NORTH COAST RESOURCE PARTNERSHIP

2014 IRWM Drought Project Grant Application

ATTACHMENT 3:

Project Justification Appendix

Integrated Regional Water Management Program
Applicant: Humboldt County

North Coast Resource Partnership 2014 IRWM Drought Project Grant

Attachment 3. Project Justification Appendix

Supporting Documentation

1. City of Rio Dell – Scotia Annexation Water Distribution System Technical Memorandum (2006)
2. Rio Dell and Scotia CSD Emergency Water Intertie Maps
3. Humboldt Operational Area Hazard Mitigation Plan Update Volume 2 2014
4. Eel River flow data
5. City of Rio Dell Water System Asset Management Plan and Preliminary Capital Improvement Plan
6. Rio Dell Scotia Intertie Project Estimates
7. Rio Dell Scotia Intertie Schedule
8. Rio Dell Complaint for Negligent Design; Breach of Contract and Negligent Supervision

WINZLER & KELLY
CONSULTING ENGINEERS

DRAFT TECHNICAL MEMORANDUM

TO: Graham Hill, Interim City Manager

FROM: Neal Carnam, Winzler & Kelly

DATE: September 6, 2006

RE: **City of Rio Dell-Scotia Annexation: Water Distribution System Technical Memorandum**

JOB #: 01061-06002-11004

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1. INTRODUCTION

This technical memorandum describes the water distribution system and fire system in the Pacific Lumber Company (PALCO) town of Scotia and assesses the current condition of the systems' infrastructure. Facility descriptions including sizes, condition, and capacity are presented, along with recommended locations for new water lines and service connections. In addition, recommendations are made for system improvements deemed necessary to meet city and state standards in the case that the proposed annexation of Scotia by the City occurs.

2. SYSTEM DETAILS, INFRASTRUCTURE, FACILITIES, SERVICES

This section describes the major system components of both the domestic and fire water systems in greater detail. The majority of pipe in the fire system is made of cast-iron and was installed prior to 1940. The majority of pipe in the domestic water system is steel and cast-iron and was also installed prior to 1940. Scotia's domestic water distribution system is classified as D-1 by the California Department of Health Services (DHS). Their treatment system is classified as T-2 by the DHS. Rio Dell shares the same designations for its domestic distribution and treatment systems.

2.1 PALCO Domestic Water System

Scotia's existing domestic water system is owned, operated, and maintained by PALCO. The system serves residential, commercial, and industrial customers within Scotia. There are approximately 280 residential, 15 commercial, and 20 industrial connections within the system. Water usage by residential customers is not metered. The main industrial water users in Scotia are the mills and the power plant, whose usage is metered. Industrial customers use on average slightly over half of all water produced at the drinking water treatment plant.

Raw water enters the domestic water system through the intake facility, an infiltration gallery constructed in 1966. The gallery consists of two 24-inch perforated steel pipes totaling 1,100 feet in length, located in the Eel River gravel bed slightly over ten feet below the low river water level. Water enters the pipes and flows by gravity to a concrete collection well, located on the

river bank. The collection well currently contains two 125-hp, Byron Jackson submersible pumps, each capable of producing 1,500 gallons per minute (gpm). Both pumps were installed in 1995, and one pump runs constantly. Their operation alternates monthly. The pumps discharge into 10-inch steel pump columns followed by 12-inch cast-iron pipes. The 12-inch pipes join into a single 20-inch cast-iron water supply line.

Approximately 800 feet from the collection well, the 20-inch pipe splits into separate lines for the domestic and fire systems. The domestic line is a 12-inch cast iron pipe which reduces to two 8-inch pipes that connect to two 150 hp Ingersoll-Rand horizontal split case pumps, each having a 1,200 gpm pumping capacity. These pumps were originally installed in the 1940's and have since been rebuilt. One pump was rebuilt in 1994, and the other was more recently completed in 2004 (SHN, 2006a). The domestic booster pumps rotate every cycle of operation.

The domestic booster pumps' outlet piping tees and discharges into a recently installed, aboveground 8-inch PVC pipe which transitions to an underground 12-inch transite (asbestos-cement) pipe installed in the 1970s. This pipe conveys water to the treatment plant where coagulant is injected directly into the pipe upstream of an in-line mixer. A 12-inch steel pipe transports water from the plant to a 1 million gallon (MG) tank. The 1 MG raw water storage tank also serves as a clarifier/settling tank where coagulated materials can settle out of the raw water prior to filtration. The tank was constructed in 1966 and sits at a bottom tank elevation of approximately 411 feet. It requires annual cleaning to remove settled materials that build up on the bottom of the tank. The water level in this tank controls the operation of the domestic booster pumps.

Water flows by gravity in a 10-inch steel pipe from the 1 MG raw water storage tank back to the treatment plant situated at an elevation of approximately 313 feet through outlet pipes located approximately 17 feet above the tank bottom elevation (a lower outlet exists for emergency situations). The treatment plant consists of two pressure filters, flow meter, chlorinator, and a fluoridation system, which is currently off-line. The treatment facility is in overall good condition and seems very well maintained. The plant currently operates at approximately 800 gpm for about 8 hours per day. In the winter, raw water turbidity ranges between 300-400 nephalometric turbidity units (NTU), while in the summer the turbidity drops to about 1 NTU. Treated water leaving the plant has about 0.05 – 0.1 NTU year-round. Further discussion of the treatment plant can be found in a separate report, titled "City of Rio Dell-Scotia Annexation: Water Treatment Facility Technical Memorandum."

The treated, filtered water then flows through a 10-inch steel pipe to a 0.488 MG finished water storage tank of welded steel construction, which supplies the domestic system of Scotia with excellent quality water. This tank was constructed in 1990 and sits at a bottom tank elevation of about 279 feet. An altitude valve is in place between the finished water storage tank and the 1 MG raw water storage tank. Head (2006) noted that when the water level drops to approximately 18.5 feet in the finished water storage tank, the altitude valve opens thus filling the tank. The altitude valve closes after the tank fills to about 27 feet.

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PALCO's existing domestic water distribution system provides potable water to Scotia's residences, commercial and institutional buildings, and the mill and power plant in the industrial zones. The entire system serves a single pressure zone from the 0.488 MG finished water storage tank. Most of the domestic distribution system lies at an elevation between approximately 120 feet and 190 feet and experiences pressures ranging between 45 psi and 80 psi.

The majority of the distribution system was installed between the 1930s and 1940s. Current mapping provided by PALCO and SHN has limited descriptions of the distribution facilities with respect to use, size, and material. An inventory of estimated lengths of pipe in the existing domestic water system was prepared and is shown below in Table 1.

Table 1. Inventory of Scotia's existing domestic water distribution system.

Diameter (inches)	Material	Year of Installation	W&K Estimated Lengths[1] (feet)	SHN Reported Lengths (feet)
1	PVC	1970's to Present	865	975
1.5	Galvanized Iron	1930s-1940s	336	225
2	Steel/Galvanized Iron	1930s-1940s	7,892	13,448
2.5	Cast-Iron	1930s-1940s	3,530	4,049
3	Cast-Iron	1930s-1940s	297	301
4	Cast-Iron	1930s-1940s	4,558	9,081
6	Cast-Iron	1930s-1940s	2,802	4,275
8	Cast-Iron	1930s-1940s	678	1,317
Unknown	Unknown	1930s-1940s	15,538	3,343
Total	**---**	**---**	**36,496**	**37,014**

[1] All estimates are approximate and based on best available information.

As shown above, some differences exist between SHN estimates and our current estimates on lengths of pipe. Estimates of the overall amount of piping in the distribution system are very similar. Amounts of unknown sized pipe are much larger in our estimates, directly attributable to the lack of pipe sizing information in the maps made available to us. All pipes labeled with diameter sizes were accounted for in our estimates.

The domestic water system can also be used to back-up the fire system in the case of insufficient fire flows, by opening gate valves in the 1 MG storage tank's outlet piping which directs water to the two 0.5 MG fire storage tanks. The overflow from the 1 MG tank also fills the fire tanks. The 1 MG tank can also be filled by a creek located behind the tank under emergency situations.

Winzler & Kelly staff performed a survey of the domestic water distribution system's isolation valves in June 2006. Survey results indicate most valves within the system either:

a) are leaking, as evidenced by standing water in several valve-boxes,
b) turn but do not actuate the gates, or
c) begin to leak when actuated.

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2.2 PALCO Fire System

PALCO's fire system splits from the domestic water system and the 20-inch cast iron pipe coming from the collection well. Water is boosted at a pump station, consisting of two horizontal split case Fairbanks Morse pumps. The first pump is 150 hp and is rated at 1,000 gpm, and the second pump is 75 hp and rated at 500 gpm. Both pumps were installed in the 1950s and have been rebuilt since then; however, the dates of the last rebuilds are unknown. However, according to Head (2006) seals were replaced approximately six months ago. Water is boosted from the fire pumps' elevation of approximately 139 feet to supply water to the power plant and to two 0.5 MG raw water storage tanks with a bottom tank elevation of about 385 feet through a 16-inch cast iron fire main installed in the 1930s. The 500 gpm booster pump runs constantly during winter months, while the 1000 gpm booster pump runs constantly during summer months (Head, 2006).

Fire flow from the 0.5 MG raw water storage tanks enters the fire distribution system through the same pipe that feeds the tanks from the booster pumps. The fire system consists of mainly cast-iron pipe varying in size from 4 inch to 16 inch. The system contains 146 fire hydrants, of which 100 of them are located on the mill site, and 124 sprinkler riser systems. Of the total amount of fire hydrants in Scotia, 129 are of a wet barrel type while the remaining 22 are dry barrel hydrants. The majority of the dry barrel hydrants are located in residential areas, while industrial areas are outfitted with mainly wet barrel hydrants. Fire flow tests are performed regularly on the mill's hydrants, as they are monitored by the Insurance Service Office.

Two backup fire booster pumps are in place – one electric and one diesel. The electric pump is capable of pumping 2000 gpm at 120 psi, while the diesel driven pump is capable of pumping 1500 gpm at 102 psi (SHN, 2006a). Both pumps intake raw water from the log pond and pump directly into the fire system in case of insufficient volumes in fire storage above at the tanks.

A similar inventory of estimated lengths in the fire system was prepared and is shown below in Table 2.

Table 2. Inventory of Scotia's existing fire distribution system.

Diameter (inches)	Material	Year of Installation	W&K Estimated Lengths[1] (feet)	SHN Reported Lengths (feet)
4	Cast-Iron	1930s-1940s	0	352
6	Cast-Iron	1930s-1940s	10,466	10,342
8	Cast-Iron	1930s-1940s	20,937	20,973
10	Cast-Iron	1930s-1940s	14,560	15,993
12	Cast-Iron	1930s-1940s	5,316	5,398
14	Cast-Iron	1930s-1940s	747	919
16	Cast-Iron	1930s-1940s	535	475
Unknown	Unknown	1930s-1940s	5,579	2,952
Total	---	---	**58,140**	**57,404**

[1] All estimates are approximate and based on best available information.

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Similar discrepancies in the estimated lengths of various pipes in the distribution system occurred as did with the domestic water system inventory. Again, this is mostly due to limited descriptions of pipe size and material in provided mapping.

Table 3 below summarizes tank information from both the domestic water and fire systems.

Table 3. Summary of tank information in both domestic and fire systems.

Tank	Type	Date Installed	# of Units	Capacity	Tank Height (ft)	Tank Diameter (ft)	Bottom Elevation (ft)[1]	High Water Level Elevation (ft)[1]
Raw Water	Welded Steel	1966	1	1.000	40	70	411	449
Finished Water	Welded Steel	1990	1	0.488	26	55	279	306
Fire Flow	Riveted Steel	1940	2	0.500	24	60	385	408

[1] All elevations are approximate and based on best available information.

2.3 City of Rio Dell Water Distribution System

The City of Rio Dell operates a water distribution system that serves approximately 1200 water connections. The City incorporated in 1965 and took over several private water companies in the area serving three separate smaller communities in the area: Wildwood, Belleview, and Eagle Prairie. The City has since dealt with the legacy of adopting an old, outdated distribution system. The aging system is a mix of sizes and types of pipes available over the last fifty years or more, and the frequency of line breaks has become more common recently due to the pipe becoming more brittle and the ground shifting over time. The result of adopting these substandard, aged distribution systems for the City was lost revenues due to leakage and large investments needed to upgrade and maintain the system. The City has recently invested substantial amounts of money and energy into replacing large amounts of its distribution system.

