill into law, creating Public Law 106-390. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous Mitigation Planning Section 409 and replacing it with a new Mitigation Planning Section 322. The DMA 2000 is the latest legislation to improve the hazard mitigation planning process. The new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. As such, the DMA 2000 establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP).

The DMA 2000 specifically addresses mitigation planning at the state and local levels. It identifies new requirements that allow HMGP funds to be used for planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive, enhanced mitigation plan prior to a disaster. States and communities must have an approved mitigation plan in place prior to receiving post-disaster HMGP funds. Local and tribal mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to, and the capabilities of, the individual communities.

State governments have certain responsibilities for implementing the program. DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. It encourages and rewards local and state pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network will better enable local and state governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk-reduction projects.

Table 3-1
DMA 2000 Requirements – Prerequisites
Adoption by the Local Governing Body

REQUIREMENT §201.6(C)(5)	The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, and Tribal Council).
EXPLANATION	Adoption by the local governing body demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in the plan. Adoption legitimizes the plan and authorizes responsible agencies to execute their responsibilities. For final approval by FEMA, the Local Hazard Mitigation Plan must include a copy of the local governing body's resolution adopting the plan.
ELEMENT	A. Has the plan been formally adopted by the local governing body? B. Is a copy of the plan adoption resolution included?

3.2 Adoption by the local governing body and supporting documentation

The City of Redding Hazard Mitigation Plan meets the requirements of Section 322 of the Disaster Mitigation Act of 2000. This includes complying with the requirement that the plan be adopted by the Redding City Council. The City of Redding Hazard Mitigation Plan has been prepared by the City of Redding Hazard Mitigation Project Team (HMPT) and adopted by the Redding City Council via resolution. A copy of the signed resolution is provided on the following page.

3.3. Resolution

RESOLUTION NO. 2014-095

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF REDDING ADOPTING THE LOCAL HAZARD MITIGATION PLAN 2014 UPDATE

WHEREAS, the City of Redding having developed a Local Hazard Mitigation Plan meeting the requirements of Section 409 of the Robert T. Stanford Disaster Relief and Emergency Assistance Act of 1988 and Section 322 of the Disaster Mitigation Act of 2000; and

WHEREAS, the City of Redding recognizes the consequences of disasters and the need to reduce impacts of natural- and human-caused hazards; and

WHEREAS, the toll on families, individuals, and businesses can be immense after a disaster, both emotionally and economically; and

WHEREAS, time, money, and the emotional effort to respond and recover from these disasters diverting public resources and attention from other important programs and problems;

NOW, THEREFORE, IT IS RESOLVED that the City of Redding does hereby adopt the Local Hazard Mitigation Plan 2014 Update, incorporated by reference and available for review in the City Clerk's office.

I HEREBY CERTIFY that the foregoing resolution was introduced, read, and adopted at a regular meeting of the City Council on the 16th day of September, 2014, by the following vote:

AYES:	**COUNCIL MEMBERS:**	**Cadd, Jones, McArthur, & Sullivan**
NOES:	**COUNCIL MEMBERS:**	**None**
ABSENT:	**COUNCIL MEMBERS:**	**Bosetti**
ABSTAIN:	**COUNCIL MEMBERS:**	**None**

/s/ Francie Sullivan
FRANCIE SULLIVAN, Vice Mayor

ATTEST:

/s/ Pamela Mize
PAMELA MIZE, City Clerk

APPROVED AS TO FORM:

/s/ Richard A. Duvernay
RICHARD A. DUVERNAY, City Attorney

4.0 BACKGROUND

4.1 Introduction

The Disaster Mitigation Act of 2000 (DMA 2000), commonly known as the 2000 Stafford Act amendments, was approved by Congress on October 10, 2000. On October 30, 2000, the President signed the bill into law, creating Public Law 106-390, amending the Stafford Act with regard to hazard mitigation planning primarily by moving from post-disaster mitigation to pre-disaster mitigation planning and projects. The DMA 2000 emphasizes greater interaction between the state and federal governments, which have a continuing interest in streamlining the mitigation planning, implementation, and project-funding process.

4.2 Purpose and Authority of Plan

The City of Redding (City) Hazard Mitigation Plan's purpose is to fulfill the requirements of the DMA 2000, which calls for all communities to prepare mitigation plans. The plan includes resources and information to assist City residents, public- and private-sector organizations, and others interested in participating in planning for hazards. The plan provides a list of mitigation activities that may assist the City in reducing risk and preventing loss from future hazard events.

Hazard mitigation is any action that reduces the effects of future disasters. It has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster actually occurs. Hazard mitigation, along with preparedness, response, and recovery are the four phases of emergency management. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

The DMA 2000, Section 322a-d, requires that local governments, as a condition of receiving federal disaster mitigation funds, have a mitigation plan that describes the process for identifying hazards, risks, and vulnerabilities; identifies and prioritizes mitigation actions; encourages the development of local mitigation; and provides technical support for those efforts. This mitigation plan serves to meet those requirements.

4.3 Plan Description

The City of Redding Hazard Mitigation Plan consists of the following primary sections:

Community

This section provides details of our community to provide sufficient background for the hazard profiles and risk assessments that are presented in subsequent chapters. This description includes regional setting, history, and government and includes information regarding the climate, population, demographics, and economy.

Vulnerability Assessment

Through this process, the project team identified and gathered corresponding data on all potential hazards that present a danger to the City and the adjacent surrounding area. The information gathered includes historical data on natural hazard events that have occurred in and near the City and what impacts these events had on residents and their property.

Risk Assessment

This section utilizes the information gathered through the vulnerability assessment process to determine what assets in the community will be affected by the hazard event. The inventory of assets includes people, housing units, critical facilities, special facilities, infrastructure, hazardous materials facilities, and commercial facilities. This data was compiled by assessing the potential impacts from each hazard using past events. The information in this section provides the City with information that outlines the full range of hazards the City may face and the potential social impacts, damages, and economic losses.

Mitigation Strategy

This section identifies mitigation actions/measures and implementation strategies for the City. Additionally, this section provides a comprehensive strategy for addressing mitigation priorities. The mitigation measures include preventive actions, property-protection techniques, structural projects, natural resource-protection strategies, emergency services, and public education and awareness activities.

5.0 PLANNING PROCESS

This section describes the process in which the plan was developed. This includes the federal requirement followed by the City's actions applied to this process.

5.1 DMA 2000 Requirements

The table below summarizes the DMA 2000 requirements for documentation of the planning process.

Table 5-1
DMA 2000 Requirements – Planning Process and Documentation Planning Process

REQUIREMENT §201.6(b) and §201.6(c)(1)	Requires that there be an open public involvement process in the formation of the plan. This includes opportunities for the public to comment on the plan at all stages of its formation and the involvement of any neighboring communities, interested agencies, or private and nonprofit organizations. This should also include a review of any existing plans or studies and incorporation of these if appropriate. Documentation of the planning process, including how the plan was prepared, who was involved in the process, and how the public was involved is essential.
EXPLANATION	A description of the planning process should include how the plan was prepared, who was involved in the planning process, and the timeframe for preparing the plan. The plan should document how the planning team was formed and the number and outcomes of the meetings the planning team held. Ideally, the local mitigation planning team is composed of local, state, and federal agency representatives, as well as community representatives, local business leaders, and educators. In addition to the core team preparing the plan, it is also important to indicate how the public (residents, businesses, and other interested parties) participated, including what means (e.g., Web pages, storefronts, toll-free phone lines) were made available to those who could not attend public forums to voice concerns or provide input during the planning process.
ELEMENT	A. Does the plan provide a description of how the plan was prepared? B. Does the plan indicate how the planning team was formed (including who was involved)? C. Does the plan indicate how the public was involved in the process? D. Does the planning process describe what means were made available to those who could not attend public meetings to provide input?

5.2 Plan Development

The initial phase of the planning process was to identify a team leader and to establish a project team comprised of City agencies. Associate Planner Lily Toy and Deputy Fire Marshal John Kaylor served as the project team leaders and as the primary contact persons for the City. The project team was formed as an advisory group and as a task group to review and update the plan. Meeting dates were set on a bi-weekly basis. As done in the past, the project team solicited participation for the team. The project team invited interested parties, such as the local American Red Cross, the Shasta County Office of Emergency Services, and various City agencies not represented on the project team. Additionally, an invitation was made to members of the Shasta County Multi-Jurisdictional Hazard Mitigation Plan at their Steering Committee meetings which were held between April 2010 and November 2010. The members of the Shasta County Multi-Jurisdictional Hazard Mitigation Plan Steering Committee consisted of various County agencies, responsible officials, and consultants (ENPLAN Environmental Scientists and Planners and Western Shasta Resource Conservation District). The members of the City of Redding Hazard Mitigation Project Team (HMPT) are listed in Table 5-2 below:

Table 5-2
Hazard Mitigation Project Team

Project Team Leaders	
Lily Toy	Associate Planner
Kevin Kreitman	Fire Chief
Project Team Members	
Devon Hedemark	Information Technology Supervisor
Steve Kincaid	GIS Analyst I
Butch Brown	Police Lieutenant
Marty Wayne	Associate Civil Engineer
Steve Hiner	Plan Check Engineer

The update to the plan was initiated in May 2010. The project team participated in working independently reviewing and making revisions for specific portions of the Plan. Interested parties and/or stakeholders were involved in reviewing and updating the goals, objectives and actions. The project team reviewed the Shasta County Multi-Jurisdictional Hazard Mitigation Plan, the City's General Plan, and the City's Flood Inundation/Evacuation Plan to incorporate information and ensure consistency with other existing plans. The project team held monthly meetings through May 2011. Bi-weekly meetings were held from February 2012 until the draft plan was circulated for public review in September 2012. During the review period, the stakeholders were allowed opportunities to review the goals, objectives and actions and maps of the analyzed hazard scenarios developed by the project team. Following the review period, the project team re-assessed and re-identified characteristics and potential consequences of natural and non-natural hazards affecting the City. With the understanding of the risks posed by the identified hazards, the team determined priorities and assessed various methods to avoid or minimize any undesired effects. As a result, mitigation strategy and goals were updated. The team then went on to revised the implementation and monitoring plan in which the plan will be implemented through various hazard mitigation projects, changes in day-to-day City operations, and through continued hazard mitigation development.

5.3 Community Participation

Public input during the development of the mitigation plan update assisted in shaping plan goals and mitigations. The HMPT invited various stakeholders to the regularly scheduled meetings and held a separate stakeholders workshop to help identify priorities in developing goals for reducing risk and preventing loss from natural and non-natural hazards in the City. Press releases were issued to invite the public to the public workshop. When the draft was completed, a 20-day public comment period was initiated. A public notice was placed in the local newspaper to invite the public to review and comment on the draft plan. Copies of the plan were made available at the local library and at City Hall. Furthermore, a draft of the plan was posted on the City's website. The draft plan updates were presented to the City Council on November 6, 2012 and September 16, 2014, which were open to the public for further comment.

5.4 Local Hazard Mitigation Planning Benefits

During the process of developing the plan, benefits were realized. The following is a list of the benefits that were generated during development of the plan.

1. Allowed for an in-depth analysis of current Hazardous Materials Facilities in the City and the potential effects of a release of Hazardous Material.

2. Provided the City with a thumbprint view of where those facilities are located and what chemical hazards they have on-site.

3. Provided for the sharing of information and team building between City departments.

4. Gave the City a beginning point for discussions on transportation hazards and how to effectively deal with one should it occur. "Plan for the worst, hope for the best."

5. Heightened our awareness level as to the nature of disasters in our community.

6. Provided an evaluation tool on our current resources and how to best utilize them in an emergency.

7. Allowed the City to practice the plan for scenario responses and mitigation measures on some of the disasters.

8. Provided more up-to-date informational maps on specific hazards and facility locations.

9. Provided better methodology for quickly calculating property loss, number of affected structures, and population.

10. Enhanced the City of Redding Emergency Preparedness Program.

6.0 COMMUNITY DESCRIPTION

This section is to provide a glimpse into the community of Redding. This includes general information concerning regional setting, history, government, climate, population, economy, land use, and development patterns.

6.1 Regional Setting

The City of Redding is located in Shasta County in northern California, nestled between the Cascades and Trinity Alps. It is approximately 100 miles south of the Oregon border and 160 miles north of Sacramento. Redding's current population is approximately 90,200, which makes it the largest city in Shasta County and the largest city in California north of Sacramento. Redding also serves as the county seat of Shasta County.

Redding is situated at the far northern end of the Sacramento Valley, at the point where the valley meets the foothills of the Cascade mountain range. Elevations range from 500 to 5,000 feet above mean sea level. The City's mean elevation is 557 feet above mean sea level. Redding is surrounded by mountains to the west, north, and east. The most distinctive geographical feature in the area is the Sacramento River, which meanders nine miles through the City in a general north-south direction. Several creeks also run through the City from the west and east. These creeks function as tributaries to the Sacramento River. Some have carved gullies and ravines with depths of up to 200 feet, mainly in the western part of the City. This stretch of river is one of the finest trout-fishing waters in the western United States.

Redding is bisected by Interstate 5, a major north-south freeway that runs from Canada to Mexico. Interstate 5 connects Redding with major metropolitan areas such as Seattle, Portland, Sacramento, and Los Angeles. State Routes 299, 273, and 44 also pass through Redding, connecting the City with the Pacific Coast and Nevada. The main north-south line of the Union Pacific Railroad runs through the community as well. Redding's location also places it near many outdoor attractions and recreational areas, such as Shasta Lake, Lassen Volcanic National Park, and the Shasta/Trinity/Whiskeytown National Recreation Area.

Redding was founded in 1872 and incorporated in 1887 at the northern terminus of the California and Oregon Railroad. The City's early growth was stimulated by the railroad and by the move of the county seat from Shasta in 1884. Mining played a major role in the economic life of Redding as the century progressed. In 1938, the beginning of construction of Shasta Dam provided another stimulus to growth in Redding. The construction boom after World War II boosted the lumber industry, which became the mainstay of Redding's economy. In more recent years, retail trade, construction, and tourism have become more significant activities as the lumber industry has declined. Redding has become a major regional center for shopping, health care, education, and government. As a result of this, the Redding area has become one of the faster-growing areas in California.

6.2 History

In 1843, Pierson B. Reading, one of the pioneers of the lumber industry in Shasta County, and his partner received a Spanish land grant for 26,000 acres near the Sacramento River. He built a home and settled in, also planting the state's first cotton plants and northern California's first grapevines. By 1862, he had mapped out a town near the mouth of Clear Creek and the Sacramento River. Redding was founded in 1872; the year the "California and Oregon Railroad" reached the site of the City, which was to be its northern terminus for the next 12 years. The coming of the railroad saw the rise of Redding, along with the decline of Shasta, the "Queen City" of northern California and, in the 1870's, the largest settlement in that part of the state. Shasta did not have a railroad, so business activity swung to Redding. With the railroad came a man named Benjamin Redding, who was a land agent for the Central Pacific Railroad. With the development of the town, the legislature wanted to name the town Reading after its founder. The railroad was not happy with this choice and would not recognize the name. It wanted the town named after its agent, Benjamin Redding. Finally in 1880, everyone gave in and the town was given the railroad's choice of names. At that time, there were 9,492 residents in Redding. By 1884, Redding had become the county seat of Shasta County. Redding was incorporated on October 4, 1887, the same year that the Southern Pacific Railroad came to Redding.

Since its incorporation in 1887, the area within the city limits of Redding has grown from 3.65 square miles to 60.03 square miles. The original City town site as plated in 1872 established the town limits at North (now Eureka Way), South, East, and West Streets. Redding's early growth was spurred by copper and gold strikes during the late 1800s, which led to an initial boom period between 1890 and 1910. By 1890, Redding's boundary had grown to the Sacramento River on the north, Sequoia Street on the east, Grant Street on the south, and Almond Street on the west. In the 1940s, initial development north of the river and residential development moving toward the south occurred. In the 1950s, initial development of the area along North Market Street occurred. With the opening of the Interstate 5 freeway, development spread to the north. Interstate 5 continued to spur development along its corridor during the 1970s.

On January 1, 1970, the City was comprised of 15.2 square miles. Two significant annexations occurred in 1976 that dramatically altered the size and configuration of Redding. In June 1976, the Cascade Community Services District was annexed, adding 3,000 acres to the City south of town. Later, in December, the former Enterprise Public Utility District was annexed, adding another 3,200 acres east of town. These two annexations increased Redding's size by nearly 10 square miles. The largest annexation since 1976 was the Texas Springs/Oregon Gulch annexation, which added 1,692 acres on the west side to the City. With a few smaller annexations and one de-annexation occurring since, the City is now comprised of 60.68 square miles.

6.3 Government

The City of Redding is a general law city, formed under state legislative statutes and governed by a body of laws in the State Constitution. The Redding City Council consists of five council members elected "at large" for staggered four-year terms. Council members must be residents of the City and registered voters both at the time nomination papers are taken out and upon assuming office.

Redding is one of the many California cities operating under the Council-Manager form of government. Under this system, the Council establishes the policies under which the City operates and appoints a trained and experienced City Manager to administer the affairs of the City. His responsibilities include hiring of City staff, preparation of the annual budget, administration and coordination of the City's operations, general supervision over all property under the control of the City, and enforcement of City ordinances and applicable state laws.

The City Manager appoints a staff to assist him in carrying out his duties. City departments include Administrative Services, City Attorney's office, City Clerk's office, City Treasurer's office, Community Services, Development Services, Electric, Fire, Human Resources, Municipal Services, Support Services, and Police.

Like the City Manager, the City Attorney is appointed by the City Council. Both the City Clerk and the City Treasurer are elected by the public.

Redding is a full-service city with approximately 1,000 full- and part-time employees. The City's services include:

Airport
General Administrative Services
Highways and Streets
Housing
Planning and Zoning
Public Safety (Police and Fire)
Public Improvements
Recreation and Parks
Solid Waste Collection and Disposal
Tourist Bureau
Utilities (Electric, Water, and Wastewater)

A list of the City's critical facilities is provided in Appendix 1 of this document.

6.4 Climate

Climatologists describe the climate in the Redding area as Mediterranean, with hot, dry summers and cool, wet winters. In January, the average temperatures range from 36 degrees to 55 degrees. In April, the average daily high is 70 degrees, with an average daily low of 46 degrees. During July, the temperatures range from 65 to 99 degrees, with some days exceeding 100. Annual rainfall averages 33 inches, most of which falls between November and March.

6.5 Population/Demographics

Redding has sustained growth over the past two decades. The current population is approximately 90,200 (California Department of Finance, DOF, January 2012). Between 1990 and 2010, the City grew from 66,462 to 89,861, at an average annual rate of 1.8 percent. An exhibit geographically depicting the density of population within the City of Redding is attached (See Figure 2).

Category	
Population (2012 estimate: DOF):	90,200
Population (Census of 2010)	89,861
Population (Census of 2000)	80,865
Estimated percentage change (between 2000 and 2010)	+11.1
Population density per square mile	1,481
Housing units (Census of 2010):	38,679
Median household income: (2010 American Community Survey 1-Year Estimates)	$40,741
Households (Census 2010):	36,130
Persons per household (Census 2010)	2.43

Races in Redding (Source: 2010 American Community Survey 1-Year Estimates)	
White	86.56%
Black or African American	0.75%
American Indian and Alaska Native	2.33%
Asian	2.33%
Native Hawaiian and Other Pacific Islander	0.08%
Other race	1.82%
Two races, including Other race	1.52%
Two races, excluding Other race, and three or more races	4.6%

Square Miles and Population

Year	Acres	Square Miles	Population Estimate
1978	15778.00	28.3	40,055
1990	33801.99	52.82	66,462
1991	33801.99	52.82	69,305
1992	37385.22	58.41	72,091
1993	37672.02	58.86	74,570
1994	38036.86	59.43	75,932
1995	38036.86	59.43	76,837
1996	38036.86	59.43	77,706
1997	38036.86	59.43	78,474
1998	38043.06	59.44	79,343
1999	38044.06	59.44	79,822
2000	38420.46	60.03	80,714
Census 2000	38,163.20	59.63	80,865
2001	38,442.56	60.03	82,930
2002	38,247.56	59.76	84,952
2003	38,247.56	59.76	86,249
2004	38,282.56	59.82	87,389
2005	38,282.56	59.82	88,333
2006	38,282.56	59.82	88,998
2007	38,282.56	59.82	89,794
2008	38,837.56	60.68	90,353
2009	38,837.56	60.68	90,931
2010	38,837.56	60.68	91,561
2011	38,837.56	60.68	90,050
2012	38,837.56	60.68	90,200

6.6 Economy

The outdoor lifestyle and air quality of the Redding area have attracted many highly skilled people from larger urban areas, creating a choice labor force. Both *Money Magazine* and *Expansion Management Magazine* have recognized the Shasta County metro area for its quality business environment.

Redding's overall job growth in a five-year period was more than double the national average (19.9 percent compared with 8.7 percent). The increase in the number of businesses in the City is almost triple the national average (38.8 percent compared with 13 percent) for the same period.

Redding also offers an extremely successful Down Payment Assistance Program to aid first-time homebuyers. Affordable commercial and residential real estate, low-cost skilled labor, and a low crime rate also contribute to Redding's rapid growth.

One of the key components of Shasta County's business retention plan is to acknowledge and cater to small businesses; particularly those that help create a diverse economy with industrial linkages between local manufacturers. The Redding City Council has developed a number of local incentives for industrial development and businesses that create new jobs.

The Shasta Metro Enterprise Zone consists of 51 square miles of commercial and industrial sectors of the cities of Redding, Anderson, and Shasta Lake, as well as adjacent industrial areas of Shasta County. Special incentives offered by the Enterprise Zone include sales and tax credit, hiring assistance, business expense deduction, net operating loss carryover, and net interest deductions for lenders.

Occupations in Redding include:

Agriculture
Construction
Finance
Government
Manufacturing
Retail Trade
Services
Transportation, Commercial, Utilities
Wholesale Trade

6.7 Land Uses

Redding adopted its first General Plan in 1958. The Plan Area covered 9,366 acres, or 14.6 square miles, consisting of a land use diagram and a streets and highways plan, and included five land use classifications: Single Family, High Density Residential/Professional, Retail Commercial, Planned Industrial, and Public. By contrast, the General Plan adopted in 1970 covered approximately 73 square miles. The current General Plan, adopted in 2000, covers approximately 110 square miles and includes 23 land use designations. The residential land uses encompass approximately 37,000 acres. The nonresidential land uses encompass approximately 35,000 acres. The non-residential land uses include office, commercial, heavy commercial, industrial, public facilities/institutional, airport service, greenway, park, and recreation.

6.8 Development Patterns

While in part the result of topography, flood-prone land and physical barriers (such as the Sacramento River, Interstate 5, and the Union Pacific Railroad), the relatively low-density, discontinuous nature of Redding's development pattern does not come without its costs. These include increased costs of providing public services; loss of community identity, or "sense of place"; decreased air quality due to a near total reliance on the automobile; and a neglect of older, established residential neighborhoods and commercial areas in preference for development in new areas.

Few cities have the luxury of sole control over all land uses contained within them, and Redding is no exception. Redding has grown geographically through the annexation of lands which were formerly outside its jurisdictional control. In fact, some of the larger annexations (e.g., Enterprise and Cascade areas) added not only significant territory to the City, but also increased its population base and level of development as well. In part, this helps to explain why there seems to be no organizing principle

underlying Redding's urban structure. It also serves to explain the lack of consistency in infrastructure improvements, landscape, and building design, as well as lack of public-street access to individual properties found in various parts of the City.

Redding can be divided into five primary sectors, each of which is shaped by its unique characteristics, histories, and issues. These areas are: (1) Central and West Redding, (2) East Redding (Enterprise), (3) Dana Drive and Northeast Redding, (4) North Redding, and (5) South Redding.

Central and West Redding

Central Redding is the location of the City's original commercial and office core. Local government facilities and most of its older residential districts are also located here. Spreading outward from the original town site astride the railroad in a grid pattern typical of the time, Redding grew north and east to the edge of the bluff that borders the Sacramento River, south along the highway and railroad spine, and west into the hills and gullies. Extension of the early street pattern across the ravines created unusable lots and "paper" streets that remain undeveloped today.

Some of the City's most unique and historic residential areas are located west of Central Redding in the Magnolia neighborhood and its adjacent neighborhoods. Farther west, beyond Benton Airpark and the now-closed Benton Sanitary Landfill, lays a large, residential district, consisting exclusively of single-family subdivisions. Development of some of these areas began in the early 1950s and new developments continue to be constructed today.

West Redding is not only home to some of the City's more popular neighborhoods, but is also home to Mercy Medical Center and numerous doctors' office complexes and professional offices. Until such time as Downtown redevelopment occurs or additional multiple-family sites are identified, Central and West Redding will have a significant imbalance in available housing opportunities.

With the construction of Interstate 5, most new commercial investment was directed to locations other than Central Redding. The expansion of county government offices, Redding Medical Center, and Mercy Medical Center also promoted office construction along Court, Oregon, and West Streets, displacing older residential uses.

Downtown Redding remains an important area, even though it was bypassed by the construction of Interstate 5, encouraging most new retail development to locate east of the river. All other major traffic arteries converge downtown, which contributes to its viability. Recent efforts, including redevelopment projects to improve the appearance and pedestrian orientation of Downtown streets, demonstrate the community's commitment to maintaining and enhancing the unique character of the heart of the community. The development of the Turtle Bay Museum and Arboretum by the Sacramento River and the Civic Center will serve to emphasize the importance of the City's core area.

East Redding (Enterprise)

Development in the Enterprise area occurred almost entirely in the postwar years. Early subdivisions were located along Old Highway 44 (now known as Cypress Avenue), Churn Creek Road, and Hartnell Avenue. Subsequent development has taken place both to the north up to the new State Route 44 and to the south into the Churn Creek Bottom area. The street pattern in some older residential areas is poor, with long, dead-end streets and offset intersections. A lack of adequate subdivision regulations in the early days of development permitted the creation of large, deep lots surrounded by smaller lots and

hundreds of landlocked parcels that can be reached only by private roads or by access drives across other properties. This lot pattern makes further development very inefficient and difficult and necessitates providing new, costly streets and infrastructure.

Like the residential areas, commercial development in the Enterprise area originally occurred in a haphazard manner along Old Highway 44, Bechelli Lane, and Hartnell Avenue and at freeway interchanges. Access to many stores in these locations is poor, and the nature of this strip-type development—with each establishment having its own parking lot and driveway—precludes parking once and visiting several businesses. The construction of Interstate 5 had a noticeable impact on commercial growth at the north end of this area along Hilltop Drive and other easily accessible locations. Service stations, motels, restaurants, and other uses that seek readily visible sites and easy freeway access can be found in this area. This area continues to develop with commercial uses, which can now be found along Churn Creek Road as well. Two overpasses across State Route 44 connect this area to the newly expanding Dana Drive regional commercial hub and to an expanding residential area to the northeast.

Dana Drive and Northeast Redding

Following the construction of Interstate 5, a noticeable pattern of commercial development, together with additional suburban residential growth, has occurred north of State Route 44 along Dana Drive. Additional growth has also occurred along the northern extension of Churn Creek Road and eastward along Old Alturas Road. Commercial development largely commenced with the Mt. Shasta Mall, which is located at the northeast corner of Hilltop Drive and Dana Drive. Subsequent regional commercial development has since spread eastward to Victor Avenue. In conjunction with commercial activities, residential development flourished to the north on Churn Creek Road and to the east on Old Alturas Road. The Dana Drive Benefit District and the Churn Creek Road Overcrossing Assessment District were formed in order to provide infrastructure for this newly established regional commercial hub.

All signs indicate that the available vacant commercial land in this area will be built out by the year 2020. In 2000, the City saw the expansion of the Mt. Shasta Mall. The Mall expansion spurred large regional commercial-store developers to develop within the Dana Drive area. Vehicle traffic in this area has increased significantly, which has necessitated the upgrade and improvement of the streets and intersections.

North Redding

Like Enterprise, the North Redding area, extending from Keswick Dam to Shasta College, includes a scattering of residential and commercial development. Along North Market Street, formerly Highway 99, Redding's "Miracle Mile" is lined with a variety of motel, restaurant, retail, and auto-sales establishments. Adjoining lowlands to the west have been developed with residential subdivisions and affordable housing units. Lake Redding-Caldwell Park extends along the north bank of the river on each side of the railroad trestle. This major recreation area has picnicking, playground, swimming, and other facilities.

Lake Boulevard is the main artery of the Buckeye area, a major portion of which was annexed to the City in 1969. Strip commercial development is strung along Lake Boulevard, and there is scattered residential development in the area. Landlocked parcels are common, with heavy dependence on private roads for access. Mobile homes are a major residential type here, both in mobile home parks and on individual lots. The pattern of small ownership and prevalence of mobile homes in some areas may tend to discourage subdivision activity, particularly on the northern fringe of the Planning Area along Oasis Road.

South Redding

Much of the development of South Redding came after World War II, when subdivision activity expanded into the lower elevations and along the Anderson-Cottonwood Irrigation District Canal (ACID). Scattered developments also sprang up in the Live Oak-Bonnyview (Cascade) area to the south and along ridge tops in the southwestern part of the Planning Area. Also to the south, the old principal traffic artery—Old Highway 99 (now known as State Route 273)—became a commercial strip lined with an assortment of motels, truck stops, and service stations; industrial and distribution establishments; and local retail services. As a commercial gateway to the City, this area has largely become obsolete in design and function.

Several recent residential developments have occurred in the area, including the Rivercrest Estates Subdivision, as well as new developments south of Girvan Road. The latter developments have led to a reduction in the pastoral setting that was until recently prevalent in the area.

7.0 RISK ASSESSMENT

The section identifies the hazards that might affect the City of Redding, profiles the major hazards, assesses the risk of such hazards, describes the City's vulnerability, and estimates potential losses from the hazards.

7.1 DMA 2000 Requirements

The overall DMA 2000 requirements for the risk assessment are shown in Table 7-1. The requirements mandate that only natural disasters are addressed, however, the City has included the most significant human-caused hazards in this plan.

Table 7-1
Risk Assessment – Overall

REQUIREMENT §201.6(c)(2)	Local risk assessment must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. This includes detailed descriptions of all the hazards that could affect the jurisdiction, along with an analysis of the jurisdiction's vulnerability to those hazards. Specific information about numbers and types of structures, potential dollar losses, and an overall description of land use trends in the jurisdiction must be included in this analysis.
EXPLANATION	The local risk assessment should identify what hazards are likely to affect the area. The plan should describe the sources used to identify hazards, noting any data limitations, and provide an explanation for eliminating any hazards from consideration. The process for identifying hazards could involve one or more of the following: • Reviewing reports, plans, flood ordinances, and land use regulations among others. • Talking to experts from federal, state, and local agencies and universities. • Searching the Internet and newspapers. • Interviewing long-time residents.

7.2 Identify and Screen Hazards

The City of Redding HMPT identified several hazards that are addressed in the plan. These hazards include natural and human-caused hazards that might affect persons and property in the City. The hazards were ranked based on the initial analysis. Twelve hazards were found to be either a significant hazard or less significant hazard and are ranked for hazard mitigation planning. These hazards were identified through public input, researching past disasters, and risk assessments included in the City Emergency Operations and General Plan.

Table 7-2
Risk Assessment - Hazard Identification and Screening for City of Redding

Hazard	Include?	Why or Why not?	Comments
Avalanche	No	The City is not located in a mountain area.	
Aviation	Yes	Some probability, but low.	
CBRNE	Yes	Probability is present, but low	
Coastal Erosion	No	The City is not located within a coastal area.	
Coastal Storm	No	The City is not located within a coastal area.	
Dam Failure / Dam Overflow	Yes	Probability is present due to nearby Shasta Dam and Whiskeytown Dam located upstream from the City.	The City's General Plan confirms that the City is within the Dams' inundation zones, should there be an uncontrolled release from Shasta and Whiskeytown Dams.
Drought	No	Availability of water from the various resources, such as Shasta and Whiskeytown Dams, would provide sufficiently.	
Earthquake	Yes	Proximity to San Andreas fault places the City at some risk, but past history reveals that the magnitude will be low.	
Expansive Soils	No	Does not affect the City.	
Electrical / Extreme Heat	Yes	Past events have been experienced by the City.	120 plus degrees experienced.
Flood	Yes	Past events have been experienced by the City.	Portions of the City are located within the 100-year floodplain
Hailstorm	No	Minimal experience and the probability are low.	
Hazardous Material	Yes	With a major rail line and interstate highways within the City, probability of a rail or highway disaster is present.	
Hurricane	No	Minimal experience and the probability is low.	
Land Subsidence	No	Minimal experience and the probability is low.	
Landslide	No	Minimal experience and the probability is low.	
MCI (Mass Casualty Incident	Yes	Some probability, but low	
Pandemic/Epidemic	Yes	Some probability, but low	
Severe Winter Storm	Yes	Past events have been experienced by the City.	Most recent event of January 2004 blanketed the City with 18 inches of snow.
Tornado	No	Minimal experience and the probability is low.	
Tsunami	No	The City is not located within a coastal area.	
Volcano	Yes	Although the City is located west of Lassen Volcanic National Park and south of Mt. Shasta, historic events do not place the City in high probability of a disaster.	
Wildfire	Yes	Past events have been experienced by the City.	The City encompasses and is adjacent to many natural open-space areas.

7.3 Loss Estimation

FEMA requires that an estimation of loss be conducted for the identified hazards. Loss estimation was conducted on the identified significant hazards (refer to Table 7-3). FEMA requires the "Vulnerability Analysis" to include the number of potential structures impacted by these hazards and the total potential costs. These estimates were determined by utilizing Geographic Information System (GIS) overlay analysis software and tools. Existing GIS data layers, such as parcels, were overlaid with theoretical hazard boundary extents. Then, using GIS overlay analysis software; items such as the number and value of structures affected by the hazard were calculated and reported.

Table 7-3 Summary of Potential Significant Hazard-Related Exposure/Loss in Redding

Hazard Type	Exposed Population	Residential		Commercial		Industrial		Critical Facilities		Education		Other	
		# of Structures	Value of Structures	# of Structures	Value of Structures	# of Structures	Value of Structures	# of Structures	Value of Structures	# of Structures	Value of Structures	# of Structures	Value of Structures
Wildland Fire	13,437	4,884	686.5 M	62	22.6 M	76	45.6 M	23	36.4M	0	0	5	4.6 M
Flood Scenario	548	222	24.9 M	0	0	0	0	0	0	0	0	0	0
Hazardous Materials	48,209	28,681	4.2 B	1,235	867.8 M	407	228 M	269	614.7 M	41	267.6 M	154	316 M
Transportation Corridor Spill Scenario	7,356	1,535	178.4 M	543	379.4 M	44	14.7 M	6	90.5 M	54	46.7 M	12	9.5 M
Hazardous Materials - Wastewater Facilities (Stillwater Plant)	4,800	0	0	0	0	0	0	0	0	0	0	0	0
Hazardous Materials - Wastewater Facilities (Clear Creek Plant)	11,400	0	0	0	0	0	0	0	0	0	0	0	0

7.4 Wildland Fire

7.4.1 Nature

Hills and mountains surround the westerly portion of the City of Redding, which is covered mostly with grasses, brush, Manzanita, oak trees, and gray pines. The climate in this area is generally referred to as "Mediterranean," with rainfall concentrated during the cool winter months. The rains usually cease sometime in April and resume in November.

Summer drought causes vegetation to become extremely dry, and a regional weather phenomenon, the northerly winds, can aggravate an already very hazardous fire situation. The hillside areas of the western portion of the City have, therefore, been classified as a very high fire hazard severity zone. With extreme dryness, relative humidity often 10 percent or less, high temperatures over 100 degrees, and 20 to 40 mph winds, a wildfire can become uncontrolled, spreading through vegetative fuels and exposing and possibly consuming structures.

The fires often begin unnoticed, spreading very quickly, and are usually signaled by dense smoke that fills the air in the immediate area.

Wildfires are ignited 90 percent of the time by human action. Over one-third of all wildland fires originate alongside roads and highways, probably as a result of equipment failure or cigarettes or matches being thrown by passing automobiles. Despite the rising penalties, approximately 22 percent of all fires recorded statewide result from an act of arson. Other causes of wildfires include the following:

Approximately 23 percent of all wildfires that burn over 5,000 acres are caused by power-line failures. Wildfires can also be ignited by sparks from off-road vehicles, construction equipment, and other power-driven equipment used for residential or recreational purposes. In the developed areas, wildfires can start from children playing with matches, unattended recreational fires, equipment use, and sparks from chimneys. Natural causes, primarily lightning, are now relatively minor for most local disastrous fires.