3. FIGURE SHOWING EXISTING CONDITIONS

Figure 1 and Figure 2 show the existing layout of the domestic water and fire distribution systems in Scotia. Figure 3 is a schematic diagram showing the hydraulic profiles of the Scotia and Rio Dell distribution systems. Figure 4 is a schematic diagram showing existing piping within the treatment system and fire and domestic water storage facilities.

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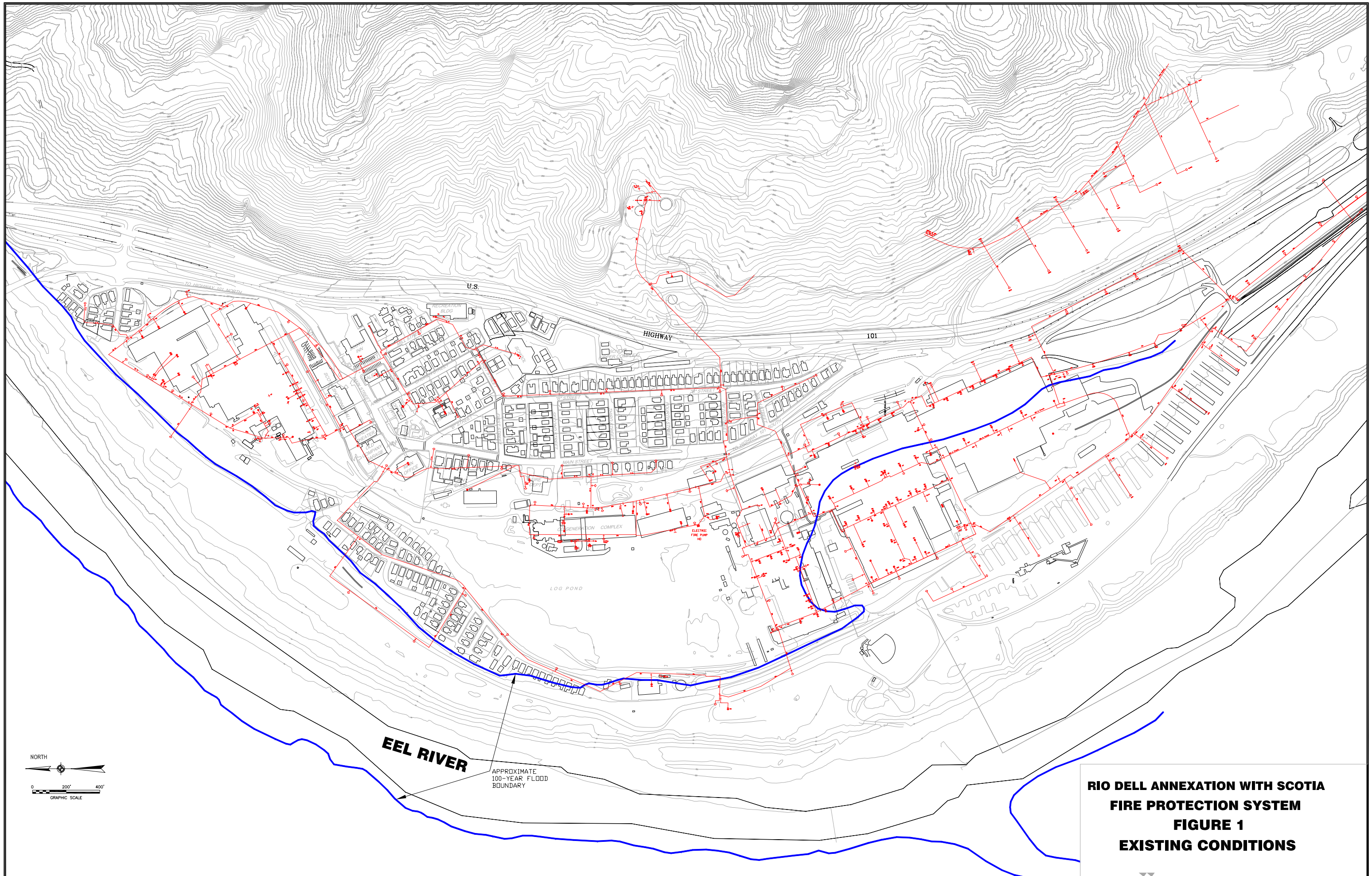

RIO DELL ANNEXATION WITH SCOTIA
FIRE PROTECTION SYSTEM
FIGURE 1
EXISTING CONDITIONS

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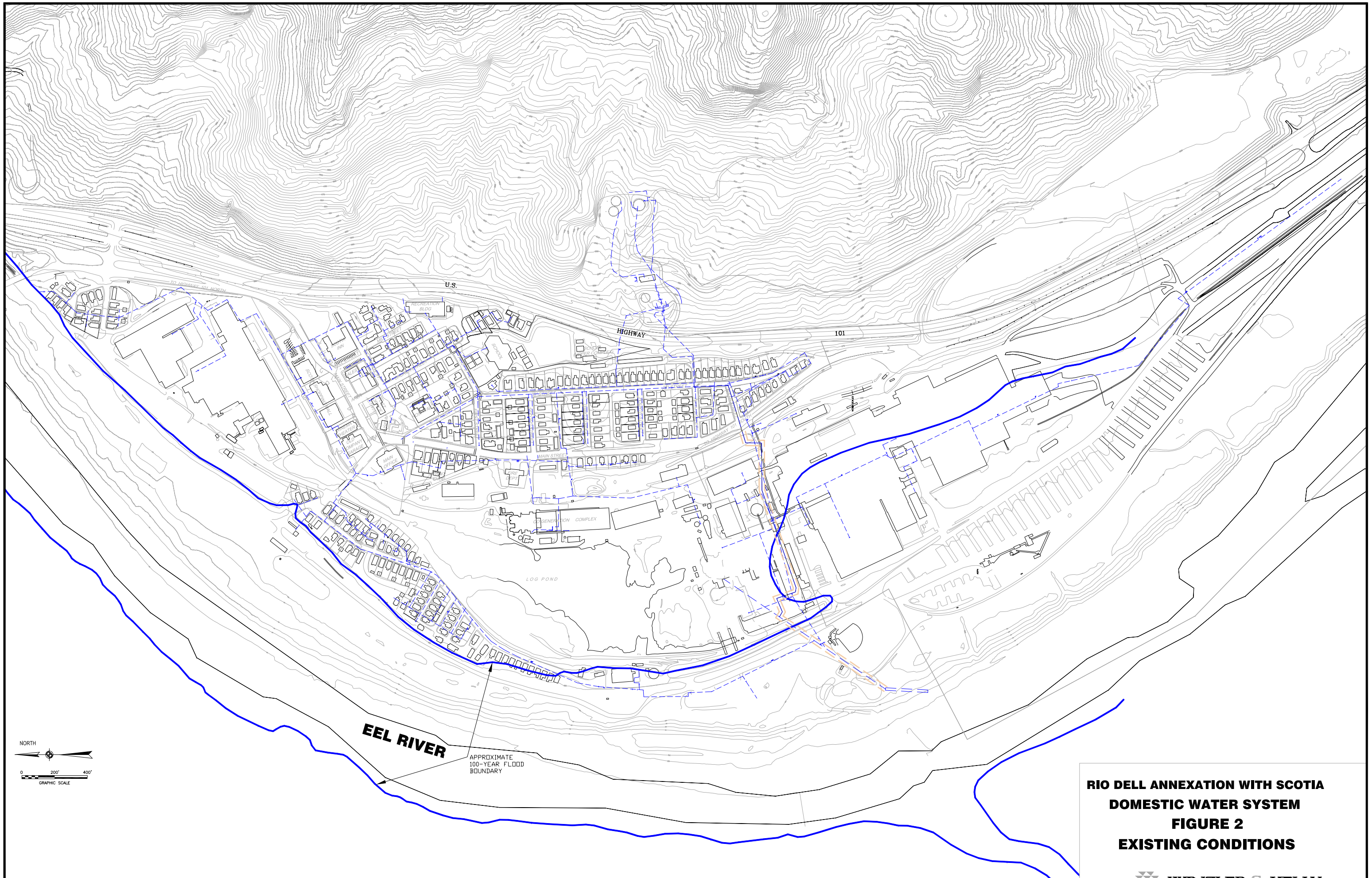

RIO DELL ANNEXATION WITH SCOTIA
DOMESTIC WATER SYSTEM
FIGURE 2
EXISTING CONDITIONS

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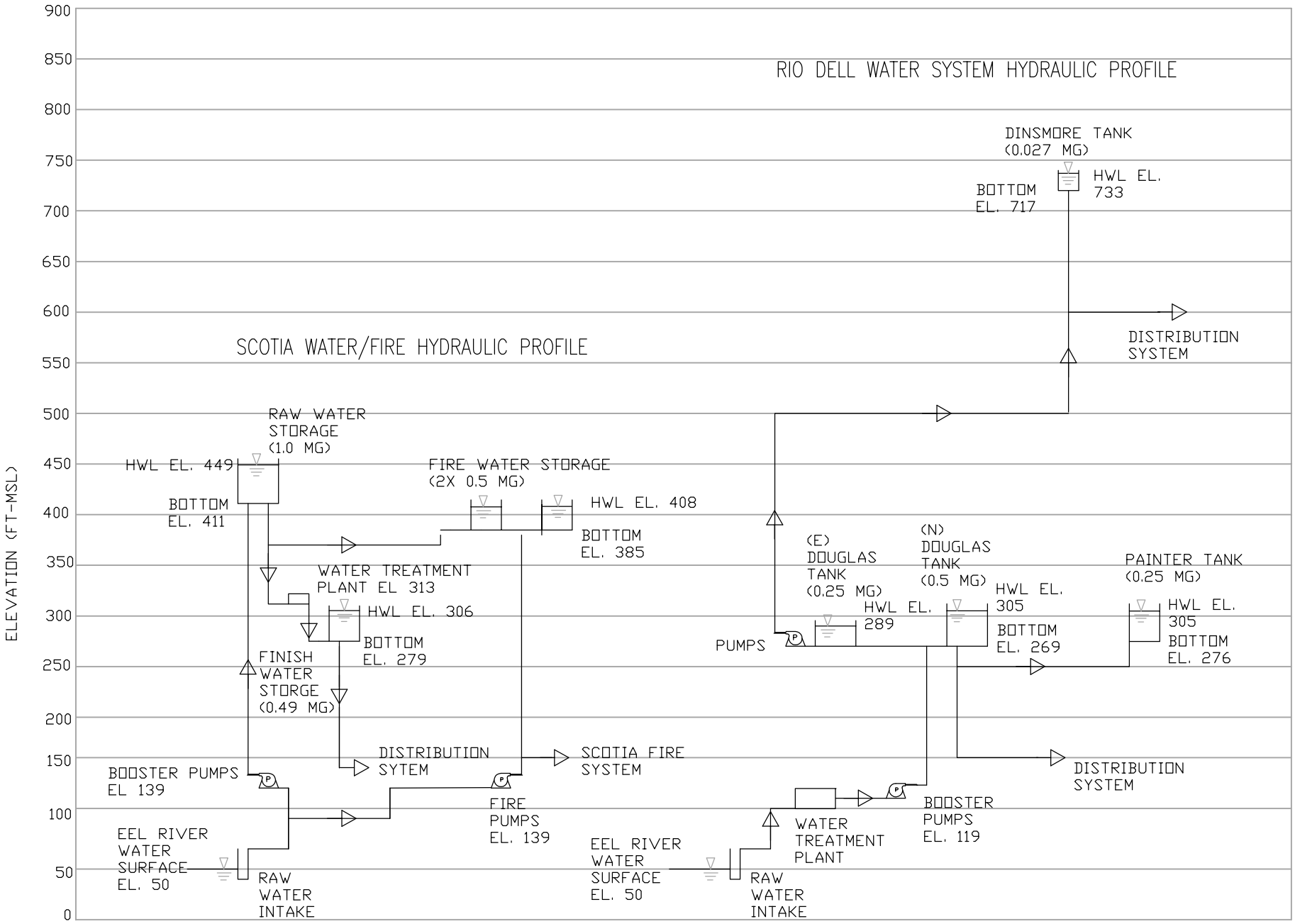