The following three factors contribute significantly to wildland fire behavior:

- Topography: As slope increases, the rate of wildland fire spread increases. South-facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying wildland fire behavior. However, ridge tops may mark the end of wildland fire spread, since fire spreads more slowly or may even be unable to spread downhill unless wind-driven.

- Fuel: Weight and volume are the two methods of classifying fuel, with volume also referred to fuel loading (measured in tons of vegetation material per acre). Each fuel is assigned a burn index (the estimated amount of potential energy released during a fire), an estimate of the effort required to contain a wildfire and an expected flame length. The fuel's continuity is also an important factor, both horizontally and vertically.

- Weather: Variation on weather conditions has a significant effect on the occurrences and behavior of wildfires. Short-term conditions, such as high heat, low humidity and high winds, facilitate the ignition and rapid spread of fires. Conversely, cool temperatures, high humidity and little to no wind reduce the risk of wildfires and allow fires to be contained more readily. Long-term conditions, such as prolonged droughts, also play a major role in fire susceptibility.

Other factors increase the wildfire hazard. These include dense vegetation growth and large accumulation of dead plant materials in areas that have not been mitigated or burned for many years. Steep terrain compounds the wildfire risk because fires normally burn much faster uphill. Rugged terrain also hinders fire-suppression attempts by hampering the mobility effectiveness of firefighters and equipment.

If not promptly controlled, wildland fires may grow into an emergency or disaster. Firestorms occur during extreme weather with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted. Even small fires can threaten lives and resources and destroy improved properties.

It is also important to note that in addition to affecting people, wildland fires may severely affect livestock and pets. Such events may require the emergency watering/feeding, sheltering, evacuation, and even burying of animals.

7.4.2 Effects of Wildfires

Wildfires generally have the most impact on the natural environment. Although some ecosystems are dependent upon recurrent fire to survive, these communities are unique. Watershed, wildlife, and recreational areas are lost due to wildfire. After the fire has been extinguished, the burned land is laid bare of its protective vegetation cover and is susceptible to excessive runoff and erosion. The fire will often destroy the root system of shrubs and grasses that aid in stabilizing slope material. When the winter rains come, the possibility of landslides and debris/mud flows are greatly increased.

The impacts of wildfire often strain public resources, including emergency response and utilities. Water reserves are drawn down, power lines become disabled, telephone service can be disrupted, roads can be blocked, etc. Flood-control facilities may be inadequate to handle the increased storm-runoff debris from barren and burned hills.

Integration of five fire determinants (human proximity, vegetation, access, slope, and wind direction) has delineated two natural fire hazard potential zones for the City of Redding. Very high fire hazard severity risk areas lie to the immediate west of central Redding and north and northeast Redding, with Manzanita, buck brush, and other highly combustible vegetation, along with steep 20 to 40 percent slope, and somewhat limited access. The medium to low risk areas lie in the vicinity of developed property with grass and scattered oak over more level to gentle (flat to 20 percent) slope and with available access. Areas not threatened by fire risk are within developed areas with cultivated urban cover and available urban access.

7.4.3 Wildland Urban Interface (WUI)

Wildland Urban Interface (WUI) fires are a significant hazard. In a study conducted by the U.S. Fire Administration in 2002, the history of urban interface fires, which have caused significant property loss, was discussed, with one of the most destructive fires occurring in the State of California with the 1991 WUI fire in the East Bay Hills of Oakland, in which 25 lives were lost and more than 3,000 structures destroyed. Fire crews were overwhelmed and the fire destroyed, for the most part, everything in its path.

In general, wildfire is not a major threat in the flat, developed areas of Redding when adequate emergency resources are available. However, fire is a major problem in the fringe-urban and hill areas on the west side of Redding and those additional areas, approximately 39 percent, of the City that are identified as very high fire severity zone. This increased risk is due primarily to a predominance of the north-facing slopes that are characteristically more vegetated than those of the southern aspect. Within the west side, the highest fire risk areas are located in the hilly populated regions. All major determinants of fire risk point to this area as the most critical area for the City of Redding.

The City of Redding has numerous subdivisions on the west side of town which are built on ridge tops with significant fuels with valleys and ravines in alignment with prevailing summer winds which results in a significant fire risk to the community. This is further compounded by the hot, dry, and low humidity levels experienced in Redding during the summer, along with wind events that can result in rapid fire growth and spread.

Once a fire starts, it is influenced by several factors, including fuels, topography, weather, drought, and development, along with the ability to quickly access and contain the fire. The combined conditions are key elements which affect the risk and severity of the fire.

The major risk involves loss of lives and property which lie in those developed areas identified as in the very high fire severity zones. Here property damage is not an uncommon occurrence. These interfacing and transitional areas are constantly vulnerable. As development extends more and more into the areas identified as very high fire severity zones, the situation becomes increasingly acute.

7.4.4 History

Within the last 15 years, there have been significant fires in Shasta County in which the City of Redding is centrally oriented. These fires have destroyed well over 1,700 structures and, in some cases, have threatened the City. The more significant fires are included in the following table:

Table 7-4
Significant Shasta County Fires

Date of Fire	Name of Fire	No. of Acres Burned	No. of Structures Destroyed
August 2012	Ponderosa	27,676	133
July 2012	Dale	1,038	2
June 2008	Lakehead	27,936	12
August 2004	Bear	11,500	216
August 2004	French	14,000	103
August 2001	Oregon	1,694	33
October 1999	Jones	26,200	954
September 1999	Canyon	2,588	238
July 1999	Lowden	1,945	43

In the last 10 years in Shasta County, there were approximately 3,186 vegetation fires which burned a total of 77,195 acres of land, causing approximately $66,475,700 in property loss. It is important to note that 53 percent of the vegetation fires were caused by equipment use, such as the blade of a mower striking a rock and causing a spark or hot engine exhaust from a mower, which would ignite dry grass. The second leading cause of vegetation fires is arson.

The City of Redding experiences close to over 150 wildland fires each year, which have been destructive to our community.

7.4.5 Future Events

Given the topography, climate and vegetation on the west side of Redding, it is ripe and conducive to having fast-spreading wildfires. According to the California Department of Forestry and Fire Protection and as shown on Shasta County's Fire Hazard Map, all the hillsides in west Redding are located within the very high fire hazard severity zone, including areas to the north and east of town. The history of the wildfire activity in Shasta County is traumatic, and we will continue to be faced with wildland fires that threaten lives and property every summer.

The wildland risk to the City of Redding can be attributed to three factors. The first are the ignition sources, the second is the fuel loading, and the third is resources available to address fires. Mitigation must address reducing the fuel-ignition sources, such as juveniles playing with matches and lighters in the open vegetated areas, transient populations occupying areas within the urban interface and utilizing fire, educating the public on better abatement procedures when using mechanical equipment, and disposing properly of cigarettes. The second is reducing the immediate fuel load surrounding the urbanized area within and around the City of Redding on public and private property. The third is adequate staffing and equipment for handling emergency incidents.

The risks associated with future events will continue to increase as the City sees development on previously approved projects in the very high fire hazard severity zone and as new developments are proposed and constructed.

7.4.6 Present and Future Mitigation Efforts

The City has over the last 16 years abated over 749 acres of brush behind homes in the very high fire hazard severity zone on public property. Continuation of fuel-reduction mitigation must continue throughout the very high fire hazard severity zone on both public and private lands.

The City also maintains an Emergency Operations Center to help coordinate information and resources for any type of disaster or threat. Yearly ongoing training, updating of critical information, and drills are conducted to help protect people and property.

All new subdivisions have been approved using the new General Plan regulations and Building and Fire Code adoptions, including residential sprinkler requirements which help mitigate the spread of fire from a residential fire incident to the WUI area. In addition, this may also include one or more of the following: (1) adequate defensible space and development of landscape maintenance districts to maintain defensible space, (2) utilizing noncombustible construction on the exterior, (3) providing two ways in and out, and (4) meeting fire-flow requirements in accordance with the California Fire Code.

7.4.7 Vulnerability:

The City of Redding recently ran a fire scenario on the west side, which was derived from an actual fire occurrence in the area. As a result of the fire-scenario information, it was discovered that 17 percent of all structures in the City could be affected by this fire, with a potential dollar loss of $135,300,000. This fire would be 10,250 acres in size and displace approximately 13,437 people (See Figure 6).

7.4.8 Mitigations

Goal 5: *Reduce the possibility of property damage and life losses due to wildland fires.*

Objective 5.A: Enforce Fire and Building Codes and the General Plan for the City of Redding, which will minimize damage to homes and structures from wildland fires.

Action 5.A.1: Ensure that new subdivisions have adequate fire-protection measures, such as multiple accesses for fire apparatus, noncombustible building construction, residential sprinkler systems, appropriate defensible space, and street widths and grade to accommodate emergency vehicles and evacuees simultaneously.

Action 5.A.2: Ensure that defensible space is being provided for all new and existing homes. Ensure that roofing material is noncombustible on new homes and that wood shake roofs on existing homes, when replaced, meet Code requirements for non-combustibility. Install a spark-arresting system on chimneys of homes with wood-burning fireplaces. Partial funding is provided for abatement of City properties.

Action 5.A.3: Continue the development of landscape maintenance districts for new developments to fund ongoing fuel reduction and maintenance of defensible space.

Objective 5.B: Educate the public about wildland fire dangers and the steps that can be taken to prevent or minimize their effects.

Action 5.B.1: Ensure that the City provides sufficient resources for public education, wildland fire mitigation and guidance, and emergency planning for the public, as funding becomes available.

Action 5.B.2: Distribute wildland fire mitigation information to persons applying for building permits in the City of Redding in the very high fire hazard severity zone.

Objective 5.C: Reduce the probability of fire ignitions.

Action 5.C.1: Focus on human causes of ignition and address the problem through education and enforcement actions, to include vigorous investigation and prosecution of arson.

Objective 5.D: Maintain Emergency Operations Center for coordination of information and resources.

Action 5.D.1: Ensure that annual emergency Operations Center exercise is performed. Funding is available to conduct exercises.

Objective 5.E: Reduce the potential for destructive actions of the fire once ignition occurs, utilizing fire pre-plans, ensuring a properly trained, staffed, and equipped emergency response capability, and timely response to prevent the spread of the fire, minimizing risks to humans and property.

Action 5.E.1: Ensure that adequate resources are available to pre-plan for incidents that may occur in the very high fire hazard severity zones within the City of Redding.

Action 5.E.2: Ensure continued training of personnel responsible for responses to wildland fires with the most current strategies, tactics, and safety actions.

Action 5.E.3: Ensure that equipment is purchased and maintained to address the wildland fire risk within the community.

Action 5.E.4: Increase staffing of current two-person companies to three-person companies to improve capabilities and initial actions at fire incidences within the community as additional funding becomes available.

Action 5.E.5 Continue to maintain training and response actions with cooperating fire agencies.

7.5 Flooding

7.5.1 Nature

Flooding is an overflow of excess water from a stream, river, lake or reservoir, a piped or channeled conveyance, or coastal body of water, onto adjacent floodplains. Flooding can also occur by the accumulation of water in a natural or manmade depression where there normally is none.

Floodplains are lowlands, adjacent to water bodies that are subject to recurring floods. Floods are natural events that are hazards only when people or property is affected. Floods occur in all 50 states and U.S. territories, with an estimated 4 percent of the total area of the United States subject to a one percent annual chance of flood (also known as the 100-year flood) [FEMA, 2001].

The amount of water in the floodplain is a function of the size and topography of the contributing watershed, the regional and local climate, and land use characteristics. Flooding in steep, mountainous areas is usually confined, strikes with less warning time, and has a short duration, while larger rivers in flatter valley and lowland areas typically have longer, more predictable flooding sequences and affect a broader floodplain.

In the City of Redding, floods can be categorized into the following types of occurrences:

- *River or stream flooding* – includes channel or bank overflows, flash floods, obstruction floods, and dam overflows or failures.
- *Local drainage* – includes channel or bank overflows, flash floods, debris or obstruction floods, and ponding in natural or manmade depressions.
- *Fluctuating lake, reservoir, or pond levels* – includes accumulations of water in lakes, reservoirs or ponds, as well as in natural or manmade depressions that are normally dry or hold insignificant volumes of water.

The City of Redding is partially bisected by the Sacramento River. In addition, the following major creeks flow through Redding and meet the Sacramento River within, or just outside, the city limits:

- Stillwater Creek
- Churn Creek
- Clover Creek
- Sulphur Creek
- Canyon Hollow Creek
- Oregon Gulch
- Olney Creek
- Several smaller creeks are also located within the city limits.

The Sacramento River

The FEMA 100-year floodplain for the above creeks and the Sacramento River total approximately 4,425 acres, or 6.9 square miles. This is approximately 11 percent of the City's land base.

The Sacramento River corridor occupies a relatively narrow and steep channel in the north, which begins to broaden somewhat in the central Redding area and becomes a fairly broad farmland floodplain at the southern limits of the City and beyond. The northern and western areas of the City are hilly, with well-defined canyons and stream corridors. The eastern and southeastern sections of the City sit atop a plateau above the Sacramento River, but are relatively flat with moderate to minor hills and broader, less defined stream channels.

Flooding along the Sacramento River typically arises due to increased flows from Shasta Dam and Keswick Dam. Shasta Dam regulates and controls mass storage of prolonged periods of rainfall from the rivers and watersheds above the dam, including the Upper Sacramento River, the Pit River, Squaw Creek, and numerous smaller creeks. Keswick Dam (immediately downstream from Shasta Dam) acts as an after-bay to more finely regulate the flows directly into the river. These two dams act in concert to deliver precise and well-regulated flows to the Sacramento River directly north of Redding.

Local drainage flooding occurs primarily due to infrequent, high-intensity rainfall events and to debris or obstructions.

7.5.2 Effects of Flooding

River flooding in the City of Redding generally causes no loss of person or property. River flood levels are regulated and predictable. Advance notice of increased releases is sent to local agencies and the media, usually with 12 or more hours' notice.

In order to maintain a safe level of storage capacity behind the dam and prevent an *overtopping* event, regulators from the Bureau of Reclamation (Bureau) routinely increase flows either during or following large, intense or prolonged rainfall periods in the watershed. These flows are increased to help draw down the lake to a safe level and typically stay below 35,000 cubic feet per second (cfs). There is no river flooding in Redding at this release.

Approximately once a year, it is necessary for the Bureau to increase releases to approximately 53,000 cfs. At this level, one street is closed and portions of two riverside parks and trails are closed due to minor flooding. This also causes flooding below Redding and Shasta County, though it is mostly farmlands and a few road closures at this level.

Approximately every five to seven years, the Bureau finds it necessary to increase flows to the maximum safe release of 80,000 cfs. During these flows, several blocks of riverside roadway are closed due to flooding, as are larger portions of the riverside parks and boat ramps. Flows greater than 80,000 cfs are possible, but are highly unlikely due to the widespread flooding in the valley areas below Redding. Several areas in Tehama and Colusa counties become inundated and several small communities in these areas become flooded or isolated due to the river flow at this level.

Following the recession of flows greater than 53,000 cfs, streets are reopened and swept of silt and minor debris. Riverside parks and trails are checked for erosion, cleaned of minor debris, and then reopened to the public.

Localized flooding from high-intensity rainfall events, of which there is a few each year, typically manifests as flooded parking lots and ponding along some surface streets. Road closures are rare and water levels recede quickly, leaving only minor cleanup of silt and debris.

Many of the local drainage channels are concrete-lined, but most are left “natural” per Department of Fish and Game permitting and regulations. These natural channels, with their increased natural vegetation, can become clogged or obstructed, especially at roadway under-crossings, due to the vegetation breaking away from the banks during periods of high flows.

Localized flooding from obstructions also takes place a few times each year. Typically during prolonged periods of rainfall with moderate to high intensity, these obstructions cause overflows in small channels and ditches. Backyard flooding, including flooding the occasional swimming pool, as well as some street flooding, can occur. Reports of minor flooding to garages and outbuildings, landscape erosion, and flooded streets have occurred. Trash and other debris can also be found obstructing culvert and pipe openings during even moderate flows in smaller channels. Vandalism can also lead to clogging or obstruction of flows from pipe systems. The increased use of plastic pipe in storm-drain systems has led to vandals building fires in the pipe openings, thus melting the pipe and causing it to sag into a closed or nearly closed opening, creating an obstruction. This forces the water to either: back-up in the pipe until it reaches a surface street and creates localized flooding or ponding; or does not allow water into the pipe system, which causes the upstream channel to overflow and flood adjoining properties. Storm Drain maintenance crews respond quickly to calls of flooding, and locate and clear the obstructions. Water levels quickly recede, but ponding may remain in some areas.

7.5.3 History

Prior to the building of Shasta Dam, the Sacramento River could reach flows in excess of 225,000 cfs [U.S. Army Corps of Engineers, 1942], flooding a portion of central Redding and much of south Redding. Since the completion of the dam, flows have not exceeded 80,000 cfs and, as previously mentioned, damage is typically limited to clean up of silt and minor debris.

Localized flooding occurs every year, causing very little damage and requiring cleanup and removal of silt and debris. In 2009 and the early '90's, there were several events that were beyond normal.

In March 2009, Redding downtown experienced more than four inches of rain in just three hours. Neighborhoods were flooded, creeks overflowed, and streets became rivers. An arterial road, Quartz Hill Road, was closed due to a mudslide. A nursing home, a preschool, and some residents were evacuated. Vehicles stalled in intersections and parked vehicles in an underground garage were moved by the flood waters. The flood also caused the death of one person who fell into the Calaboose Creek canal.

In 1993, a small tributary along the Sacramento River in north Redding experienced what was later calculated as a 50-year-storm event, causing rapid rise and fast flows along the channel, which had raised banks. A tree along the bank of the channel, upstream of a double box-culvert, dislodged and flowed downstream, becoming wedged in one of the culvert openings. The obstruction caused an overflow of the channel into the adjoining residential neighborhood, flooding a dozen homes as the water followed the path of least resistance to the river. About eight of the homes experienced garage flooding and damage to equipment and personal property, while four homes suffered flooding within the main house, as well as damage to personal property. The channel was subsequently widened, and an additional cell was added to the double-box culvert in order to provide for a 100-year-storm event.

A series of flooding events beginning in 1985 and culminating in a lawsuit against the City in 1997 brought attention to an ever-increasing problem along Clover Creek. Upstream development activity in both the City and county, near the headwaters of Clover Creek and along Airport Road, increased peak flows during periods of high intensity rainfall, causing flooding along Clover Creek in the Goodwater Avenue area below Freeman Way. Many homes and outbuildings that had been constructed in pre-FEMA mapping years in the floodway or floodplain of Clover Creek were affected, resulting in claims for property and personal property damage. Flood mitigation resulted in the building of a regional detention facility immediately upstream of the problem area. The Clover Creek Detention facility, now completed, is large enough to handle current and future flows based on build out.

Repetitive Loss

The City of Redding has one property which has claimed flood damages for 5 separate events. This property is not located within a Special Flood Hazard Area, however between January 1995 and February 1998, the property owner filed claims for 5 separate events. In 1997, the City, following an extensive research and inspection, determined the property damages were not caused by natural flood conditions but as a result of alterations performed by the property owner to the topography of the property therefore causing drainage issues. The ground surface of the property has been altered to an extent in which it is one to two inches below the level of the sidewalk adjacent to the street frontage. As a result of this alteration, the water does not readily drain to the street where there are storm drains in place. To assist in mitigating future losses on the property, the City, on an annual basis, sends the property owner a letter to inform him of how he can relieve the situation, along with things he can do to prepare for flooding, and some permanent flood-protection measures he should consider.

7.5.4 Future Events

Floods and flooding are gauged by their size (width and depth of the affected area) and the probability of occurrence. The size and depth of the floodplain area is computed using mathematical models of precipitation, slope, runoff, soil type, and cross-section. Flood depths are calculated at intervals along a stream or channel corridor and then mapped and interpolated between sections. This results in the floodplain map.

The probability of occurrence is expressed in a percentage of the chance of a flood of a specific extent occurring in any given year. The most widely adopted design and regulatory standard for floods in the United States is the one percent annual chance flood, and this is the standard formally adopted by

FEMA. The one percent annual flood is also commonly referred to as the "100-year flood," leading to the misconception that it should occur only once every 100 years. In fact, a 100-year flood may occur in any year, regardless of the time that has passed since the last one. It is the probability that smaller floods occur more often than larger floods that compels the percentage.

Flood Probability Terms

Flood Occurrence Intervals	***Percent Chance of Occurrence Annually***
10 years	10.0%
50 years	2.0%
100 years	1.0%
500 years	0.2%

7.5.5 Present and Future Mitigation Efforts

The City of Redding actively enforces the Building Code, General Plan, and Zoning Ordinance regulations concerning development within the 100-year floodplain. Limiting development within the floodplain will help safeguard routine future events from significant impacts. A map of the 100-year floodplain for the Sacramento River and the major creeks cited above is included as Figure 6.

Since July 1996, the City of Redding has actively participated in FEMA's Community Rating System (CRS). The City initially received a Class 9 rating. The following year, the City strengthened its overall Floodplain Management Program and was upgraded to a Class 7 rating. In 2011, the City was successful in achieving a Class 6 rating. The rating improvements have resulted in not only a cost savings to those citizens in need of flood insurance but proactively decrease losses by managing development in the floodplain.

The City of Redding has participated in the Community Rating System (CRS) since 1996. The CRS is a voluntary program for National Flood Insurance Program (NFIP) participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management. The CRS has been developed to provide incentives in the form of premium discounts for communities to go beyond the minimum floodplain-management requirements to develop extra measures to provide protection from flooding. The NFIP's CRS program ranks cities according to flood-awareness promotion and implementation of flood-protection measures and rewards communities with reduced flood insurance premiums. Modeled after the insurance industry's Community Fire Rating System, the CRS provides insurance discounts in 5 percent increments for each 10 rating classes, with Class 1 being the highest. A community accrues points to improve its CRS class rating and receive increasingly greater insurance rate discounts through engaging in any of 18 creditable activities. Since the City of Redding's inception into the CRS program, the City has continued to increase flood-protection measures and continues to increase public awareness of the hazards of flooding. This has ultimately resulted in increasing the City's "Community Rating" from the initial Class 9, giving residents a 5 percent discount in federal flood insurance premiums, to a Class 6, giving our residents a 20 percent discount in federal flood insurance premiums. The City will continue to participate in the CRS program and consider additional CRS activities to further reduce flood hazards and further promote flood hazard awareness.

Additionally, FEMA has updated and modernized the FIRMs nationwide through its Flood Map Modernization effort and has undertaken a Flood Insurance Rate Map update for Shasta County as part of this Map Modernization Program. After completing a re-evaluation of flood hazards in our community, FEMA adopted the new "Digital" Flood Insurance Rate Maps (DFIRMs) and has updated flood-insurance rate zones and replaced the existing maps in Shasta County. These maps went into effect March 17, 2011, and are available for review at the Planning and Permit Center counters.

During FEMA's re-evaluation of flood hazards in our community, it was determined that the Olney Creek Levee is not in compliant with current levee standards and could not be recognized as a protection measure. Therefore, this resulted in additional properties and/or homes being placed in a special flood hazard area. Efforts are being put forth to search out grants to fund the necessary studies required to pursue certification of the Olney Creek Levee.

Furthermore, during FEMA's re-evaluation, the Clear Creek Levee which protects the Clear Creek Sewer Treatment Plant, a critical facility, qualified to be provisionally accredited. The City is currently working with FEMA to certify the levee.

The City has also developed on-site retention policies relevant to all new construction. Once again, these policies are a safeguard against peak-flow increases caused by development and the subsequent runoff from impervious materials. Detention basins are designed to accommodate 100-year-storm runoff and require no net increase in historic flows at the point of release.

The City of Redding is planning to update the Storm Drain Master Plan. When complete, this Master Plan will identify key projects needed to minimize flooding and their costs. The plan will also address development of regional detention policies and locations so as to minimize the impacts of future development on existing streams and channels.

7.5.6 Vulnerability

The City of Redding's most probable vulnerability to flooding and flood damage is along the natural stream corridors. Natural growth and vegetation along these corridors, combined with a 100-year event in the watershed above a given location, would most likely cause localized flooding.

In 2008, a Regional Detention Feasibility Study was prepared for the Churn Creek Drainage Basin. The goal of the study was to analyze the impact of regional detention with the Churn Creek Drainage Basin and evaluate its effectiveness at reducing the number of detention basins within the City, as well as reducing the number of proposed improvements listed in the 1992 Montgomery Watson Citywide Storm Drain Master Plan. The Churn Creek Basin was the focus of this study, since it is the largest of the drainage basins in the City. The study identified several areas of inundation within the Churn Creek Basin during a 100-year-storm event with an average depth of flooding, ranging from 1.0 feet to 3.4 feet. It was estimated that 272 structures would be impacted with potential damages of $3,797,464.00.

A flooding scenario was run whereby a box culvert became obstructed because of a tree that dislodged from a stream bank. This flood scenario would affect over 200 structures. Damage estimates are approximately $2 million. (See Figure 7)

7.5.7 Mitigations

Goal 6: *Reduce deaths, injuries, structural damage, and losses from floods.*

Objective 6.A: Enforce the Building Codes, General Plan, and Zoning Ordinances of the City of Redding, which will prevent or minimize damage to residential and commercial structures from flooding.

Action 6.A.1: Ensure that new development does not encroach on the designated floodplain.

Action 6.A.2: Ensure that new development does not contribute to downstream flow increases through the use of detention/retention measures, and continue to review plans and hydraulic calculations for new development to limit net flow increases.

Action 6.A.3: Continue to participate in the NFIP to ensure the availability of federally sponsored floodplain insurance for City residents.

Action 6.A.4: Continue to participate in the CRS. This program involves accruing points based on the City's engagement in FEMA-defined activities.

Action 6.A.5: Review and consider additional CRS activities particularly relating to public information and emergency services to apply for credit to increase the City's points.

Objective 6.B: Reduce the possibility of localized flooding.

Action 6.B.1: Routinely inspect stormwater channels for vegetation build-up or encroachment, trash and debris, silt and gravel build-up, and erosion or bank failure, and routinely maintain said channels where permitted by California Department of Fish and Game.

Action 6.B.2: Routinely inspect and maintain stormwater inlets and outfalls for debris and obstructions, sand and gravel build-up, and structural damage or vandalism.

Objective 6.C: Alleviate pre-existing flooding conditions that are a result of past practices and regulations or lack of regulation.

Action 6.C.1: Update Storm Drain Master Plan, identify key projects needed to minimize flooding and their costs, identify regional detention policies and locations to minimize the impact of future development, and develop costs and possible funding strategies for the identified capital projects.

Objective 6.D: Seek FEMA accreditation of the local levees—Olney Creek and Clear Creek Levees.

Action 6.D.1: Continue the grant funding process through the State's Local Levee Assistance Program to fund the geotechnical studies for the Olney Creek Levee.

Action 6.D.2: Continue the provisionally accredited levee process to certify the Clear Creek Levee.

Action 6.D.3: Continue to seek and apply for grant funding as it becomes available.

7.6 Hazardous Material

7.6.1 Nature

Hazardous materials (Hazmat) may include hundreds of substances that pose a significant risk to humans. These substances may be highly toxic, reactive, corrosive, flammable, radioactive, or infectious. They are present in nearly every community in the U.S., where they may be manufactured, used, stored, transported, or disposed of. Because of their nearly ubiquitous presence, there are hundreds of Hazmat release events annually in the U.S. that contaminate air, soil, and groundwater resources, potentially triggering millions of dollars in clean-up costs, human and wildlife injuries, and occasionally human deaths (FEMA, 1997).

The City of Redding Clear Creek and Stillwater Wastewater Treatment Plants store and utilize chlorine gas to disinfect wastewater and then neutralize the chlorine with sulfur dioxide gas prior to reclaimed water discharge into the Sacramento River, in accordance with NPDES permits from the California Central Valley Regional Water Quality Control Board. Chlorine and sulfur dioxide are both DOT Class 2.3 poison gases.

Hazardous material releases may occur from any of the following:

- Fixed site facilities (e.g., refineries, chemical plants, storage facilities, manufacturing, warehouses, wastewater treatment plants, swimming pools, dry cleaners, automotive sales/repair, gas stations, etc.)
- Highway and rail transportation (e.g., tanker trucks, chemical trucks, railroad tankers)
- Air transportation (e.g., cargo packages)
- Pipeline transportation (liquid petroleum, natural gas, other chemicals)

In response to concerns over the environmental and safety hazards posed by the storage and handling of toxic chemicals in the U.S., Congress passed the Emergency Planning and Community Right to Know Act (EPCRA) in 1986. These concerns were triggered by the 1984 disaster in Bhopal, India, in which more than 2,000 people died or were seriously injured from the accidental release of methyl isocyanine from an American-owned Union Carbide plant. To reduce the likelihood of such a disaster in the U.S., EPCRA established specific requirements on federal, state, and local governments; Indian tribes; and industries to plan for hazardous-materials emergencies.

EPCRA's Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities working with facilities can use the information to improve chemical safety and protect public health and the environment (EPA, May 2003). Under EPCRA, hazardous materials must be reported to the Environmental Protection Agency (EPA), even if they do not result in human exposure. Such releases may include the following:

- Air emissions (e.g., pressure-relief valves, smokestacks, broken pipes, water or ground emissions with vapors).

- Discharges into bodies of water (e.g., outflows to sewers, spills on land, water runoff, and contaminated groundwater).

- Discharges onto land.

- Solid waste disposals in on-site landfills.

- Transfer of wastewater to public sewage plants.

- Transfers of waste to off-site facilities for treatment or storage.

In addition to accidental human-caused hazardous material events, natural hazards may cause the release of hazardous materials and complicate response activities. The impact of earthquakes on fixed facilities may be particularly bad due to the impairment of the physical integrity or even failure of containment facilities. The threat of any hazardous material event may be magnified due to restricted access, reduced fire suppression and spill containment, and even complete cut-off of response personnel and equipment. In addition, the risk of terrorism involving hazardous materials is considered a major threat due to the location of hazardous-material facilities and transport routes throughout communities and the frequently limited anti-terrorism security at these facilities.

In the event of accidental releases of chlorine or sulfur dioxide gases at the wastewater treatment plants, the plant staff as well as the surrounding citizenry should be evacuated. Initial evacuation is suggested at 0.2 mile in all directions for a small release, and then expanding downwind and downhill for 2 miles for larger releases.

Due to the high level of risk posed by hazardous materials, numerous federal, state, and local agencies are involved in their regulation, including the EPA, U.S. Department of Transportation (DOT), National Fire Protection Association (NFPA), FEMA, U.S. Army, and the International Maritime Organization.

Unless exempted, facilities that use, manufacture, or store hazardous materials in the U.S. fall under the regulatory requirements of EPCRA, enacted as Title III of the federal Superfund Amendments and Reauthorization Act (SARA) 42 U.S.C. §§11001-11050 (1988)). EPCRA has four major provisions:

- Emergency Planning (Sections 301-303) is designed to help communities prepare for, and respond to, emergencies involving hazardous substances. It requires every community in the United States to be part of a comprehensive emergency response plan.

- The Governor of California has designated a State Emergency Response Commission (SERC) responsible for implementing EPCRA provisions within California. The SERC oversees Local Emergency Planning Committee (LEPC) districts. Emergency Release Notification (Section 304) includes a list of chemicals that if spilled must be reported, including Extremely Hazardous Substances (EHS). The SERC supervises and coordinates activities of each LEPC, establishes

procedures for receiving and processing public requests for information collected under EPCRA and reviews LEPC developed local emergency response plans. Facilities with an EHS at quantities exceeding the Threshold Planning Quantities (TPQ) must notify the SERC and LEPC and provide a representative to participate in the county emergency planning process.

- Hazardous chemical storage reporting requirements (Sections 311-312) that require facilities possessing a threshold reporting quantity of a hazardous material under EPCRA (Section 311/312, 40 CFR Part 370) to submit an annual chemical inventory report (Tier II Hazardous Chemical Inventory Form) to the SERC, LEPC and local fire department.

- Toxic chemical release inventory (Section 313). Of the hundreds of hazardous materials under the EPCRA regulatory scheme, those hazardous materials that pose the greatest risk for causing catastrophic emergencies are identified as an EHS. As noted above, the presence of EHSs in quantities at or above TPQ require additional emergency planning and mitigation activities. These chemicals are identified by the US EPA in the *List of Lists – Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112 of the Clean Air Act* (EPA, October 2001).

Releases of EHSs can occur during transport and from fixed facilities. Transportation related releases are generally more troublesome because they may occur anywhere, including close to human populations, critical facilities, or sensitive environmental areas. Transportation-related EHS releases are also more difficult to mitigate due to the variability of locations and distance from response resources. It should be noted that while comprehensive and readily accessible information is available on hazardous material release and facilities subject to EPCRA, there are numerous other sources of information on hazardous material facilities and incidents that are beyond the scope of this plan. A more in-depth analysis of potential hazardous material events would include the following:

- Risk Management Plan (RMP) facilities.

- Tier II Hazardous Chemical Inventory Form facilities.

- Toxic Release Inventory (TRI) facilities.

- Pipelines and related facilities.

- Railroad transportation facilities.

- Explosive storage, sales, use, and manufacturing facilities.

- Hazardous Materials Management Plan (HMMP) Permit and Hazardous Materials Inventory Statement (HMIS) facilities.

- Hazardous waste facilities (RCRA information and RMS databases).

- National Response Center Emergency Response Notification System (ERNS).

- U.S. Department of Transportation (DOT) Hazardous Materials Information Reporting System (HMIRS).
- California Hazardous Material Incident Reporting System (CHMIRS).
- California Department of Transportation (Caltrans).
- Trucking terminal facilities.
- U.S. Office of Occupational Safety and Health Administration (OSHA) Injury, Illness, and Fatality Database.
- 911 regional dispatch centers.
- EPA Envirofacts and Window to My Environment.
- EPA Enforcement and Compliance History Online (ECHO).

7.6.2 History

Some of the worst hazardous material events have occurred outside the U.S., such the 1984 incident in Bhopal, India. Within the U.S., the National Response Center (NRC) reported that an average of 280 hazardous material releases and spills occurred at fixed sites annually during the period 1987-1990. The US Department of Transportation reported an average of 6,774 hazardous material events annually during the period 1982-1991, with highways accounting for 81.4 percent, railroads 14.7 percent, and other events 6.6 percent. Additionally, highway transportation hazardous material events have caused more than 100 deaths, 2,800 injuries, and $22.4 million in damages (FEMA, 1997).

Hazmat releases are a major concern for the City of Redding and surrounding communities in Shasta County. Local records show a number of hazardous material events within the City. In the past five years, there have been seven major Hazardous Materials Incident Responses. The incidents range from two drums of unknown substance in 2004 to a 1000-gallon gasoline spill at Churn Creek Road and Dana Drive in 1999.

One significant release of chlorine gas occurred at the Clear Creek Plant during the 1970s, where the City Fire Department responded and isolated the container. Since that time, only minor releases have occurred once every few years, which were corrected immediately by the on-site maintenance staff.

In 2004, the City of Redding responded to 140 hazardous materials incidents of varying degree. While many of the incidents have been handled at the first-responder level, several required the Shasta-Cascade Hazardous Materials Response Team (SCHMRT) to assist in mitigating the hazard.

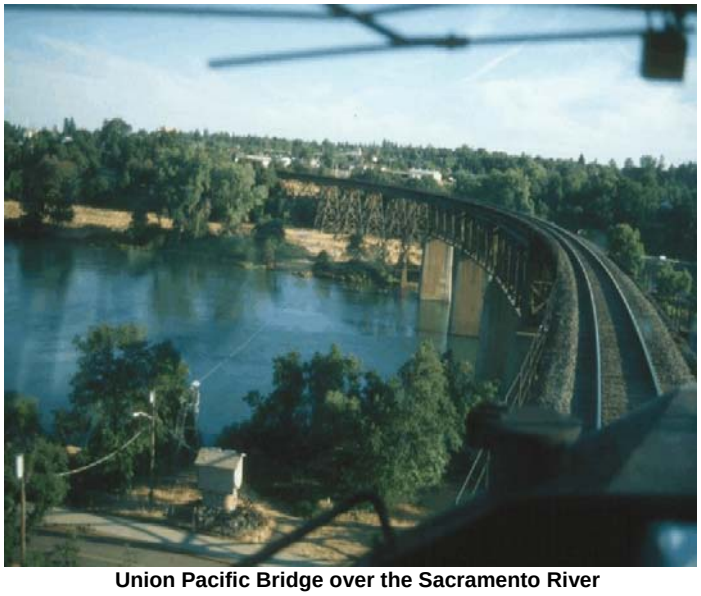
Hazardous Materials Responses – 2004		
400 - Hazardous condition, other	54	0.55%
410 - Flammable gas or liquid condition, other	7	0.07%
411 - Gasoline or other flammable liquid spill	16	0.16%
412 - Gas leak (Natural gas or LPG)	28	0.28%
413 - Oil or other combustible liquid spill	25	0.25%
420 - Toxic condition, other	2	0.02%
421 - Chemical hazard (no spill or leak)	1	0.01%
422 - Chemical spill or leak	3	0.03%
423 - Refrigeration leak	1	0.01%
424 - Carbon monoxide incident	3	0.03%

7.6.3 Future Events

In California, the majority of hazardous materials incidents are handled prior to becoming a disaster. Nevertheless, the City's emergency organization needs to be flexible and evolutionary in its response to a developing incident in order to accommodate both the large number of relatively routine minor releases to truly disastrous hazardous materials releases. The City is considered by most to be rural in nature and therefore, does not include large industrial facilities which house or manufacture large quantities of hazardous materials that could potentially cause a devastating release.

Comprehensive information on the probability and magnitude of hazardous material events across all types of sources (e.g., fixed facility, transport vehicle) is not available. Wide variations in the characteristics of hazardous material sources and between the materials themselves make such an evaluation very difficult.

The US Department of Transportation's Hazardous Materials Transportation Program is one of the most advanced probability and magnitude estimation programs. The program collects information on unintentional releases of hazardous materials, including the consequences, and analyzes them. One of the major efforts of the program is to identify low-probability, high-consequence events (which may not be apparent from incident data) and to provide appropriate levels of protection (DOT, September 2003).



Union Pacific Bridge over the Sacramento River

Areas of concern in the City of Redding are the Union Pacific Railroad and Interstate 5, which are major interstate transportation routes that pass through our community. In addition, State Routes 44, 273, and 299 East and West support relatively high traffic volumes. Trains and trucks commonly

carry a variety of hazardous materials, including gasoline and various crude-oil derivatives and other chemicals known to cause human health problems. The City is exposed to the effects of a major catastrophic hazardous material emergency due to the proximity of these transportation routes to densely populated areas of the City. However, when properly contained, these materials present no hazard to the community.

But in the event of an accident or derailment, such materials may be released, either in solid, liquid, or gas form. In the case of some chemicals (such as chlorine), highly toxic fumes may be carried far from the accident site. Although standard accident and hazardous materials recovery procedures are enforced by the state and followed by private transportation companies, the City of Redding is at relatively high risk because of its location along interstate, rail, and highway corridors.

Storing and handling hazardous materials always presents a potential danger for releases that would affect the wastewater treatment plant staff and the surrounding citizens. Accidents by staff or the supplier, equipment failure, vandalism, terrorism, or natural disasters such as earthquakes and catastrophic floods could initiate the uncontrolled release of chlorine or sulfur dioxide gases from the treatment plants. Due to the long history of only minor problems with these systems and the extensive staff training noted below, there is only a small chance of accidental releases that are not corrected immediately so as to affect the off-site citizenry.

Informal surveys conducted by the Shasta County Office of Emergency Services, Shasta County Environmental Health, and the Redding Fire Department have indicated the presence of the following classifications of hazardous materials: explosives, poisons, corrosives, flammable liquids, combustible liquids, cryogenics, compressed gases (flammable and nonflammable), radioactive materials, and oxidizers. Large pressurized natural gas pipelines traverse the City. Three large propane facilities are located in the City. Other small, fixed facilities have varying uses of hazardous chemicals, but in general these do not pose a significant risk to the City. Air transportation of hazardous materials involves the smallest quantity, but still poses a potential hazard.

While it is beyond the scope of this plan to evaluate the probability and magnitude of hazardous material events in the City of Redding in detail, it is possible to determine the exposure of population, buildings, and critical facilities should such an event occur. Of the facilities that were required to file an annual Tier II Material Inventory Report (under EPCRA) in Shasta County because of the presence of hazardous materials, six were identified as having Extremely Hazardous Substance (EHS). The general locations of these facilities are shown on Figure 9. The substances recorded at these facilities include common hazardous substances, such as chlorine, sulfur dioxide, anhydrous ammonia, hydrogen peroxide, ethylene oxide, large amounts of sulfuric acid, etc. EHSs pose the greatest risk for causing catastrophic emergencies. Therefore, facilities with EHSs are considered a greater threat than situations where non-EHSs are involved. The list provided for this report does not include an additional 42 facilities in the City of Redding that have quantities of sulfuric acid (an EHS) in new and used batteries, nor the sixteen City of Redding sites that have Chlorine Gas, Ammonia and/or small amounts of Sulfuric Acid.

7.6.4 Present and Future Mitigation Efforts

The Redding Fire Department responds to spills, leaks, and releases of hazardous materials in the entire City service area. The goal of hazardous materials (hazmat) response is to protect life, the environment, and property from the damaging effects that can occur from the unplanned release of such materials.

All Redding Fire Department personnel are trained, at minimum, to the level of Hazardous Materials First Responder, which allows them to take defensive action at hazmat incidents. Additional personnel are trained to the higher levels of Hazardous Materials Technician and Hazardous Materials Specialist. Individuals trained to these levels are able to implement offensive control measures at hazmat incidents. Other City of Redding departments have undergone hazardous materials training and respond as needed to assist in incident mitigation.

Members of the Redding Fire Department who are trained and certified to the level of Technician and Specialist are eligible to participate on the regional Hazmat Team. The SCHMRT Team is a multiagency team based in Shasta County that serves the counties of Shasta, Tehama, Trinity, Siskiyou, Lassen, and Modoc. Members from participating agencies train together every month and can respond to emergencies involving hazardous materials, such as poisons, radioactive materials, corrosives, compressed gases, and oxidizer releases.

SCHMRT has been able to acquire additional equipment in the last year, thanks in large part to grants from the Office of Domestic Preparedness and Homeland Security Administration. Such equipment has expanded the Team's capability to handle incidents involving chemical, biological, and radioactive weapons. One such grant recently purchased a new response vehicle with an on-board field laboratory.

SCHMRT pursues cost recovery from individuals and agencies deemed responsible for causing a spill, leak, or release of hazardous materials. In the event the responsible party cannot be located, the municipality in which the incident occurred is billed for the cost of mitigating the hazard. Because the Redding Fire Department is a part of the regional hazmat team, the City of Redding does not incur those costs, which can easily exceed $10,000 per incident.

Continued involvement in SCHMRT is invaluable in our efforts to control and mitigate hazardous materials incidents. The costs of participating on the team are a small price, considering the costs associated with hiring an outside firm to respond to each incident in the City of Redding.

With regard to the treatment plants, both facilities have undergone the development of Risk Management Plans that document the preventive and mitigation measures in place, as well as Vulnerability Assessments that document any system weaknesses to vandalism and terrorism activities.

Both facilities have continuous monitoring security alarms and gas-leak detection. Staff is trained to safely handle chlorine and sulfur dioxide, to maintain the equipment in a reliable manner and to direct safe procedures by suppliers and visitors. The Stillwater Plant has a scrubber system that automatically initiates upon a leak detection and can neutralize up to a one-ton release of either chemical.

The City Water and Wastewater Utilities operate a fully trained and certified hazardous materials response team that is equipped to respond and correct any releases of chlorine or sulfur dioxide at any time. Call-out procedures to activate this team are on file with the Redding Public Works Field Operations office, the Redding Fire Department Administration, and SHASCOM.

7.6.5 Vulnerability

Overall, the City of Redding faces a moderate to high risk from exposure to hazardous material incidents, as shown in Figure 9. The exposure was determined via two methods, the first of which is a one-mile buffer around the six Extremely Hazardous Substances (EHS) sites, and the second of which is a one-mile buffer around selected sites on the major transportation corridors (Interstate 5; State Routes 44, 273, and 299; and the Union Pacific Railroad Line).

Within the one-mile buffer around the 21 EHS sites, exposed are: 48,209 people, 28,681 residential structures (worth $4.2 billion), 1,837 nonresidential structures (worth $2,280 million), and 269 critical facilities (worth $614.7 million). These figures are for all of the EHS sites and, therefore, overstate the exposure, since the probability of all EHS sites having an event simultaneously is very low. These facilities are predominately located within industrial- and public-zoned areas within the City. However, all 21 EHS facilities are located within a mile of residential areas.

Within a one-mile buffer around one selected site on the major transportation corridors (Interstate 5 and Cypress Avenue), exposed are: 7,356 people, 1,535 residential structures (worth $178.4 million), 653 nonresidential structures (worth $450.3 million), and 6 critical facilities (worth $90.5 million). These figures are calculated for one of the selected sites on the transportation corridor to give a representation of the potential risk in this specific area. The other sites would have similar risk and exposure if an incident were to occur. The incident magnitude is dependent on a number of factors, including: time of day, day of week, location of incident, terrain, quantity of hazardous material involved, and type of hazardous material involved.

With regard to the wastewater treatment plants, the Risk Management Plans document that a small release of 180 pounds of chlorine or sulfur dioxide gas from the Stillwater Plant would be contained within 0.1 mile and not affect the surrounding population, whereas a worst-case release of 2,000 pounds would transmit 1.3 miles and affect 2,400 people (See Figure 11).

The Risk Management Plans document that a small release of 180 pounds of chlorine or sulfur dioxide gas from the Clear Creek Plant would be contained within 0.1 mile and not affect the surrounding population, whereas a worst-case release of 2,000 pounds would transmit 3 miles and affect 9,700 people (See Figure 11).

7.6.6 Mitigations

Goal 7: *Reduce deaths, injuries, structural damage, and losses from hazardous material releases.*

Objective 7.A: Develop a comprehensive approach to enhance the City's ability to respond to hazardous material releases.

Action 7.A.1: Encourage the county, state, and federal hazardous material regulators to continue updating and consistently enforce hazardous materials regulations.

Action 7.A.2: Conduct hazardous materials incident emergency exercises.

Action 7.A.3: Introduce hazardous materials plume-modeling software into the Emergency Operations Center.

Action 7.A.4: Reinforce our partnership with Shasta County Environmental Health to provide additional information on all businesses regarding their use, handling, storage, and transportation of hazardous materials and their generation and disposal of hazardous wastes.

Action 7.A.5: Make sure that hazardous processes are not allowed to be adjacent to, or co-mingle with, residential or high life hazard occupancies.

Action 7.A.6: Provide, along with other stakeholders, educational materials to businesses who work with hazardous materials that clearly identify the risks, the safe practices for use, and the requirements for storage, of hazardous materials. Financial impact: $50,000.

Objective 7.B: Train personnel to the technician and specialist level to be an integral part of the Regional Hazardous Materials Response Team.

Action 7.B.1: Provide continued funding for training to enhance and promote safe hazardous material responses by City personnel.

Action 7.B.2 Invite rail freight companies to conduct freight train-accident response training with City Field responders.

Objective 7.C: Secure funding through Homeland Security grants and other sources to maintain and enhance equipment utilized and needed to ensure continued response and mitigation capabilities.

Action 7.C.1: Identify if additional equipment is needed to ensure protection of community from identified risks.

Action 7.C.2: Establish equipment-replacement schedule and potential funding sources for existing equipment.

Goal 8: *Provide continued and increased protection against releases of hazardous materials from the Clear Creek and Stillwater Wastewater Treatment Plants.*

Objective 8.A: Upgrade aging facilities with newer protective measures whenever feasible.

Action 8.A.1: Install a chemical scrubbing system at the Clear Creek Plant when the facility is upgraded in the future.

Action 8.A.2: Install vandalism- and terrorism-preventive enhancements at both the Clear Creek and Stillwater Treatment Plants, such as considering more extensive perimeter fencing, video surveillance, and stronger door locks.

Objective 8.B: Continue staff preparedness for releases of hazardous chemicals.

Action 8.B.1: Continue monthly training and annual recertification of the RMU Hazmat team, with ongoing emergency-response practice exercises and safety equipment upgrades as needed.

Action 8.B.2: Control visitor and contractor access to both treatment-plant facilities through such actions as gate-locking and sign-in procedures.

7.7 Severe Winter Weather

7.7.1 Nature

Severe winter weather includes extreme cold, heavy snowfall, ice storms, winter storms, and/or strong winds. In addition, winter storms may result in other hazards such as flooding, severe thunderstorms, tornadoes, or extreme winds.

The Hazard Mitigation Team identified snowstorms and strong winds as the most likely severe winter weather hazards based on history in the City of Redding.

Snow

The National Weather Service (NWS) defines *snow* as a steady fall of snow for several hours or more. *Heavy snow* is defined as either snowfall accumulating to 4 inches in depth in 12 hours or less, or snowfall accumulating to 6 inches or more in depth in 24 hours or less.

Heavy snow can result in collapse of structures from the weight of the snow, downed trees or large branches, power outages, flooding, and auto accidents. In addition, it can hamper emergency services and recovery efforts.

Wind

Wind is commonly reported using terms such as *fastest-mile* wind speed and/or *peak-gust* wind speed. The *fastest-mile* wind speed is defined at the highest wind speed measured at an altitude of 30 feet, in open terrain, over a period of time that it takes for one mile of wind to pass by the anemometer, the instrument used to measure wind speed.

The *peak-gust* wind speed is the highest wind speed measured over a period of 2 to 5 seconds. It is approximately 20 percent larger than the *fastest-mile* wind speed. Therefore, a *fastest-mile* wind speed of 75 miles per hour (mph) would correspond to a peak-gust wind speed of approximately 90 mph. The shorter the duration of measurement, the higher the wind speed due to the gust factor (i.e., the rapid variation of wind speed in time).

High winds are defined as winds of 40 mph or greater lasting for one hour or longer, or wind gusts of 58 mph or greater. Hurricane-force winds are often referred to when sustained winds exceed 74 mph. High winds can result in damage to roofing materials; downed trees or large branches; power outages; auto accidents; and the collapse of awnings, patio covers, and carports. The presence of downed trees and branches can also hamper emergency services and recovery efforts.

7.7.2 History

The City of Redding typically experiences severe winter weather during the months of December and January. Storms with strong southerly winds with or without heavy rain are relatively common during these months and typically occur several times per year. Wind speeds of 40 to 50 mph and peak gusts

up to 60 mph occur with some regularity. On the other hand, snowstorms are not as common an occurrence for the City. It's not unusual for the City to experience no measurable amounts of snow for several years in a row.

Snow

According to newspaper reports, the largest one-day (unofficial) record for snowfall in Redding occurred on New Year's Day in 1899, with more than 23 inches of snow.

The NWS official records, which began in 1893, indicate the largest one-day snowfall total at 16 inches, two-day snowfall total at 20 inches, and maximum three-day snowfall total at 23 inches. The exact dates of the NWS records are not known, but are likely to be from the City of Redding's most damaging snowstorm on record, which began on December 22, 1968. In this event, several storms produced wet snow that caused a number of roofs to collapse, most notably a drug store, bowling alley, billiard parlor, roller rink, grocery store, wholesale-food warehouse, and the top of the main airplane hangar at Benton Airpark. Other damage reported included the toppling or breaking of overloaded trees and large limbs and metal awnings collapsing onto cars. Total damage was estimated at $3.2 million.

In December 1988, three different storm systems dumped a total of 17 inches of snow in Redding. On New Year's Eve in 1992, an unexpected snowstorm caught Redding residents off guard, when 4 to 10 inches of snow fell. These events appear to have been mostly an inconvenience to City residents and resulted in little damage.

In late December 2003, the City of Redding experienced its most damaging snowfall since 1968. Snow began falling in the evening of December 28 and continued to do so steadily through the next morning. While snow accumulations did vary significantly throughout the City, the north and west areas of the City experienced the largest snowfall amounts of nearly 12 inches. There were a few industrial buildings that experienced partial roof collapses, and several metal-roof carports collapsed at an apartment complex. While the structural damage was much less than what had occurred in the 1968 snowstorm, there were a significant number of downed trees, tree branches, and power lines and some auto accidents from this storm. The tree damage occurred most commonly on large-canopy live oak trees that collected the heavy snow on their leaf-laden branches. Unlike other oak trees common in the Redding area, live oaks do not lose their leaves in the fall. Some of the fallen trees and/or limbs caused damage to residences while many others fell into and blocked streets.

The City of Redding Electric Utility classified the December 2003 snowstorm as a 1 in 25-year event (i.e., occurs once every 25 years). The storm event was logged between December 28, 2003, and January 2, 2004, and included the snowstorm and a windstorm that followed, with wind speeds in excess of 60 miles per hour. The storm events affected 13,229 customers. The total direct cost to the Electric Utility was reported as $328,500.

Wind

According to the NWS, the highest recorded wind speeds in the City of Redding occurred in early December 1995, when 60 mph (fastest-mile) and 85 mph peak gusts were measured. The Record Searchlight reported that these hurricane-force winds knocked down fences, toppled trees and power poles, tore roofing off houses, tipped a big rig in a parking lot, and caused damage at the Redding Municipal Airport to 4 planes and 18 hangars. The storm also resulted in the death of a woman who was smothered when a large oak tree fell through her mobile home and landed on the bed where she was sleeping. This storm appears to have produced the strongest winds since 1877, when peak gusts were estimated to be nearly 80 mph.

Many longtime Redding residents make comparisons between the December 1995 storm and what is referred to as the Columbus Day Storm. On October 12, 1962, this storm blew into to California as a result of tropical typhoon Frieda, apparently with wind gusts slightly less than the December 1995 storm. It too caused damage to fences, roofs, trees, power poles, etc. throughout the City.

The most recent windy weather event occurred in the final days of 2014 which contributed to the death of a woman who was trapped by a large gray pine that landed on a house. The wind gusts at the Redding Airport peaked at 38 mph around 2 a.m. Wednesday, December 31, with sustained winds averaging 29 mph.

7.7.3 Future Events

Based on the historical data, it is expected that the entire planning area, the City of Redding, will continue to be equally at risk and experience severe winter weather, including high winds and heavy snow. High winds with gusts up to 60 mph are anticipated to occur on a fairly regular basis. While snowstorms that produce small amounts of snowfall accumulation may occur slightly less often as storms that produce high winds, snowstorms that produce damaging amounts of snowfall are expected to occur much less often (i.e., approximately once every 20 years).

7.7.4 Present and Future Mitigation Efforts

The City of Redding enforces the California Building Code (CBC) and the applicable sections of the CBC that relate to snow-load and wind-load design. The current design criterion for the City of Redding is 30 pounds per square foot (psf) non-reducible snow load and wind loading based on 85 mph three-second-gust wind speed with the appropriate exposure category for the site (i.e., Exposure B or Exposure C for open and flat site conditions).

In the summer of 1969, as a direct result of the damage from the December 1968 snowstorm, the City adopted a minimum design (roof) snow load of 30 pounds per square foot (psf) for all new structures. This design snow load was based on the recommendations from a committee of local engineers, architects, and building inspectors who investigated and studied the roof failures. Prior to the 1968 storm, there was no snow load-design requirement.

The City does not have a number of structures that were constructed prior to the 30 psf snow load. The current policy is that structures built prior to 1970 must undergo a snow-load analysis by a qualified design professional (i.e., licensed engineer of architect) when that structure undergoes a change in use or occupancy that results in the structure being placed in higher hazard occupancy group, as required by CBC Chapter 34. Structures that are found to be structurally deficient are required to be upgraded to support a 30 psf snow load.

7.7.5 Vulnerability

Snow

When winter snow storms occur, they will affect the entire community's population. Power outages from snow fall alone are rare, unless freezing rain has accompanied the snow fall. The City has snow-clearing equipment to plow non-state roads. This mitigates car accidents as drivers with little winter driving experience will tend to drive too fast and brake too quickly, therefore relieving the strain on emergency services. Additionally, snow fall means lower temperatures which have a tendency to mean more structure fires created by using unsafe heating methods. In large snow falls, businesses may suffer because of the inability of employees to get to work because of road conditions. This generally lasts for a day. Homeowners are often not prepared for the cold weather associated with snow fall which means that water pipes often break. Snow fall typically does not have as significant an impact on the total population of the City as high winds.

Wind

When wind storms occur, it will affect the entire population. The first effect will be power loss to the residences and businesses. Power will be interrupted by downed lines as a result of trees blowing over or branches falling onto lines. The City of Redding Electric Utility have been proactive by implementing mitigation programs that cut back tree branches in compliance with the California State Public Utility Commission (CPUC) tree-trimming clearance standards that were established in January 1997. This helps tree limbs from falling onto the lines. Debris such as fallen branches in the road causes driving hazards for the public and emergency service personnel. Debris clearing becomes a top priority for the City after high wind storms.

7.7.6 Mitigations

Goal 9: *Reduce deaths, injuries, structural damage, and losses from severe winter weather.*

Objective 9.A: Ensure that structures in the City are adequate to resist snow and wind loads.

Action 9.A.1: Continue to enforce the snow and wind provisions of the latest edition of the California Building Code for new construction, alterations, and additions.

Action 9.A.2: Continue to require a snow-load analysis of existing structures (built prior to 1970) that undergo a change in use or occupancy that results in a higher hazard occupancy group.

Objective 9.B: Ensure City preparedness for emergency response actions due to severe winter weather.

Action 9.B.1: Continue active participation and training of City personnel in the Cal EMA Safety Assessment Program (SAP).

Action 9.B.2: Provide yearly review of the procedures of safety assessment inspections, including proper use of the City's official placards (unsafe, restricted use and inspected) and how to complete the rapid and detailed safety assessment evaluation forms.

Action 9.B.3: Conduct annual emergency operation center drills to ensure efficiency of City staff and coordination of resources and information.

7.8 Earthquakes

7.8.1 Nature

A fault is a thin layer of crushed rock between two blocks of the earth's crust that have moved relative to one another. A fault can range in length from a few centimeters to thousands of miles.

An earthquake is the shaking and vibration at the surface of the earth resulting from underground movement along a fault plane and less frequently from volcanic activity. Earthquakes occur when forces underground cause the fault to rupture and suddenly slip. This occurs when the stress buildup at the fault exceeds the strength of rock resisting the movement.

Two of the most common methods to describe an earthquake are by intensity and magnitude. Intensity and magnitude measure different characteristics of earthquakes.

Intensity

Intensity is a measure of the strength of shaking experienced in an earthquake at a particular location. The intensity scale used in the United States is the Modified Mercalli (MM) intensity scale, which represents the local effect or damage caused by an earthquake (see Table 7-5). This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals (I through XII). The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. The maximum observed intensity generally occurs near the earthquake epicenter, and the intensity generally decreases away from the epicenter.

Sometimes earthquakes are referred to by the maximum intensity they produce. The Modified Mercalli intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the general public than the earthquake magnitude, because intensity refers to the observed effects and damage actually experienced at that location. For example, an earthquake of intensity *MM II* would barely be felt by people favorably situated, while intensity *MM X* would produce heavy damage, especially to unreinforced masonry structures.

Local geologic conditions strongly influence the intensity of an earthquake. Commonly, sites on soft ground or alluvium may have intensities 2 to 3 units higher than sites on bedrock.

Magnitude

Magnitude is a measure of the size of the earthquake and energy released at the source of the earthquake where the fault slip has occurred. Magnitude is determined from measurements on seismographs which record the ground motion from the earthquake.

Magnitude scales, like the Richter (local) magnitude and moment magnitude, measure the size of the earthquake at its source. Thus, they do not depend on where the measurement of the earthquake is made. Earthquakes below magnitude M2.5 are generally not felt by people. Table 7-6 represents the

approximate Modified Mercalli intensity near the epicenter of the earthquake versus the earthquake magnitude.

Table 7-5
Modified Mercalli Intensity Scale

MM Intensity	Observed effects and damage
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	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	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	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	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	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	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	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Table 7-6
Modified Mercalli Intensity and Magnitude

MM Intensity	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Magnitude	1 – 2	2 – 3	3 – 4	4	4 – 5	5 – 6	6	6 – 7	7	7 – 8	8	> 8

Seismic Hazards

The primary seismic hazard is ground shaking caused by the earthquake and resulting seismic waves. Ground shaking is most often reported as peak ground acceleration (PGA) which represents the largest ground acceleration recorded by a particular station during an earthquake. PGA may be given in various acceleration units but is most commonly reported as a percentage (or fraction) of the acceleration of gravity (i.e. "g"). Table 7-7 represents the approximate relationship between the Modified Mercalli intensity and PGA, as a percentage of "g".

Table 7-7
Modified Mercalli Intensity and Pga

MM Intensity	I	II-III	IV	V	VI	VII	VIII	IX	X+
Perceived Shaking	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
Potential Damage	None	None	None	Very light	Light	Moderate	Moderate/ Heavy	Heavy	Very heavy
PGA (%g)	< .17	.17 - 1.4	1.4 - 3.9	3.9 - 9.2	9.2 - 18	18 - 34	34 - 65	65 - 124	> 124

Secondary hazards include surface faulting, liquefaction, landslides, and tsunamis. Surface faulting is displacement that reaches the earth's surface during slip along a fault. Liquefaction is the process by which water-saturated sediment temporarily loses strength and acts as a fluid.

7.8.2 History

Shasta County has a low level of historic seismic activity. In the past 120 years, there has been no significant property damage or loss of life due to earthquakes occurring within or near the county. Maximum recorded intensities have reached *MM VII*, with possibly one instance of *MM VIII*. Most of the stronger intensity seismic activity in Shasta County has occurred in the eastern half of the county near Lassen Peak.

The City of Redding is located in the less seismically active western half of Shasta County, referred to as an area of "moderate seismicity". Earthquake activity has not been a serious hazard in the City of Redding's history, nor is it probable that it will become a serious hazard in the future.

Research of historical earthquakes indicates that Redding has experienced several moderate-sized earthquakes, magnitude 4.0 to 4.5 (estimated) in 1904, 1915, 1919, 1920 and 1930.

On November 26 (Thanksgiving Day), 1998, the City of Redding experienced a local magnitude M_L 5.2 earthquake that was centered three miles north-northwest of Redding near Keswick Dam. This was the

largest recorded earthquake since the U.S. Geological Survey began monitoring Shasta County in 1981 and was believed to be the largest earthquake in the Redding area since 1878. No structural damage was reported in the City of Redding. Nonstructural damage that was reported consisted of broken merchandise at a liquor store, grocery store, and drug store; loss of power at a grocery store due to a damaged electrical panel; a fire sprinkler break causing damage in a mechanical room and two operating rooms at Mercy Medical Center; and nonstructural cracks at expansion joints in a highway overpass. Outside the city limits, a 4-million-gallon water tank in Bella Vista lifted about an inch off its foundation, resulting in bent anchor bolt washers; and a PG&E transformer caught fire in Corning, resulting in a temporary power outage for 7,500 customers.

The only reported earthquake injury occurred in the City of Shasta Lake when a woman slipped and fell in a grocery store. She was later admitted to Mercy Medical Center for X-rays.

7.8.3 Future Events

Ground Shaking

The City of Redding is assigned to Seismic Design Category D per the 2010 California Building Code. The City of Redding, in its entirely, would be at a relatively low risk of exposure to strong seismic shaking. The maximum earthquake intensity is expected to be between *MM VI & MM VII* (see Table 7-5).

According to the California Department of Conservation – Division of Mines and Geology (DMG), seismic hazard mapping indicates approximate probabilistic peak-ground accelerations (PGA) of 16%g, 18%g, and 22%g on firm rock, soft rock, and alluvium site soil categories, respectively. These ground accelerations correspond to the earthquake that has a 10 percent probability of being exceeded in 50 years, or the earthquake that has a return interval of 475 years.

Surface Faulting

There are no fault-rupture hazard zones within the City of Redding, as defined by the Alquist-Priolo Earthquake Fault Zoning Act. Therefore, surface fault rupture is not considered to be a significant hazard.

Ground Failure

Based on the low to moderate expected PGA and the geology and the topography within the City of Redding, seismically induced land sliding and/or liquefaction are not considered significant hazards.

7.8.4 Present and Future Mitigation Efforts

Damage in Redding resulting from earthquakes would most likely be from ground shaking and less likely from related ground failure. The effects of ground shaking are best mitigated by adequate design for the maximum probable earthquake for the City of Redding. The effects of ground failure are best mitigated by adequate geotechnical investigations of specific sites.

The City of Redding enforces the California Building Code, which establishes building requirements for all new structures based on predicted earthquake intensities. The risk of loss of life and property damage due to seismic activity is assumed to be minimized if the California Building Code is enforced. The Seismic Hazards Assessment for the City of Redding states *"... the UBC (Uniform Building Code) generally provides conservative ground motion criteria for the design of new buildings and structures ... the probability is small that the UBC [design standard] will be exceeded."* However, the Assessment also states that some structures on alluvial deposits and soft rock could experience peak horizontal accelerations greater than those anticipated in the UBC and, therefore, recommends that site-specific seismic hazard evaluations be performed for critical facilities.

The Seismic Hazards Assessment for the City of Redding also includes maps of the potential liquefaction areas within the City's sphere of influence. The Assessment recommends that where areas of liquefaction potential are anticipated, site-specific investigations regarding liquefaction potential should be made.

Plan review of building permit applications are provided through the Building Division of the Development Services Department. The Building Division currently consists of 11 staff members: a Building Official/Development Services Director, a supervising building inspector, two building inspectors, two plan checkers, two plan check engineers, three Code Enforcement officers, and one administrative assistant. All the building inspectors and plan checkers are certified by the International Code Council (ICC). In addition to the ICC certifications, the Building Official and both plan check engineers hold licenses as California structural engineers. As compared to other jurisdictions north of Sacramento, the City of Redding has long had a reputation of having one of the most thorough building plan-check processes intended to safeguard life, limb, and property as stated in the California Building Code.

7.8.5 Vulnerability

The City of Redding recently ran an earthquake scenario based on an expected peak-ground acceleration (PGA) of 18%g over the entire City (See Figure 11). Building Damage Ratios were estimated at 6 percent for older structures located in the immediate downtown area of the City and 3 percent for all other areas within the City. The Building Damage Ratio represents an estimate of the ratio, as a percentage, of the repair cost divided by the replacement cost. The higher damage ratio in the downtown area was chosen, since these structures are typically older and less likely to have been constructed with any seismic code-design provisions (i.e., pre-seismic-code buildings). The total damage is estimated at $303 million for the City as a whole (see Table 7-8), which is less than 2 percent of the damage estimates from the 1994 Northridge earthquake which was $20 billion, making it one of the costliest natural disasters in U.S. history.

Table 7-8
Earthquake Damage Estimates

Type of Structure	Number of Structures			Value of Structures			Estimated Damage
	# in City	# with DR = 6%	# with DR = 3%	Value in City	Value with DR = 6%	Value with DR = 3%	
Residential	27,267	2,440	24,827	$6,234 M	$255 M	$5,979 M	$198 M
Commercial	1,733	577	1,156	$1,256 M	$418 M	$838 M	$44 M
Industrial	393	35	358	$172 M	$8 M	$163 M	$5 M
Agricultural	18	1	17	6 M	$0	6 M	$0 M
Religious / Non-Profit	57	7	50	$132 M	$3 M	$130 M	$6 M
Government	302	81	221	$884 M	$387 M	$497 M	$31 M
Education	352	101	251	$348 M	$109 M	$238 M	$14 M
Utilities	138	10	128	$149 M	$13 M	$136 M	$5 M
TOTAL	**30,260**	**3,252**	**27,008**	**$9,181 M**	**$1,193 M**	**$7,987 M**	**$ 303 M**

DR = Estimated Damage Ratio = repair cost / replacement cost
M = millions of dollars

7.8.6 Mitigations

Goal 10: *Reduce deaths, injuries, structural damage, and losses from earthquakes.*

Objective 10.A: Ensure that structures in the City are adequately earthquake resistant.

Action 10.A.1: Continue to enforce the seismic provisions of the latest edition of the California Building Code for new construction, alterations, and additions.

Action 10.A.2: Continue to require a seismic analysis of existing structures (built under earlier building codes) that undergo a change in use or occupancy that results in a higher hazard occupancy group.

Objective 10.B: Ensure City preparedness for emergency-response actions due to earthquakes.

Action 10.B.1: Continue active participation and training of City personnel in the Cal EMA Safety Assessment Program (SAP).

Action 10.B.2: Provide yearly review of the procedures of safety assessment inspections, including proper use of the City's official placards (unsafe, restricted use and inspected) and how to complete the rapid and detailed safety assessment evaluation forms.

Action 10.B.3: Conduct annual emergency operation center drills to ensure efficiency of City staff and coordination of resources and information.

7.9 Utility Disruption

7.9.1 Nature

Redding Electric Utility (REU) owns, operates, and maintains the City of Redding's electric distribution system. REU is responsible for the production, procurement, and delivery of electric energy to the City of Redding customers. The major hazards facing the Utility are natural disasters and energy-supply shortage.

The City of Redding also owns, operates, and maintains the City's water and wastewater systems. The water utility produces more than 30 million gallons a day of treated surface water and in excess of 12 million gallons a day of well water during peak summer demand.

The wastewater utility can currently treat 9 million gallons a day at the Stillwater treatment plant and 16 million gallons a day at the Clear Creek treatment plant during wet weather. However, during intense, short-duration rainfall events, the plants can divert 12 and 100 million gallons a day, respectively, into their overflow ponds. The major hazards facing the City's water and wastewater utilities are energy-supply shortages, equipment failures, and peak storm-event capacity.

7.9.2 History

Historically, wind and snow storms have had the greatest impact on the delivery of power to our customers. On December 31, 2003, the Redding area experienced an abnormally heavy snowstorm, leaving many customers without power for a period of up to four days.

Energy-supply shortages in California also threaten the reliability to our customers. Major causes can be attributed to wildfires and large-area electrical-grid disturbances. In 1996, Redding was impacted by a West Coast power outage that caused the automatic load shedding of about 30 percent of our customers for over 30 minutes.

Since Pump House No. 1 at the Sacramento River supplies over half the City's raw water to the Foothill Water Treatment Plant, the ability to pump water from the river is necessary. Fish screens and pump upgrades were installed in 2005 to successfully pump water without harming the local fish population and to operate more efficiently. Also, upgrades to two water pump stations allow water to be diverted from the Buckeye pressure zone into the Foothill pressure zone, providing more operational flexibility for water delivery. During severe storm events, spikes in turbidity could lead to the shutdown of Pump House No. 1. By having an alternate to the pump house, the water delivery system is more reliable and allows more flexibility for periodic inspection, maintenance, and repairs to be performed at the treatment plant.

During a few days in the winter of 2005, over 60 million gallons a day were entering the Clear Creek treatment plant, requiring flow diversion into the overflow ponds. Capacity upgrades are being implemented to provide treatment from 16 to 40 million gallons a day.

7.9.3 Present and Future Mitigation Efforts

To mitigate the impact of natural disasters, REU participates in a local Emergency Response group, belongs to the California Utility Emergency Association (CUEA) and has entered into individual "mutual aid" agreements with many other California utilities. REU also adheres to a comprehensive system-maintenance and tree-trimming program.

In regard to energy-supply mitigation, REU belongs to the Western Electricity Coordinating Council (WECC). WECC is one of the nation's electric reliability organizations under the jurisdiction of the North American Reliability Council (NERC). NERC sets the reliability standards for all electric utilities connected to the Bulk Electric System. These standards govern the majority of REU's emergency procedures and protocols relating to system stability and reliability. In addition to meeting NERC standards, REU has taken additional measures to mitigate energy-supply shortages, such as installing local power generation, participating in regional emergency reserve groups, and installing emergency "off-system" generators. REU maintains the following emergency plans:

REU Plans

- Emergency Operating Procedures
- Energy Emergency Plan – Public Notification and Appeal
- Recognition and Reporting of Sabotage
- Spill Prevention Control and Countermeasure Plans (SPCC)
- Hazardous Materials Business Plans for REU Facilities

Wet Utilities

To mitigate the impact of utility disruption, the City of Redding's water and wastewater facilities are equipped with redundant power supplies, diesel generators, and back-up portable pumps. Some generators are at permanent locations, while others are portable, providing flexibility in operations. The City adheres to a comprehensive system- and facility-maintenance schedule.