FIGURE 3 - EXISTING RIO DELL AND SCOTIA WATER AND FIRE SYSTEM HYDRAULIC PROFILES

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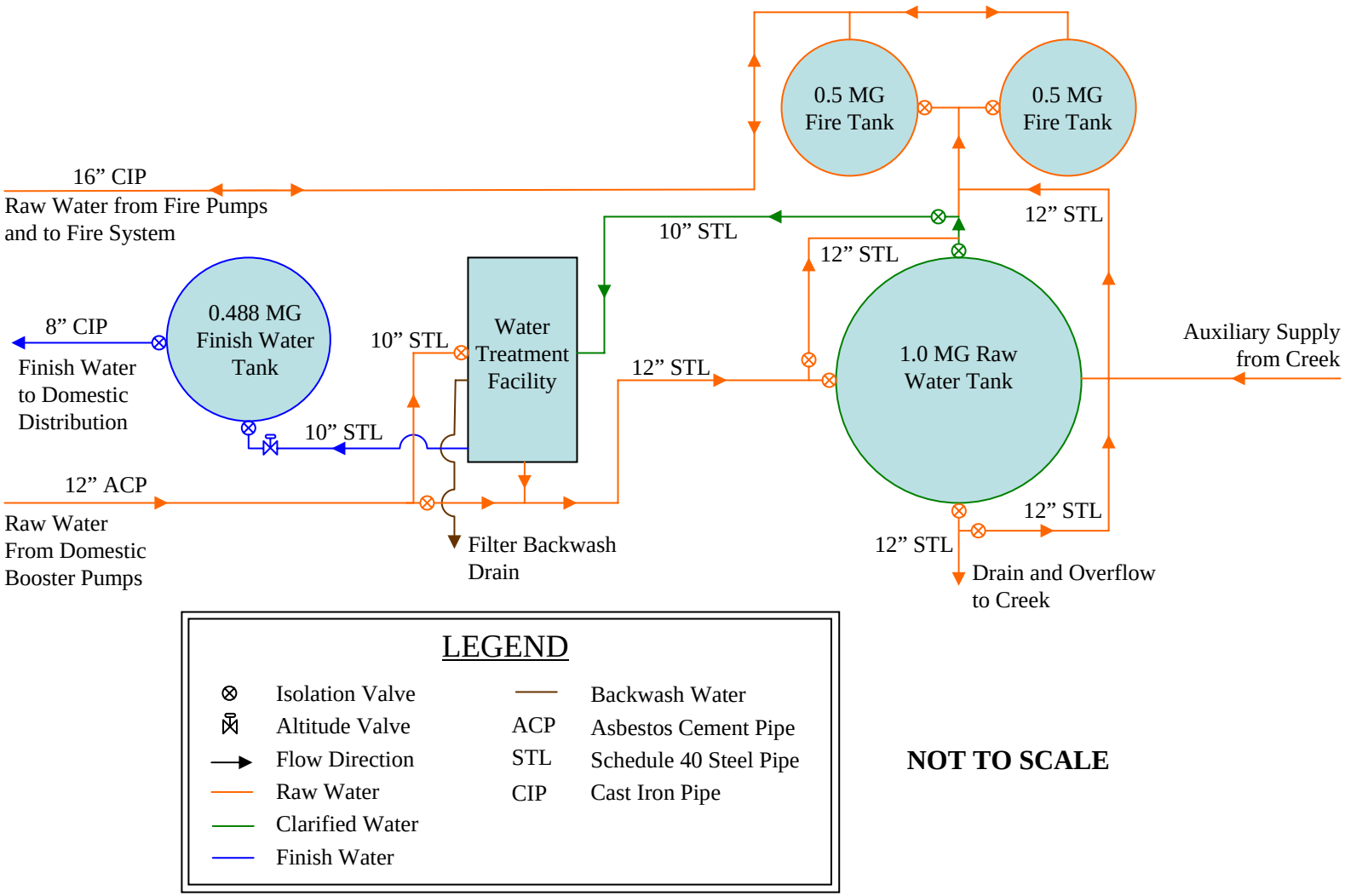

Figure 4. Flow and piping schematic of Scotia’s treatment facility and storage tank systems.

4. DEMAND AND CAPACITY

This section summarizes background data and addresses demand and capacity issues associated with PALCO's fire and domestic water systems.

4.1 Domestic Water System Demands

According to the "Year 2006 Annual Report to the Drinking Water Program for Community Water Systems Over 200 Service Connections" report submitted to the DHS, Scotia's domestic water system serves 280 residential service connections, 15 commercial users, and 20 industrial connections serving the mill areas and the power plant (PALCO, 2006). It is difficult to estimate domestic water demands in Scotia, as the majority of the system is not metered. A flow meter has been installed on the discharge end of the domestic booster pumps; however, no flow data is collected here. A flow meter is also installed at the discharge of the water treatment plant, which is recorded regularly. Tank levels are not monitored or recorded, and there are no residential meters. The mills are equipped with meters; however, the PALCO power plant only recently installed a meter in early 2006.

Production data from the treatment plant indicate that on average 411,525 gallons per day (gpd) flow into the domestic water system (SHN, 2006a). Since meters were only recently installed at the power plant, two weeks of metered data in April, a meter reading from May, and two meter readings from August were used to estimate daily water usage in the industrial areas, which was determined to be approximately 151,000 gpd. Assuming this is correct, the power plant and mills are consuming approximately 37% of all drinking water produced at the treatment plant. The remaining 63% of water produced at the treatment plant goes to serve residential and commercial users, but the majority of this water is likely unaccounted for in the form of leaks and/or unknown service connections. Visual inspections of isolation valves and valve-boxes and correspondence with PALCO staff have verified leaks in the system, as is expected for aged cast-iron and galvanized steel pipes.

An Equivalent Dwelling Unit (EDU) approach was used to estimate residential water use in Scotia. Of the 411,525 gpd produced on average at the treatment plant, approximately 151,000 gpd is metered. The remaining 260,525 gpd is unmetered upon entering the distribution system. Assuming this quantity of water serves the 280 residential, 15 commercial, and 17 industrial services (and treating each connection as an EDU), domestic water system demands are approximately 835 gpd/EDU. The California Department of Finance report on city/county population and housing estimates for 2006 estimates 2.48 persons per household (PPH) in unincorporated areas of Humboldt County (DOF, 2006). Using these values, domestic water use is estimated to be approximately 337 gallons per capita per day (gpcd). This per capita water use estimate is approximately **three times** that expected for a community such as Scotia, with mainly single-family homes.

A second approach was also used to estimate per capita water usage based on SHN and PALCO notes and information. According to SHN (2006b), PALCO staff estimates 25% of Scotia's homes are vacant (~70 homes) and approximately 800 people are currently living in Scotia. Based on this assumption, the 210 residential, 15 commercial, and 17 industrial services are

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using the 260,525 gpd of unmetered water. A persons per household estimate of 3.81 was arrived at by assuming 800 people and 210 inhabited homes. Domestic water demands using this approach are estimated at 1077 gpd/EDU and 283 gpcd. This per capita water use estimate is also approximately **two to three times** the value expected for a community such as Scotia. A comparison of the two methods is shown below in Table 4.

Table 4. Comparison of water usage estimation methods.

Statistic[1]	Method 1[2]	Method 2[3]
Residential Connections	280	210
Commercial Connections	15	15
Industrial Connections	17	17
PPH	2.48	3.81
Estimated Water Usage (gpd/EDU)	**835**	**1077**
Estimated Water Usage (gpcd)	**337**	**283**

[1] EDUs = Equivalent Dwelling Units; PPH = persons per household
[2] Method 1 = Uses DHS service connection information and CDOF PPH data
[3] Method 2 = Uses SHN (2006b) reported data.

As shown in Table 4, both approaches resulted in estimated water usages **in excess of 300 gpcd**. The two most likely contributors to this high per capita water use are unaccounted for losses from the system and excessive water use due to the fact that there is no incentive to conserve water given the lack of residential meters and the current flat rate system. Losses from the system are probably the more significant factor given the age of the pipe network, the lack of dielectric fittings, and past history with leaks.

Attempts were made to estimate the amount of water lost from the system. As noted above, there is a total of 260,525 gpd of unmetered water currently in the system. Assuming a typical use of 120 gpd for the 800 residents of Scotia, and assuming each commercial and non-metered industrial connection uses 1000 gpd, the expected water use for these service connections is approximately 128,000 gpd. Therefore, the system is using about 133,000 gpd in excess of what would be expected under typical water use conditions.

4.2 Fire System Demands

In addition to filling the two 0.5 MG fire flow tanks located on the hill above Scotia, the fire system also supplies raw water to the cogeneration power plant. A new meter was recently installed at the power plant in April 2006, and the current estimate of raw water use at the plant totals 354,000 gpd, or approximately 246 gpm averaged over a 24 hour period. This represents a baseline demand for the fire system. The system has more than adequate capacity to meet minimum fire flow and duration requirements of 1500 gpm for 5 hours in residential, commercial, and industrial areas of Scotia in addition to supplying the power plant.

5. CITY STANDARDS

Two references were used to establish baseline standards for water distribution systems in order to determine what improvements would be required of Scotia's water systems prior to the proposed annexation by the City. The City's Standard Improvement Specifications, herein

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referred to as the "City Standards", were used to determine City requirements and specifications for water distribution systems, including materials, installation, and design criteria. Sections of the City Standards applicable to water distribution systems and fire protection are included with this technical memorandum as Appendix A.

Chapter 16 of Division 4 of Title 22 of the California Code of Regulations, titled California Waterworks Standards, was also referenced to establish minimum requirements and specifications for water distribution systems. These standards state that water mains shall be installed at least ten feet horizontally from and one foot higher than sanitary sewers located parallel to sewer mains, and one foot higher than sanitary sewers crossing the water main. Separation distances are measured from the nearest edges of the facilities. Applicable sections of the California Waterworks Standards have been included as Appendix B.

The City Standards met all California Waterworks Standards, and in some cases called for more stringent requirements. Some City Standards and specifications stand out with particular importance in the potential annexation of Scotia. These include:

- The City Standards state a minimum pipe size of 6-inch diameter for distribution facilities. Four-inch pipe is acceptable, upon approval by the City Engineer, if the main is serving cul-de-sacs or courts serving less than seven connections.
- The distribution facilities, wherever possible, should be in grid form for pressure equalization.
- Water mains must have sufficient valving to prevent the shutdown of transmission mains or the removal of more than 500 feet in length of pipe.
- Fire hydrants must have a maximum normal spacing of 500 feet in residential areas and 300 feet in commercial areas. Not more than one hydrant is allowed on a 6-inch main between intersecting lines, and not more than two hydrants are allowed on an 8-inch main between intersecting lines.

6. REQUIRED IMPROVEMENTS TO MEET CITY STANDARDS

This section discusses required improvements needed to bring Scotia's water systems up to conditions that meet City Standards before the City of Rio Dell takes over operation and maintenance through annexation. Several alternatives were considered in the process of selecting the best solution for all stakeholders involved. These included:

1) City annexes the entirety of both the existing domestic and fire systems and combines both systems into a single distribution system following treatment. PALCO receives the same treated water for domestic use, industrial use, and fire protection. PALCO decides whether to combine their domestic and fire systems or not.
2) City annexes the entirety of both the existing domestic and fire systems and maintains them as separate systems. Only the domestic system undergoes treatment. PALCO's water use is metered from both systems.
3) City combines elements of existing fire and domestic water systems into a single system owned, operated, and maintained by the City that meets domestic demands and provides fire protection for annexed service areas (not including industrial areas). PALCO would

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retain ownership of the fire storage tanks and components of the fire system serving the industrial areas. Raw water usage would be metered by Rio Dell prior to the fire booster pumps. Rio Dell would provide and meter domestic water usage by PALCO.

The third alternative presented above was preferred for several reasons. This alternative allows PALCO to retain ownership and autonomy of its fire system and allows the City to incorporate useful elements of both systems into a single, combined system, which will be easier and less expensive to operate and maintain. The following section discusses the preferred alternative further.

6.1 The Proposed Alternative

The proposed alternative involves Rio Dell annexing and combining several elements of Scotia's existing domestic and fire water systems currently serving residential and commercial areas into a single distribution system. Portions of both systems will either be abandoned or annexed by the City, while PALCO will retain ownership and responsibility of sections serving PALCO's industrial properties. Installation of new transmission mains are recommended in certain areas needed to tie together separate portions of the system. PALCO will retain ownership of its fire and domestic water infrastructure on its industrial properties, in addition to piping from the fire booster pumps to the two 0.5 MG fire water storage tanks, the tanks themselves, and the outlet piping from the tanks to PALCO's existing industrial fire system. Its fire system will be hydraulically separated from the proposed water system for Scotia. A reduced pressure backflow preventer should be placed on the fire system after the bifurcation and before the booster pumps. PALCO's domestic water system will be served and metered by the City of Rio Dell through multiple connections to Scotia's combined water system. PALCO's fire water usage will be metered prior to the fire booster pumps.

Construction of a new transmission main intertie between the City's existing water system and the proposed Scotia system is recommended. Two main locations were considered – the U.S. Highway 101 bridge and the Scotia – Rio Dell bridge. The U.S. Highway 101 bridge is recommended due to its more recent construction and enhanced design to withstand seismic activity and floods. Additionally, the 101 bridge is of a box-girder design, which facilitates the installation of a water main. Figure 5 below shows the conceptual, proposed pipe alignment for the intertie between Scotia and Rio Dell.