The City is currently in the process of evaluating and updating its water and wastewater models to better assess required facility improvements. These improvement recommendations establish what is required now and in the future, with projected population growth.

The City also has emergency pumping plans when flows exceed the capacity of strategic wastewater lift stations.

7.9.4 Mitigations

Goal 11: *Prevent deaths, injuries, structural damage, environmental damage, and losses from utility disruptions.*

Objective 11.A: Manage the Power System to ensure safe and reliable operation of the City's electric system through 24-hour dispatching of the distribution system and real-time monitoring of REU resources.

Action 11.A.1: Provide safe, reliable switching control and coordination of field crews throughout the year.

Action 11.A.2: Real-time System Operators continue to constantly monitor the power grid and dispatch resources to mitigate power-supply curtailments.

Action 11.A.3: Annual training of System Operators to respond to power-system emergencies.

Objective 11.B: Ensure that the Redding Power Plant is available to meet the City's needs whenever required.

Action 11.B.1: Continue maintenance of the Redding Power Plant facilities to assure availability to respond to power-grid emergencies.

Objective 11.C: Continue construction of new, or upgrading of existing, generation, sub-transmission, substation, and distribution facilities to meet expanding system needs and maintain a safe and reliable system.

Action 11.C.1: Continue modernization of substation equipment and communication systems.

Objective 11.D: Continue to mitigate potential hazards of overhead power lines.

Action 11.D.1: Continue to implement a program that allows for trimming of trees on a three-year-or less trim cycle that meets new California State Public Utility Commission (CPUC) tree-trimming clearance standards that were established in January 1997.

Action 11.D.2: Continue annual equipment inspection and pole-replacement programs to assure reliability and public safety.

Objective 11.E: Manage the water and wastewater systems to ensure safe and reliable operations during potential utility disruptions caused by severe storm events.

Action 11.E.1: Provide safe and reliable collection-system, pump-station, and treatment-plant controls and operations. Perform preventative maintenance with coordination of field crews throughout the year.

7.10 Aviation Disaster

7.10.1 Nature

Redding Municipal Airport experiences thousands of landings and takeoffs each year. Various user groups utilize the public airport, such as private, commercial, and governmental agencies, including U. S. Forest Service and California Department of Forestry and Fire Protection (Cal Fire). During the summer months, the use of the airport becomes somewhat busier due to the fire-suppression flights offered to the northwest region by the U. S. Forest Service and Cal Fire.

7.10.2 History

The airport has very few crashes and maintains airport approaches in accordance with FAA Regulations.

7.10.3 Mitigation Efforts and Vulnerability

The airport's most probable scenario for an incident would likely occur during the hot summer months, during a significant wildfire with strong gusty winds. Using this scenario, we created the most likely incident: a Lockheed P2V or P-3 Orion loaded with fire retardant and fuel crashes soon after departure at either end of Runway 16-34 or near Airport Road. In this impact area, there are one residential and two commercial occupancies. The values of the properties total approximately $620,000, and life loss would be estimated at three persons on the ground and unknown number of persons on board the aircraft. The Airport Emergency Plan - 2004 (revised 8/4/06) has been created and maintained by the Airport Managers to mitigate and respond to any disaster.

7.10.4 Mitigations

Goal 12: *Reduce deaths, injuries, structural damages, and losses from aviation disasters.*

Objective 12.A: Implement the adopted Airport Emergency Plan which is utilized to mitigate and respond to an aviation disaster.

Action 12.A.1: Continue to update the Airport Emergency Plan.

Action 12.A.2: Ensure that the Airport Emergency Plan complies with FAA regulations.

Action 12.A.3: Conduct aviation disaster drills once every three years.

7.11 Chemical, Biological, Radiological, Nuclear, Explosives (CBRNE)

7.11.1 Nature

Unlike accidents or natural disasters, an act of terrorism is a manmade event designed to extort governments or communities for the purpose of bringing about political, social, and/or economic change. The damage and disruption that may occur from such an event could be immeasurable, crippling a city, region, state, or nation's economy with long-lasting effects. The psychological factor alone would affect the well-being and sense of security people have come to know and enjoy.

The goals and objectives of a terrorist attack are to disrupt society and affect as many lives as possible. This can be accomplished by many means, including the deployment of weapons of mass destruction or by disrupting or damaging community and/or government infrastructure. It may also be accomplished through cyber-attacks on business and/or government computer systems.

Weapons of mass destruction (WMD) used by terrorists to accomplish their goals may include, but are not limited to, the following:

- Chemical (i.e., nerve gas or blistering agent).
- Biological (i.e., anthrax, botulism, or smallpox).
- Radiological (i.e., "dirty bomb").
- Nuclear (i.e., thermonuclear).
- Explosives.
- Cyber-terrorism.

Of all these weapons, the easiest to obtain and use has been the conventional or improvised explosive device.

The catastrophic attacks on the World Trade Center buildings in New York City, the Pentagon, and the Alfred P. Murrah Federal building in Oklahoma City proved to the nation that there are no safe havens when considering acts of terrorism and Redding, California, is no exception. The freedom of movement and virtually unrestricted access to government officials, buildings, and critical infrastructure that are afforded to citizens and visitors presents terrorists the opportunity to deliver a devastating attack with only the crudest of devices or WMD.

Chemical

Chemical weapons have been used primarily to terrorize an unprotected civilian population and not as a weapon of war. This is because of fear of retaliation and the likelihood that the agent would contaminate the battlefield for a long period of time. Some analysts suggest that the possibility of a chemical attack would appear far more likely than either the use of nuclear or biological materials, largely due to the easy availability of many of the necessary substances needed to construct chemical weapons. Additionally, the rudimentary technical knowledge needed to build a working chemical device is taught in every college-level chemistry course in the world. Some chemical agents are odorless, tasteless, and are

difficult to detect. They can have an immediate effect (a few seconds to a few minutes) or a delayed effect (several hours to several days).

Biological

Biological weapons are defined as any infectious agent, such as a bacteria or virus, used to produce illness or death in people, animals, or plants. This definition is often expanded to include biologically derived toxins and poisons. Biological agents can be dispersed as aerosols or airborne particles. Terrorists may use biological agents to contaminate food or water because the agents are extremely difficult to detect.

Radiological

A radioactive material is a material made up of unstable atoms which give off excess energy in the form of radiation through the process of radioactive decay.

Radiation cannot be detected by human senses. Wherever radioactive materials are used, transported, or stored there is a potential for a radiological accident to occur. Some of their most common uses include use:

- By doctors to detect and treat serious diseases.
- By educational institutions and companies for research.
- By the military to power large ships and submarines.
- By companies in the manufacture of products.
- As a critical base material to help produce the commercial electrical power that is generated by a nuclear power plant.
- As one of the critical components in nuclear weapons which help deter the threat of war.

Nuclear

The possibility exists that a terrorist organization might acquire the capability of creating a small nuclear detonation. A single nuclear detonation in the United States would likely produce fallout affecting an area many times greater than that of the blast itself. There is also the possibility that a terrorist will construct a “dirty bomb” (a bomb that is used to distribute contaminated nuclear materials). It would have less of an effect than a “traditional” nuclear bomb, but the terror effect on the population would be great.

Explosive

The possibility exists that a terrorist may attack with conventional explosives, particularly in a public setting. Innumerable incidents have occurred around the world involving car bombs, truck bombs, and bombs attached directly to terrorist individuals.

Cyber-terrorism

Cyber-terrorism is the use of computer network tools to shut down critical government infrastructures such as energy, transportation, and government operations, or to coerce or intimidate a government or civilian population. The premise of cyber-terrorism is that as nations and critical infrastructure become more dependent on computer networks for their operation, new vulnerabilities are created. A hostile nation or group could exploit these vulnerabilities to penetrate a poorly secured computer network and disrupt or even shut down critical public or business operations. The goal of cyber-terrorism is believed to be aimed at hurting the economy of a region or country and to amplify the effects of a traditional physical terrorist attack by causing additional confusion and panic.

7.11.2 History

Fortunately, the City of Redding has yet to experience significant incidents of chemical, biological, radiological, nuclear, or explosive terrorism. However, as with most midsize cities in California, Redding has its vulnerabilities. In consideration of its mild climate, special events, and attractiveness to tourists, Redding stands out for those who would commit such atrocities.

Although no significant acts of terrorism have occurred in Redding, the area has experienced acts of terrorism on a much smaller scale. Such acts include: arson, bomb threats, and hostage incidents. Additionally, Redding has been impacted by recent computer viruses and worms.

7.11.3 Future Events

Chemical

A terrorist would not have to build a complicated chemical release device. During favorable weather conditions, an already existing chemical plant could be sabotaged or bombed, releasing a toxic cloud to drift into a populated area. The result could be just as dangerous as having placed a smaller chemical device in a more confined space. This type of incident would cause the maximum amount of fear, trepidation, and potential panic among the civilian population, thus achieving a major terrorist objective.

Biological

The agents are cheap, easy to make, and simple to conceal. Even small amounts, if effectively deployed, could cause massive injuries and overwhelm emergency rooms. The production of biological weapons can be carried out virtually anywhere - in simple laboratories, on a farm, or even in a home. However, experts say it remains very difficult to transform a deadly virus or bacterium into a weapon that can be effectively dispersed. A bomb carrying a biological agent would likely destroy the germ as it explodes. Dispersing the agents with aerosols is challenging because biomaterials are often wet and can clog sprayers. Most agree that, while a biological attack could be devastating in theory, in reality the logistical challenges of developing effective agents and then dispersing them make it less likely a terrorist could carry out a successful widespread assault.

Radiological/Nuclear

Under extreme circumstances an accident or intentional explosion involving radiological materials can cause very serious problems. Consequences may include death, severe health risks to the public, damage to the environment, and extraordinary loss of, or damage to, property.

Explosive

While generally more limited in the extent of the damage inflicted, explosive terrorist attacks may have consequences, including death and damage to property.

Cyber-terrorism

Recent incidents illustrate the area's vulnerability to cyber-terrorism.

Effects

- *On people and housing* - Depending on levels of contamination and exposure, effects could range from minimal to devastating.
- *On commercial and industrial structures* - Depending on levels of contamination and exposure, effects could range from minimal to devastating.
- *On infrastructure* - Nuclear, radiological, and cyber-terrorism can have profound effects on infrastructure.
- *On agriculture* - Depending on levels of contamination and exposure, effects could range from minimal to devastating.

Without a history of significant acts of terrorism, or threats thereof, having taken place in the City of Redding, there is virtually no data available in which to predict a specific act that may occur. However, when considering the increase of terrorist attacks that have occurred worldwide and throughout the nation, it is only prudent to plan and prepare for when such an event occurs in Redding, and where the City's vulnerabilities lie.

More than ever before, plans to mitigate possible terrorist attacks are taken into consideration during the planning phases of special events taking place throughout the city each year. By monitoring intelligence bulletins from agencies that include the FBI and Department of Homeland Security, as well as from local allied agencies, city officials are now in a position to greatly decrease the chances of a terrorist attack and/or mitigate the effects of an attack if one were to occur. Additional measures can be found under the section, *Present and Future Mitigation Efforts*.

7.11.4 Present and Future Mitigation Efforts

Over the past few years, the Redding Police Department (RPD), in concert with other City departments and allied agencies, have taken steps in which to combat the threat of a terrorist attack. These steps include, but are not limited to, the following:

- The standard service weapon of a Redding police officer has been upgraded to a semiautomatic pistol.
- In addition, to augment RPD's arsenal capability in the event of a terrorist attack, most officers have been trained in, and are now equipped with, .223-caliber semiautomatic rifles. They have been outfitted with ballistic helmets and gas masks and have been trained in the area of crowd management and control. They have also been trained in response tactics and identification of potential terrorist targets.
- Police patrol vehicles have been equipped with MDCs (Mobile Data Computers) that contain software specific to our local schools to include site survey information. Planning sessions have also been conducted with school officials to coordinate emergency-service response to critical incidents at school facilities.
- RPD personnel have kept current with suspected terrorist activities through information bulletins provided by the FBI, the Department of Homeland Security, and CATIC (California Anti-Terrorist Information Center). Police management reviews these bulletins daily. Police investigators have also worked with and have shared suspected terrorist information with state and federal law enforcement agencies. A police officer is attending WMD training at the Federal Law Enforcement Training Center. A police lieutenant is attending anti-terrorism training at the FBI National Academy.
- RPD has worked, and continues to work, in unison with the Shasta County Sheriff's Department with annual countywide disaster drills. Both agencies have worked together to identify potential terrorist targets in our region.
- RPD representatives meet quarterly with state and local Office of Emergency Services (OES) representatives on the Mutual Aid Region Advisory Committee to discuss recent disasters and ways in which to mitigate future events.
- RPD representatives meet occasionally with Shasta County Public Health Joint Advisory Committee (JAC) representatives to discuss natural disasters, disease outbreaks, and terrorist incidents affecting public health.
- City officials and department heads meet semiannually to conduct Emergency Operations Center (EOC) drills and exercises. The drills simulate large-scale natural disasters and terrorism incidents in and around the City of Redding. All City departments practice their skills to manage critical incidents utilizing the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).
- Site surveys have been conducted of critical City infrastructure to include the Civic Center, water treatment facilities, power generation facilities, and airports. Police officers tour these facilities with management personnel to determine vulnerabilities in security and operational procedures. Recommendations are made for improvements.
- A police department policy to address the Homeland Security Advisory System "threat conditions" was adopted. This policy addresses both national and regional threats. The policy guides police officers in securing critical facilities within the City.
- Several City of Redding departments, in cooperation with the Shasta County Office of Emergency Services, have procured anti-terrorism and disaster management equipment through annual U.S. Department of Homeland Security funding. Some items include: armored vehicles, hazmat response equipment, and personal protective equipment. Plans to improve radio communications with allied agencies are currently in effect.

- The Shasta Cascade Hazardous Materials Response Team (SCHMRT) is a cooperative team covering six Northern California counties. All personnel are trained to meet mandated requirements for the Hazardous Materials Operational Level. A small group of personnel have been trained to the higher levels of Hazardous Materials Technician and Specialist. Due to lengthy railway lines and state highways traversing the City, there is an ongoing potential for a hazardous materials transportation incident. Personnel have limited abilities to respond to incidents of biological agent exposure.
- In an effort to combat the potential threat of bioterrorism, the Redding main postal facility of the US Postal Service is being equipped with the Bio Defense/Bio Shield Program. The program aims to keep the public safe by detecting the presence of biological agents.
- Personnel of the Redding Fire and Police Departments are members of the Shasta County Public Health Joint Advisory Council (JAC). The Shasta County Public Health Department has access to the California Health Alert Network (CAHAN). This network is designed to alert local health departments throughout California in the event of a public health emergency (bioterrorism). CAHAN provides a central point of access to local health departments and their partners for sending and receiving alerts as well as locating, creating, and sharing critical information from a web-based interface.
- The Shasta County Public Health Department recently upgraded its laboratory facility to process and test a variety of materials which may include suspected biological agents. The department added additional microbiologists who received specialized training in select-agent testing.

7.11.5 Mitigations

Goal 13: *Reduce deaths, injuries, structural damage and losses from CBNRE.*

Objective 13.A: Provide training to personnel in the latest tactics and personal protection in the event of CBNRE.

Action 13.A.1: Continue to provide training to all personnel to meet mandated requirements for the Hazardous Materials Operational Level.

Action 13.A.2: Continue to provide training to a small group of personnel to the higher levels of Hazardous Materials Technician and Specialists.

Action 13.A.3: Continue to apply for grants to assist with the expenses associated with ongoing training and updated equipment purchases.

Objective 13.B: Enhance communication between agencies to mitigate deaths, injuries, structural damage and losses from CBNRE.

Action 13.B.1: Continue membership with the Shasta County Public Health Joint Advisory Council (JAC).

Action 13.B.2: Continue to provide access to the California Health Alert Network (CAHAN).

Goal 14: *Reduce the potential of terrorist activity in the City of Redding.*

Objective 14.A: Increase the expertise and awareness of various City of Redding personnel regarding terrorism issues.

Action 14.A.1: Selected police officers and fire fighters will attend training regarding weapons of mass destruction (WMD).

Action 14.A.2: Obtain access to FBI secure database for terrorism-related, law-enforcement sensitive information.

Objective 14.B: Increase networking communication between City of Redding personnel and the community regarding terrorist-related activity.

Action 14.B.1: Increase community awareness through Neighborhood Watch crime prevention program.

Action 14.B.2: Disseminate press releases and activate the Emergency Alert System (EAS) during times of severe terrorism-threat conditions.

Objective 14.C: Augment City of Redding personnel with additional personal protective equipment (PPE).

Action 14.C.1 Procure additional weaponry for police personnel such as small-caliber patrol rifles.

7.12 Dam Overflow or Failure

7.12.1 Nature

Shasta Dam, on the Sacramento River just above Redding, serves to control floodwaters and store winter runoff for irrigation in the Sacramento and San Joaquin Valleys, maintain navigable flows, provide flows for the conservation fisheries in the Sacramento River and its downstream tributaries, provide water for municipal and water district use, protect the Sacramento-San Joaquin Delta from saltwater intrusion, and generate hydroelectric power. In addition, Shasta Lake (behind Shasta Dam) provides boating and recreation opportunities that bring millions of dollars to the Redding area annually.

Measured in mass, Shasta Dam is the second largest dam in the United States (behind Grand Coulee Dam on the Columbia River in Washington State). The dam is 602 feet high, with a crest length of 3,460 feet. It is 883 feet thick at the bottom and 30 feet thick at the top. Shasta Dam is a curved concrete gravity-type dam with 6.5 million cubic yards of concrete weighing 15 million tons. Construction of the dam started in 1938 and was completed in 1945. The spillway is 487 feet long, creating the largest man-made waterfall in the world. The spillway is 375 feet wide with three drum-gates. Each drum-gate is 110 feet wide, 28 feet tall, and weighs 500 tons. There are 18 outlets on the face of the dam, each 8.5 feet in diameter, with a maximum overall capacity of 186,000 cubic feet per second.

Prior to the construction of Shasta Dam, floods frequently ravaged the Sacramento Valley, including the State Capital. It is estimated that Shasta Dam has prevented over 5 billion dollars in flood damages. The U.S. Bureau of Reclamation uses flood control procedures and regulations prescribed by the Corps of Engineers for operations per agreements between the two entities.

The City of Redding is the first incorporated city downstream of Shasta Dam through which the Sacramento River flows. As such, the City would be directly affected by a dam overflow or failure. Although these are two different types of events, the results are the same - uncontrolled releases from Shasta Dam.

Dam Overflow

Although it is highly unlikely, a dam overflow is more likely than a dam failure. A dam overflow would be characterized by an “overtopping” of the dam. The design of the structure includes three large spillway gates to minimize the possibility of a true overtopping of the dam. During an intense and prolonged storm period that might bring water levels near the top of the dam, these spillway gates would be lowered allowing water to be discharged down the spillway. Controlling, or funneling, the discharge down the spillway prevents structural erosion along the base and sides of the dam, protects the turbine power generation plant at the base of the dam, and allows control of the release in cubic feet per second.

Dam Failure

A dam failure is less likely than a dam overflow. A dam failure would be characterized by a structural breach of the dam. Flooding and overtopping, earthquakes, release blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, or terrorism typify dam failures.

California has had about 45 failures of nonfederal dams. These failures occurred for a variety of reasons, the most common being overtopping of earthen dams. Some of the other reasons include specific shortcomings in the dams themselves or inadequate assessment of the surrounding geomorphologic characteristics. Shasta Dam is a federal dam, one of the largest concrete dams in the world, and secured firmly on bedrock.

7.12.2 Effects of Dam Overflow or Failure

Uncontrolled releases from the dam, although very unlikely, would devastate the entire northern Central Valley. The Sacramento River and its tributaries would overtop banks and levees. Massive flooding in the lowlands along the river would occur and Interstate 5, the main west coast transportation artery, would be affected by closure and possible structural damage.

Other effects of large-scale flooding downstream include: loss of life, limited potable water supplies, potential for spread of disease from the release of untreated sewage, structural damage to buildings, probable loss of electricity and landline communications, crop damage and loss of agricultural lands, loss of livestock, emergency response efforts hampered by flooded transportation corridors, and the inevitable clean-up of silt, mudflows, erosion, and debris.

In the event of a dam failure, large-scale flooding could occur repeatedly until the replacement of the dam is complete. As stated before, prior to the completion of Shasta Dam, devastating floods were a regular occurrence in the Sacramento River valley.

7.12.3 History

Dam Overflow

Shasta Dam has never overflowed in its 60-year history. In 1977, and again in 1998, prolonged warm spring rainfalls in the watershed above Shasta Dam raised the lake levels as much as 10 feet per day for more than one week. This early snowmelt was followed by intense storms that dropped record precipitation, bringing lake levels to within 10 feet of the top. In 1998, the flows were increased to 80,000 cfs out of the dam, but inflow to the lake was steady at more than 225,000 cfs. The storms subsided as the lake neared 4 feet from the top of the dam and the Bureau of Reclamation assured everyone that the dam was never in danger of overtopping. The next day officials at the dam announced that for only the second time in the dam's history, the massive drum-gates would all be lowered and water would come over the entire spillway in an effort to draw the lake back down to comfortable levels. The spillway gates remained open for several days, as shown in the picture below, releasing 78,000 cfs.

Dam Failure

Although there is a history of 45 dam failures within the State of California, most of the failures were earthen dams. Of the concrete dams that failed, all were of the “thin-arch” design. Shasta Dam is a federally controlled and inspected dam and is considered a “thick arch.” Seismic activity is monitored, and tunnels throughout the dam itself allow inspectors to monitor for cracks and seepage. The dam is built on bedrock and is geomorphologically sound. The probability of a dam failure is extremely low.

7.12.4 Future Events

There is an extremely low likelihood of a dam overflow or a dam failure. Record rainfall events drew lake levels near the top twice in the last two decades, but both events were sidestepped using modern weather forecasting and safe release levels from the dam. Following the terrorist events of September 11, 2001, Shasta Dam was closed to traffic across the dam for security reasons, thus minimizing a terrorist threat. The dam has since re-opened to through traffic by permit but maintains a policy of "no parking or stopping" on the dam.

7.12.5 Present and Future Mitigation Efforts

The City of Redding has developed Inundation Maps showing the flood-prone areas should a catastrophic failure or a dam overflow occur. This map shows projected floodplain for flows of 100,000 cfs and 310,000 cfs, as delineated from water surface profiles generated by the Army Corps of Engineers, 1942. An EOC drill simulated uncontrolled releases of 100,000 cfs as part of an exercise. A map of the 100-year floodplain for the Sacramento River showing these inundation areas is included as Figure 7.

7.12.6 Vulnerability

Although it is highly unlikely, the most probable scenario would be a dam overflow, not a dam failure. In the event that prolonged periods of high-intensity rain, typically in mid to late spring, in the watersheds above Shasta Dam, the inflows to the lake could exceed 225,000 cfs for extended periods of time. If the lake levels were near capacity and discharges from the dam at 80,000 cfs were unable to draw the lake down enough to prevent an overtopping, the Bureau of Reclamation would likely be forced to open the spillway gates and allow higher flows. There is no precedence for this, but it is likely that the Bureau would give at least 12-hours' notice of the impending rise in river flows. The City of Redding has run an EOC drill simulating an uncontrolled release at 100,000 cfs with 12-hours' notice for evacuation of people and livestock from the inundation area. The affected area covers 3,000 acres and would displace some 1,987 people. Damages estimates are $131.2 million. See Figure 8 for 100-year-flood scenario.

Shasta Dam releasing 78,000 cfs

7.12.7 Mitigations

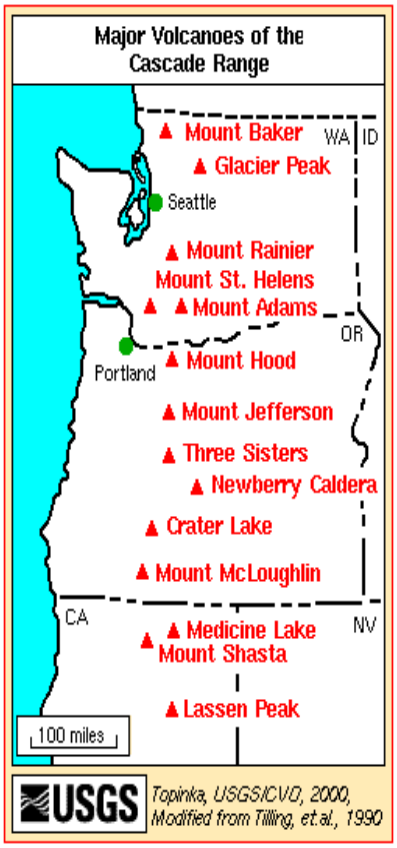
Goal 15:	*Reduce the possibility of property damage and loss of life due to flooding from a dam overflow or failure.*
Objective 15.A:	Maintain best possible coordination of information and emergency response.
Action 15.A.1:	Continue communication and coordination with the Bureau of Reclamation and maintain up-to-date Inundation maps.
Action 15.A.2:	Maintain Emergency Operations Center (EOC) for coordination of information and emergency response, with annual exercises simulating disaster response. Funding is available.

7.13 Volcanic

7.13.1 Nature

Volcano activity in this region is a rare occurrence; however, the City of Redding is flanked on two sides by large mountains that are considered volcanic in nature. The two mountains, Mount Shasta, located approximately 56 miles to the north, and Lassen Peak, located approximately 46 miles to the east of Redding, are considered two of the potentially active volcanoes in the Cascade Range. The Cascade Range, a chain of volcanic cones, extends through Washington and Oregon into California. The Cascade Range is transected by deep canyons of the Pit River. The river flows through the range between Mount Shasta and Lassen Peak, after winding across interior Modoc Plateau on its way to the Sacramento River.

Mt. Lassen



The largest and highest volcano in the southern Cascades, Mount Shasta, is a compound stratovolcano composed of overlapping cones centered around at least four main vents. -- *Miller, 1980; 1989*

Lassen Peak marks the southern end of the Cascade Range and is the most recently active volcano in northern California. Lassen Peak is a dacite plug which formed about 11,000 year ago after the collapse of nearby Brokeoff Mountain, once a volcano the size of Mount Shasta about 450,000 years ago. -- *Kilbourne and Anderson, 1981*

Mt. Shasta

7.13.2 Effects of Volcano Activity

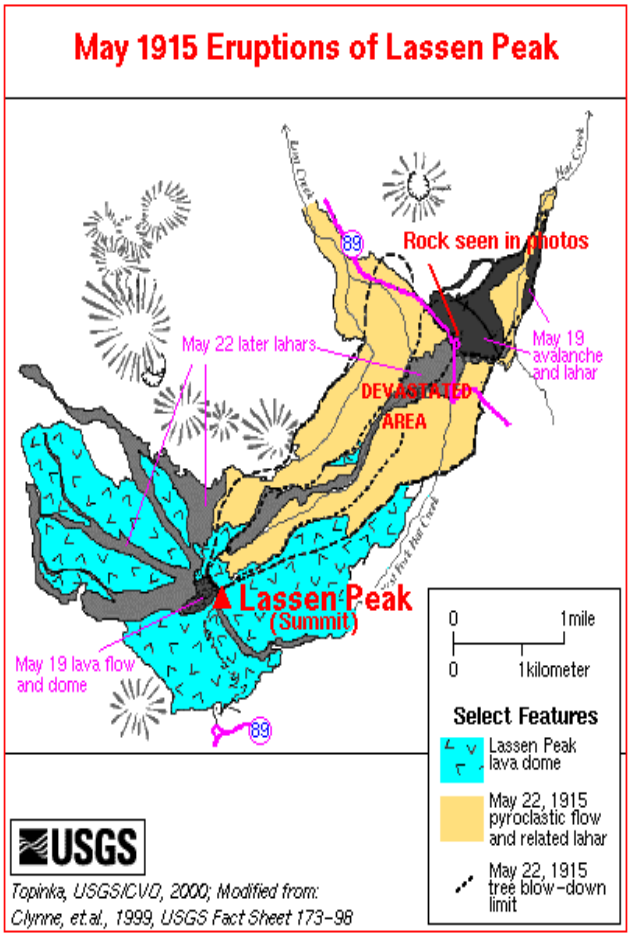
Mount Shasta is within Siskiyou County and poses the greatest volcanic risk to our neighbors within Shasta County; however, will only impact some residents or properties within the northern portions of the City of Redding with moderate ash-fall. The extent of impacts from volcanic activity has been discussed in the Shasta County Multi-Jurisdictional Hazard Mitigation Plan. More specifically, the County's plan has divided the areas subject to risk from future eruptions of Mount Shasta into zones that delineate the estimated degree of risk from each type of eruptive phenomenon.

7.13.3 History

Shastina, west of the cluster of other central vents, was formed mainly between 9,700 and 9,400 years; the Hotlum cone, which forms the summit and the north and northwest slopes of Mount Shasta, may overlap Shastina in age, but most of the Hotlum cone is probably younger. Mount Shasta has continued to erupt at least once every 600-800 years for the past 10,000 years. Its most recent eruption probably was in 1786. Evidence for this eruption, recorded from sea by the explorer La Perouse, is somewhat ambiguous, but his description could only have referred to Mount Shasta (this description has been the subject of debate). A small craterlike depression in the summit dome, containing several small groups of fumaroles and an acidic hot spring, might have formed during that eruption; lithic ash preserved on the slopes of the volcano and widely to the east yields charcoal dates of about 200 years. -- *Christiansen, 1990, IN: Wood and Kienle*

Three episodes of volcanism have occurred at the Lassen volcanic center in the past 1,100 years. These are the complex eruption at Chaos Crags, the eruptions at Cinder Cone, and the summit eruptions of Lassen Peak in 1914-1917. -- *Clynne, 1990, IN: Wood and Kienle*

The most recent eruptive activity occurred at Lassen Peak in 1914-1917 A.D. This eruptive episode began on May 30, 1914, when a small phreatic eruption occurred at a new vent near the summit of the peak. More than 150 explosions of various sizes occurred during the following year. By mid-May 1915, the eruption changed in character; lava appeared in the summit crater and subsequently flowed about 100 meters over the west and probably over the east crater walls. Disruption of the sticky lava on the upper east side of Lassen Peak on May 19 resulted in an avalanche of hot rock onto a snowfield. A lahar was generated that reached more than 18 kilometers down Lost Creek. On May 22, an explosive eruption produced a pyroclastic flow that devastated an area as far as 6 kilometers northeast of the summit. The



eruption also generated lahars that traveled more than 20 kilometers down Lost Creek and floods that went down Hat Creek. A vertical eruption column resulting from the pyroclastic eruption rose to an altitude of more than 9 kilometers above the vent and deposited a lobe of pumiceous tephra that can be traced as far as 30 kilometers to the east-northeast. The fall of fine ash was reported as far away as Elko Nevada, more than 500 kilometers east of Lassen Peak. Intermittent eruptions of variable intensity continued until about the middle of 1917. -- *Hoblitt, et.al., 1987*

7.13.4 Future Events

According to the 1995 Woodward-Clyde study commissioned by the City of Redding, the potential for impact from either Mount Shasta or Lassen Peak eruptions are minimal. Due to the upper wind currents and geographical locations, ash from either of these two mountains will not likely impact Redding. It is noted in this study that debris flows from a Mount Shasta eruption would follow river valleys such as those occupied by the Sacramento River, Squaw Valley River, and the McCloud River to the south and the Shasta River to the north. This debris flow hazard zone terminates where the tributaries enter Lake Shasta and would be unlikely to overflow Shasta Dam. Redding lies outside the flowage hazard zones associated with Mount Shasta, and the City is not likely to be threatened by future eruptions, according to the 1995 study.

7.13.5 Present and Future Mitigation Efforts

Due to the low probability of a catastrophic eruption from either of these two mountains impacting the City of Redding, it is our recommendation to monitor the situations and develop a plan when and if such events would occur.

7.13.6 Vulnerability

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away. Residents near volcanoes should learn about the community warning systems and emergency plans; be prepared for the hazards that can accompany volcanoes, which includes mudflows and flash floods, landslides and rockfall, earthquakes, as fall and acid rain. Residents should make evacuation plans and if living in a known volcanic hazard area, plan a route out and have a backup route in mind. Residents should develop an emergency communication plan. In case family members are separated from one another during a volcanic eruption (a real possibility during the day when adults are at work and children are at school), have a plan for getting back together. Ask an out-of-state relative or friend to serve as the “family contact,” because after a disaster, it’s often easier to call long distance. Make sure everyone knows the name, address, and phone number of the contact person.

The City of Redding faces a low probability of impact from eruptions occurring at either Mount Shasta or Lassen Peak.

7.13.7 Mitigation

Goal 16: *Reduce deaths, injuries, structural damage and losses from volcanic activity.*

Objective 16.A: Minimize future deaths, injuries, structural damage and losses due to volcanic activity.

Action 16.A.1: Monitor the situations and develop a plan when and if the probability of volcanic activity increases to a level of significance.

7.14 Mass Casualty

7.14.1 Nature

Many of the hazards in this City of Redding Hazard Mitigation Plan have the potential to produce mass casualties. Each hazard is unique in how mass casualties may occur and are addressed. In most disasters, deaths and injuries are just one of the effects of the hazard, while in a mass casualty accident deaths and injuries are the hazard. In a tornado or flood, for example, besides dealing with deaths and injuries, one has the larger task of dealing with replacing or repairing what was damaged; feeding, clothing, and sheltering disaster victims; cleaning up the debris, etc. Mass casualty accidents are just the opposite. The main emphasis has to be response to the large numbers of deaths and injuries.

Secondary emphasis will be on the other problems and needs. Mass casualty accidents are a very special variety of hazard.

For planning purposes we will define mass casualty accidents as: “A transportation accident that is of such magnitude that the disruptive event overtaxes both a city’s resources and its ability to respond.”

7.14.2 History

Whereas other hazards have a track record in the city, transportation accidents involving mass casualties have had no significant record of occurrence.

7.14.3 Future Events

Although there has not been a significant record of occurrence, by no means is this an indication that such a tragedy could not happen. Such accidents not only affect people with significant numbers of deaths and injuries, but they also cause traffic problems, property damage, explosions, fires, etc.

7.14.4 Present and Future Mitigation Efforts

The City’s Emergency Operations Plan (EOP) addresses the City’s field planned response to mass casualty incidents. The EOP is designed to be consistent with the California-mandated Standardized Emergency Management System (SEMS) and federal plan requirements. Within the EOP is an Emergency Operations Center (EOC) Guidebook which includes a checklist for mass casualty incidents.

Additionally, the Sierra Sacramento Valley Emergency Medical Services (EMS) Agency’s Multiple Patient/Casualty Incidents Plan, updated December 2010, describe the procedures necessary to ensure an effective and coordinated response to an incident involving mass casualties in the Redding City area. This plan should be implemented whenever a mass casualty incident develops which requires resources

beyond the normal day-to-day operations, mutual aid or which may overwhelm an individual department, service, hospital or community. This plan has been endorsed by the ten counties the S-SV serves (Placer, Yuba, Yolo, Nevada, Sutter, Butte, Colusa, Shasta, Tehama, and Siskiyou).

7.14.5 Vulnerability

Mass casualty accidents occur with little or no warning. They involve a large number of people and require special types of equipment and emergency medical personnel. The National Railroad Passenger Corporation, Amtrak, operates one north-south route, the Coast Starlight, on the Union Pacific line which starts in Seattle, Washington, and ends in Los Angeles. This route includes a station stop in Redding. The average daily ridership is 1,217.

The City is serviced by approximately 10,000 miles of all-weather roads. Besides passenger cars, these all-weather roads are used by trucks and commercial bus lines. In 1990, these bus lines carried 120,000 passengers over 3,100,000 miles.

One commercial airline currently services the Redding area. United Express, an affiliate of SkyWest Airlines, has regularly scheduled daily arrivals and departures at the Redding Municipal Airport. In 2010, the airport saw 114,105 travelers pass through its terminal. The following is a list of identified risks:

- Blocked Roads.
- Business Interruptions.
- Delayed Emergency Response.
- Evacuation (Localized).
- Explosion.
- HAZMAT Release.
- Increased Public Safety Runs.
- Mass Casualties.
- Property Damage.

7.14.6 Mitigation

Goal 17: *Reduce deaths, injuries, structural damage and losses from mass casualty incidents.*

Objective 17.A: Maintain best possible coordination of information and emergency response.

Action 17.A.1: Maintain Emergency Operations Center (EOC) for coordination of information and emergency response, with annual exercises simulating disaster response. Funding is available.

Action 17.A.2: Continue communication and coordination with the Sierra Sacramento Valley Emergency Medical Services (EMS).

7.15 Pandemic/Epidemic

7.15.1 Nature

An epidemic is an outbreak of a contractible disease that spreads at a rapid rate through a human population. A pandemic is an epidemic whose spread is global. Pandemics are characterized by the emergence of a new infectious disease that causes serious illness and spreads easily among humans. Since pandemics/epidemic involves new diseases, there are often no vaccines and little natural immunity to thwart the spread of the epidemic.

Pandemics spread quickly through communities, nationally, or even globally. Generally, the elderly, young children, and people with pre-existing illnesses are most vulnerable to a pandemic. However, some pandemics such as the H1N1 influenza outbreak of 2009 and the influenza outbreak of 1918-1919 have defied this pattern by primarily affecting otherwise healthy individuals[1].

7.15.2 Effects of Pandemic/Epidemic

In 2009, the World Health Organization (WHO) revised its phase descriptions for its pandemic influenza preparedness and response alert system. The grouping and description of pandemic phases have been revised to make them easier to understand, more precise, and based upon observable phenomena. Phases 1-3 correlate with preparedness, including capacity development and response planning activities, while Phases 4-6 clearly signal the need for response and mitigation efforts. Furthermore, periods after the first pandemic wave are elaborated to facilitate post pandemic recovery activities. The phases are shown in the table below:

World Health Organization Pandemic Alert System Phases	
Phase 1	No viruses circulating among animals have been reported to cause infections in humans.
Phase 2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat.
Phase 3	An animal or human-animal influenza virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.
Phase 4	Verified human-to-human transmission of an animal or human-animal influenza virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk for a pandemic.
Phase 5	Human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication and implementation of the planned mitigation measures in short.
	This pandemic phase is characterized by community level outbreaks in at least one other country

[1] Tara Smith, "Swine flu and deaths in healthy adults-cytokine storm?" Aetiology April 26, 2009, http://scienceglogs.com/aetiology/2009/04/swine_flu_and_deaths_in_health.php.

World Health Organization Pandemic Alert System Phases	
Phase 6	in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.
Post-Peak Period	During this period, pandemic disease levels in most countries with adequate surveillance will have dropped below peak observed levels. The post-peak period signifies that pandemic activity appears to be decreasing; however, it is uncertain if additional waves will occur and countries will need to be prepared for a second wave. Previous pandemics have been characterized by waves of activity spread over months. Once the level of disease activity drops, a critical communications task will be to balance this information with the possibility of another wave. Pandemic waves can be separated by months and an immediate "at-ease" signal may be premature.
	Influenza disease activity will have returned to levels normally seen for seasonal influenza. It is expected that the pandemic virus will behave as a seasonal influenza A virus. At this stage, it is important to maintain surveillance and update pandemic preparedness and response plans accordingly. An intensive phase of recovery and evaluation may be required.

7.15.3 History

Many types of diseases can result in a pandemic. There have been many epidemics throughout history, such as the Black Death which peaked in Europe between 1348 and 1350. In the last hundred years, significant pandemics include the Spanish flu in 1918, killing an estimated 50 million people worldwide and the 2002 to 2003 SARS (Severe Acute Respiratory Syndrome) pandemic. The more recent diseases such as SARS or the H1N1 Flu are causes for concern.

7.15.4 Future Events

Pandemic[2]

According to the WHO, the avian flu and H1N1 flu (A strain) are most likely the illnesses to become a pandemic threat in the future.

The avian flu, first identified in Vietnam in 2004, is also specifically referred to as the H5N1 virus strain. Since late 2003, outbreaks from this pathogenic flu virus have occurred in East Asia. In addition, deaths from this virus have occurred Thailand, China, Indonesia, Cambodia, and Vietnam.

The H1N1 influenza A Strain, also referred to as the swine flu, began spreading in Mexico in April 2009. Just a few months later in June of 2009, this type of flu was declared a pandemic by the WHO. As most of the deaths and illness occurred primarily in young people, this virus does not follow the pattern seen in most other flu viruses. Pregnant women, young children, and people with chronic lung or other health issues are most likely to suffer complications.

[2] Jennifer Bell, "The History and Future of Pandemics" Health Training Guide February 21, 2012, http://www.healthtrainingguide.com/the-history-and-future-of-pandemics/

Epidemic

The most likely epidemic to occur in the City of Redding is the West Nile virus (WNV). The WNV is a mosquito-borne disease that was originally found in Africa. In 1999, it was detected in the eastern United States; since then, the virus has spread throughout the United States and is well-established in most states, including California.

According to the Center of Disease Control, more than 30,000 people in the United States have been reported as getting sick with WNV since 1999. Infected mosquitoes spread WNV that can cause serious, life-altering disease. Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes are WNV carriers ("vectors") that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

According to the California Department of Public Health, 34 counties have been affected by the WNV as of August 31, 2012. The 3,142 reported cases include animal, mosquito samples, and human cases. Of these reported cases, approximately 2 percent (69) are human cases; 3 of which were fatalities.

7.15.5 Present and Future Mitigation Efforts

The California Department of Public Health (CDPH) is the lead pandemic/epidemic planning agency in California. It coordinates the public health response to a pandemic/epidemic with local health departments, the healthcare community, the federal government, and other key partners. In a pandemic/epidemic incident, the CDPH Pandemic Preparedness Plan will be implemented in collaboration with the Emergency Medical Services Authority (EMSA), California Health and Human Services Agency, Cal EMA, local health departments, and tribal entities. While primarily a preparedness and response plan, the plan also identifies potential mitigation actions that can be taken to reduce the impacts of the pandemic/epidemic, including:

- Ensure rapid and early detection of a novel virus.
- Confirm identity or type of a novel virus by laboratory identification.
- Identify the exposure source of the outbreak and the population at risk.
- Control and contain the spread of influenza through pharmaceutical and nonpharmaceutical community containment strategies, including isolation, quarantine, infection control, antiviral treatment and prophylaxis, and, if available, vaccination.
- Manage and disseminate accurate information for scientific, resource, and policy decisions in public health and healthcare delivery settings.

7.15.6 Vulnerability

The City of Redding faces a low probability of impact from a pandemic/epidemic incident.

7.15.7 Mitigation

Goal 18: *Reduce deaths and injuries from pandemic/epidemic incidents.*

Objective 18.A: Maintain best possible coordination of information and emergency response with State and local health departments.

Action 18.A.1: Continue communication and coordination with Shasta County Department of Public Health.

Action 18.A.2: Continue to provide information to the public regarding WNV.

7.16 Inventory Assets

An inventory of assets is a step in the risk assessment process. This is the identification of assets that may be affected by hazard events. The inventory of assets is divided into population, buildings, and critical facilities and infrastructure. The detailed information on these identified assets has been provided in Section 6, *Community Description*. The information was from various sources, including the US Census Bureau and the Red Cross**.**

8.0 MITIGATION STRATEGY

This section describes the City's strategy to utilize our resources to achieve our goals of reducing losses from future hazard events. This strategy identifies who is responsible for which actions, what funding mechanisms (e.g., grant funds, capital budget, or in-kind donations) and resources are available or will be pursued, and when the actions are to be completed.

8.1 DMA 2000 Requirements

The DMA 2000 requirement for planning a hazard mitigation strategy is shown in Table 8-1.

TABLE 8-1
DMA 2000 Requirements – Mitigation Strategy

REQUIREMENT §201.6(c)(3)	The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.
EXPLANATION	The community's hazard reduction goals, as reflected in the plan, along with their corresponding objectives, guide the development and implementation of mitigation measures. This section should describe what these goals are and how they were developed. The goals could be developed early in the planning process and refined based on the risk assessment findings, or developed entirely after the risk assessment is completed. They should also be compatible with the goals of the community as expressed in other community plan documents (such as the General Plan). Although the Interim Federal Regulations language does not require a description of objectives, communities are highly encouraged to include a description of the objectives developed to achieve the goals so that reviewers understand the connection between goals, objectives, and activities. The goals and objectives should: • Be based on the findings of the local and State risk assessments; and • Represent a long-term vision for hazard reduction or enhancement of mitigation capabilities.

8.1.1 Development Mitigation Goals and Objectives

Based on the identified hazards that might affect the City of Redding, the goals and objectives have been updated accordingly to include information on the hazards added to this 2014 Plan update: CBRNE, Mass Casualty, and Pandemic/Epidemic. There has not been any development since the plan was previously adopted that impacts the City's overall vulnerability, therefore the City validates the previously adopted goals and objectives. Section 7 of the plan profile of the major hazards, assess the risk of such hazards, describe the City's vulnerability, and estimate potential losses from the hazards. Based on the risk assessment, the HMPT developed mitigation goals and objectives. The goals and objectives represent our City's efforts to reduce the potential losses identified in Section 7. The mitigation goals are long-term policy statements and global visions that support the mitigation strategy. These goals have been developed to reduce or avoid long-term vulnerabilities to the identified hazard. The mitigation

objectives define measurable steps to achieve the goals. The goals and objects are consistent or are complementary to our existing policies, programs, and resources.

8.1.2 Mitigation Actions and Priorities

Mitigation actions are intended to eliminate or lessen the impact of a hazard. Actions are a means of carrying out the objectives. The City must also have the legal, administrative, fiscal, and technical capacities to perform each action. The process of analyzing the capacity of a jurisdiction is called the capabilities assessment which has been prepared and provided in Section 8.2.

In this 2014 update, the Capability Assessment remains unchanged. Based on the Capability Assessment, the project team reviewed the mitigation actions and added realistic actions where applicable.

Actions/projects from the 2005 Plan that have been completed are listed in Table 8-9. Additionally, new actions were developed for the new goals and objectives that were added to the Plan. The mitigation actions were then identified and prioritized with the highest to lowest priorities. Table 8-8 summarizes the implementation of the identified mitigation actions and projects that are ongoing and new which are being considered by elected officials, staff, and the community, as resources permit, to reduce the effects of each hazard. The table lists each action and indicates a responsible agency or department shows a priority rating, establishes a time line for completion, shows potential funding sources and other necessary resources. The priorities were based on a review by the HMP Team, according to their greatest cost benefit ratio, their expected present value, and their internal rate of return. The priority of the ongoing/existing mitigation actions did not change.

8.2 Capability Assessment

Although not required by DMA 2000, a highly recommended component of the Mitigation Strategy is a local capability assessment. A capability assessment has two components: an inventory of an agency's mission, programs, and policies; and an analysis of its capacity to carry them out. The capability assessment is a review of the City's resources in order to identify, review, and analyze what the City is currently doing to reduce losses and identify the framework that is in place or should be in place for the implementation of new mitigation actions. The assessment involves four parts: (1) A review of the City's legal and regulatory capability, including ordinances, codes, and plans to address hazard mitigation activities; (2) A review of the administrative and technical ability of Redding's staff and personnel resources; (3) A review of the fiscal capability of Redding to provide the financial resources to implement the mitigation strategy; and (4) A summary review of the activities of each administrative division within the City that supports hazard mitigation activities and details any previous mitigation activities undertaken by these entities. The legal and regulatory hazard mitigation capability of the City of Redding is shown in Table 8-2. The table includes a review of existing ordinances, codes and plans that affect the built environment in Redding.

TABLE 8-2
Legal and Regulatory Capability

Regulatory Tools (ordinances, codes, plans)	Local Authority (Y/N)	Does State Prohibit? (Y/N)	Higher Level Jurisdiction Authority (Y/N)	Comments
Building code	Y	N	N	
Fire code	Y	N	N	
Zoning ordinance	Y	N	N	
Subdivision ordinance	Y	N	N	
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildland fire ordinances, hazard setback requirements)	Y	N	Y	Floodplain regulations (Zoning Code Section 18.51); Open space district regulations (Zoning Code Section 18.35); Airport environs overlay district (Zoning Code Section 18.50); Wildland Fire Regulations (Municipal Code Sections 9.20.160 through 180).
Growth management ordinances	N	N	N	
Site plan review requirements	Y	N	N	
General Plan	Y	N	N	
Capital improvement plan	Y	N	N	
Economic development plan	Y	N	N	General Plan: Economic Development Element.

Regulatory Tools (ordinances, codes, plans)	Local Authority (Y/N)	Does State Prohibit? (Y/N)	Higher Level Jurisdiction Authority (Y/N)	Comments
Emergency response plan	Y	N	N	
Post-disaster recovery plan	Y	N	N	
Real Estate disclosure requirements	Y	N	N	On case by case basis, the City requires notices to be recorded on tentative maps.

TABLE 8-3
Administrative and Technical Capacity

Staff/Personnel Resources	Y/N	Department/Agency and Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Y	Planners: Development Services Department: Director, Planning Manager, Senior Planners; Engineers: Development Services Department: City Engineer, Assistant City Engineer.
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineers: Development Services Department: -Building Division: Building Official, plan check engineers, 2 plan checkers, and 2 building inspectors. -Engineering Division: City Engineer, Land Development Manager, Associate Civil Engineers, and 4 Public Works Inspectors
Planners or Engineer(s) with an understanding of natural and/or human-caused hazards	Y	(See responses above)
Floodplain managers	Y	Development Services Department: 2 Planners
Surveyors	Y	Engineering Division: City Surveyor
Staff with education or expertise to assess the community's vulnerability to hazards	Y	Police Chief, Fire Chief, and Emergency Services Coordinator.
Personnel skilled in GIS and/or HAZUS	Y	Support Services Department: GIS Division
Scientists familiar with the hazards of the community	N	N/A
Emergency Manager	Y	City Manager, Fire Department, and Department Heads
Grant writers	Y	Housing Division: Housing Program Supervisor; City Manager's Office: Staff Development Services: Staff

TABLE 8-4
Fiscal Capability

Financial Resources	Accessible or Eligible to Uses (Yes/No/Don't Know)
General Fund	Yes
Enterprise Fund	Yes
Development Fees	Yes
Community Development Block Grants (CDBG)	Yes
Capital improvements project funding	Yes
Authority to Levy Taxes for Specific Purposes	No
Fees for Water, Sewer, Gas, or Electric Service	Yes - Water, Sewer, & Electric
Impact Fees for Homebuyers or Developers for New Developments/Homes	Yes
HOME Grant Fund	Yes
Federal Hazard Mitigation Grant Program (HMGP)	Yes

8.3 Goals, Objectives, and Actions

The goals, objectives, and actions were developed from the information in the hazard vulnerability analysis and loss estimation sections. The goals, objectives, and actions were developed to represent a vision of long-term hazard reduction or enhancement of existing capabilities. In developing the action plan, an agency lead has been determined for ongoing and new mitigation actions. A large majority of the actions are integrated into existing mechanisms. Each lead agency will make a determination as to how to integrate any new mitigation action into existing mechanisms when appropriate. The tables provided in this section are as follows:

Table 8-5: Provides this section's organization strategy, which has been broken down into three conceptual levels.
Table 8-6: Lists the City's Hazard Mitigation Goals.
Table 8-7: Lists the City's full list of Goals, Objectives, and Actions.
Table 8-8: Ongoing and New Mitigation Actions
Table 8-9: Completed Mitigation Actions.

Table 8-5
Mitigation Strategy Organization

HAZARD TYPE	
Strategy Level	**Description**
Goals	Represent the policy level priorities that the community seeks to achieve to reduce its vulnerability to disasters.
Objectives	Support goals and represent the various strategies to be used to accomplish the goals.
Actions	Support objectives and are the various direct actions that elected officials, staff and the community seek to undertake, as resources permit, to accomplish objectives.

Table 8-6
City of Redding Hazard Mitigation Goals

Goal 1	Promote disaster resistance for existing and future development.
Goal 2	Promote public understanding, support and demand for hazard mitigation.
Goal 3	Protect the City of Redding from the devastation of small and large scale disasters
Goal 4	Enhance the City's ability to rapidly and effectively respond to disasters.
Goal 5	Reduce the possibility of property damage and life losses due to wildland fires.
Goal 6	Reduce deaths, injuries, structural damage and losses from floods.
Goal 7	Reduce deaths, injuries, structural damage and losses from hazardous materials releases.
Goal 8	Provide continued and increased protection against releases of hazardous materials from the City's wastewater system including the Clear Creek and Stillwater Wastewater Treatment Plants.
Goal 9	Reduce deaths, injuries, structural damage and losses from severe winter weather.
Goal 10	Reduce deaths, injuries, structural damage and losses from earthquakes.
Goal 11	Prevent deaths, injuries, structural damage, environmental damage and losses from utility disruptions.
Goal 12	Reduce deaths, injuries, structural damage and losses from aviation disasters.

Goal 13	Reduce the potential, deaths, injuries, structural damage and losses from CBNRE.
Goal 14	Reduce the possibility of property damage and loss of life due to flooding from a dam overflow or failure.
Goal 15	Reduce deaths, injuries, structural damage and losses from volcanic activity.
Goal 16	Reduce deaths, injuries, structural damage and losses from mass casualty incidents.
Goal 17	Reduce deaths and injuries from pandemic/epidemic incidents.

Redding's full list of goals, objectives, and actions is shown in Table 8-7.

TABLE 8-7
Mitigation Strategy

MULTIPLE HAZARDS	
Goal 1:	***Promote disaster resistance for existing and future development.***
Objective 1.A:	Encourage and facilitate the development of updating General Plans and Zoning Codes to limit development in hazard areas.
Action 1.A.1: Action 1.A.2:	Modify the City's General Plan as required by law to address improvements to the Safety Element. Modify the City's Zoning Ordinance as required by law to address development in hazard areas and reflect changes in the General Plan.
Objective 1.B:	Encourage and facilitate the adoption of building and fire codes that protect renovated existing assets and new development in hazard areas.
Action 1.B.1: Action 1.B.2: Action 1.B.3:	Modify local Building and Fire Codes as required by law to address development issues in hazard areas. Actively participate in the state and nationwide Building Code development groups to ensure the development issues in hazard areas are properly addressed. Require site-specific studies to evaluate specific hazards in hazard prone areas and identify alternative site design criteria to mitigate hazards to the maximum extent possible.
Objective 1.C:	Encourage consistency between General Plan, Zoning Codes and Building and Fire Codes.
Action 1.C.1: Action 1.C.2:	Review General Plan, Zoning Codes, Fire Codes, Subdivision Ordinance and Building Codes for consistency. Establish hazard mitigation training for development staff on development procedures in zoning and Building Code interpretation.
Objective 1.D:	Address identified data limitations regarding the lack of information about new development and build-up potential in hazard areas.
Action 1.D.1:	Update data base/Geographic Information System (GIS), with particular attention to maintaining hazard overlay layers.
Objective 1.E:	Actively pursue grant funding for City-wide hazard mitigation.
Action 1.E.1:	Apply for hazard mitigation grant funding as it becomes available.
Goal 2:	***Promote public understanding, support and demand for hazard mitigation.***
Objective 2.A:	Educate the public to increase awareness of all hazards and opportunities for mitigation actions.
Action 2.A.1: Action 2.A.2: Action 2.A.3: Action 2.A.4: Action 2.A.5:	Assist local mobile home parks with their community preparedness plans. Develop and conduct a variety of community workshops to educate about earthquake preparedness and the benefits of retrofitting buildings for improved seismic performance. Increase awareness among at-risk populations of emerging earthquake damage mitigation techniques. Develop a program that identifies the needs of senior citizens and assists them to meet those needs. Utilize the "*Redding Record Searchlight*" to provide disaster preparedness and mitigation information.

Objective 2.B:	Promote partnerships among federal, state, county and local governments to identify, prioritize and implement mitigation actions.
Action 2.B.1:	Maintain communications with FEMA, Cal EMA, County emergency management agencies and other Northern California cities to address hazard mitigation issues.
Objective 2.C:	Promote hazard mitigation in the business community.
Action 2.C.1:	Explore potential hazard mitigation programs with the Chamber of Commerce, e.g., Street Fair, workshops, website information, etc.
Action 2.C.2:	Utilize the Fire Department's fire prevention inspection program to educate business owners and managers regarding hazard mitigation.
Objective 2.D:	Discourage activities that exacerbate hazardous conditions.
Action 2.D.1:	Explore ways to develop programs and public service announcements on local government cable channel that demonstrate and encourage hazard correction and disaster preparedness.
Objective 2.E:	Increase awareness hazard mitigation principles among local officials.
Action 2.E.1:	When appropriate, issue hazard-related news releases.
Action 2.E.2:	When appropriate, conduct meetings with various City Departments to share information and innovations in hazard mitigation.
Action 2.E.3:	Coordinate hazard mitigation activities with local utilities, water suppliers and critical facilities within the City.
Action 2.E.4:	Utilize on-going drills at the Emergency Operations Center to increase awareness of hazards and their mitigation measures. All members are SEMS trained and updated.
Objective 2.F:	Assure adequate infrastructure is in-place for emergencies.
Action 2.F.1:	Promote the establishment and maintenance of: safe and effective evacuation routes; ample peak-load water supply; adequate road widths; and safe clearances around buildings.
Action 2.F.2:	Explore non-traditional public and private mutual aid resources.
Goal 3:	***Protect the City of Redding from the devastation of small and large scale disasters***
Objective 3.A:	Continue to enhance emergency preparedness and pursue the identified mitigation efforts.
Action 3.A.1:	Explore the possibility of creating a position to coordinate and manage emergency preparedness and implement mitigation efforts on a full-time basis.
Objective 3.B:	Create a cost efficient interoperable communications system for the City of Redding.
Action 3.B.1:	Designate committee members made up of representatives for all City agencies to give oversight for creating an interoperable communications system and fund the system through various grants and City funds.
Objective 3.C:	Continue to review and update the Local Hazard Mitigation Plan.
Action 3.C.1:	Bring the Hazard Mitigation Project Team together annually to meet, review, and update the plan.
Goal 4:	***Enhance the City's ability to rapidly and effectively respond to disasters.***
Objective 4.A:	Develop a comprehensive approach to enhance the City's ability to respond to disasters.
Action 4.A.1:	Encourage liaison agencies to develop emergency response plans and participate in emergency exercises.
Action 4.A.2:	Keep the City's Emergency Operation Plan updated. The plan is currently being updated.
Action 4.A.3:	As funding permits, enhance the use of GIS and Information Technology in the Emergency Operations Center.
Action 4.A.4:	Review all non-profiled hazards (train accidents, aircraft crashes, drought, extreme heat, terrorism, extreme pollution, power failure) regularly and update or develop procedures to effectively respond to them.

Objective 4.B:	Develop a program to enhance the disaster response skills of City employees.
Action 4.B.1:	As resources permit, continue to develop the disaster response orientation for City employees.
Action 4.B.2:	Continue to update information for employees that describe their responsibilities following a disaster.
Action 4.B.3:	Continue Emergency Operations Center drills to prepare for city wide emergencies and disasters.
Action 4.B.4:	The City participates in the Cal EMA Safety Assessment Program including assisting in the training of SAP evaluators and SAP coordinators. Currently there are 68 registered SAP evaluators residing within the Shasta County. The City employs approximately 8.
Objective 4.C:	Prevent, monitor, and respond to local emergencies by maintaining an up-to-date City Geographic Information System (GIS).
Action 4.C.1:	Make GIS available to emergency response personnel during an emergency.
Action 4.C.2:	Ensure GIS resources are adequate to maintain critical data base.
Objective 4.D:	Enhance the Police and Fire Department's ability to effectively function in disasters.
Action 4.D.1:	Seek grants to conduct a variety of training programs, classroom and field drills for Police and Fire personnel, including terrorism response, the Incident Command System, NIMS and other appropriate topics.
Action 4.D.2:	Seek Department of Homeland Security Grants to equip field personnel for terrorism incidents.
Action 4.D.3:	Conduct Annual County-Wide Disaster Drills.
Action 4.D.4:	Attend Mutual Aid Region Advisory Committee
Action 4.D.5:	Train personnel in basic ICS/SEM concepts for the purpose of managing large-scale natural and/or manmade disasters.
Action 4.D.6:	Maintain a mobile communication center for special events, emergency responses, drills, or trainings.
Action 4.D.7:	Conduct monthly training for the Redding Police Department's SWAT Team.
Objective 4.E:	Continue to implement all current hazard mitigation programs and projects.
Action 4.E.1:	Review all current hazard mitigation activities and seek to continue their implementation.
Action 4.E.2:	Review all current hazard mitigation activities, as necessary, to develop better ways to implement them.
WILDLAND FIRE	
Goal 5:	***Reduce deaths, injuries, structural damage and losses from wildfires/structure fires.***
Objective 5.A:	Enforce Fire and Building Codes and the General Plan for the City of Redding which will minimize damage to homes and structures from wildland fires.
Action 5.A.1:	Ensure new subdivisions have adequate fire protection measures such as multi-access for fire apparatus, noncombustible building construction, residential sprinkler systems, appropriate defensible space, street widths and grade to accommodate emergency vehicles and evacuees simultaneously.
Action 5.A.2:	Ensure defensible space is being provided for all new and existing homes; ensure roofing material is noncombustible on new homes and wood shake roofs on existing homes, when replaced, meet code requirements for non-combustibility; and installation of a spark arresting system on chimneys of homes with wood burning fireplaces. Partial funding is provided for abatement of City properties.
Action 5.A.3:	Continue the development of landscape maintenance districts for new developments to fund ongoing fuel reduction and maintenance of defensible space.
Objective 5.B:	Educate the public about wildland fire dangers and the steps that can be taken to prevent or minimize their effects.
Action 5.B.1:	Ensure the City provides sufficient resources for public education, wildland fire mitigation and guidance, and emergency planning for the public, as funding becomes available.
Action 5.B.2:	Distribute wildland fire mitigation information to persons applying for building permits in the City of Redding in the very high fire hazard severity zone.
Action 5.B.3:	Continue to participate with Shasta County Fire Agencies and California Department of Forestry and Fire Protection in fire prevention education fair at various locations.
Action 5.B.4:	Continue to participate in annual school fire prevention visits to provide fire prevention education.
Objective 5.C:	Reduce the probability of fire ignitions.

Action 5.C.1:	Focus on human causes of ignition and address the problem through education and enforcement actions, to include vigorous investigation and prosecution of arson.
Action 5.C.2:	Continue the Redding Police Department's Community Cleanup Program that utilizes persons assigned to a work release program to clean up areas of blight throughout the City. This includes week trimming and brush removal in green belt areas which eliminates or mitigates the probability of fire ignitions.
Objective 5.D:	Maintain Emergency Operations Center for coordination of information and resources.
Action 5.D.1:	Ensure annual emergency Operations Center exercise is performed. Funding is available to conduct exercises.
Objective 5.E:	Reduce the potential for destructive actions of the fire once ignition occurs, utilizing fire pre-plans, ensuring a properly trained, staffed, and equipped emergency response capability, and timely response to prevent the spread of the fire, minimizing risks to humans and property.
Action 5.E.1:	Ensure adequate resources are available to pre-plan for incidents that may occur in the very high fire hazard severity zones within the City of Redding.
Action 5.E.2:	Ensure continued training of personnel responsible for responses to wildland fires with the most current strategies, tactics, and safety actions.
Action 5.E.3:	Ensure equipment is purchased and maintained to address the wildland fire risk with in the community.
Action 5.E.4:	Increase staffing of current two person companies to three person companies to improve capabilities and initial actions at fire incidents within the community, as additional funding becomes available.
Action 5.E.5	Continue to maintain training and response actions with cooperating fire agencies.
Action 5.E.6	Continue to replace aging water lines which provide adequate fire flows. (Status: Replaced 26,275 feet of aging waterlines throughout the City)
Action 5.E.7	Continue to install new waterlines which provide necessary fire flows. (Status: Installed 29,600 feet of new water lines)

FLOODING

Goal 6:	***Reduce deaths, injuries, structural damage and losses from Floods***.
Objective 6.A:	Enforce the Building Codes, the General Plan and Zoning Ordinances of the City of Redding, which will prevent or minimize damage to residential and commercial structures from flooding.
Action 6.A.1:	Ensure that new development does not encroach on the designated floodplain.
Action 6.A.2:	Ensure that new development does not contribute to downstream flow increases through the use of detention/retention measures, and continue to review plans and hydraulic calculations for new development to limit net flow increases.
Action 6.A.3:	Continue to participate in the NFIP to ensure the availability of federally sponsored floodplain insurance for City residents.
Action 6.A.4:	Continue to participate in the CRS. This program involves accruing points based on the City's engagement in FEMA-defined activities.
Action 6.A.5	Review and consider additional CRS activities particularly relating to public information and emergency services to apply for credit to increase the City's points.
Objective 6.B:	Reduce the possibility of localized flooding.
Action 6.B.1:	Routinely inspect storm water channels for vegetation build-up or encroachment, trash and debris, silt and gravel build-up, and erosion or bank failure; and routinely maintain said channels where permitted by California Department of Fish and Game.
Action 6.B.2:	Routinely inspect and maintain storm water inlets and outfalls for debris and obstructions, sand and gravel build-up, and structural damage or vandalism.
Objective 6.C:	Alleviate pre-existing flooding conditions that are a result of past practices and regulations, or lack of regulation.

Action 6.C.1:	Update Storm Drain Master Plan; identify key projects needed to minimize flooding and their costs; identify regional detention policies and locations to minimize the impact of future development; and develop costs and possible funding strategies for the identified capital projects.
Objective 6.D:	Seek FEMA accreditation of the local levees; Olney Creek and Clear Creek Levees.
Action 6.D.1:	Continue the grant funding process through the State's Local Levee Assistance Program to fund the geotechnical studies for the Olney Creek Levee. Grant received through the State's Local Levee Assistance Program to fund the geotechnical studies for the Olney Creek Levee. Consultant is in the process of being selected. Study is projected to be complete by January 2015.
Action 6.D.2:	Continue the provisionally accredited levee process to certify the Clear Creek Levee
Action 6.D.3:	Continue to seek and apply for grant funding as it becomes available.
HAZARDOUS MATERIAL	
Goal 7:	***Reduce deaths, injuries, structural damage and losses from Hazardous Materials Releases.***
Objective 7.A:	Develop a comprehensive approach to enhance the City's ability to respond to Hazardous Materials Releases.
Action 7.A.1:	Encourage the County, State and Federal hazardous materials regulators to continue updating and consistent enforcing of hazardous materials regulations.
Action 7.A.2:	Conduct hazardous materials incident emergency exercises.
Action 7.A.3:	Introduce hazardous materials plume modeling software into the Emergency Operations Center.
Action 7.A.4:	Reinforce our partnership with Shasta County Environmental Health to provide additional information on all businesses regarding their use, handling, storage, and transportation of hazardous materials and their generation and disposal of hazardous wastes.
Action 7.A.5:	Make sure that hazardous processes are not allowed to be adjacent to or co-mingle with residential or high life hazard occupancies.
Action 7.A.6:	Provide, along with other stakeholders, educational materials to our businesses who work with hazardous materials that clearly identify the risks, the safe practices for use and the requirements for storage of hazardous materials.
Objective 7.B:	Train personnel to the technician and specialist level to be an integral part of the Regional Hazardous Materials Response Team.
Action 7.B.1:	Provide continued funding for training to enhance and promote safe hazardous materials responses by City personnel.
Action 7.B.2:	The SCHMRT continues to train for response to hazardous materials emergencies in our community.
Action 7.B.3:	Invite rail freight companies to conduct freight train accident response training with City Field responders.
Objective 7.C:	Secure funding through Homeland Security Grants and other sources to maintain and enhance equipment utilized and needed to ensure continued response and mitigation capabilities.
Action 7.C.1:	Identify if additional equipment is needed to ensure protection of community from identified risks.
Action 7.C.2:	Establish equipment replacement schedule and potential funding sources for existing equipment.

Goal 8:	***Provide continued and increased protection against releases of hazardous materials from the City's wastewater system including the Clear Creek and Stillwater Wastewater Treatment Plants.***
Objective 8.A:	Upgrade aging facilities with newer protective measures whenever feasible.
Action 8.A.1:	Install a chemical scrubbing system at the Clear Creek Plant when the facility is upgraded in the future.
Action 8.A.2:	Install vandalism and terrorism preventive enhancements at both the Clear Creek and Stillwater Treatment Plants, such as considering more extensive perimeter fencing, video surveillance and stronger door locks.
Action 8.A.3:	Wastewater Collection Division is reinforcing remote manholes with concrete to protect them from vandalism and infiltration during major storm water events.
Action 8.A.4:	Wastewater Collection Division continues to maintain and replace as necessary, emergency generator at seven lift stations to prevent sanitary sewer overflows. Three mobile emergency generators also are maintained for various incidents.
Action 8.A.5:	All electrical systems pertaining to safety at the Clear Creek Wastewater Treatment Plant influent pumping station will be upgraded and replaced, and replacing and upgrading one of the generators at the influent pumping station. Brush clearing between the Sacramento River and their wastewater overflow ponds will insure the integrity and minimize the potential for any breech of these pond walls.
Objective 8.B:	Continue staff preparedness for releases of hazardous chemicals.
Action 8.B.1:	Continue monthly training and annual recertification of the RMU Hazmat team, with ongoing emergency response practice exercises and safety equipment upgrades as needed.
Action 8.B.2:	Wastewater Collection Division provide excavator training to City of Redding personnel, other government agencies, and members of the private sector. Also, staff training in confined space, excavation, and trench rescue protocol and technique.
Action 8.B.3:	Water Treatment personnel, along with Wastewater personnel, are continuing to train as HAZMAT Industry Technicians for emergency responses to hazardous chemical releases at the City's water and wastewater treatment plants.
SEVERE WINTER WEATHER	
Goal 9:	***Reduce deaths, injuries, structural damage and losses from severe winter weather.***
Objective 9.A:	Ensure that structures in the City are adequate to resist snow and wind loads.
Action 9.A.1:	Continue to enforce the snow and wind provisions of the latest edition of the California Building Code for new construction, alterations and additions.
Action 9.A.2:	Continue to require a snow load analysis of existing structures (built prior to 1970) that undergo a change in use or occupancy that results in a higher hazard occupancy group.
Objective 9.B:	Ensure City preparedness for emergency response actions due to severe winter weather.
Action 9.B.1:	Continue active participation and training of City personnel in the Cal EMA Safety Assessment Program (SAP).
Action 9.B.2:	Provide yearly review of the procedures of safety assessment inspections including proper use of the City's official placards (unsafe, restricted use & inspected) and how to complete the rapid and detailed safety assessment evaluation forms.
Action 9.B.3:	Conduct annual emergency operation's center drills to ensure efficiency of City staff and coordination of resources and information.
EARTHQUAKES	
Goal 10:	***Reduce deaths, injuries, structural damage and losses from earthquakes.***
Objective 10.A:	Ensure that structures in the City are adequately earthquake resistant.

Action 10.A.1:	Continue to enforce the seismic provisions of the latest edition of the California Building Code for new construction, alterations and additions.
Action 10.A.2:	Continue to require a seismic analysis of existing structures (built under earlier building codes) that undergo a change in use or occupancy that results in a higher hazard occupancy group.
Objective 10.B:	Ensure City preparedness for emergency response actions due to earthquakes.
Action 10.B.1:	Continue active participation and training of City personnel in the Cal EMA Safety Assessment Program (SAP).
Action 10.B.2:	Provide yearly review of the procedures of safety assessment inspections including proper use of the City's official placards (unsafe, restricted use & inspected) and how to complete the rapid and detailed safety assessment evaluation forms.
Action 10.B.3:	Conduct annual emergency operation's center drills to ensure efficiency of City staff and coordination of resources and information.