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Figure 5. Approximate alignment of inter-tie between Scotia and Rio Dell water distribution systems.

6.1.1 Proposed Alternative – Areas of Concern

This section lists the performance limiting factors that were identified for this alternative during the course of this study. Below each problem is a recommendation in *italics* that may reduce or eliminate the problem. No priority is given to problems and recommended solutions.

Problem 1: The existing intake facilities provide raw water for both the existing fire and domestic water systems. Although the City of Rio Dell would assume ownership, operation, and maintenance of the raw water intake facilities, both the City and PALCO will be contributing to wear and tear on these facilities.

Recommendation 1: *A rate analysis must be performed to determine an appropriate rate the City could charge per unit of water that would recoup PALCO's proportion of operation and maintenance costs associated with PALCO's use of the infiltration gallery, collection well, raw water pumps, and piping to the meter located prior to the fire booster pumps.*

Problem 2: PALCO currently has a License for Diversion and Use of Water from the Eel River as outlined in Application A005504, Permit 003027, License 006373 from the Division of Water Rights. PALCO has a license to remove up to 7.1 cubic feet per second from the Eel River. A transfer of license will be required before the City annexes and assumes responsibility over Scotia's water systems.

Recommendation 2: *The City of Rio Dell must acquire said License for Diversion and Use of Water from PALCO. Carlson (2006), in the Watershed Unit 1 Permitting Section of the State Water Resources Control Board, Division of Water Rights, stated that a license can easily be transferred between parties by filing a Notice of Assignment with the Division of Water Rights. The assignment of the right, title, and interest in the application, permit, and license is all or none. Therefore, the City and PALCO must reach agreement concerning the share of water that PALCO is entitled to and that the City is committed to providing.*

Since PALCO's license has a purpose of use of industrial and domestic, the City of Rio Dell could file a Petition for Change to change the purpose of use from domestic to municipal, which allows more flexibility in providing water for commercial and outdoor landscaping water uses. Proper environmental documentation, such as a CEQA Negative Declaration, has to accompany the petition in addition to a $1000 fee for the SWRCB and an $850 fee for the Department of Fish and Game.

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Problem 3: Scotia's existing domestic water system consists mainly of 2-inch steel pipe, which does not meet current City Standards for minimum pipe diameter in distribution systems. As discussed in Section 6 of this report, the City requires a minimum pipe size of 6-inch diameter for distribution facilities. However, 4-inch pipe can be used to serve cul-de-sacs and courts serving less than seven homes upon approval by the City Engineer.

Recommendation 3: *The majority of the 2-inch steel pipe in the current domestic water distribution system was installed around the 1930's. These pipes do not meet current City Standards for minimum pipe diameter. Additionally, considerable losses are believed to be occurring in the system. Head (2006) noted that significant losses are probably occurring at the junctions of the 2-inch steel pipes and copper service lines, as no dielectric unions were used and considerable galvanic corrosion has likely occurred at these locations. The City should replace 2-inch diameter steel pipe within annexed service areas to 6-inch diameter pipe or larger.*

Problem 4: The City will have to monitor PALCO's water use in both the domestic and fire water systems.

Recommendation 4: *Install a flow meter prior to the fire booster pumps to monitor raw water use. Install flow meters at all points of connection between Scotia's proposed distribution system and PALCO's domestic system.*

Problem 5: PALCO's emergency, back-up fire booster pumps pump water from the log pond directly into the existing fire system at a location after the main fire booster pumps. There exists the potential for contamination due to this cross-connection (the 20" CI pipe from the collection well splits to the fire booster pumps and to the domestic booster pumps) between the domestic water distribution system and PALCO's emergency fire water storage in the case of a loss of pressure.

Recommendation 5: *Install appropriate backflow prevention devices, if not installed already, with the proposed new meter on the fire system line, where the intake pipe from the collection well splits into the fire and domestic water systems.*

Problem 6: Portions of the existing fire and domestic water systems are located on existing residential and commercial properties, which would become private property if and when PALCO sells these properties. In some cases, pipes may even be located under existing buildings and/or homes. This could create issues for serviceability and maintenance as the City would not have access to these areas through right of ways or easements.

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Recommendation 6: *Any pipes located on private property, other than service laterals from existing or proposed transmission mains, must be abandoned and replaced with new mains in the City right of way, as these pipes would be impossible to access when repairs and/or maintenance were required.*

Problem 7: PALCO will own, operate, and maintain piping from the fire booster pumps to the fire water storage tanks and the outlet piping from the existing tanks to its proposed fire water system on its industrial properties.

Recommendation 7: *PALCO must obtain an encroachment permit from the City Department of Public Works to access infrastructure in the public right-of-way in case of maintenance requirements.*

Problem 8: The City will own, operate, and maintain piping infrastructure from the raw water intake to the domestic booster pumps and from the pumps to the 1 MG raw water storage tank. Sections of this piping and the domestic booster pump are located on private properties/industrial areas owned by PALCO. Additionally, the proposed U.S. Highway 101 pipe crossing to intertie Scotia's and Rio Dell's water systems will be located on Caltrans right of way.

Recommendation 8: *The City must obtain an easement from PALCO to access the infrastructure located on private properties in case of maintenance requirements. Another option might involve relocation of the pumps along with some piping alignment; however, this might also require resizing of the pumps depending on the elevation of the relocation site.*

An encroachment permit will be required from Caltrans to install the water main in the public right-of-way on the U.S. Highway 101 bridge.

Problem 9: The City will have no ability to meter water usage in the residential or commercial areas of Scotia, as no water meters exist in these areas.

Recommendation 9: *Install meters meeting current City standards at every residential and commercial service connection in the domestic water system. Monitoring water use will also facilitate identification of leaks.*

Problem 10: Most service lines in Scotia are copper pipe and are connected to steel pipes in the distribution system without any kind of dielectric couplings. Head (2006) noted significant corrosion has likely occurred at the steel end of these unions as a result of galvanic corrosion over the years.

Recommendation 10: *Replace all copper service lines with polyethylene or other approved material.*

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Problem 11: PALCO currently has a permit to operate surface gravel extractions on the Eel River. Currently, the County of Humboldt is the lead agency and is responsible for issuing conditional use permits to PALCO to operate. The City would like to exclude any gravel mining activities from the direct vicinity surrounding the infiltration gallery due to potentially adverse impacts on water quality at the raw water intake.

Recommendation 11: *In the case that the City annexes the intake facilities, then they would assume the role of lead agency, upon approval of SMARA ordinances by the State, and would become responsible for issuing new conditional use permits to PALCO for its gravel extraction operations. Any new conditional use permits would have to assure protection of the City's water intake facilities and raw water quality at the intake facilities. In addition, SMARA law Public Resources Code Section 2773 does not allow in-stream mining activities to undermine community water system facilities.*

Problem 11: The pumps currently located in the collection well and domestic water booster station are 2.4 kV, 3 phase power. All existing power lines will be abandoned and removed, and PG&E will be installing new power lines (most likely 1.2 kV) throughout Scotia.

Recommendation 11: *The pump motors must be replaced with motors that are compatible with the new power source. An alternative to this would be purchasing transformers that could convert the voltage from 1.2 kV to 2.4 kV.*

Problem 12: The majority of fire hydrants in Scotia's residential and commercial areas are of a dry barrel type.

Recommendation 12: *Replace all dry barrel fire hydrants within areas proposed for annexation with new, wet barrel hydrants.*

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6.1.2 WaterCAD Hydraulic Model

A hydraulic model of the proposed combined water distribution system was developed using the Haestad Methods WaterCAD v7.0 water distribution modeling and management software. The model was used to simulate both the existing fire system and proposed, combined distribution system. The model was developed out of concern that fire flows would be negatively impacted by dropping the fire flow storage from the two 0.5 MG fire storage tanks to the 0.488 MG finished water storage tank (an approximate 106 foot drop) and also by separating the existing fire system in various locations so PALCO can retain an independent fire system.

Some fire flow test data obtained in the field with PALCO staff were used to calibrate a hydraulic model of the existing fire system. The model was calibrated by altering the C-factor of the cast-iron piping network. Calibrated values ranged between 75 and 110, which is within the

range of expected values for aged cast-iron pipe. The model's outputted available fire flows at a minimum 20 psig matched what was calculated from pressures and flows measured in the field within an acceptable tolerance.

A hydraulic model of the new, proposed system was developed by changing a few items in the calibrated model of the existing system. First, the finished water storage tank was used instead of the fire flow storage tanks. Second, parts of the distribution system to remain in PALCO's hands were removed from the model. Third, new pipe was included in the model to serve areas of the system now inaccessible due to separation of PALCO's proposed fire system. The hydraulic model revealed that the proposed system will provide adequate fire flows of a minimum of 1500 gpm for the minimum duration of four hours throughout the proposed areas of annexation. The new, proposed system will meet City Standards for minimum fire flow and duration requirements.

7. CONCEPTUAL LAYOUT OF PROPOSED SYSTEM

Conceptual layouts of the proposed water system are shown in Figure 6, Figure 7, and Figure 8. Figure 6 and Figure 7 show which sections of the existing fire and domestic water systems, respectively, are proposed for annexation, abandonment, or PALCO ownership. Areas where construction of new domestic water lines are proposed are also shown. Figure 8 presents the recommended, combined domestic and fire system that will become responsibility of the City in the case of annexation (piping on PALCO's properties is not shown). This figure makes it easier to identify points of connection between the previously separated systems that may not be apparent when viewing Figure 6 or Figure 7 alone.

Table 5 provides an approximate inventory of the existing quantities of pipe proposed for annexation, abandonment, and construction in both the domestic and fire systems. Table 6 presents our opinion of the probable costs for construction of the proposed improvements.

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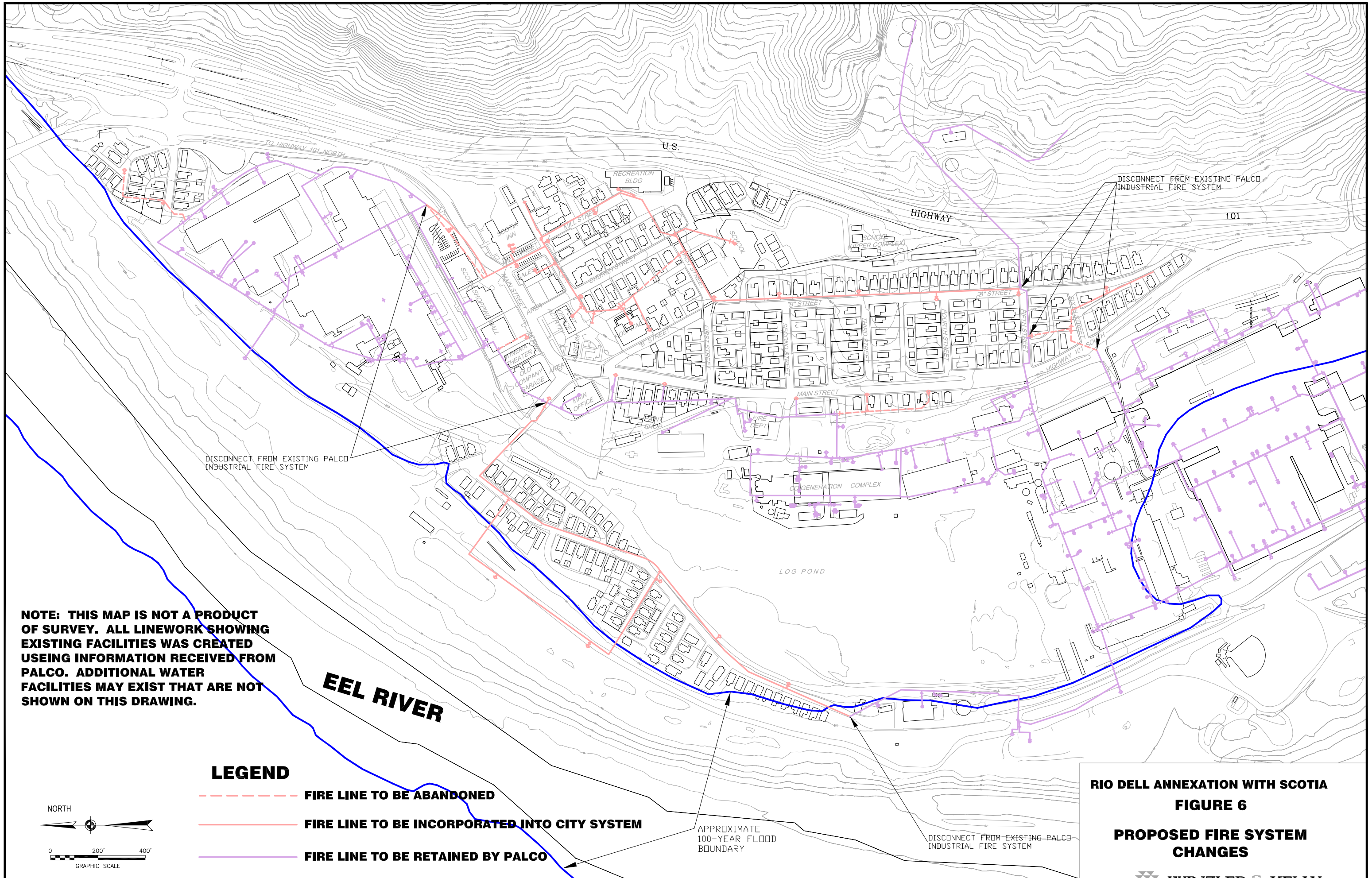


NOTE: THIS MAP IS NOT A PRODUCT OF SURVEY. ALL LINEWORK SHOWING EXISTING FACILITIES WAS CREATED USEING INFORMATION RECEIVED FROM PALCO. ADDITIONAL WATER FACILITIES MAY EXIST THAT ARE NOT SHOWN ON THIS DRAWING.

LEGEND

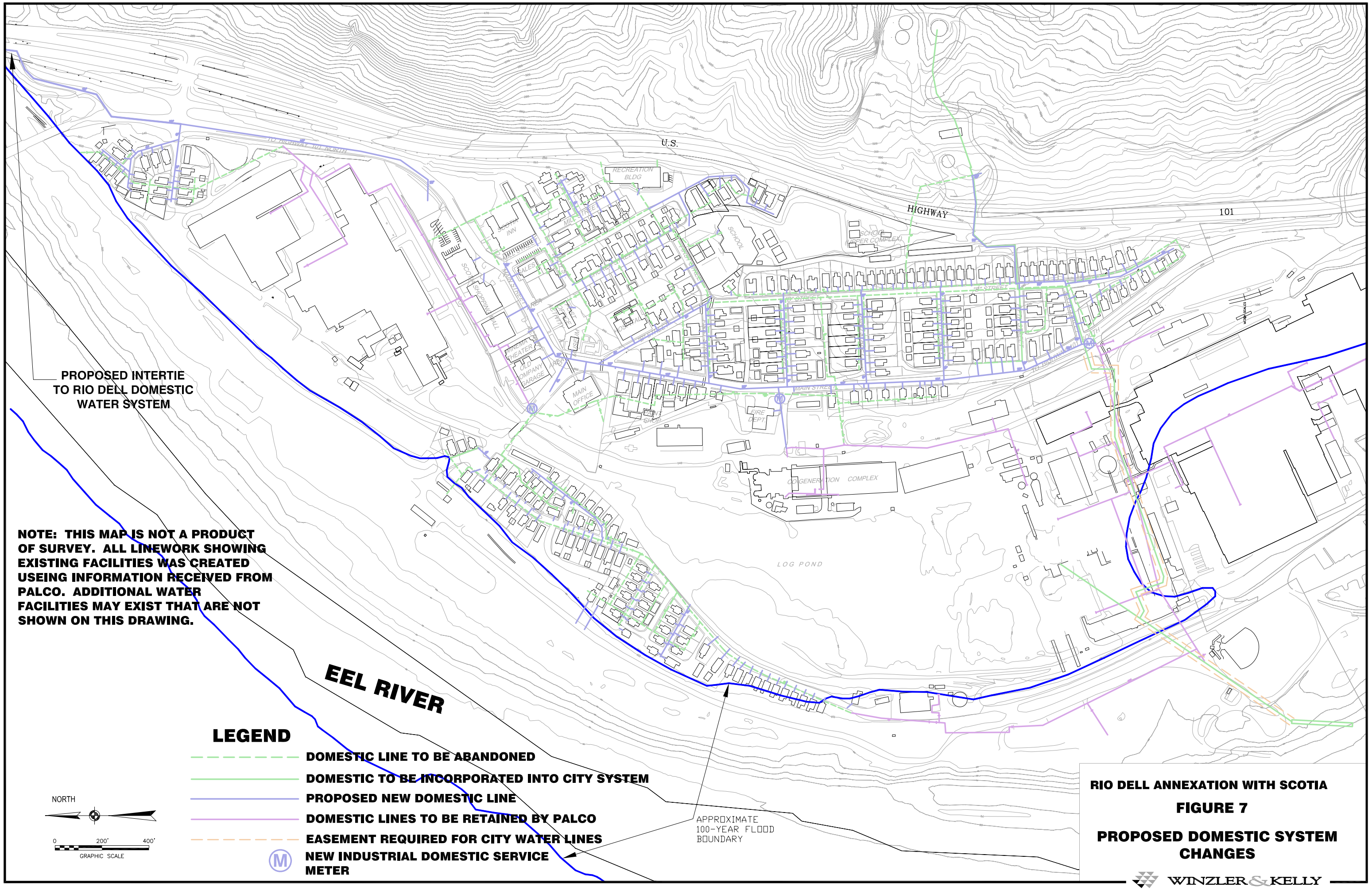
- FIRE LINE TO BE ABANDONED
- FIRE LINE TO BE INCORPORATED INTO CITY SYSTEM
- FIRE LINE TO BE RETAINED BY PALCO

RIO DELL ANNEXATION WITH SCOTIA

FIGURE 6

PROPOSED FIRE SYSTEM CHANGES

WINZLER & KELLY


U.S.
HIGHWAY
101
RECREATION BLDG
SCHOOL
SCHOOL (UPPER COMPLEX)
INN
SALES
SCOTIA SHOPPING MALL
THEATER
OLD COMPANY GARAGE
MAIN OFFICE
SHOP
FIRE DEPT
MAIN STREET
COGENERATION COMPLEX
LOG POND
EEL RIVER
PROPOSED INTERTIE TO RIO DELL DOMESTIC WATER SYSTEM
NOTE: THIS MAP IS NOT A PRODUCT OF SURVEY. ALL LINEWORK SHOWING EXISTING FACILITIES WAS CREATED USEING INFORMATION RECEIVED FROM PALCO. ADDITIONAL WATER FACILITIES MAY EXIST THAT ARE NOT SHOWN ON THIS DRAWING.
LEGEND
DOMESTIC LINE TO BE ABANDONED
DOMESTIC TO BE INCORPORATED INTO CITY SYSTEM
PROPOSED NEW DOMESTIC LINE
DOMESTIC LINES TO BE RETAINED BY PALCO
EASEMENT REQUIRED FOR CITY WATER LINES
NEW INDUSTRIAL DOMESTIC SERVICE METER
APPROXIMATE 100-YEAR FLOOD BOUNDARY
NORTH
0 200' 400'
GRAPHIC SCALE
RIO DELL ANNEXATION WITH SCOTIA
FIGURE 7
PROPOSED DOMESTIC SYSTEM CHANGES
WINZLER & KELLY
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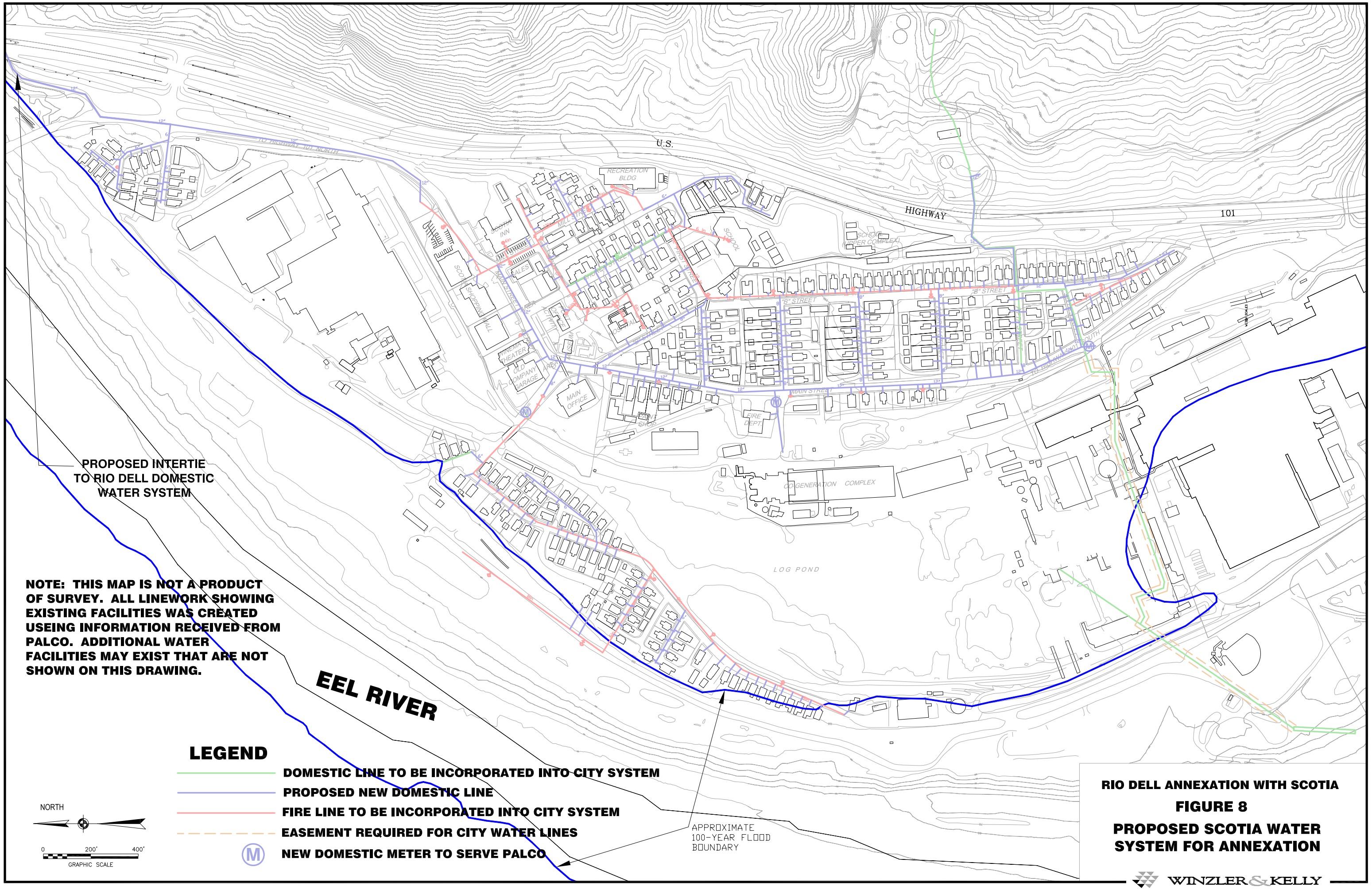

NOTE: THIS MAP IS NOT A PRODUCT OF SURVEY. ALL LINEWORK SHOWING EXISTING FACILITIES WAS CREATED USEING INFORMATION RECEIVED FROM PALCO. ADDITIONAL WATER FACILITIES MAY EXIST THAT ARE NOT SHOWN ON THIS DRAWING.

LEGEND

- DOMESTIC LINE TO BE INCORPORATED INTO CITY SYSTEM
- PROPOSED NEW DOMESTIC LINE
- FIRE LINE TO BE INCORPORATED INTO CITY SYSTEM
- EASEMENT REQUIRED FOR CITY WATER LINES
- (M) NEW DOMESTIC METER TO SERVE PALCO

RIO DELL ANNEXATION WITH SCOTIA

FIGURE 8

PROPOSED SCOTIA WATER SYSTEM FOR ANNEXATION

WINZLER & KELLY

Table 5. Inventory of pipe quantities proposed for different actions.1

Water System	Action Item	Pipe Diameter (in)	Unit[2]	Quantity
Domestic Water	Annex	4	LF	0
		6	LF	450
		Unknown	LF	420
	Abandon	2	LF	6370
		2.5	LF	1,900
		4	LF	1,940
		6	LF	910
		8	LF	680
		Unknown	LF	10,040
	New Install	6	LF	2,780
		8	LF	2,050
		12	LF	3,730
Fire	Annex	6	LF	2,050
		8	LF	3,450
		10	LF	290
		12	LF	2,320
	Abandon	6	LF	810
		8	LF	340
		10	LF	580
		12	LF	170

[1] All quantities are approximate and based on best available information.
[2] LF = linear feet

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Table 6. Opinion of probable costs for proposed improvements.