UTILITY DISRUPTION

Goal 11:	***Prevent deaths, injuries, structural damage, environmental damage and losses from utility disruptions.***
Objective 11.A:	Manage the Power System to ensure safe and reliable operation of the City's electric system through twenty-four-hour dispatching of the distribution system and real-time monitoring of REU resources.
Action 11.A.1:	Provide safe, reliable switching control and coordination of field crews throughout the year.
Action 11.A.2:	Real-time System Operators continue to constantly monitor the power grid and dispatch resources to mitigate power supply curtailments.
Action 11.A.3:	Annual training of System Operators to respond to power system emergencies.
Action 11.A.4:	Annual review and update of emergency plans. Joined North West Power Pool to obtain additional energy emergency resources. Ongoing meetings with local power agencies to coordinate response to energy emergencies.
Action 11.A.5:	Participate in state wide power grid emergency operation training (CETAC). Annual training on black start procedures, system restoration procedures, and emergency communications. Ongoing coordination of emergency plans with Western Area Power Administration and Sacramento Municipal Utility District.
Action 11.A.6:	Annual review and update of Sabotage procedures. Registered power plant site and equipment with the California Emergency Management Agency.
Action 11.A.7:	Develop and implement an internal NERC Standards compliance program. Assigned committees to audit and ensure compliance with national and regional reliability standards.
Action 11.A.8:	Develop and implement a natural gas pipeline emergency response plan per PHSMA regulations. Conduct joint emergency response training with local emergency response agencies.
Action 11.A.9:	Develop and maintain an emergency Real-time Scheduling and Trading office (to be located at Redding City Hall) for periods of time in which the current scheduling and trading facility (located at Redding Power) is unavailable, unreachable, or compromised.
Objective 11.B:	Ensure the Redding Power Plant is available to meet the City's needs whenever required.
Action 11.B.1:	Continue maintenance of the Redding Power Plant facilities to assure availability to respond to power grid emergencies.
Objective 11.C:	Continue construction of new or upgrading of existing generation, sub- transmission, substation, and distribution facilities to meet expanding system needs and maintain a safe and reliable system.
Action 11.C.1:	Continue modernization of substation equipment and communication systems.
Action 11.C.2:	Modernize Sulphur Creek Substation, Canby Substation, and Eureka Way Substation.
Action 11.C.3:	Partial reconditioning of the Eureka Way/Sulphur Creek 115kV line.
Action 11.C.4:	Construct the Stillwater 115kV line from East Redding Substation to Airport Substation.

Objective 11.D:	Continue to mitigate potential hazards of overhead power lines.
Action 11.D.1:	Continue to implement a program that allows for trimming of trees on a three-year or less trim cycle that meets new California State Public Utility Commission (CPUC) tree-trimming clearance standards that were established in January of 1997.
Action 11.D.2:	Continue annual equipment inspection and pole replacement programs to assure reliability and public safety.
Objective 11.E:	Manage the water and wastewater systems to ensure safe and reliable operations during potential utility disruptions, caused by severe storm events.
Action 11.E.1:	Provide safe and reliable collection system, pump station, and treatment plant controls and operations. Perform preventative maintenance with coordination of field crews throughout the year.
AVIATION DISASTER	
Goal 12:	***Reduce deaths, injuries, structural damages and losses from aviation disasters.***
Objective 12.A:	Implement the adopted Airport Emergency Plan which is utilized to mitigate and respond to an aviation disaster.
Action 12.A.1:	Continue to update the Airport Emergency Plan.
Action 12.A.2:	Ensure the Airport Emergency Plan complies with FAA regulations.
Action 12.A.3:	Conduct aviation disaster drills once every three years.
Action 12.A.4:	Conduct table top emergency preparedness drill each year.
CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPOSIVES (CBRNE)	
Goal 13:	***Reduce deaths, injuries, structural damage and losses from CBNRE.***
Objective 13.A:	Provide training to personnel in the latest tactics and personal protection in the event of CBNRE.
Action 13.A.1:	Continue to provide training to all personnel to meet mandated requirements for the Hazardous Materials Operational Level.
Action 13.A.2:	Continue to provide training to a small group of personnel to the higher levels of Hazardous Materials Technician and Specialists.
Action 13.A.3:	Continue to apply for grants to assist with the expenses associated with ongoing training and updated equipment purchases.
Action 13.A.4:	Upgrade Self-Contained Breathing Apparatus (SCBA) to meet CBRNRE requirements.
Objective 13.B:	Enhance communication between agencies to mitigate deaths, injuries, structural damage and losses from CBNRE.
Action 13.B.1:	Continue membership with the Shasta County Public Health Joint Advisory Council (JAC).
Action 13.B.2:	Continue to provide access to the California Health Alert Network (CAHAN).
Objective 14.A:	Increase the expertise and awareness of various City of Redding personnel regarding terrorism issues.
Action 14.A.1:	Selected police officers and fire fighters will attend training regarding weapons of mass destruction (WMD).
Action 14.A.2:	Obtain access to FBI secure database for terrorism related, law enforcement sensitive information.
Objective 14.B:	Increase networking communication between City of Redding personnel and the community regarding terrorist related activity.
Action 14.B.1:	Increase community awareness through Neighborhood Watch crime prevention program.
Action 14.B.2:	Disseminate press releases and activate the Emergency Alert System (EAS) during times of severe terrorism threat conditions.
Objective 14.C:	Augment City of Redding personnel with additional personal protective equipment (PPE).

Action 14.C.1:	Procure additional weaponry for police personnel such as small caliber patrol rifles.
Action 14.C.2:	All officers are issued gas masks upon being hired with the department.

DAM OVERFLOW OR FAILURE

Goal 15:	***Reduce the possibility of property damage and loss of life due to flooding from a dam overflow or failure.***
Objective 15.A:	Maintain best possible coordination of information and emergency response.
Action 15.A.1:	Continue communication and coordination with the Bureau of Reclamation and maintain up-to-date Inundation maps.
Action 15.A.2:	Maintain Emergency Operations Center (EOC) for coordination of information and emergency response, with annual exercises simulating disaster response. Funding is available.

VOLCANIC

Goal 16:	***Reduce deaths, injuries, structural damage and losses from volcanic activity.***
Objective 16.A:	Minimize future deaths, injuries, structural damage and losses due to volcanic activity.
Action 16.A.1:	Monitor the situations and develop a plan when and if the probability of volcanic activity increases to a level of significance.

MASS CASUALTY

Goal 17:	***Reduce deaths, injuries, structural damage and losses from mass casualty incidents.***
Objective 17.A:	Maintain best possible coordination of information and emergency response.
Action 17.A.1:	Maintain Emergency Operations Center (EOC) for coordination of information and emergency response, with annual exercises simulating disaster response. Funding is available.
Action 17.A.2:	Continue communication and coordination with the Sierra Sacramento Valley Emergency Medical Services (EMS).

PANDEMIC / EPIDEMIC

Goal 18:	***Reduce deaths and injuries from pandemic/epidemic incidents.***
Objective 18.A:	Maintain best possible coordination of information and emergency response with State and local health departments.
Action 18.A.1:	Continue communication and coordination with Shasta County Department of Public Health.
Action 18.A.2:	Participate in quarterly meetings and/or drills conducted by the Shasta County Public Health Joint Advisory Council.
Action 18.A.3:	Continue to provide information to the public regarding WNV.

8.3.1 Mitigation Action Items

Table 8-8
Ongoing and New Mitigation Actions

Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	1.A.2	Modify the City's Zoning Ordinance as required by law to address development in hazard areas and reflect changes in the General Plan.	DS	1 - 5	GF	EC	2
Ongoing	1.B.1	Modify local Building and Fire Codes as required by law to address development issues in hazard areas.	DS/FD	1 - 5	GF	EC	1
Ongoing	1.B.2	Actively participate in the state and nationwide Code development groups to ensure development issues in hazard areas are properly addressed.	DS/FD	1 - 5	GF	EC	3
Ongoing	1.B.3	Require site-specific studies to evaluate specific hazards in hazard-prone areas and identify alternative site design criteria to mitigate hazards to the maximum extent possible.	DS/FD	1 - 5	GF	EC	1
Ongoing	1.C.1	Review General Plan, Zoning Codes, Fire Codes, Subdivision Ordinance and Building Codes for consistency.	DS/FD	2 - 4	GF	EC	2
Ongoing	1.C.2	Establish hazard mitigation training for development staff on development procedures and Zoning and Building Code interpretation.	DS/FD	2 - 4	GF	EC	3
Ongoing	1.D.1	Update data base/Geographic Information System (GIS) with particular attention to maintaining hazard overlay layers.	DS	2 - 4	GF	EC	1
Ongoing	1.E.1	Apply for hazard mitigation grant funding as it becomes available.	All	1 - 5	GF	EC	1
Ongoing	2.A.1	Assist local mobile home parks with their community preparedness plans	FD	2 - 4	GF	EC	2
Ongoing	2.A.2	Develop and conduct a variety of community workshops to educate about earthquake preparedness and the benefits of retrofitting buildings for improved seismic performance.	DS/FD	2 - 4	GF	EC	2
Ongoing	2.A.3	Increase awareness among at-risk populations of emerging earthquake damage mitigation techniques.	DS	1 - 5	GF	EC	2
Ongoing	2.A.4	Develop a program that identifies the needs of senior citizens and assists them to meet those needs.	FD	1 - 5	GF	EC	2

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CIP - Capital Improvement Project Funding
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COST
EC - Existing Cost
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PRIORITY
1 - Highest Priority
2 - Medium Priority
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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	2.A.5	Utilize the *"Redding Record Searchlight"* to provide disaster preparedness and mitigation information.	FD	2 - 4	GF	EC	1
Ongoing	2.B.1	Maintain communications with FEMA, Cal EMA, County emergency management agencies and other Northern California cities to address hazard mitigation issues.	All	1 - 5	GF	EC	1
Ongoing	2.C.1	Explore potential hazard mitigation programs with the Chamber of Commerce, e.g., Street Fair, workshops, website information, etc.	All	1 - 5	GF	EC	2
Ongoing	2.C.2	Utilize the Fire Department's fire prevention inspection program to educate business owners and managers regarding hazard mitigation.	FD	2 - 4	GF	EC	1
Ongoing	2.D.1	Explore ways to develop programs and public service announcements on local government cable channel that demonstrate and encourage hazard correction and disaster preparedness.	DS/FD	1 - 5	GF	EC	2
Ongoing	2.E.1	When appropriate, issue hazard-related news releases.	FD	2 - 4	GF	EC	1
Ongoing	2.E.2	When appropriate, conduct meetings with various City Departments to share information and innovations in hazard mitigation.	DS	2 - 4	GF	EC	2
Ongoing	2.E.3	Coordinate hazard mitigation activities with local utilities, water suppliers and critical facilities within the City.	All	2 - 4	GF	EC	1
Ongoing	2.E.4	Utilize on-going drills at the Emergency Operations Center to increase awareness of hazards and their mitigation measures. All members are SEMS trained and updated.	FD	1 - 5	GF	EC	1
Ongoing	2.F.1	Promote the establishment and maintenance of: safe and effective evacuation routes; ample peak-load water supply; adequate road widths; and safe clearances around buildings.	All	1 - 5	GF	EC	1
Ongoing	2.F.2	Explore non-traditional public and private mutual aid resources.	All	1 - 5	GF	EC	2
Ongoing	3.A.1	Explore the possibility of creating a position to coordinate and manage emergency preparedness and implement mitigation efforts on a full-time basis.	FD	2 - 4	GF	EC	2
Ongoing	3.B.1	Designate committee members made up of representatives for all City agencies to give oversight for creating an interoperable communications system and fund the system through various grants and City funds.	All	2 - 4	GF	EC	1
Ongoing	3.C.1	Bring the Hazard Mitigation Project Team together annually to meet, review, and update the plan.	All	1 - 5	GF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	4.A.1	Encourage liaison agencies to develop emergency response plans and participate in emergency exercises.	FD/PD	1 - 5	GF	EC	3
Ongoing	4.A.2	Keep the City's Emergency Operation Plan updated. The plan is currently being updated.	FD	1 - 5	GF	EC	1
Ongoing	4.A.3	As funding permits, enhance the use of GIS and Information Technology in the Emergency Operations Center.	FD/SS	1 - 5	GF/DHS	EC	1
Ongoing	4.A.4	Review all non-profiled hazards (train accidents, aircraft crashes, drought, extreme heat, terrorism, extreme pollution, power failure) regularly and update or develop procedures to effectively respond to them.	All Dept.'s	1 - 5	GF	EC	3
Ongoing	4.B.1	As resources permit, continue to develop the disaster response orientation for City employees.	FD	1 - 5	GF	EC	2
Ongoing	4.B.2	Continue to update information for employees that describe their responsibilities following a disaster.	FD	1 - 5	GF	EC	2
New	4.B.3	Continue Emergency Operations Center drills to prepare for city wide emergencies and disasters.	FD	1-5	GF	EC	1
New	4.B.4	The City participates in the Cal EMA Safety Assessment Program including assisting in the training of SAP evaluators and SAP coordinators. Currently there are 68 registered SAP evaluators residing within the Shasta County. The City employs approximately 8 registered SAP evaluators.	DS	1-5	GF	EC	1
Ongoing	4.C.1	Make GIS available to emergency response personnel during an emergency.	DS	1	GF/DHS	EC	2
Ongoing	4.C.2	Ensure GIS resources are adequate to maintain critical data base.	DS	2 - 4	GF+ TBD	EC	2
Ongoing	4.D.1	Seek grants to conduct a variety of training programs, classroom and field drills for Police and Fire personnel, including terrorism response, the Incident Command System, NIMS and other appropriate topics.	DS/FD	1 - 5	DHS	EC	1
Ongoing	4.D.2	Seek Department of Homeland Security Grants to equip field personnel for terrorism incidents.	SS	1 - 5	DHS	TBD	1
New	4.D.3	Conduct Annual County-Wide Disaster Drills.	PD	1-5	GF	EC	1
New	4.D.4	Attend Mutual Aid Region Advisory Committee.	PD	1-5	GF	EC	1
New	4.D.5	Train personnel in basic ICS/SEM concepts for the purpose of managing large-scale natural and/or manmade disasters.	PD	1-5	GF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
New	4.D.6	Maintain a mobile communication center for special events, emergency responses, drills, or trainings.	PD	1-5	GF	EC	1
New	4.D.7	Conduct monthly training for the Redding Police Department's SWAT Team.	PD	1-5	GF	EC	1
Ongoing	4.E.1	Review all current hazard mitigation activities and seek to continue their implementation.	FD/PD	1	DHS	EC	1
Ongoing	4.E.2	Review all current hazard mitigation activities, as necessary; develop better ways to implement them.	All Agencies	1 - 5	GF	EC	1
Ongoing	5.A.1	Ensure new subdivisions have adequate fire protection measures such as multi-access for fire apparatus, noncombustible building construction, residential sprinkler systems, appropriate defensible space, street widths and grade to accommodate emergency vehicles and evacuees simultaneously.	All Agencies	1	GF	EC	1
Ongoing	5.A.2	Ensure defensible space is being provided for all new and existing homes; ensure roofing material is noncombustible on new homes and wood shake roofs on existing homes, when replaced, meet code requirements for non-combustibility; and installation of a spark arresting system on chimneys of homes with wood burning fireplaces. Partial funding is provided for abatement of City properties.	FD	1	GF	EC	1
Ongoing	5.A.3	Continue the development of landscape maintenance districts for new developments to fund ongoing fuel reduction and maintenance of defensible space.	FD	1 – 5	GF	EC	1
Ongoing	5.B.1	Ensure the City provides sufficient education and guidance on wildland fire mitigation and emergency planning for the public as funding becomes available.	FD	1	GF	EC	1
Ongoing	5.B.2	Distribute wildland fire mitigation information to persons applying for building permits in the City of Redding in the very high fire hazard severity zone.	DS/FD	1 - 5	GF	EC	1
New	5.B.3	Continue to participate with Shasta County Fire Agencies and California Department of Forestry and Fire Protection in fire prevention education fair at various locations.	FD	1-5	GF	EC	1
New	5.B.4	Continue to participate in annual school fire prevention visits to provide fire prevention education.	FD	1-5	GF	EC	1
Ongoing	5.C.1	Focus on human causes of ignition and address the problem through education and enforcement actions to include vigorous investigation of prosecution of arson.	FD	1 - 5	GF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
New	5.C.2	Continue the Redding Police Department's Community Cleanup Program that utilizes persons assigned to a work release program to clean up areas of blight throughout the City. This includes weed trimming and brush removal in green belt areas which eliminates or mitigates the probability of fire ignitions.	PD	1-5	GF	EC	1
Ongoing	5.D.1	Ensure annual emergency Operations Center exercise is performed. Funding is available to conduct exercises	FD	1 – 5	GF/EF	EC	1
Ongoing	5.E.1	Ensure adequate resources are available to pre-plan for incidents that may occur in the very high fire hazard severity zones within the City of Redding.	FD	5+	GF	TBD	1
Ongoing	5.E.2	Ensure continued training of personnel responsible for responses to wildland fires with the most current strategies, tactics, and safety actions.	FD	1 – 5	GF	EC	1
Ongoing	5.E.3	Ensure equipment is purchased and maintained to address the wildland fire risk with in the community.	FD	1 – 5	GF	EC	1
Ongoing	5.E.4	Increase staffing of current two person companies to three person companies to improve capabilities and initial actions at fire incidents within the community, as additional funding becomes available.	FD	5+	GF	TBD	1
Ongoing	5.E.5	Continue to maintain training and response actions with cooperating fire agencies.	FD	1-5	GF	EC	1
New	5.E.6	Replace aging water lines which provide adequate fire flows. (Status: Replaced 26,275 feet of aging waterlines throughout the City)	MU	1-5	GF	EC	1
New	5.E.7	Install new waterlines which provide necessary fire flows. (Status: Installed 29,600 feet of new water lines	MU	1-5	GF	EC	1
Ongoing	6.A.1	Ensure that new development does not encroach on the designated floodplain.	DS	1-5	GF	EC	1
Ongoing	6.A.2	Ensure that new development does not contribute to downstream flow increases through the use of detention/retention measures, and continue to review plans and hydraulic calculations for new development to limit net flow increases.	DS	1-5	GF	EC	1
Ongoing	6.A.3	Continue to participate in the NFIP to ensure the availability of federally sponsored floodplain insurance for City residents.	DS	1-5	GF	EC	1
Ongoing	6.A.4	Continue to participate in the CRS. This program involves accruing points based on the City's engagement in FEMA-defined activities.	DS	1-5	GF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	6.A.5	Review and consider additional CRS activities particularly relating to public information and emergency services to apply for credit to increase the City's points.	DS	1-5	GF	EC	1
Ongoing	6.B.1	Routinely inspect storm water channels for vegetation build-up or encroachment, trash and debris, silt and gravel build-up, and erosion or bank failure; and routinely maintain said channels where permitted by California Department of Fish and Game.	MU	1-5	ENT	EC	1
Ongoing	6.B.2	Routinely inspect and maintain storm water inlets and outfalls for debris and obstructions, sand and gravel build-up, and structural damage or vandalism.	MU	1-5	ENT	EC	1
Ongoing	6.C.1	Update Storm Drain Master Plan; identify key projects needed to minimize flooding and their costs; identify regional detention policies and locations to minimize the impact of future development; and develop costs and possible funding strategies for the identified capital projects.	DS/MU	5+	ENT	EC	1
Ongoing	6.D.1	Continue the grant funding process through the State's Local Levee Assistance Program to fund the geotechnical studies for the Olney Creek Levee.	DS/PW	1 - 3	LLAP	EC	1
Ongoing	6.D.2	Continue the provisionally accredited levee process to certify the Clear Creek Levee	PW/DS	1 - 3	GF	EC	1
Ongoing	6.D.3	Continue to seek and apply for grant funding as it becomes available.	DS/PW	1 - 5	GF	EC	1
Ongoing	7.A.1	Encourage the County, State and Federal hazardous materials regulators to continue updating and consistent enforcing of hazardous materials regulations.	FD	1 - 5	GF	EC	1
Ongoing	7.A.2	Conduct hazardous materials incident emergency exercises.	PD/FD	1 - 5	TBD	$10,000	1
Ongoing	7.A.4	Reinforce our partnership with Shasta County Environmental Health to provide additional information on all businesses regarding their use, handling, storage, and transportation of hazardous materials and their generation and disposal of hazardous wastes.	FD	2 - 4	GF	EC	2
Ongoing	7.A.5	Make sure that hazardous processes are not allowed to be adjacent to or co-mingle with residential or high life hazard occupancies.	DS/FD	1 - 5	GF	EC	1
Ongoing	7.A.6	Provide, along with other stakeholders, educational materials to our businesses who work with hazardous materials that clearly identify the risks, the safe practices for use and the requirements for storage of hazardous materials.	FD	1 - 5	TBD	$50,000	2
Ongoing	7.B.1	Provide continued funding for training to enhance and promote safe hazardous materials responses by City personnel.	PD/FD	1 - 5	TBD	$100,000	2

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	7.B.2	The SCHMRT continues to train for response to hazardous materials emergencies in our community.	FD/PD	1-5	GF	EC	1
Ongoing	7.B.3	Invite rail freight companies to conduct freight train accident response training with City Field responders.	PD/FD	1 - 5	TBD	$5,000	2
Ongoing	7.C.1	Identify if additional equipment is needed to ensure protection of community from identified risks.	PD/FD	1 – 5	GF	EC	1
Ongoing	7.C.2	Establish equipment replacement schedule and potential funding sources for existing equipment	PD/FD	1 – 5	GF	EC	1
Ongoing	8.A.1	Install a chemical scrubbing system at the Clear Creek Plant when the facility is upgraded in the future.	MU	1 – 5	EF	EC	1
Ongoing	8.A.2	Install vandalism and terrorism preventive enhancements at both the Clear Creek and Stillwater Treatment Plants, such as considering more extensive perimeter fencing, video surveillance and stronger door locks.	MU	1	EF	EC	1
New	8.A.3	Wastewater Collection Division is reinforcing remote manholes with concrete to protect them from vandalism and infiltration during major storm water events.	MU	1	GF	EC	1
New	8.A.4	Wastewater Collection Division continues to maintain and replace as necessary, emergency generator at seven lift stations to prevent sanitary sewer overflows. Three mobile emergency generators also are maintained for various incidents.	MU	1-5	GF	EC	1
New	8.A.5	All electrical systems pertaining to safety at the Clear Creek Wastewater Treatment Plant influent pumping station will be upgraded and replaced, and replacing and upgrading one of the generators at the influent pumping station. Brush clearing between the Sacramento River and their wastewater overflow ponds will insure the integrity and minimize the potential for any breech of these pond walls.	MU	2-4	GF	EC	1
Ongoing	8.B.1	Continue monthly training and annual recertification of the RMU Hazmat team, with ongoing emergency response practice exercises and safety equipment upgrades as needed.	MU/FD	1 - 5	EF/GF	EC	1
New	8.B.4	Wastewater Collection Division provide excavator training to City of Redding personnel, other government agencies, and members of the private sector. Also, staff training in confined space, excavation, and trench rescue protocol and technique.	MU	1-5	GF	EC	1
New	8.B.5	Water Treatment personnel, along with Wastewater personnel, are continuing to train as HAZMAT Industry Technicians for emergency responses to hazardous chemical releases at the City's water and wastewater treatment plants.	MU/FD	1-5	GF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	9.A.1	Continue to enforce the snow and wind provisions of the latest edition of the California Building Code for new construction, alterations and additions.	DS	1-5	GF	EC	1
Ongoing	9.A.2	Continue to require a snow load analysis of existing structures (built prior to 1970) that undergo a change in use or occupancy that results in a higher hazard occupancy group.	DS	1-5	GF	EC	1
Ongoing	9.B.1	Continue active participation and training of City personnel in the Cal EMA Safety Assessment Program (SAP).	DS	1-5	GF	EC	2
Ongoing	9.B.2	Provide yearly review of the procedures of safety assessment inspections including proper use of the City's official placards (unsafe, restricted use & inspected) and how to complete the rapid and detailed safety assessment evaluation forms.	DS	1-5	GF	EC	3
Ongoing	9.B.3	Conduct annual emergency operation's center drills to ensure efficiency of City staff and coordination of resources and information.	DS	1-5	GF	EC	1
Ongoing	10.A.1	Continue to enforce the seismic provisions of the latest edition of the California Building Code for new construction, alterations and additions.	DS	1-5	GF	EC	1
Ongoing	10.A.2	Continue to require a seismic analysis of existing structures (built under earlier building codes) that undergo a change in use or occupancy that results in a higher hazard occupancy group.	DS	1-5	GF	EC	1
Ongoing	10.B.1	Continue active participation and training of City personnel in the Cal EMA Safety Assessment Program (SAP).	DS	1-5	GF	EC	2
Ongoing	10.B.2	Provide yearly review of the procedures of safety assessment inspections including proper use of the City's official placards (unsafe, restricted use & inspected) and how to complete the rapid and detailed safety assessment evaluation forms.	DS	1-5	GF	EC	3
Ongoing	10.B.3	Conduct annual emergency operation's center drills to ensure efficiency of City staff and coordination of resources and information.	DS	1-5	GF	EC	1
Ongoing	11.A.1	Provide safe, reliable switching control and coordination of field crews throughout the year.	EL	1 - 5	EF	EC	1
Ongoing	11.A.2	Real-time System Operators continue to constantly monitor the power grid and dispatch resources to mitigate power supply curtailments.	EL	1 - 5	EF	EC	1
Ongoing	11.A.3	Annual training of System Operators to respond to power system emergencies.	EL	1 – 5	EF	EC	1
New	11.A.4	Annual review and update of emergency plans. Joined North West Power Pool to obtain additional energy emergency resources. Ongoing meetings with local power agencies to coordinate response to energy emergencies.	EL	1-5	GF/EF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
New	11.A.5	Participate in state wide power grid emergency operation training (CETAC). Annual training on black start procedures, system restoration procedures, and emergency communications. Ongoing coordination of emergency plans with Western Area Power Administration and Sacramento Municipal Utility District.	EL	1-5	EF	EC	1
New	11.A.6	Annual review and update of Sabotage procedures. Registered power plant site and equipment with the California Emergency Management Agency.	EL	1-5	EF	EC	1
New	11.A.7	Develop and implement an internal NERC Standards compliance program. Assigned committees to audit and ensure compliance with national and regional reliability standards.	EL	1-5	EF	EC	1
New	11.A.8	Develop and implement a natural gas pipeline emergency response plan per PHSMA regulations. Conduct joint emergency response training with local emergency response agencies.	EL	1-5	EF	EC	1
New	11.A.9	Develop and maintain an emergency Real-time Scheduling and Trading office (to be located at Redding City Hall) for periods of time in which the current scheduling and trading facility (located at Redding Power) is unavailable, unreachable, or compromised.	EL	1-5	EF	EC	1
Ongoing	11.B.1	Continue maintenance of the Redding Power Plant facilities to assure availability to respond to power grid emergencies.	EL	1 - 5	EF	EC	1
Ongoing	11.C.1	Continue modernization of substation equipment and communication systems.	EL	2 - 4	EF	EC	1
New	11.C.2	Modernize Sulphur Creek Substation, Canby Substation, and Eureka Way Substation.	EL	2-4	EF	EC	1
New	11.C.3	Partial reconditioning of the Eureka Way/Sulphur Creek 115kV line.	EL	1	EF	EC	1
New	11.C.4	Construct the Stillwater 115kV line from East Redding Substation to Airport Substation.	EL	2-4	EF	EC	1
Ongoing	11.D.1	Continue to implement a program that allows for trimming of trees on a three-year or less trim cycle that meets new California State Public Utility Commission (CPUC) tree-trimming clearance standards that were established in January of 1997.	EL	1 - 5	EF	EC	1
Ongoing	11.D.2	Continue annual equipment inspection and pole replacement programs to assure reliability and public safety.	EL	1 - 5	EF	EC	1
Ongoing	11.E.1	Provide safe and reliable collection system, pump station, and treatment plant controls and operations. Perform preventative maintenance with coordination of field crews throughout the year.	EL	1 - 5	EF	EC	1
Ongoing	12.A.1	Continue to update the Airport Emergency Plan.	SS	1 - 5	EF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	12.A.2	Ensure the Airport Emergency Plan complies with FAA regulations.	SS	1	EF	EC	1
Ongoing	12.A.3	Conduct aviation disaster drills once every three years.	SS	1 - 5	EF	EC	1
New	12.A.4	Conduct table top emergency preparedness drill each year.	SS	1-5	EF	EC	1
Ongoing	13.A.1	Continue to provide training to all personnel to meet mandated requirements for the Hazardous Materials Operational Level.	PD/FD	1 - 5	EF	EC	1
Ongoing	13.A.2	Continue to provide training to a small group of personnel to the higher levels of Hazardous Materials Technician and Specialists.	MU/FD	1 - 5	EF	EC	1
Ongoing	13.A.3	Continue to apply for grants to assist with the expenses associated with ongoing training and updated equipment purchases.	All	1 - 5	EF	EC	1
Ongoing	13.A.4:	Upgrade Self-Contained Breathing Apparatus (SCBA) to meet CBRNRE requirements.	FD	1 – 3	GF	EC	1
Ongoing	13.B.1	Continue membership with the Shasta County Public Health Joint Advisory Council (JAC).	All	1 - 5	GF	EC	1
Ongoing	13.B.2	Continue to provide access to the California Health Alert Network (CAHAN).	All	1 - 5	GF	EC	1
Ongoing	14.A.1	Selected police officers and fire fighters will attend training regarding weapons of mass destruction (WMD).	PD/FD	1 - 5	GF	EC	1
Ongoing	14.A.2	Obtain access to FBI secure database for terrorism related, law enforcement sensitive information.	PD	2 - 4	GF	EC	1
Ongoing	14.B.1	Increase community awareness through Neighborhood Watch crime prevention program.	PD	1 - 5	GF	EC	1
Ongoing	14.B.2	Disseminate press releases and activate the Emergency Alert System (EAS) during times of severe terrorism threat conditions.	All	1 - 5	GF	EC	1
Ongoing	14.C.1	Procure additional weaponry for police personnel such as small caliber patrol rifles.	PD	2 - 4	TBD	EC	1
New	14.C.2	All officers are issued gas masks upon being hired with the department.	PD	1-5	GG	EC	1
Ongoing	15.A.1	Continue communication and coordination with the Bureau of Reclamation and maintain up-to-date Inundation maps.	FD/MU/ GIS	1-5	GF	EC	3
Ongoing	15.A.2	Maintain Emergency Operations Center (EOC) for coordination of information and emergency response, with annual exercises simulating disaster response. Funding is available.	FD/SS	1-5	GF/DHS	EC	1
Ongoing	16.A.1	Monitor the situations and develop a plan when and if the probability of volcanic activity increases to a level of significance.	ALL	1 - 5	GF	EC	1
Ongoing	17.A.1	Maintain Emergency Operations Center (EOC) for coordination of information and emergency response, with annual exercises simulating disaster response. Funding is available.	FD	1 – 5	GF	EC	1

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Ongoing/ New	Action Item #	Action	Lead Agency	Time Line	Fund Source	Cost	Priority Rating
Ongoing	17.A.2	Continue communication and coordination with the Sierra Sacramento Valley Emergency Medical Services (EMS).	FD	1 – 5	GF	EC	1
Ongoing	18.A.1	Continue communication and coordination with Shasta County Department of Public Health.	FD	1 – 5	GF	EC	1
Ongoing	18.A.2	Continue to provide information to the public regarding WNV.	CM	1 – 5	GF	EC	1

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TABLE 8-9
Completed Mitigation Actions

Action	Description
Modify City's General Plan's Safety Element	Modified the City's General Plan as required by law to address improvements to the Safety Element.
Identify GIS data layer	Identify data layer for hazard mitigation applicable to the City of Redding.
Funding for geotechnical studies for the Olney Creek Levee	Continue the grant funding process through the State's Local Levee Assistance Program to fund the geotechnical studies for the Olney Creek Levee. Grant received through the State's Local Levee Assistance Program to fund the geotechnical studies for the Olney Creek Levee. Consultant is in the process of being selected. Study is projected to be complete by January 2015.
ICS/SEMS Training	Supervisory level personnel of the Redding Police Department have been trained by the Shasta County Sheriff's Department Emergency Services personnel in basic ICS/SEM (Incident Command System/ Standardized Emergency Management System) concepts for the purpose of managing large-scale natural and/or manmade disasters.
Mobile Data Computers/Site Survey Information	Patrol vehicles have been equipped with MDCs (mobile data computers) that contain software specific to our local schools.
New distribution lines	Install 11 miles of new 12kV distribution lines.
Storm Drain Master Plan Update	Update Storm Drain Master Plan; identify key projects needed to minimize flooding and their costs; identify regional detention policies and locations to minimize the impact of future development; and develop costs and possible funding strategies for the identified capital projects.
Access Control Program at Clear Creek Wastewater Treatment Plant	Control visitor and contractor access to both treatment plant facilities through such actions as gate locking and sign-in procedures.
Security Enhancement at Clear Creek Wastewater Treatment Plant	A private security company has been hired to patrol and check the Clear Creek Wastewater Treatment Plant. Security checks take place three to four times during non-work hours. Non-bolt cutting type locks have been installed and signs stating that "Employees only - all must report and sign in before entering the plant facility" have been installed.
Plume Modeling Software	Introduce hazardous materials plume modeling software into the Emergency Operations Center.
National Fire Protection Standard 704 Placard Program	During the past 3 years, the fire department initiated and completed the NFPA 704 placarding and marking program to better identify those occupancies that store or use hazardous materials.
Shasta County Public Health Department Laboratory Upgrade	The Shasta County Public Health Department recently upgraded their laboratory facility to process and test a variety of materials which may include suspected biological agents. The department added additional microbiologists who received specialized training in select-agent testing.
California Health Alert Network (CAHAN)	The Shasta County Public Health Department has access to the California Health Alert Network.
Bio Defense/Bio Shield Program	The Redding main postal facility of the US Postal Service is being equipped with the Bio Defense/Bio Shield Program.

Action	Description
City's Wastewater Utility Master Plan Update	Updated the City's Wastewater Master Plan: Performed analysis of the City's wastewater system with projected 10-year and future capital improvement projects.
2 Million Gallon Reservoir Repair	Completed the rehabilitation and painting of the Buckeye 2 million gallon reservoir which helps meet water demand and fire flows in the water distribution system.
7 Million Gallon Reservoir Expansion and Instrumentation and Controls Upgrade	Completed the installation of 7 million gallon reservoir at the Buckeye Water Treatment Plant to significantly increase treated water supply capacity.
Installed 4 Million Gallon Tank and Removed Two 1.5 Million Gallon Tanks	Completed the removal of two 1.5 Million Gallon tanks and installed 4 million gallon tank at the Foothill Pressure Zone to significantly increase treated water supply capacity.
New Water Main Installation	Completed the installation of 29,600 feet on new water mains throughout the City.
Water Main Replacement	Completed the replacement of 26,275 feet of existing galvanized water main throughout the City.
Tested and Constructed Enterprise Wells No. 14 and 23	Completed the testing and installation of Enterprise Wells No. 14 and 23 in the Enterprise Pressure Zone.
Replaced 18-Inch Steel Raw Water Supply Line for Foothill Treatment Plant	Installed 5,460 feet of 30-inch redundant raw water transmission main from the Pump House #1 in the Sacramento River to the Foothill Water Treatment Plant to replace 70-year-old steel main providing a larger/additional raw water supply line.
Wastewater Treatment Plant Vulnerability Study	Oscar Larsen and Associates have completed a vulnerability study to assess safety at both Clear Creek and Stillwater Wastewater Treatment Plants.
Stillwater Wastewater Treatment Plant Equipment and Safety Storage Room	Stillwater Wastewater Treatment Plant completed a new equipment and safety storage room. All emergency response, gas monitoring, and safety equipment will be stored in this room. Security fence and gate was also installed.
Sacramento River North Market Street Overhead Sewer Line Abandonment	Wastewater Collection Division has completed the Sacramento River North Market overhead sewer line abandonment. A new sewer force main line is now being used under the Sacramento River in conjunction with the upgraded lift station.
Mary Street Lift Station and Force Main Replacement and Upgrade	Initiated the replacement and upgrade of the Mary Street Lift Station and force main.
Sewer Main Replacement	Replaced 11,670 feet of existing 60-year-old sewer main through-out the City. This included the Jenny Creek, Vista Avenue, Willis Street, Almond Avenue, and Boulder Creek Sewer Mains.
New Generator Installation at Redding Power Plant	Install a new generator at the Redding Power Plant site. The new generator was commissioned on August 22, 2011.

9.0 PLAN ADOPTION, MAINTENANCE, REVIEW, EVALUATION, AND IMPLEMENTATION

9.1 Adoption

The Redding Hazard Mitigation Plan 2014 Update was adopted by the Redding City Council on September 16, 2014. The resolution is provided on page 9. The plan was approved by FEMA on November 16, 2015, for a five-year period that will expire on November 16, 2020.