Action Item	Unit[1]	Quantity[2]	Unit Cost ($)	Total Cost ($)[3]
Furnish & Install New 6”	LF	2,780		
Furnish & Install New 8”	LF	2,050		
Furnish & Install New 12”	LF	3,730		
Furnish & Install New Services	EA	300		
Furnish & Install New Water Meters/Box/Lid	EA	300		
Furnish & Install Valving & Appurtenances for Connections Between Systems	EA	38		
Furnish & Install New Hydrants	EA	18		
Cut Abandoned Pipes and Install Caps/Plugs	EA	12		
			Subtotal	
			Estimating Contingency @ 25%	
			Engineering Legal & Admin @ 25%	
			Total Project Cost	

[1] LF = linear feet; EA = each
[2] All quantities are approximate and based on best available information.
[3] All costs rounded to nearest thousand.

DRAFT

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SHN Consulting Engineers & Geologists, Inc. (2006b). Response to July 28, 2006, Review Comments on the “PALCO Scotia Wastewater Treatment Facility Assessment of Conditions Technical Memorandum.” Prepared for Winzler & Kelly. August 21, 2006. Eureka, CA.

Appendix A

City of Rio Dell Standards

CITY OF RIO DELL

STANDARD IMPROVEMENT SPECIFICATIONS

ARTICLE I - IMPROVEMENT REQUIREMENTS

SECTION I-1 STANDARDS AND APPROVAL

A. All improvements hereinafter mentioned shall conform to these Standard Improvement Specifications as prepared by the City Engineer, recommended by the Planning Commission, and adopted by the City Council.

B. Improvement work shall not be commenced until all plans and specifications for such work have been prepared by a registered Civil Engineer and have been submitted to and approved by the City Engineer and the Public Works Director. The plans shall be submitted together with a plan checking fee, the amount of which shall be estimated by the City at the time of filing said plans and specifications. The City shall estimate the cost for providing the plan checking service and the subdivider shall deposit an amount equal to the estimate, however, at the conclusion of the City's efforts a final cost shall be computed and the subdivider shall pay the difference between the original deposit and final costs. All plans and specifications provided by the subdivider shall be prepared in accordance with requirements of the City Engineer.

C. Improvement work shall not be commenced until the City Engineer or Public Works Director has been notified in advance and if work has been discontinued for any reason, it shall not be recontinued until the City Engineer or Public Works Director has been notified.

D. All required improvements shall be constructed under the inspection of and to the approval of the City Engineer and Public Works Director. The City Engineer may require tests to be performed on any specific item of improvement work and such tests shall be conducted at the sole expense of the subdivider.

E. It shall be the responsibility of the subdivider that all underground utilities, sanitary sewers, watermains and storm drains installed in streets, service roads, alleys or highways shall be constructed prior to the surfacing of such streets, service roads, alleys, or highways. Service connections for all underground utilities, and sanitary sewers and water mains shall be placed at sufficient length to obviate the necessity for disturbing the street or alley improvements when service connections thereto are made.

lateral connection extending to the right-of-way line to serve each lot within the subdivision. Sanitary sewer lines, appurtenances, and service connections shall be constructed or laid to grades approved by the City Engineer and shall be of such size and design as he prescribes.

1. Where sanitary sewers are not available immediately adjacent to the proposed subdivision, the Planning Commission and City Council may require the construction of off-site sewer lines and appurtenances as may be necessary to permit connection to the City's sanitary sewer system.

2. Where sanitary sewers are not reasonably available, provisions shall be made for a temporary wastewater treatment facility to ultimately connect to the City sanitary system.

Notwithstanding the provisions of Paragraphs 1 and 2 of this Section, connection to the City sanitary sewer system shall be made in accordance with policies and ordinances as adopted by the City Council.

G. Drainage Works. The subdivider shall provide such drainage structures, including storm sewers, drainage channels and drainage pumps, as may be necessary for adequate drainage of surface and storm waters, and further including means for the disposal of surface and storm waters generated by the subdivision. Disposal of surface and storm waters into drainage wells or sewer lines shall not be permitted. Drainage facilities shall be installed as required by the City Engineer. The subdivider shall provide all easements necessary to accomplish the requirements of adequate drainage to existing drainage facilities or to natural creeks or drainage swales.

H. Water. Adequate water supply and distribution system, water mains and fire hydrants connected to the water system serving the City of Rio Dell shall be installed by the subdivider, subject to the approval of the City Engineer. Where further development appears probable beyond the proposed subdivision, the subdivider may be required to install larger water mains to handle such additional development. Where additional storage facilities or pumps are required to serve the development, the developer may be required to have such facilities constructed at his sole expense.

SECTION I-5 EASEMENTS

Where necessary or required by the City Engineer, the subdivider shall grant easements in any subdivision not less than ten (10) feet in width, for public utility, sanitary sewer and drainage purposes on each side of rear lot lines, along side lot lines, and in planting strips wherever necessary, provided easements of lesser width may be allowed when at the determination of the City Engineer that the purposes of the easements may be accomplished by easements of lesser width and provided further that in such determination the City Engineer shall prescribe the width of such easement. Dedication of easement shall be to the City for the purpose of installing utilities, planting strips and for other public purposes as may be ordered or directed by the City Council. The final map of a subdivision shall show the side lines of all easements to which the lots are subject. The easements must be clearly labeled and identified and if already of record, its recorded reference given.

ARTICLE II SUBDIVISION AGREEMENT

SECTION II-1 SUBDIVISION AGREEMENT - GENERAL

Upon the approval of the City Council of the final map of the subdivision, the subdivider thereof shall execute and file an agreement between himself and the City specifying the period within which he shall complete all improvement work to the satisfaction of the City Engineer, and providing that if he shall fail to complete such work within such period the City may complete such work and recover the full cost expense thereof from the subdivider. The Agreement shall also provide for inspection of the improvement by the City Engineer, and reimbursement of the City by the subdivider for the cost of such inspection. Such Agreement may also provide:

(a) For the construction of the improvements in units.

(b) For extension of time under conditions therein specified.

(c) For the termination of the Agreement upon completion of proceedings under an Assessment District Act for the construction of improvement deemed by the City Engineer to be at least the equivalent of the improvements specified in such Agreement and required to be constructed by subdivider.

The distribution system shall be equipped with a sufficient number of valves so that no single shutdown will result in shutting down a transmission main, or necessitate the removal from service of a length of pipe greater than five hundred (500') feet in length and in no case should more than two fire hydrants be removed from service.

Service lines from the water main to the property line shall be installed at the time the main is constructed to avoid frequent cutting of the street. Single and double service lines shall be 3/4-inch and 1-inch respectively, in diameter, however, approval of the Director of Public Works will be required prior to the use of any double service connection.

Concrete anchors or thrust blocks shall be provided at all bends of 22-1/2 degrees or more, behind trees and fire hydrants, and behind crosses which are valved in such a manner that they can be used as tees.

Installation, materials of construction and testing shall be in accordance with the Standard Plans and specific Specifications set forth in Appendix A hereto.

SECTION V-4 FIRE HYDRANTS

Fire hydrants shall be installed at all locations required by the City Engineer and shall be of the type and style conforming with the standards of the City. Generally, fire hydrants shall be required at all street intersections and shall be located to minimize the hazards damaged by traffic. They shall have a maximum normal spacing of five hundred (500') feet in residential areas and three hundred (300') feet in commercial areas measured along the street frontage. Not more than one hydrant shall be placed on a 6-inch main between intersecting lines and not more than two hydrants on an 8-inch main between intersecting lines. The pipeline connecting the hydrant and the main shall be 6-inch, with a gate valve installed between the main and hydrant.

ARTICLE VI - SANITARY SEWERS

SECTION VI-1 GENERAL

Sanitary sewers shall be designed in conformance with the criteria established by the American Society of Civil Engineers in the manual of Engineering Practices No. 37, Design and Construction of Sanitary and Storm Sewers, as amended an in conformance with the Plans and Specifications set forth herein. Additionally, all applicable requirements of the Uniform Building Code shall apply.

SECTION VI-2 SEWER PLANS

Sewer plans indicating the location and size for the proposed lines and their profiles shall be prepared by a Registered Civil Engineer. Such plans shall indicate the size and type of material proposed, the character, width and depth of lines, manholes, lift stations and other appurtenances and shall indicate locations of existing sewers and the method of interconnecting with the new facility. All such plans shall be approved by the City Engineer.

SECTION VI-3 MATERIALS, INSTALLATION AND TESTING

The acceptability of all materials to be placed in the sanitary sewer system, the method of installation and the required testing shall be in conformance with the accepted practices of the City of Rio Dell and the General Plans and Specifications appended hereto.

16.03 Expansive Soil: Attention is directed to the requirements of providing base material under curb and sidewalks in those areas where the soil reports indicate the presence of expansive soils.

17. S E W E R S

17.01 Description: The sanitary sewers for the subdivision shall be constructed in accordance with the plans as approved by the City Engineer. All plans shall be signed by a registered civil engineer under whose direction the plans and specifications were prepared.

This section is for the purpose of defining the minimum requirements for the construction of sanitary sewers and is not intended to prohibit the use of any material or method of construction not specified herein provided such alternate is approved by the City Engineer.

17.02 Scope of Work: The work under this section shall include all work required to complete the construction and testing of all facilities necessary for the satisfactory operation and protection of the system as shown on the plans.

17.03 Sewer Pipe: All sizes of sewer pipe shall conform to the applicable requirements of Section 71-1.02 of the latest revision of the Standard Specifications excluding Sections 71-1.02A, 1.02B, 1.02D, 1.02F and 1.02L.

17.04 Installation: The installation of on-site main lines and outfalls shall be within the dedicated road right-of-way except where easements are necessary to provide a gravity flow system, and shall be in accordance with requirements and standards of the City of Fortuna.

17.05 Manholes and Structures: All manholes and structures, either precast or built-up to be installed within the roadway, shall be designed for a minimum AASHO H-20 highway loading and shall conform to the requirements of the Improvement Standards and to Sections 70-1.02H and 71-1.07 of the Standard Specifications.

17.06 Sewer Connections: Unless otherwise permitted by the City Engineer, sewer connections shall be laid in straight lines from the main sewers to a point beyond the curb or to the property line at the time of the laying of the mains in accordance with the approved sewer plans or Improvement Standards.

The Contractor shall place "Y" branches of the size and in the positions shown on the approved plans, and the house connection lines shall be placed to the lines and grades shown thereon. Connections to be stubbed off shall be closed at their outer end with an approved stopper and cement grout.

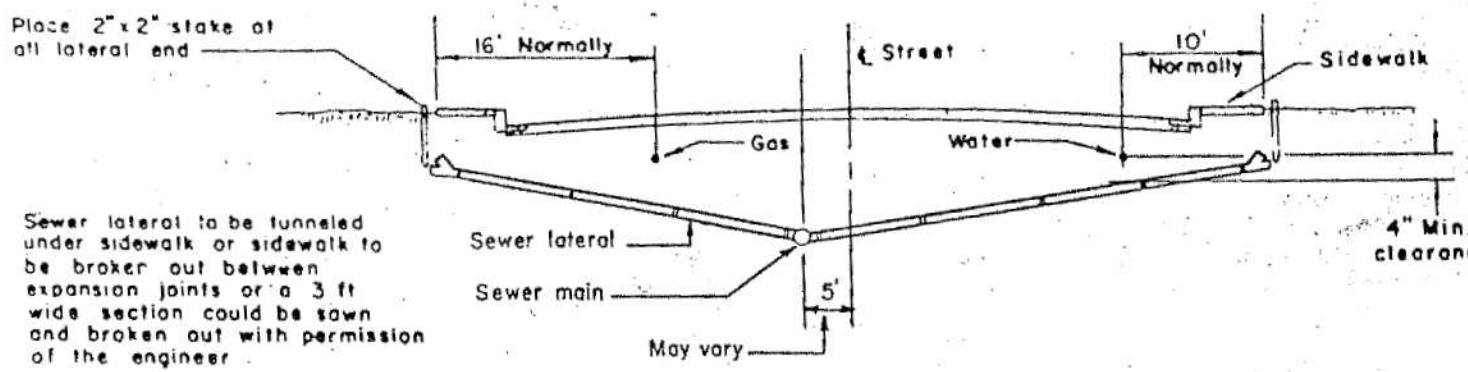
Connections to an existing sewer shall be made by the use of saddles. The saddle shall be fitted to the pipe and a hole that exactly fits the saddle shall be carefully cut into the main sewer line. The edges of the hole shall be carefully trimmed of projections and care exercised to prevent trimmings from entering sewer. The entire assembly then shall be cemented to the pipe and a band of concrete poured that entirely surrounds the sewer at the point of installation of the saddle.