9.2 Monitoring, Evaluating, and Updating the Plan

The Hazard Mitigation Plan is a living document that reflects the City's ongoing hazard mitigation activities. The process of monitoring, evaluating, and updating the Plan will be critical to the effectiveness of hazard mitigation.

The City's Emergency Services Coordinator in the City's Fire Department will be responsible for maintaining, evaluating, and updating the Plan. The City's Hazard Mitigation Project Team (HMPT) will play a crucial role in providing direction, input, and guidance. The Emergency Services Coordinator will lead the HMPT and will review and recommend for approval any Plan updates proposed by the HMPT. The Plan will be reviewed at least every two years and updated at least every five years.

Recommendation for Plan revisions will be based on the following criteria:

- Changes in federal or state laws.
- Accomplishment of Actions, Objectives and Goals.
- Advances in knowledge or understanding of hazards.
- Additional hazard events, including federally declared disasters.
- Changes in the City's risk to the identified and/or additional hazards.
- Performance of mitigation projects during hazard events.

The HMPT will convene annually to review the progress made towards the Plan's goals and objectives. The HMPT will review each goal and objective to determine their relevance to changing situations in the City, as well as changes in state or federal policy and laws to ensure that the Plan is addressing current and expected conditions. This annual review will include: a prioritization and re-evaluation of mitigation actions, as appropriate; an assessment of each action's current status; and recommendations for improvements and/or changes. The HMPT will produce an annual Hazard Mitigation Status Report that represents the results of the annual review and present it to the Redding City Council.

Additionally, per FEMA regulations, the Plan will undergo a comprehensive review and update every five years. The Plan will be forwarded first to the California Office of Emergency Services for initial review; then to FEMA for final approval, and lastly to the Redding City Council for adoption.

2014 Plan Evaluation

Review of the implementation of the 2005 plan allowed the opportunity to review the Plan's goals, objectives and identified actions to determine their relevance and current status. Prior to the initiation of the 2014 plan update process, little evaluation of the plan was conducted, primarily due to the economic downturn and its impact onto City staffing. As the plan was evaluated during the update process, the following was determined:

- 78 of the 96 identified 2005 actions are ongoing;
- 9 of the 18 identified non-ongoing 2005 actions were successfully completed; and
- 10 additional unidentified actions were successfully completed.

As a part of the 2014 Update, a review of development within hazard prone areas was performed to determine their impact since the adoption of the plan in 2005. The table below list development that has occurred in hazard prone areas since the adoption of the plan and identifies which hazard prone area and its vulnerability.

Type of Development	Hazard	Vulnerability
Single Family Homes	Fire	No impact to vulnerability. Homes have been allowed to be constructed in the very high fire severity zone; however their vulnerability is mitigated with the adoption of recent building codes which require the installation of fire sprinklers.
Various Development	Flood	No impact to vulnerability. All development within a designated flood plain is subject to the City's adopted Flood Plain Regulations which are more stringent than the National Flood Insurance Program's mandated regulations for a Community Rating System Class 6 community.
Clover Creek Detention Basin	Flood	Decreased vulnerability. This was designed as a regional detention facility and decreases the vulnerability of flooding along Churn Creek.

9.3 Implementation Through Existing Programs

The City of Redding currently utilizes comprehensive land use planning, capital improvements planning, building codes and fire codes to guide and regulate development. The City of Redding addresses statewide planning goals and legislative requirements through these various programs. The Local Hazard Mitigation Plan provides a series of actions, many of which are closely related to the goals and objectives of these existing planning programs. The Steering Committee is responsible for determining how each individual action will be implemented through existing programs. After the City officially adopts the Plan, these existing mechanisms will have hazard mitigation strategies integrated into them. The Emergency Services Coordinator will ensure incorporation of hazard mitigation strategies during the periodic reviews of the City's comprehensive plans and land use policies.

Capital Improvement Plan

The action items in the mitigation plan may be achieved through activities recommended in the Capital Improvement Plan (CIP). The CIP is updated every five years. Upon review of the CIP, the Steering Committee will work with the City's Public Works Department to identify areas where the hazard mitigation action items are consistent with CIP goals and integrate them where appropriate.

- **Date of last revision:** 2014
- **Plan owner:** Development Services Department
- **Plan description:** The Capital Improvement Plan is a planning document that identifies capital projects in the next five-year horizon for elected officials, citizens, and staff. Hazard mitigation priorities will be considered during the CIP process.
- **Plan cycle:** Five-year cycle
- **Relation to hazard mitigation:** Action items may be inserted into the Captial Improvement Plan as approved by the City Council.

After formal adoption of the Hazard Mitigation Plan, the action items in the Plan will be incorporated into existing plans as is practical. The meetings of the Steering Committee will provide an opportunity for committee members to report back on the progress made on the integration of mitigation planning elements into City planning documents and procedures.

In addition to the Capital Improvement Plan, various other existing plans, policies, and programs have hazard mitigation ties. The Steering Committee will identify how best to implement individual actions into the appropriate existing plan, policy, or program. The following existing plans, policies, and programs were identified by the Steering Committee.

General Plan

- **Date of last revision:** 2013
- **Plan owner:** Planning Division
- **Plan description:** The City's General Plan is a guide for growth. The General Plan outlines where the City wants to be and how to get there. It is an action plan for the City. The Plan reflects the values of the community. These values are the common thread that link the goals, policies, and implementation measures of the Plan. The General Plan Diagram is a part of this document.
- **Plan cycle:** The General Plan changes when the needs and desires of the public change, when development occurs at a different rate than predicted, and when corrections in a plan are needed, the plan needs to be revised.
- **Relation to hazard mitigation:** The Hazard Mitigation Plan mission statement and goals should be cohesive with and align with the mission and goals of the City's General Plan.

Construction Standards

- **Date of last revision:** 2013
- **Plan owner:** Public Works
- **Plan description:** The City's Construction Standards is to provide minimum standards to be applied to improvements which are to be dedicated to the public and accepted by the City of Redding for maintenance or operation and certain private works, as well as improvements to be installed within existing rights-of-way and easements.
- **Plan cycle:** There is no set schedule for updates.
- **Relation to hazard mitigation:** Public involvements and related facilities are directly tied to mitigation efforts in a number of the natural hazards that can affect the city. By assuring there are consistent policies we improve the efforts to minimize natural hazards damage to property and loss of life.

Zoning Ordinance

- **Date of last revision:** 2015
- **Plan owner:** Planning Division
- **Plan description:** The broad purposes of the City's Zoning Ordinance are to implement the General Plan and promote and protect the public health, safety, peace, comfort, and general welfare of the City of Redding.
- **Relation to hazard mitigation:** Action items initiated by the Hazard Mitigation Plan that change the Zoning Ordinance must be consistent with the goals of the City's General Plan.

Downtown Redding Specific Plan

- **Date of last revision:** 2010
- **Plan owner:** Planning Division
- **Plan description:** The City's Downtown Specific Plan provides the foundation for achieving the vision for Downtown Redding which is a unique place and viewed by the community at large as one of its most prized possessions.
- **Plan cycle:** The plan is currently being updated.
- **Relation to hazard mitigation:** Action items initiated by the Hazard Mitigation Plan that change the Downtown Redding Specific Plan must be consistent with the goals of the City's General Plan.

Building Code

- **Date of last revision:** 2013
- **Plan owner:** Building Division
- **Plan description:** The State Building Codes purpose is to set forth and coordinate City regulations governing the construction of buildings and infrastructure.
- **Plan cycle:** Every three years.
- **Relation to hazard mitigation:** Inspections of new construction are intended to ensure compliance with Building Code and Zoning Ordinance provisions that relate to hazard mitigation.

Goals and action items set forth in the Hazard Mitigation Plan are intended to address Statewide Planning Goal 2. Goal 2 is to minimize damage to structures and property, as well as interruption of essential services and activities. Goal 2 encourages new development to occur in locations avoiding or minimizing exposure to hazards and enhance design requirements to improve resiliency in future disasters.

The Building Division is responsible for administering the building codes in the City. After adoption of the Hazard Mitigation Plan, they will continue to work with the State Building Code Office to ensure that the City adopts, and is enforcing, the minimum standards established in the new Building Code. This is to make sure that life and safety criteria are met for new construction. The capital improvement planning that occurs in the future will also contribute to the goals in the Hazard Mitigation Plan. Within two years of the formal adoption of the Hazard Mitigation Plan, the mitigation strategy will be incorporated into existing planning mechanisms, whenever feasible.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, county, regional, state, federal agencies, utilities or other organizations.

City Programs

Capital Improvement Program (CIP)

The City of Redding's Capital Improvements Program (CIP) is used as a tool to help ensure that the City's short- and long-term capital investments are made in the context of careful consideration of the City's needs as well as the resources available to fund the related capital projects. The budgeting for the CIP starts with the development of the City's 2-year budget and 10-year financial plan. This biennial process includes a combination of detailed staff analysis and broad public involvement. It is during this process that basic municipal operational and specific infrastructure needs are identified and matched with revenues generated from various local, state and federal funding sources. The CIP can assist the City of Redding in mitigation against wildland fire, flooding, and severe weather events by improving infrastructure most prone to damage.

Downtown Redding Transportation Plan
The City of Redding is currently in the process of developing the City's Downtown Redding Transportation Plan. The process began in September 2014. This plan will identify the transportation improvements needed to accommodate existing and future development in Downtown Redding and provide connectivity throughout the City.

Emergency Operation Center (EOC)
The Emergency Operation Center is an established location/facility from which City staff and officials can provide direction, coordination, and support to emergency operations in the event of an incident such as a disaster. City personnel who are assigned to and trained for specific positions within the EOC organizational structure staff the EOC. The structure is based on the National Incident Management System (NIMS) Incident Command System (ICS) as outlined in the National Response Framework (NRF).

The EOC staff provides information and recommendations to the EOC Manager through the Incident Commander, or as directed, to develop a course of action to respond to and contain, control, and recover from an emergency. Some of the primary functions performed at the EOC include: coordination, operations management, planning, information tracking and dissemination, logistical support, financial management and support, and emergency public information.

Emergency Operations Plan (EOP)
The primary purpose of the EOP is to outline the City's all-hazard approach to emergency operations in order to protect the safety, health, and welfare of its citizens throughout all emergency management mission areas.

The Plan sets forth a strategy and operating guidelines adopted by the City for managing its response and recovery activities during disasters and emergencies.

The Plan is composed of three main elements:

- Basic Plan
  The purpose of the Basic Plan is to provide a framework for emergency operations and information regarding the City's emergency management structure. It serves as the primary document outlining roles and responsibilities of elected officials during an incident.

- Functional Annexes (FAs)
  The FAs focus on critical tasks, capabilities, and resources provided by emergency response agencies for the City throughout all phases of an emergency.

- Incident Annexes (IAs)
  The IAs supplement the Basic Plan to identify critical tasks associated with specific natural, technological, and human-caused hazards identified in the City's most current Hazard Identification and Vulnerability Assessment. The IAs identifies step-by-step actions for each hazard through the pre-incident, response, and recovery phases of an incident.

9.4 Continued Public Involvement

The City of Redding is dedicated to involving the public directly in the continual reshaping and updating of the Hazard Mitigation Plan. The HMPT members will be responsible for the annual review and update of the Plan. The annual review will incorporate at least one public workshop to allow public involvement, input, and feedback about the Plan.

Copies of the Plan will be kept at the County of Shasta Library, at the Fire Prevention Office, at the Police Station, and on the City's website. The HMPT will be responsible for publicizing the location of these copies at least 30 days prior to the annual meeting to allow adequate time for the public to review and provide input. Public input will be included on the agenda of each annual meeting.

APPENDIX 1 – CRITICAL FACILITIES

Infrastructure Type	Facility Name
Airport	Benton Airpark
	Redding Municipal Airport
Bridge	Bonnyview Road
	Cypress Street
	Diestlehorst
	Keswick Dam
	Lake Redding
	North Market Street
	North Street
	River Trail Ribbon Bridge
	Sewer Suspension
	Sundial Bridge
	Turtle Bay
	UPRR
Bus Barn	RABA
Care Facilities	Applewood Inn
	Beverly Healthcare
	Canyonwood Nursing and Rehab Center
	Crestwood Treatment Center
	Golden Umbrella
	Hilltop Estates Retirement Residence
	Hilltop Medical Clinic
	Hotel Redding Senior Housing
	Kirkwood Assisted Living
	Lakewood Christian Homecare
	Lorenz Hotel
	Northern California Rehab
	Oakdale Heights I
	Oakdale Heights II

Infrastructure Type	Facility Name
Care Facilities (Cont.)	Owens Healthcare
	Quest
	Redding Care Center
Communications	AT&T
	AT&T Communication of California
	KGEC 26
	KRCR
	Pac Bell
	Qwest Communications Corporation
	Valley Industrial Communications
	River Oaks Retirement Community
	Shasta Healthcare
	Sierra Oaks III
	Touch of Heaven
	Tree House Senior Apartments
	Willow Springs Alzheimer's Special Care
Corp Yard	Caltrans Corp Yard
	Redding Corp Yard
	Shasta County Corp Yard
Electric	Airport Substation
	Beltline Substation
	Canby Substation
	Clear Creek Substation
	College View Substation
	Cypress Substation
	East Redding Substation

Infrastructure Type	Facility Name
Electric (cont.)	Eureka Way Substation
	Moore Road Substation
	Oregon Substation
	Redding Power
	Sulphur Creek Substation
	Texas Springs Substation
	Waldon Substation
	WAPA Power
Fire	CDF Headquarters
	CDF, US Forest Service
	Fire Station #1
	Fire Station #2
	Fire Station #3
	Fire Station #4
	Fire Station #5
	Fire Station #6
	Fire Station #7
	Fire Station #8
Government Offices	Caltrans District Office
	RABA Fleet Maintenance
	RABA Transfer Station
	Redding City Hall
	Shascom
	Shasta County Administration Building
	Shasta County Court House
	Shasta County Jail
	State of California
	U.S. Main Post Office

Infrastructure Type	Facility Name
Government Offices (cont.)	U.S. Postal Service
Hospital	Mercy Medical Center
	Shasta Regional Center
Police	CHP Aircraft
	CHP Dispatch
	CHP Headquarters
	Redding Police Station
	Shasta County Sheriff
Shelter	Alta Mesa School
	Bonnyview School
	Boulder Creek School
	Buckeye Elementary School
	Buckeye Middle School
	Cypress School
	Enterprise High School
	Juniper Academy
	Lassen View School
	Manzanita School
	Mistletoe Elementary School
	Mountain View Middle School
	Redding School District Office
	Redding School of the Arts
	Sequoia Middle School
	Shasta College – Downtown Campus
	Shasta High School
	Shasta Learning Center (U-Prep)

Infrastructure Type	Facility Name
Shelter (cont.)	Shasta Meadows
	Sycamore School
	Turtle Bay Elementary
Utility	PG&E
Wastewater	Abernathy Lift Station
	Auditorium Lift Station
	Churn Creek Lift Station
	Clear Creek Sewer Treatment
	El Reno Lift Pump Station
	Hartnell Lift Station
	Hope Lane Lift Station
	La Crescenta Lift Station
	Lift Station #2
	Lift Station #3
	Lift Station #5
	Locust Lift Station
	Mary Street Lift Station
	North Market Street Lift Station
	Remington Lift Station
	River Bend Lift Station
	Stillwater Sewer Treatment
	Sunnyhill Lift Station
	Tierra Oaks Lift Station
	Westside Lift Station
Water	Bella Vista Water
	Bella Vista Water District
	Bella Vista Water Tank
	Bonnyview

Infrastructure Type	Facility Name
Water (cont.)	Buckeye Water Treatment
	Cascade Reservoir
	Cascade Well #1
	Cascade Well #2 (Abandoned)
	Cascade Well #3
	Cascade Well #5
	Cascade Well #6
	Cascade Well #8
	Cascade Well #9
	Enterprise Tank #1
	Enterprise Tank #2
	Enterprise Well #1 (Abandoned)
	Enterprise Well #3 and #3A
	Enterprise Well #4 (Abandoned)
	Enterprise Well #5 (Abandoned)
	Enterprise Well #6 and #6A
	Enterprise Well #7
	Enterprise Well #8
	Enterprise Well 9
	Enterprise Well #10
	Enterprise Well #11
	Enterprise Well #12
	Enterprise Well #13
	Foothill Tank #1
	Foothill Tank #2
	Foothill Water Treatment Plant

Infrastructure Type	Facility Name
Water (cont.)	Goodwater Pump Station
	Hill 900 #1
	Hill 900 #2
	Mary Lake Pump Station
	Mercy Booster Pump Station
	Pump House #1
	Pump House #2
	Pump House #3
	Pump House #4
	Pump House #5
	Redding Ranchettes Reservoir
	Supervisory Vaults
	Westwood Reservoir
	Westwood Well #1
	Westwood Well #2

FIGURE 1

Legend

Roads
County
California
Water
West States

Local Hazard Mitigation Plan
Location Map-Redding California

Print Date:
09/06/2012

City of Redding
Hazard Mitigation Study

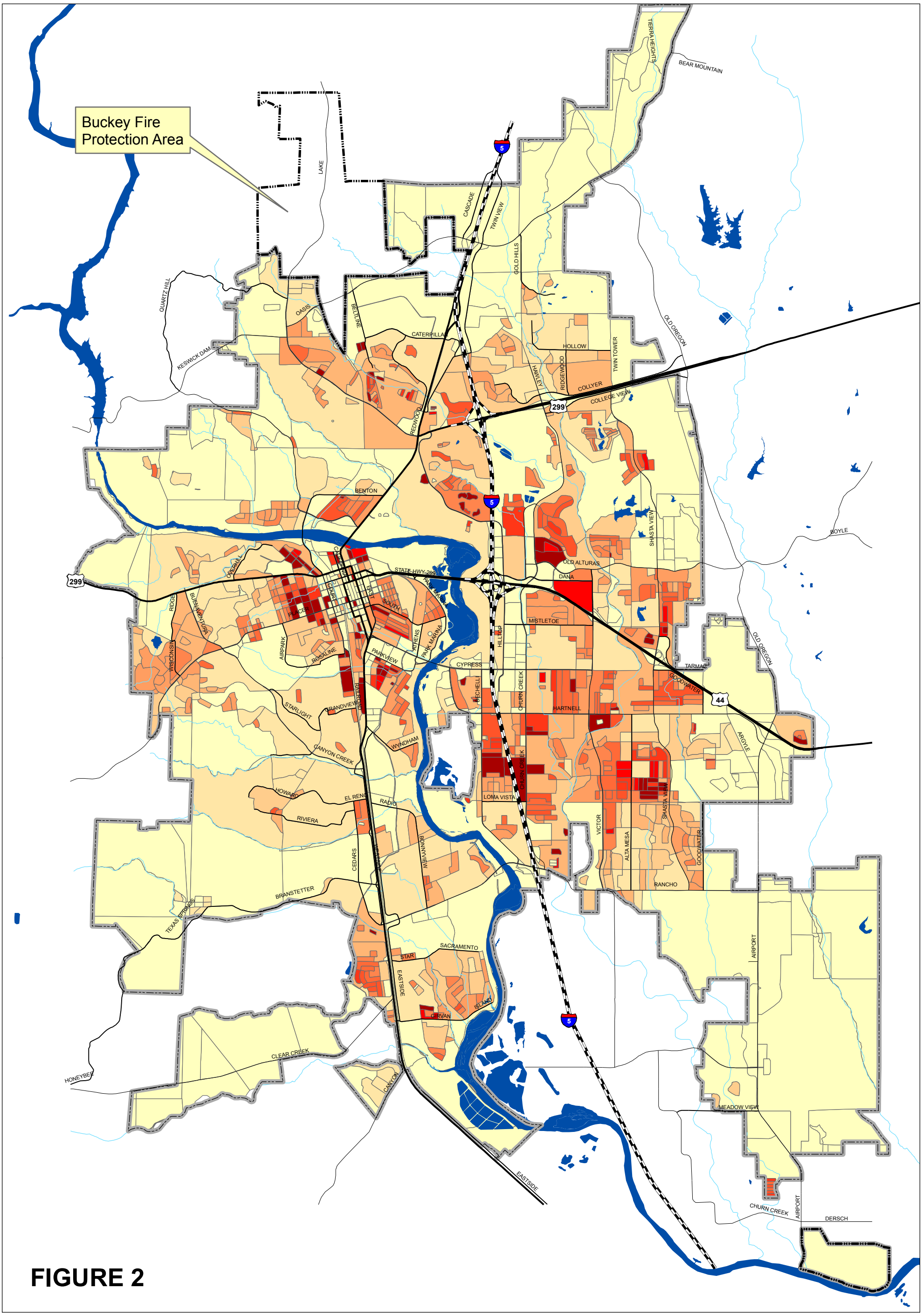

FIGURE 2

Legend

0 - 1000	4000 - 5000	8000 - 9000
1000 - 2000	5000 - 6000	9000 - 10000
2000 - 3000	6000 - 7000	10000 +
3000 - 4000	7000 - 8000	

Persons per square mile

0 0.25 0.5 1 1.5 2 Miles

Local Hazard Mitigation Plan Population Density

Print Date: 09/16/2012

Source: Planning/Census Data. Created in ArcGIS 10 using 2010 census block boundaries and data.

City of Redding Hazard Mitigation Plan

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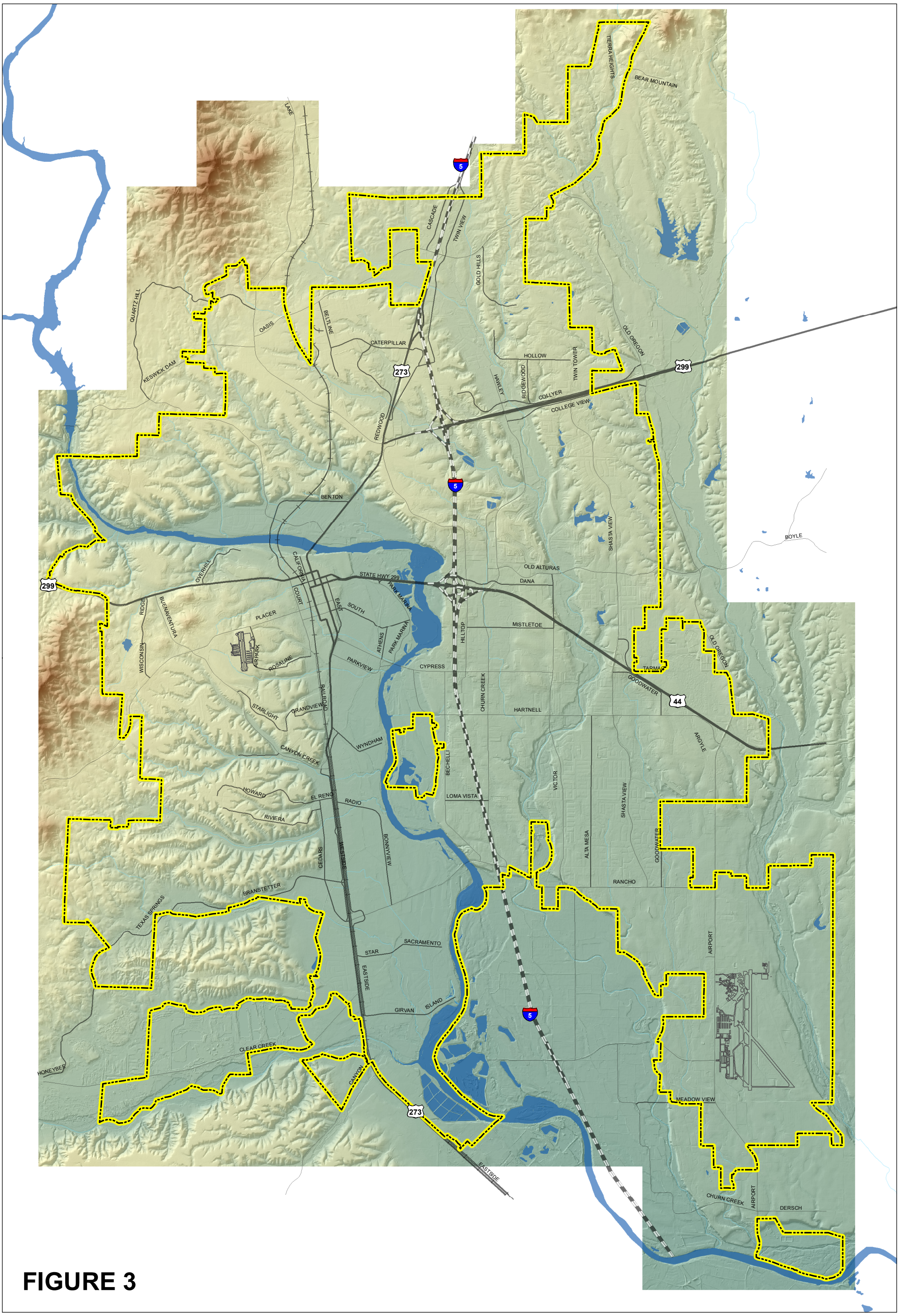


FIGURE 3

Legend

- City Limit
- Water Bodies
- Main Creeks
- Railroad
- Freeway
- Highway
- Arterial
- Collector

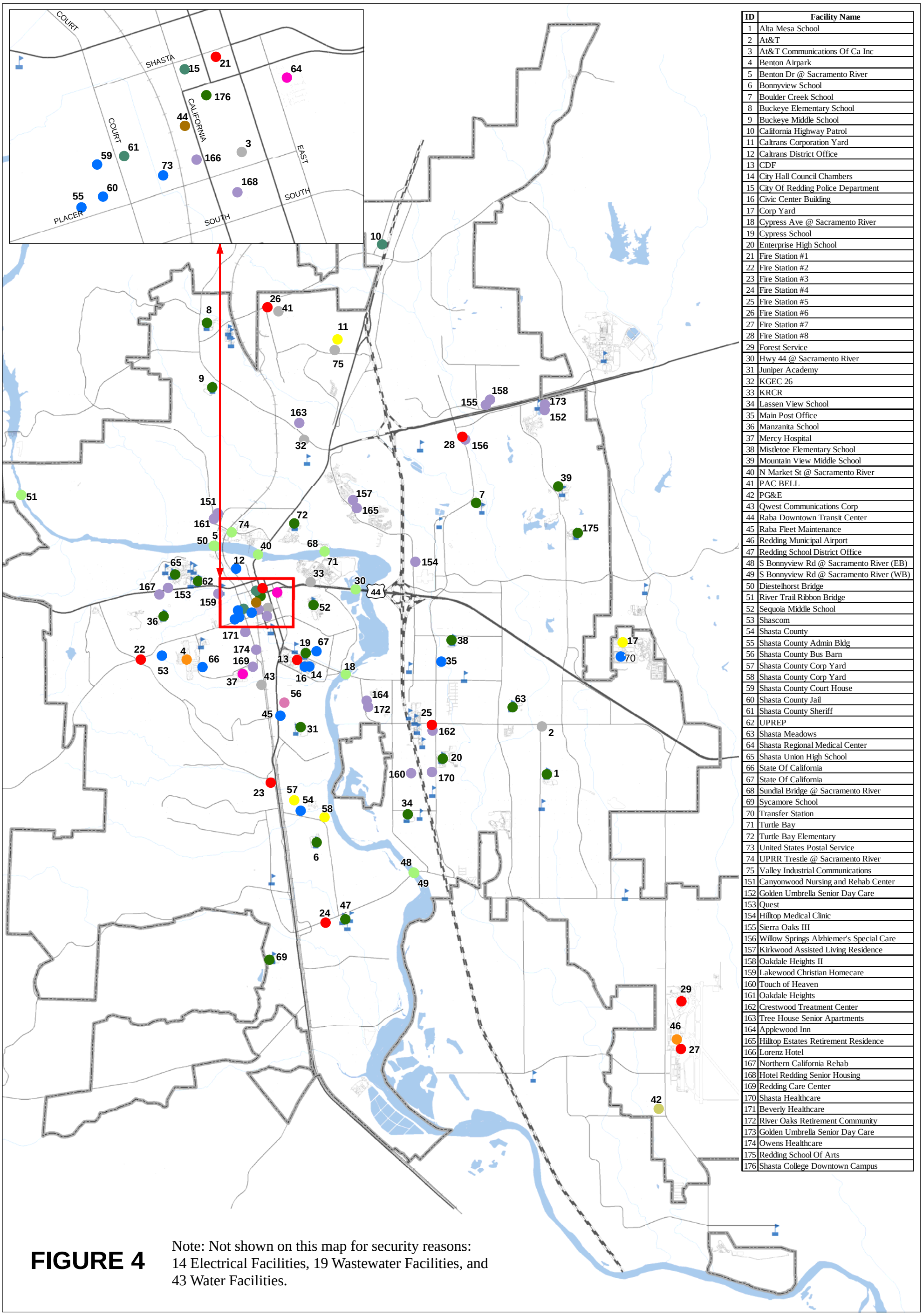
0 0.25 0.5 0.75 1 1.25 1.5 1.75 2 Miles

Local Hazard Mitigation Plan
Slope Model Map

Print Date:
09/06/2012

City of Redding
Hazard Mitigation Study

P:\LHMP\MapDocuments\03 SlopeModel2010.mxd



ID	Facility Name
1	Alta Mesa School
2	At&T
3	At&T Communications Of Ca Inc
4	Benton Airpark
5	Benton Dr @ Sacramento River
6	Bonnyview School
7	Boulder Creek School
8	Buckeye Elementary School
9	Buckeye Middle School
10	California Highway Patrol
11	Caltrans Corporation Yard
12	Caltrans District Office
13	CDF
14	City Hall Council Chambers
15	City Of Redding Police Department
16	Civic Center Building
17	Corp Yard
18	Cypress Ave @ Sacramento River
19	Cypress School
20	Enterprise High School
21	Fire Station #1
22	Fire Station #2
23	Fire Station #3
24	Fire Station #4
25	Fire Station #5
26	Fire Station #6
27	Fire Station #7
28	Fire Station #8
29	Forest Service
30	Hwy 44 @ Sacramento River
31	Juniper Academy
32	KGEC 26
33	KRCR
34	Lassen View School
35	Main Post Office
36	Manzanita School
37	Mercy Hospital
38	Mistletoe Elementary School
39	Mountain View Middle School
40	N Market St @ Sacramento River
41	PAC BELL
42	PG&E
43	Qwest Communications Corp
44	Raba Downtown Transit Center
45	Raba Fleet Maintenance
46	Redding Municipal Airport
47	Redding School District Office
48	S Bonnyview Rd @ Sacramento River (EB)
49	S Bonnyview Rd @ Sacramento River (WB)
50	Diestelhorst Bridge
51	River Trail Ribbon Bridge
52	Sequoia Middle School
53	Shascom
54	Shasta County
55	Shasta County Admin Bldg
56	Shasta County Bus Barn
57	Shasta County Corp Yard
58	Shasta County Corp Yard
59	Shasta County Court House
60	Shasta County Jail
61	Shasta County Sheriff
62	UPREP
63	Shasta Meadows
64	Shasta Regional Medical Center
65	Shasta Union High School
66	State Of California
67	State Of California
68	Sundial Bridge @ Sacramento River
69	Sycamore School
70	Transfer Station
71	Turtle Bay
72	Turtle Bay Elementary
73	United States Postal Service
74	UPRR Trestle @ Sacramento River
75	Valley Industrial Communications
151	Canyonwood Nursing and Rehab Center
152	Golden Umbrella Senior Day Care
153	Quest
154	Hilltop Medical Clinic
155	Sierra Oaks III
156	Willow Springs Alzhiemer's Special Care
157	Kirkwood Assisted Living Residence
158	Oakdale Heights II
159	Lakewood Christian Homecare
160	Touch of Heaven
161	Oakdale Heights
162	Crestwood Treatment Center
163	Tree House Senior Apartments
164	Applewood Inn
165	Hilltop Estates Retirement Residence
166	Lorenz Hotel
167	Northern California Rehab
168	Hotel Redding Senior Housing
169	Redding Care Center
170	Shasta Healthcare
171	Beverly Healthcare
172	River Oaks Retirement Community
173	Golden Umbrella Senior Day Care
174	Owens Healthcare
175	Redding School Of Arts
176	Shasta College Downtown Campus

FIGURE 4

Note: Not shown on this map for security reasons:
14 Electrical Facilities, 19 Wastewater Facilities, and
43 Water Facilities.

Legend

Critical Facility Points

- Airport
- Bridge
- Bus Barn
- Care Facility
- Government
- Communications
- Corp Yard
- Fire
- Hospital
- Intermodal
- Police
- Shelter/School
- Utility

0 0.25 0.5 1 1.5 2 Miles

Local Hazard Mitigation Plan
Critical Facilities Map

Print Date:
09/06/2012

City of Redding
Hazard Mitigation Plan

P:\LHMP\MapDocuments\04.HazardousMaterial\2010_CriticalFacilities.mxd

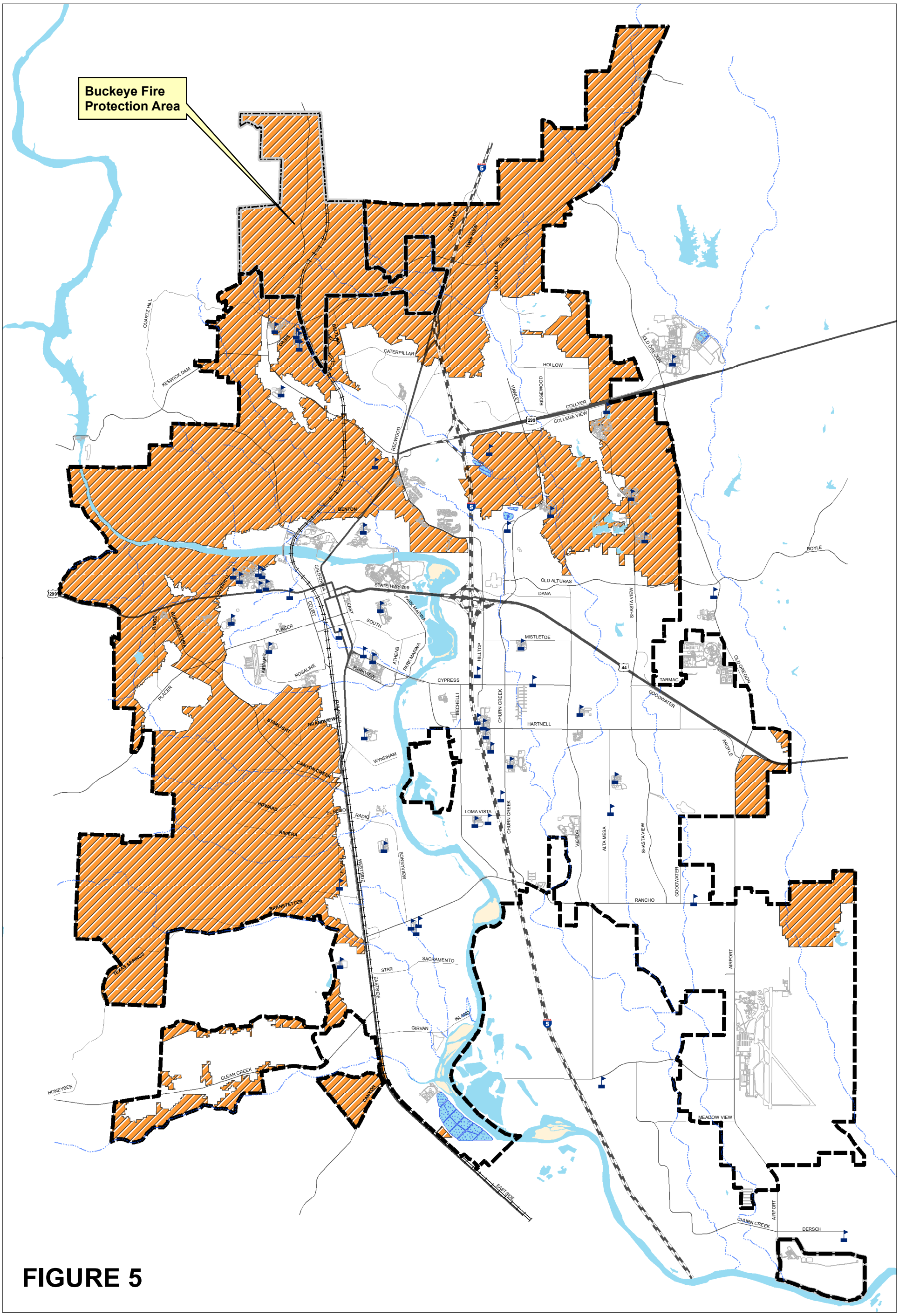


FIGURE 5

LEGEND

- Very High Fire Hazard Severity Zone
- City Limit
- Buckeye Fire Protection Area
- Major Creek
- Freeway
- Highway
- Arterial
- Collector
- School

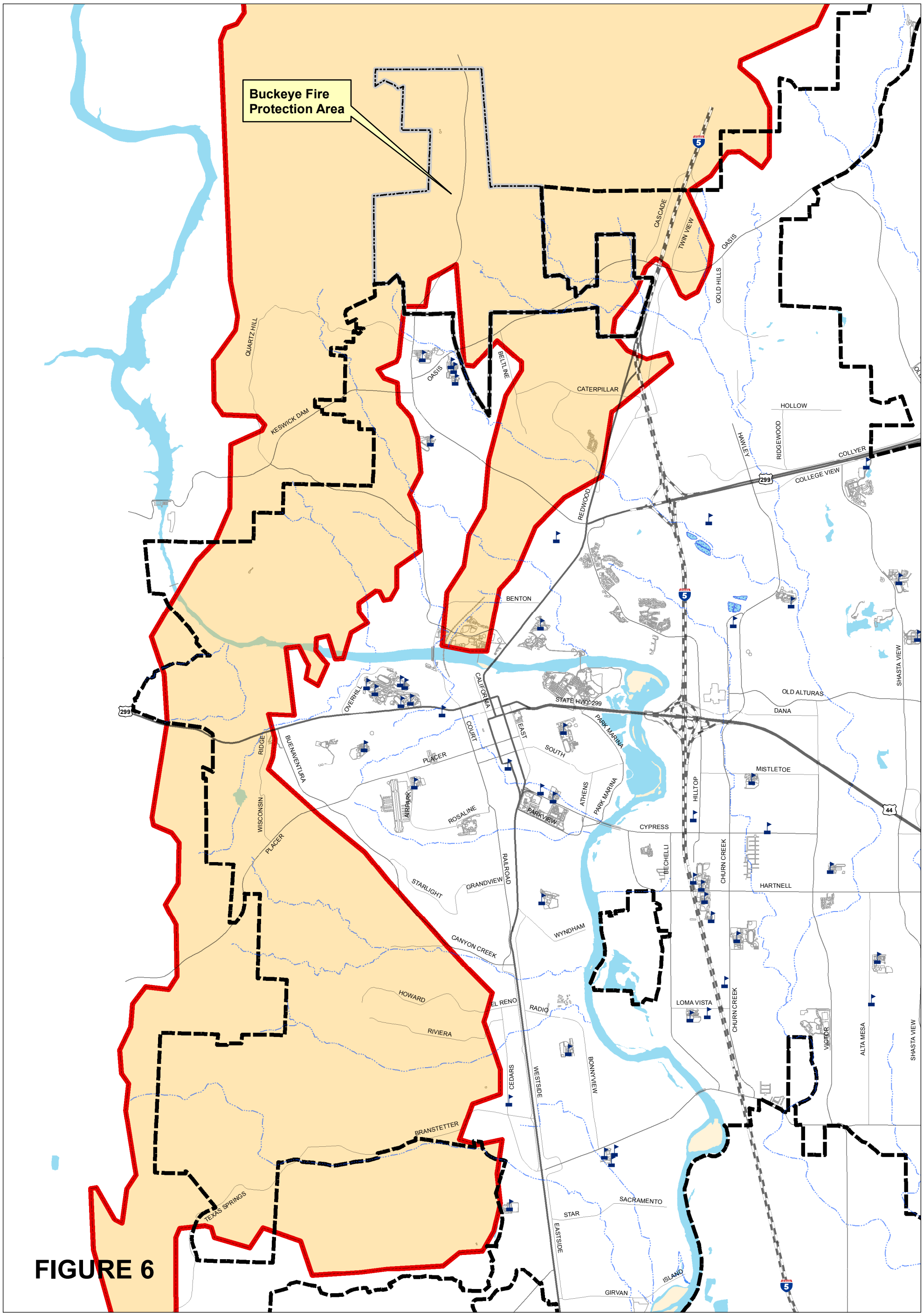
0 0.25 0.5 1 1.5 2 Miles

Local Hazard Mitigation Plan
Very High Fire Hazard Severity Zone

Print Date: 09/06/2012

Source: CAL FIRE

City of Redding
Hazard Mitigation Study


Buckeye Fire Protection Area
QUARTZ HILL
KESWICK DAM
OASIS
BELTLINE
CATERPILLAR
CASCADE
TWIN VIEW
OASIS
GOLD HILLS
HOLLOW
HAWLEY
RIDGEWOOD
COLLYER
COLLEGE VIEW
299
REDWOOD
5
BENTON
OVERHILL
CALIFORNIA
STATE HWY 299
OLD ALTURAS
DANA
SHASTA VIEW
PARK MARINA
COURT
EAST
SOUTH
PLACER
RIDGE
BUENAVENTURA
WISCONSIN
PLACER
AIRPARK
ROSALINE
PARKVIEW
ATHENS
PARK MARINA
MISTLETOE
HILLTOP
44
CYPRESS
BECHELLI
CHURN CREEK
HARTNELL
RAILROAD
STARLIGHT
GRANDVIEW
WYNDHAM
CANYON CREEK
HOWARD
RIVIERA
EL RENO
RADIO
LOMA VISTA
CHURN CREEK
VICTOR
ALTA MESA
SHASTA VIEW
CEDARS
WESTSIDE
BONNYVIEW
BRANSTETTER
TEXAS SPRINGS
SACRAMENTO
STAR
EASTSIDE
ISLAND
GIRVAN
FIGURE 6
LEGEND
City Limit
Buckeye Fire Protection Area
Fire Boundary
Major Creek
Freeway
Highway
Arterial
Collector
School
0 0.25 0.5 1 1.5 2 Miles
Local Hazard Mitigation Plan
Wildland Fire Scenario
Print Date: 09/06/2012
City of Redding
Hazard Mitigation Study
P:\LHMP\MapDocuments\06.WildlandFireScenario2010.mxd

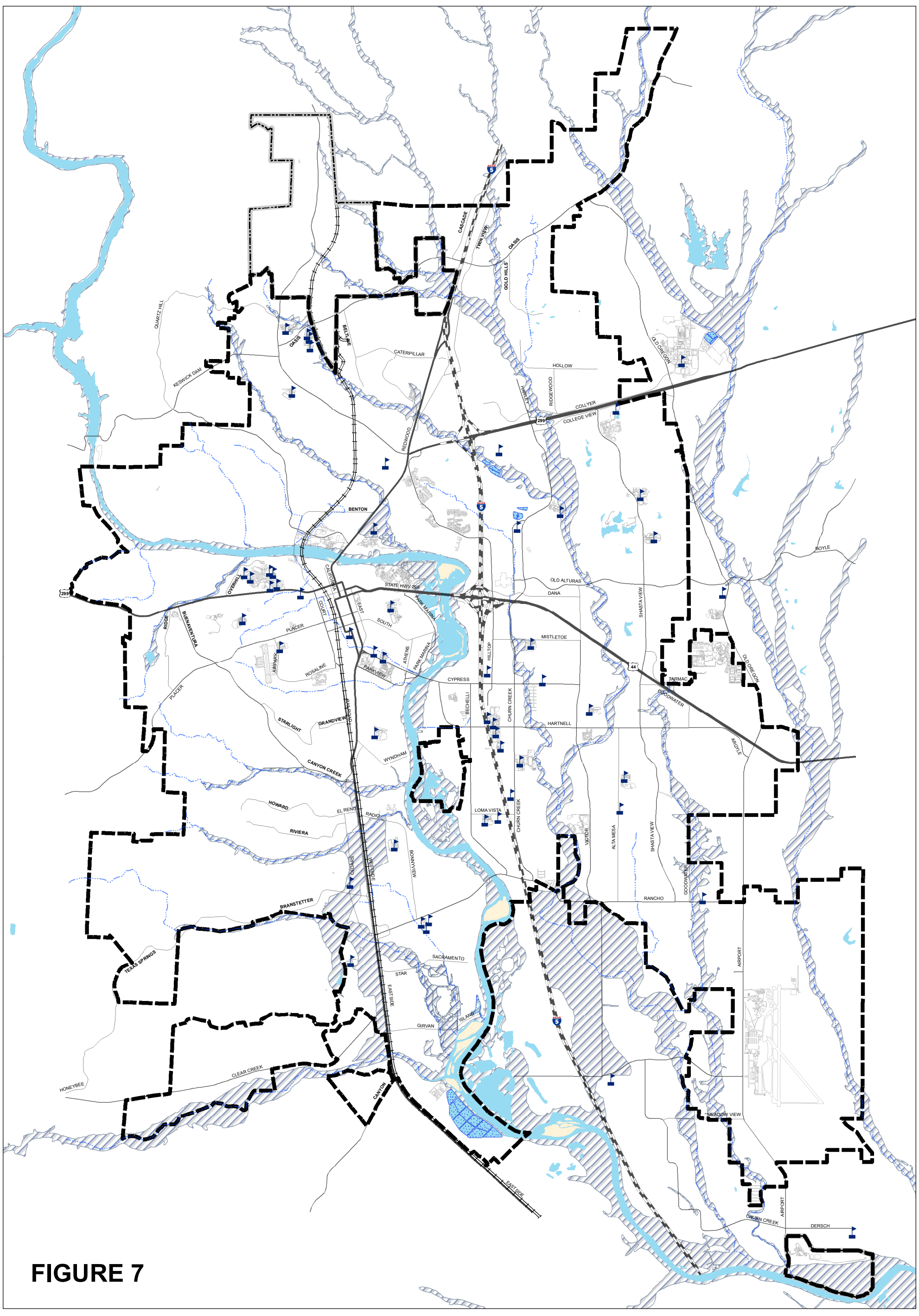


FIGURE 7

LEGEND

- City Limit
- Buckeye Fire Protection Area
- Major Creek
- FEMA 100 Year Floodplain
- School

0 0.25 0.5 1 1.5 2 Miles

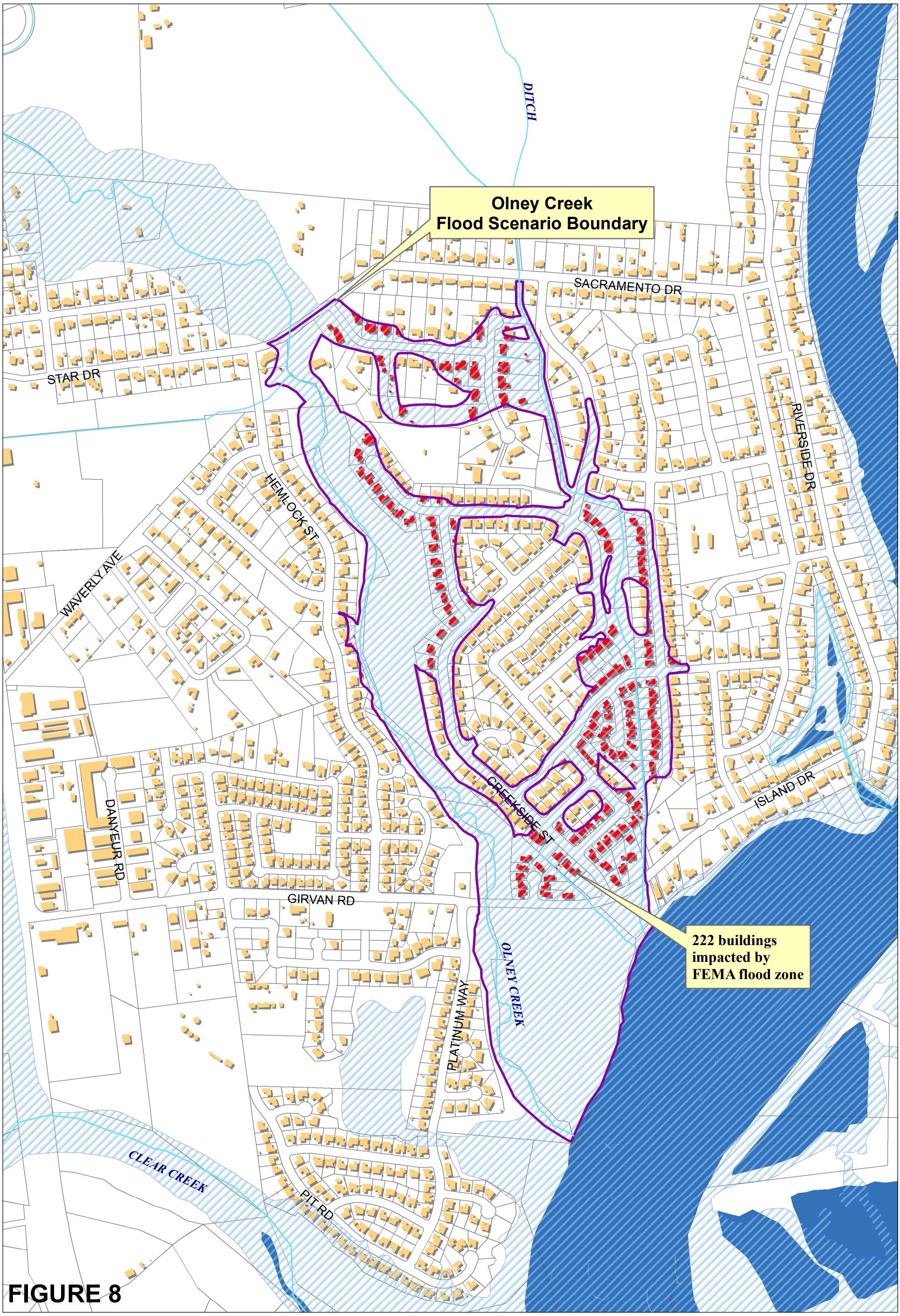
Local Hazard Mitigation Plan
FEMA 100 Year Floodplain

Print Date: 09/06/2012

Source: Federal Emergency Management Agency (FEMA) Digital FIRM data

City of Redding
Hazard Mitigation Study

P:\LHMP\MapDocuments\07.FloodPlain_Inundation2010.mxd


Olney Creek
Flood Scenario Boundary
222 buildings
impacted by
FEMA flood zone
DITCH
SACRAMENTO DR
STAR DR
HEMLOCK ST
WAVERLY AVE
RIVERSIDE DR
ISLAND DR
CREEKSIDE ST
DANYEUR RD
GIRVAN RD
PLATINUM WAY
OLNEY CREEK
CLEAR CREEK
PIT RD
FIGURE 8
Legend
FEMA 100 Year Floodplain
Sacramento River
Flood Scenario Boundary
Impacted Buildings
Building Footprint
Parcels
Creeks
Tertiary
Secondary
Main
Schools
0 150 300 600 900 1,200 Feet
Local Hazard Mitigation Plan
Olney Creek Flood Scenario
City of Redding
Hazard Mitigation Plan
Print Date: 09/06/2012
Source: Federal Emergency Management Agency (FEMA) Digital FIRM data
P:\LHMP\MapDocuments\08.OlneyCreekFloodScenario2010.mxd

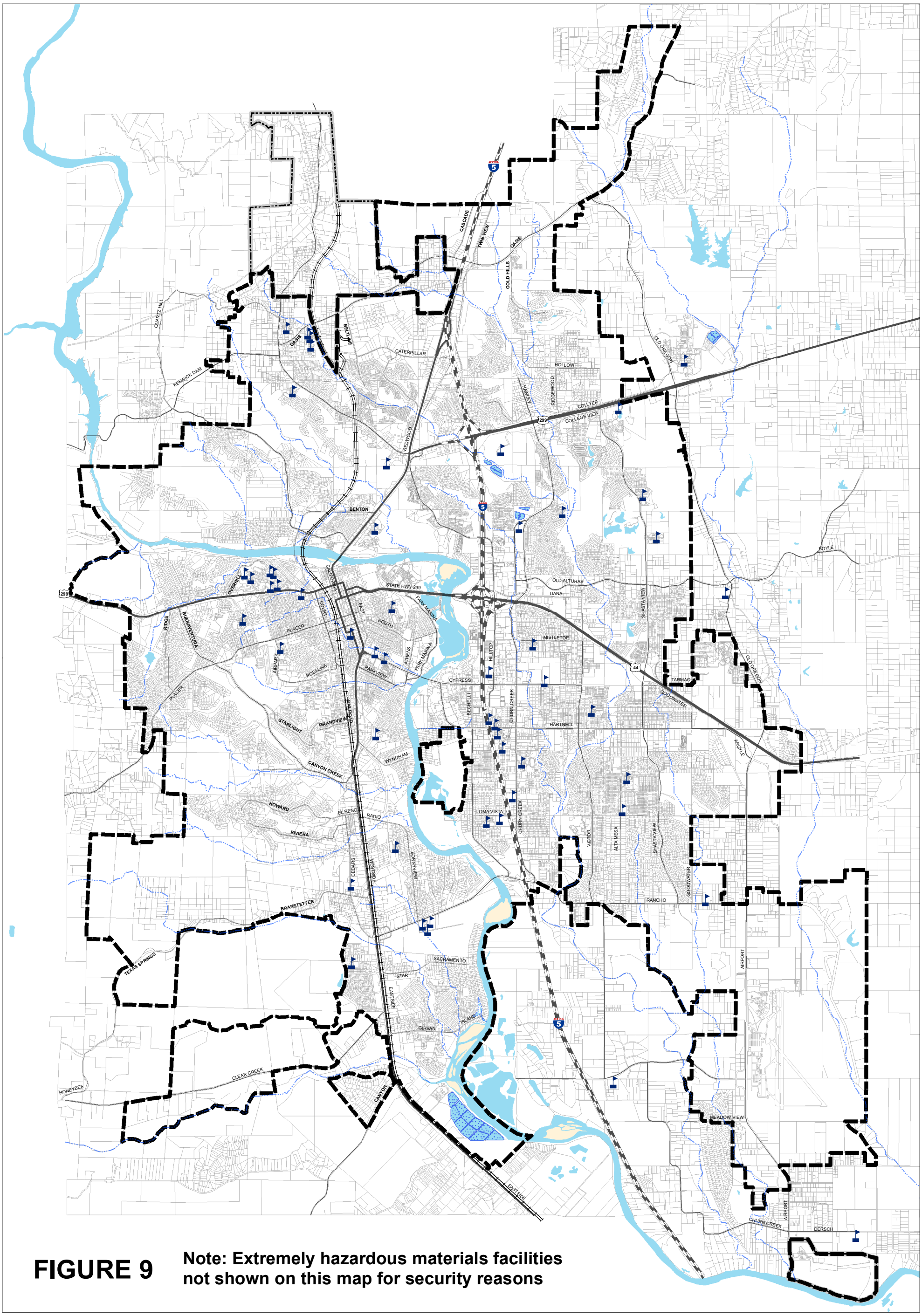


FIGURE 9

Note: Extremely hazardous materials facilities not shown on this map for security reasons

LEGEND

- City Limit
- Buckeye Fire Protection Area
- Hazardous Material Sites
- 1 Mile Buffer
- Freeway
- Highway
- Arterial
- Collector
- Major Creek
- School

0 0.25 0.5 1 1.5 2 Miles

Local Hazard Mitigation Plan Extremely Hazardous Material Facilities

City of Redding Hazard Mitigation Study

Print Date: 09/06/2012

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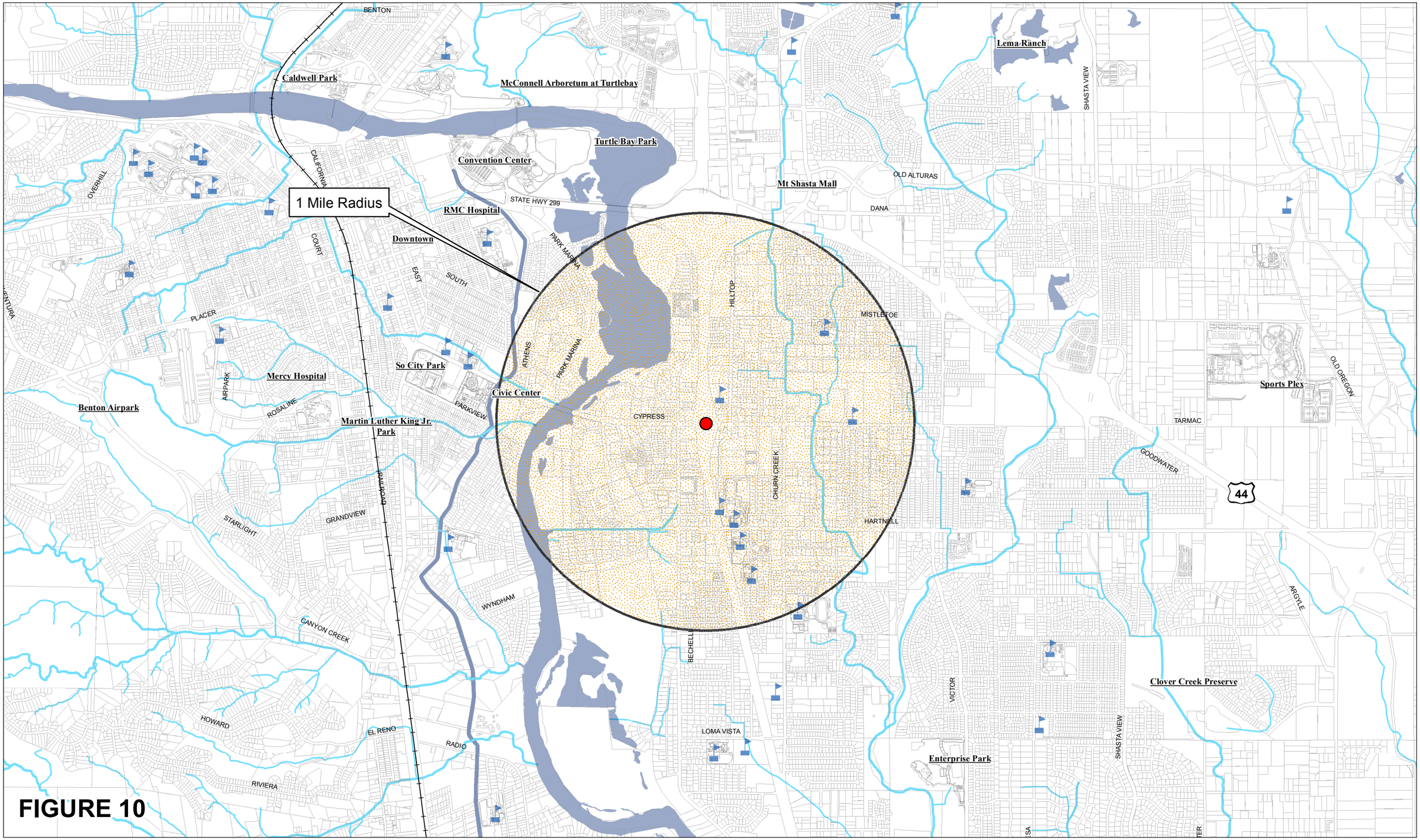

FIGURE 10

Legend

Spill Point
Spill Buffer
Water Bodies

Creeks
Main
Secondary
ACID Canal

Schools

0 0.25 0.5 0.75 1 Miles

Local Hazard Mitigation Plan HAZMAT Spill Scenario

Print Date: 09/06/2012

City of Redding
Hazard Mitigation Study

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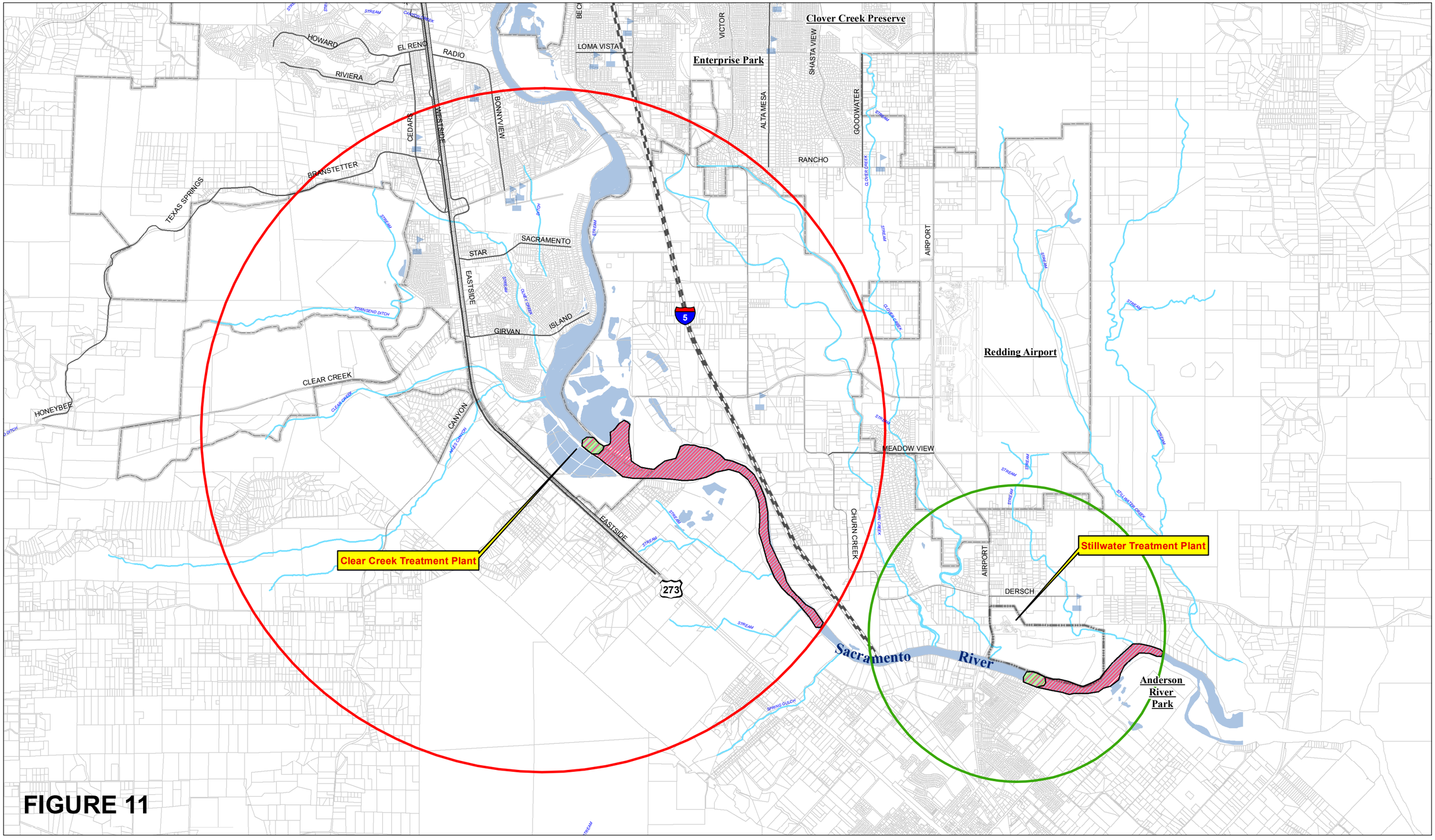

Legend

Releases
- Small Release
- Maximum Release
- 3 Mile Buffer
- 1.3 Mile Buffer

- Parcels
- Sacramento River
- Creeks

- Freeway
- Highway
- Arterial
- Collector
- Railroad

0 0.25 0.5 0.75 1 Miles

Local Hazard Mitigation Plan
Wastewater HAZMAT Spill Scenario

City of Redding
Hazard Mitigation Study

Print Date: 09/16/2012

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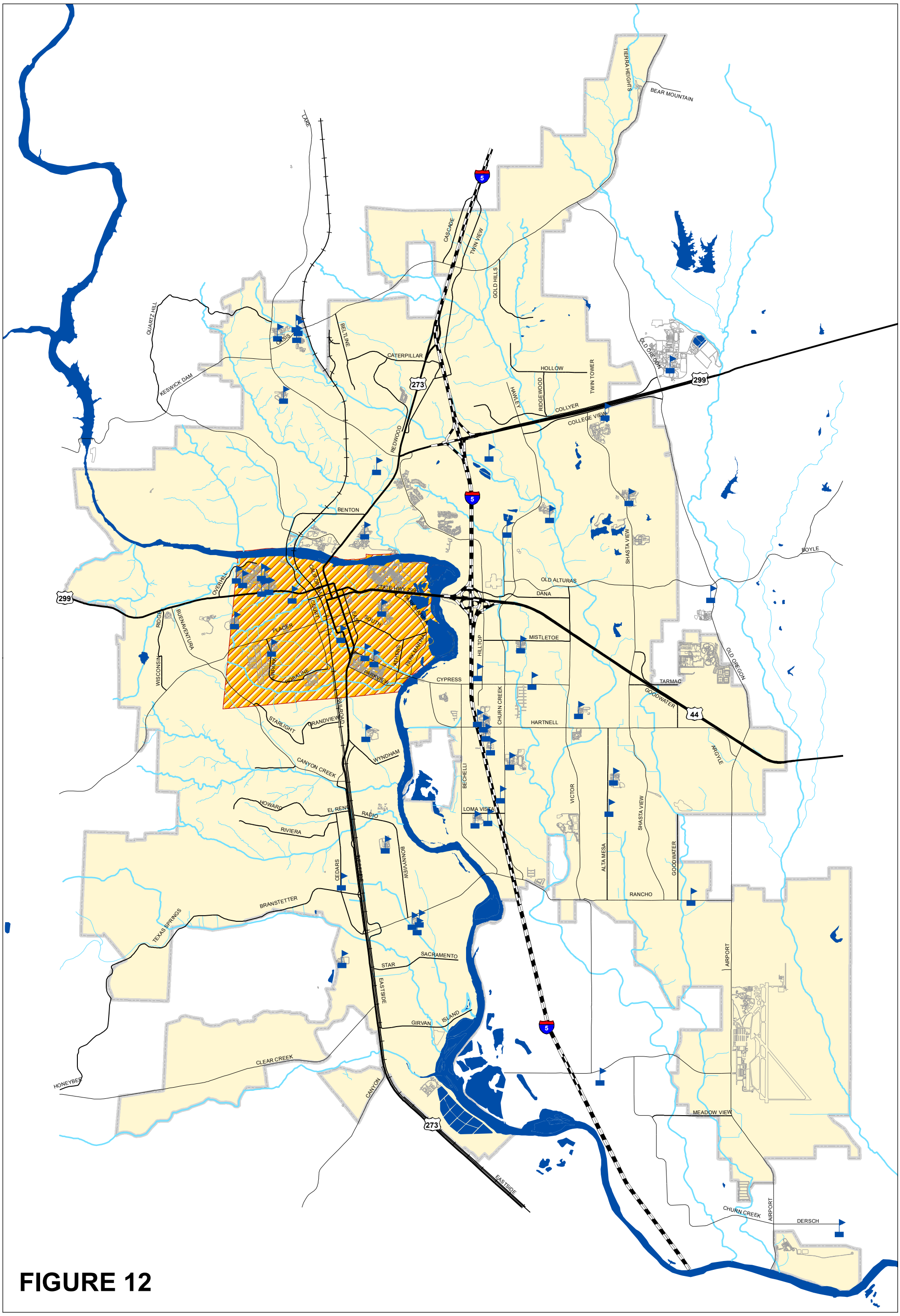

FIGURE 12

Legend

- Freeway
- Highway
- Arterial
- Collector
- Railroad
- Schools
- Water Bodies
- Major Creek
- Secondary Creek
- 6% Estimated Ratio
- 3% Estimated Ratio

0 0.5 1 1.5 2 Miles

Local Hazard Mitigation Earthquake Estimated Damage Ratio

Print Date: 09/06/2012

City of Redding Hazard Mitigation Study

P:\LHMP\MapDocuments\12.EarthquakeEstimatedDamage2010.mxd

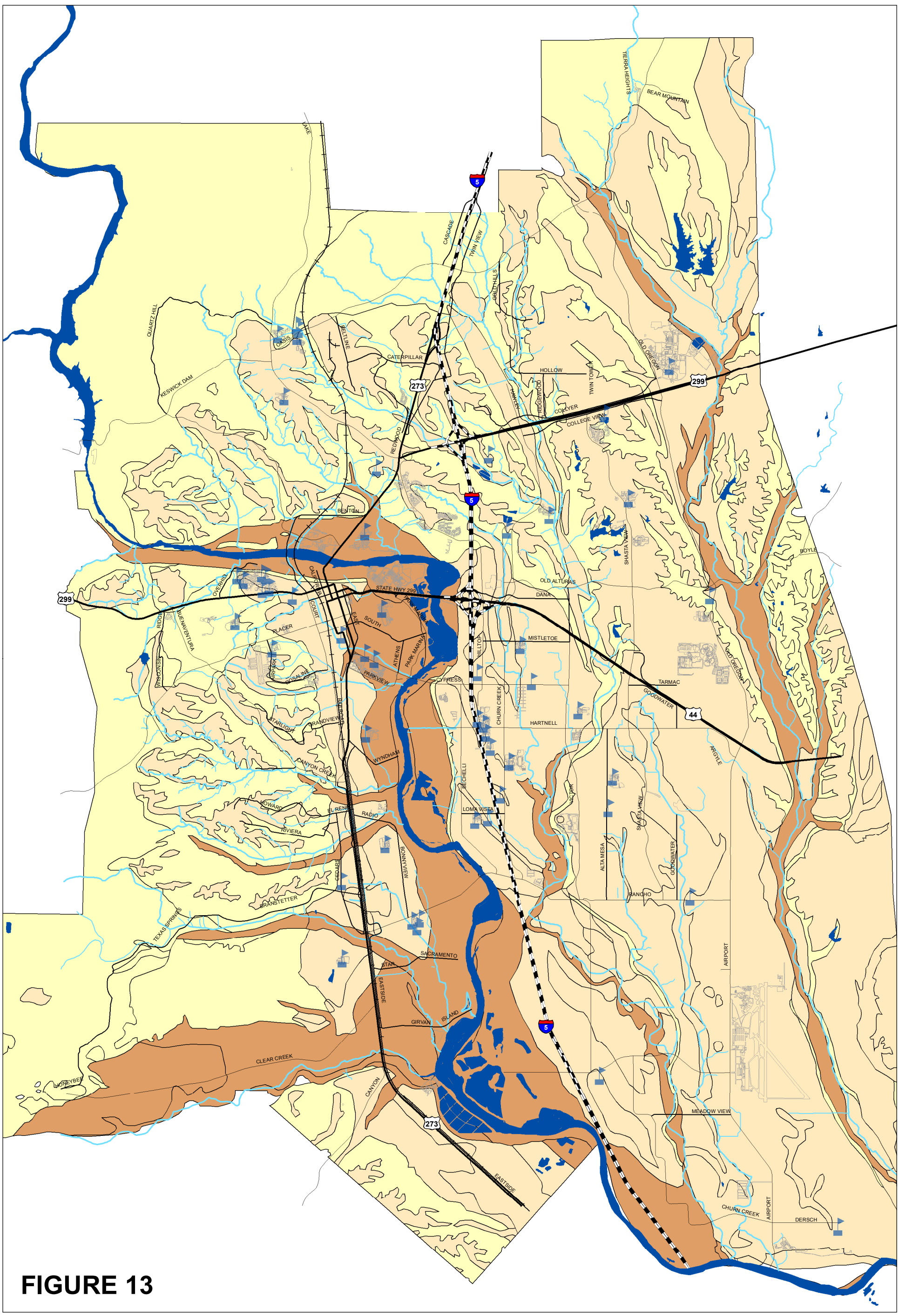

FIGURE 13

Legend

- Freeway
- Highway
- Arterial
- Collector
- Railroad

Creeks

- Main
- Secondary
- Schools

Liquefaction Potential

- High Potential
- Low Potential
- No Potential

0 0.25 0.5 0.75 1 Miles

Local Hazard Mitigation Liquefaction/Ground Shaking Map

City of Redding Hazard Mitigation Study

Print Date: 09/06/2012

Source: *Seismic Hazards Assessment for the City of Redding*, prepared by Woodward-ClydeFederal Services in 1995

P:\LHMP\MapDocuments\13.LiquefactionGroundShaking2010.mxd