17.07 Testing of Sewers: After completion of construction of sewers and manholes, the system shall be water tested in accordance with Section 71-1.08 of the Standard Specifications, with a minimum of 4' head. However, the maximum amount of exfiltration or infiltration by the tests shall not exceed 50 gallons per inch of pipe diameter per mile of pipe per day for AC or PVC pipe nor 200 gallons per inch of pipe diameter per mile of pipe per day for vitrified clay.

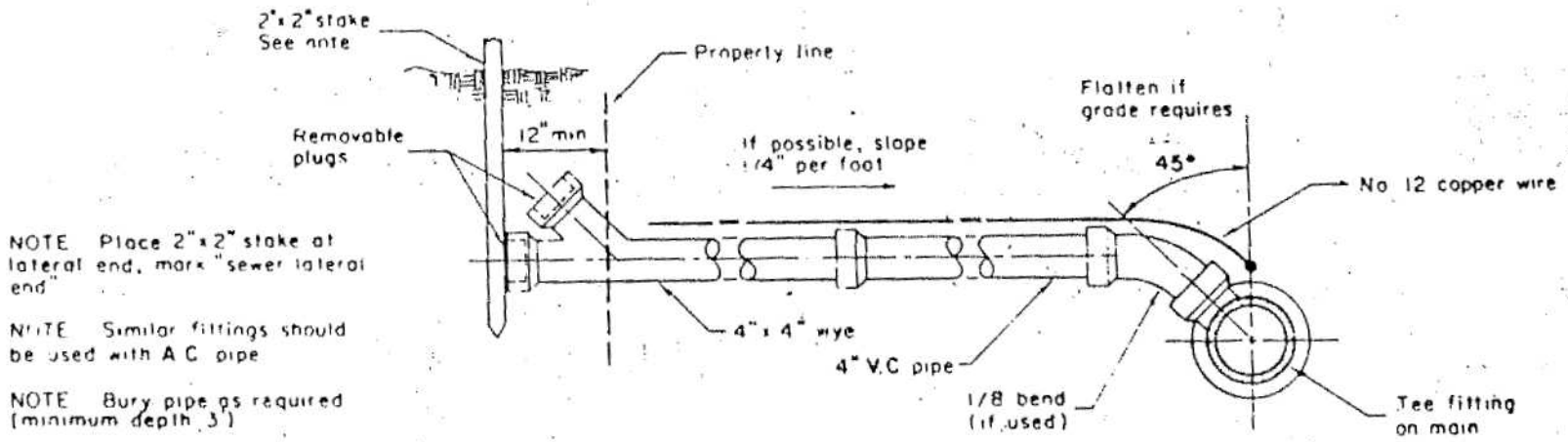
18. WATER PIPELINES

19.01 Description: The water supply system for the subdivision shall be constructed in accordance with the plans as approved by the City Engineer. All plans shall be signed by a registered civil engineer under whose direction the plans and specifications were prepared.

This section is for the purpose of defining the minimum requirements for the construction of water supply and distribution systems and is not intended to prevent the use of any material or method of construction not specified herein provided such alternate is approved by the City Engineer. Water facilities shall be designed and constructed in accordance with the applicable requirements of the California Section of the AWWA and the City of Rio Dell.

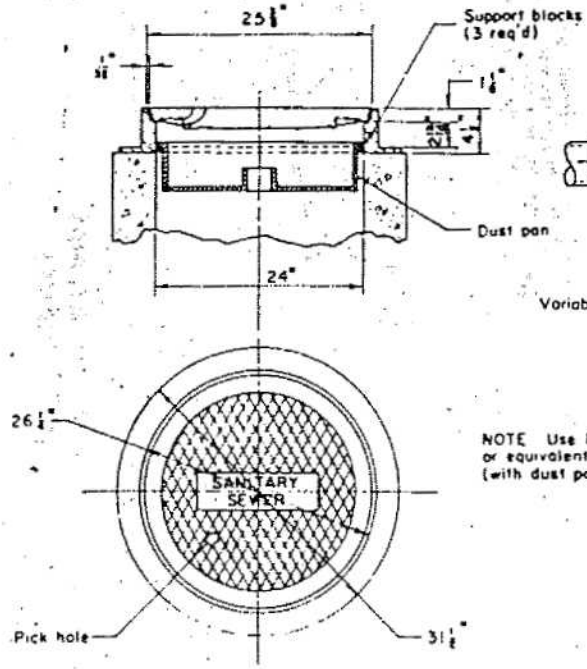


STANDARD HOUSE LATERAL
STREET SECTION



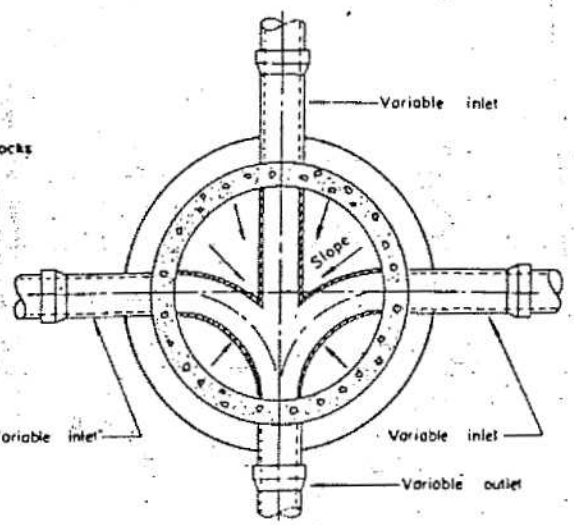
TYPICAL SINGLE
SERVICE LATERAL

RIO DELL STANDARD

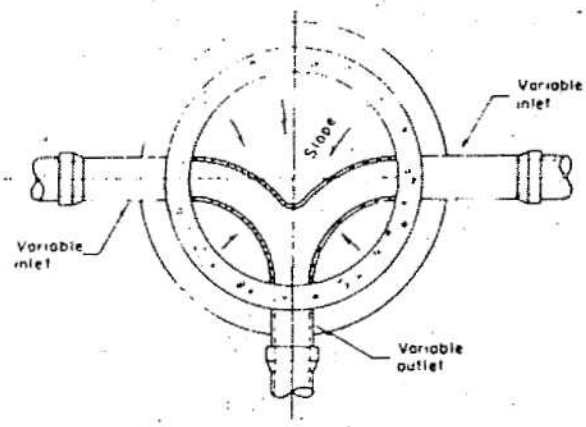


STANDARD MANHOLE FRAME & COVER

NOTE Use Phoenix P-1001 or equivalent frame and cover (with dust pan)

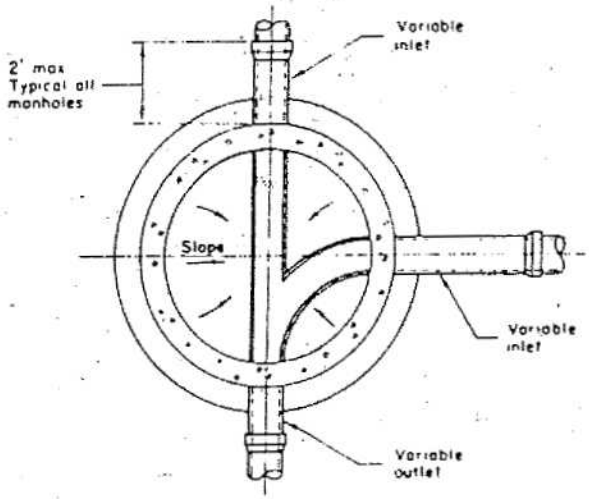


JUNCTION MANHOLE

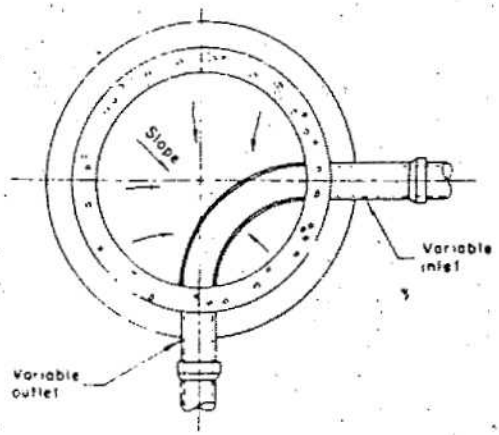


JUNCTION MANHOLE

NOTE Flow areas through manholes to be pipe or "ground" smooth concrete



JUNCTION MANHOLE



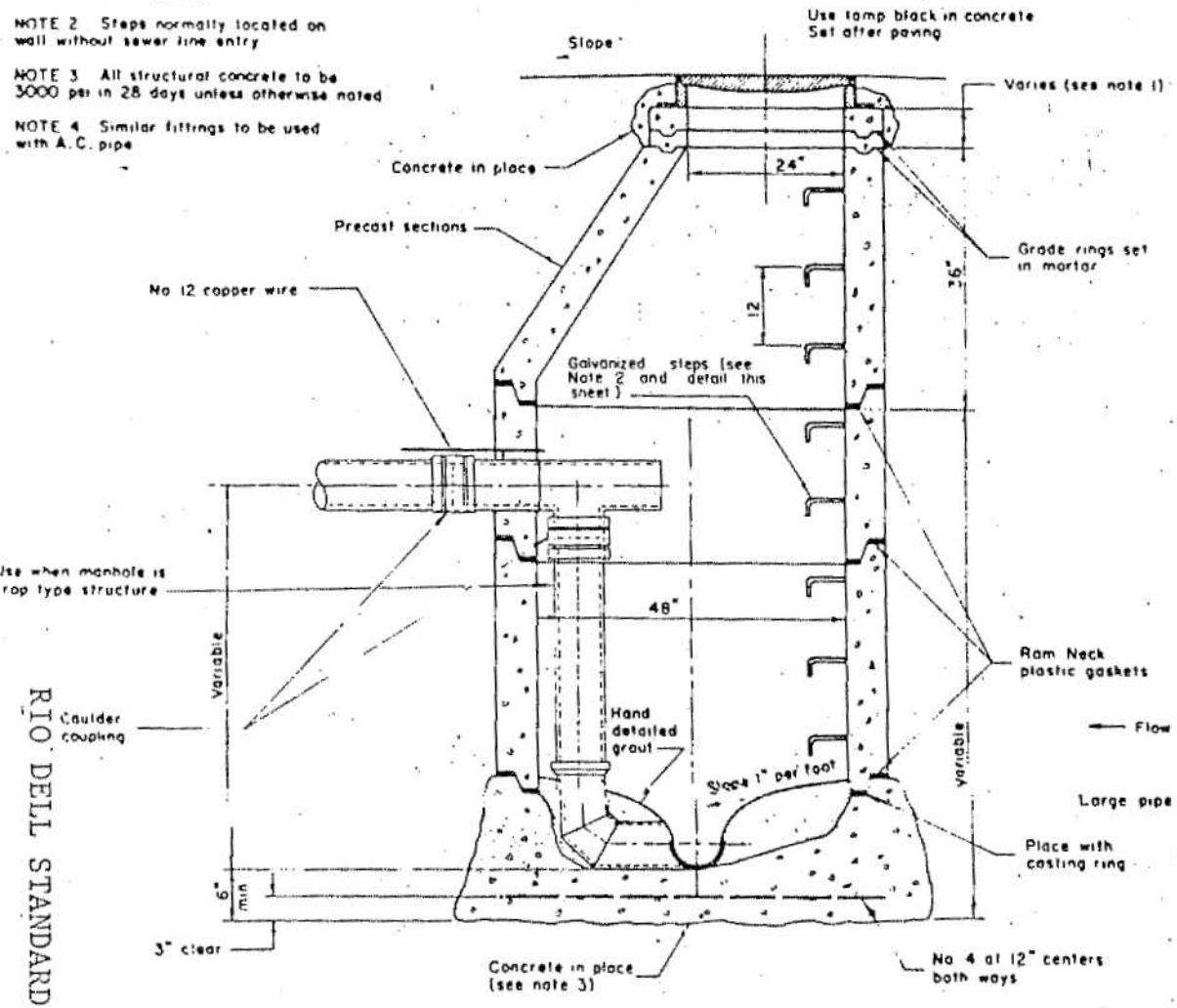
STANDARD MANHOLE

NOTE 1 - Provide up to 2' of 2' ø R.C.P. pipe or grade rings on ungraded streets, where directed by Engineer

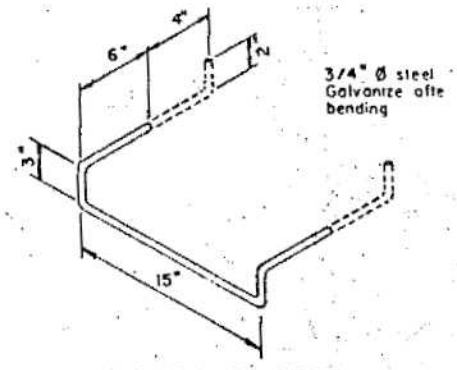
NOTE 2 Steps normally located on wall without sewer line entry

NOTE 3 All structural concrete to be 3000 psi in 28 days unless otherwise noted

NOTE 4 Similar fittings to be used with A.C. pipe

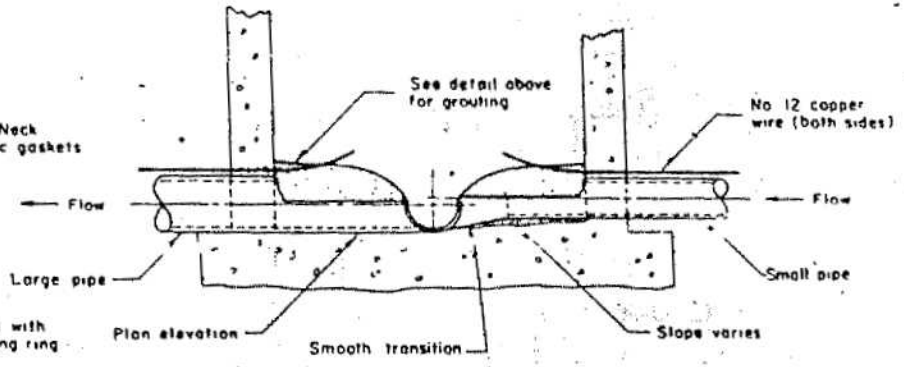


STANDARD MANHOLE
SHOWING DROP INLET



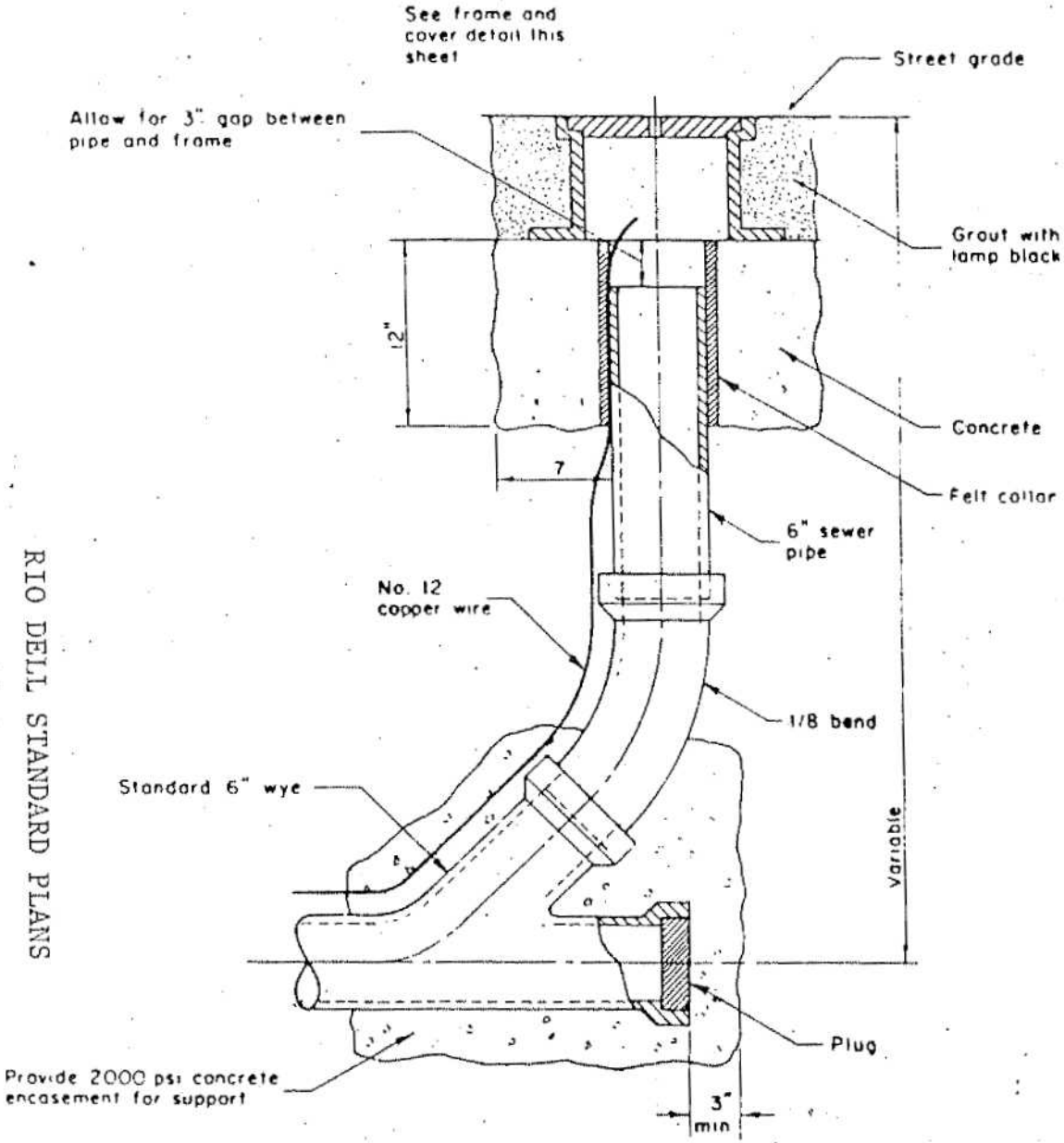
MANHOLE STEP

NOTE - Sewer inlet normally 0.05' above sewer outlet. At junction manhole where pipe sizes change, top of smaller pipe should be level with top of larger pipe. See plans for exact elevations of inverts



MANHOLE AT PIPE SIZE CHANGE

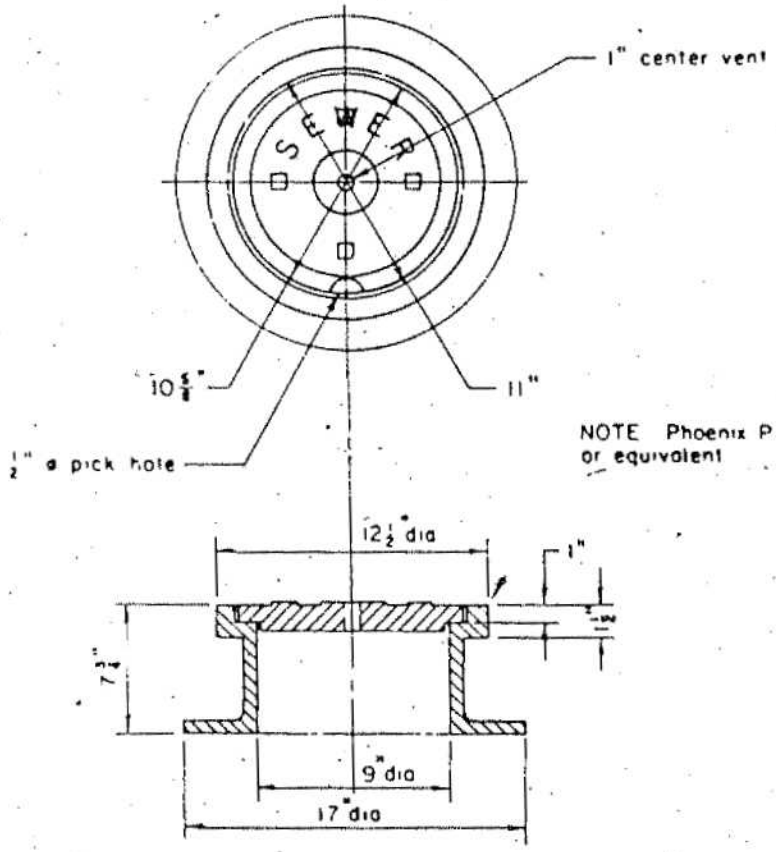
RIO DELL STANDARD PLANS



STANDARD CLEANOUT

NOTES:

1. Various details on this sheet show V.C. pipe. If A.C.P is used, couplings and fittings should be A.C.P.
2. All concrete shown this sheet shall be Class "C
3. Unless otherwise indicated, all dimensions exppressed in inches.



NOTE Phoenix P-25 or equivalent

STANDARD CLEANOUT FRAME & COVER

RIO DELL STANDARD PLANS

4/77

Appendix B

CDHS California Waterworks Standards

NOTE: This publication is meant to be an aid to the staff of the CDHS Drinking Water Program and cannot be relied upon by the regulated community as the State of California's representation of the law. The published codes are the only official representation of the law. Refer to the published codes whenever specific citations are required.

CHAPTER 16. CALIFORNIA WATERWORKS STANDARDS

Article 1. Applicability, Responsibility and Definitions

§64555. Definitions.

(a) "Asphalt Institute Standard" means a standard or specification issued by the Asphalt Institute.

(b) "ASTM Standard" means a standard issued by the American Society for Testing and Materials (ASTM).

(c) "AWWA Standard" means a standard adopted by the American Water Works Association (AWWA).

(d) "Federal Specification" means a standard approved by the United States General Services Agency for use by federal agencies.

(e) "Flat Rate Water System" means a public water system where water deliveries to at least 50 percent of the service connections are not metered.

(f) "Metered Water System" means a public water system that is not a flat rate water system.

Article 2. General Requirements

§64560. Basic Design.

(a) Additions to or changes in distribution systems shall be designed and constructed to:

(1) Be free of structural and sanitary hazards.
(2) Protect the quality of the water delivered to users at all times.
(3) Protect the distribution system against contamination by backflow.
(4) Provide adequate size and capacity to meet the requirements of Sections 64562 and 64566.
(5) Withstand, with ample safety factors, the physical stresses imposed during normal operation.
(6) Minimize the effects of events such as power supply, equipment, and structural failures, earthquakes, fires, floods and sabotage that are reasonably foreseeable.
(7) Protect against unauthorized entry and/or vandalism.
(8) Protect against adverse effects in areas subject to freezing weather.

§64562. Quantity of Supply.

(a) Sufficient water shall be available from the water sources and distribution reservoirs to supply adequately, dependably and safely the total requirements of all users

under maximum demand conditions before agreement is made to permit additional service connections to a system.

(b) To ascertain this, first determine the total capacity of the existing source by procedures prescribed in Section 64563 and determine the total storage volume of the existing distribution reservoirs. Then determine the needed source capacity and the needed storage volume by procedures prescribed in Section 64564. The total available source capacity shall not be less than the needed source capacity.

(c) The requirements of this section shall apply to an entire public water system and to each pressure zone within a public water system.

(1) Requirements for an entire public water system shall be determined from the total source capacity, total storage volume and the total number of service connections.

(2) Requirements for a particular pressure zone shall be determined from the total water supply available from the water sources and interzonal transfers directly supplying the zone, from the total storage volume within the zone and from the number of service connections within the zone.

§64563. Procedures for Determining Source Capacity.

(a) The source capacity of a well shall be based on the sustained yield of the well or pump output, whichever is less.

(1) Sustained yield of a well shall be determined from a pump test or from historical records.

(2) The conditions of a pump test used to determine sustained yield of a well shall be acceptable to the Department and shall include:

(A) Constant rate of water discharge from the well during the pump test.

(B) Continuation of the pump test until at least four consecutive measurements of water level drawdown in the well and the elapsed time since the beginning of the pump test yield a straight line when the drawdown is plotted against the logarithm of the elapsed time.

(b) The source capacity of a surface water supply or a spring shall be the lowest anticipated daily yield, based on adequately supported and documented data.

(c) The source capacity of a purchased water connection between two public water systems shall be included in the total source capacity of the purchaser if the purchaser has sufficient storage or standby source capacity to meet user requirements during reasonably foreseeable shutdowns by the supplier.

(d) Where the capacity of a source varies seasonally, the source capacity shall be the capacity at the time of maximum day demand.

§64564. Procedures for Determining Needed Source Capacity and Needed Storage Volume.

(a) Whenever possible, needed source capacity and needed storage volume shall be determined from existing water use records of the water system.

The records used shall clearly indicate total source capacity, total storage volume and maximum day demand of previous years.

The existing records of the water system may be supplemented as needed by the records of a similar water system acceptable to either the Department or a qualified registered engineer.

(b) When the existing records of the water system are inadequate to determine these values and no records of a similar water system can be found to supplement the existing records, the maximum day demand, the needed source capacity and the needed storage volume for typical residential and general commercial areas (without provisions for fire flow) shall be determined as follows:

(1) Determine the maximum day demand (Qo) from Chart 1 or Chart 2.

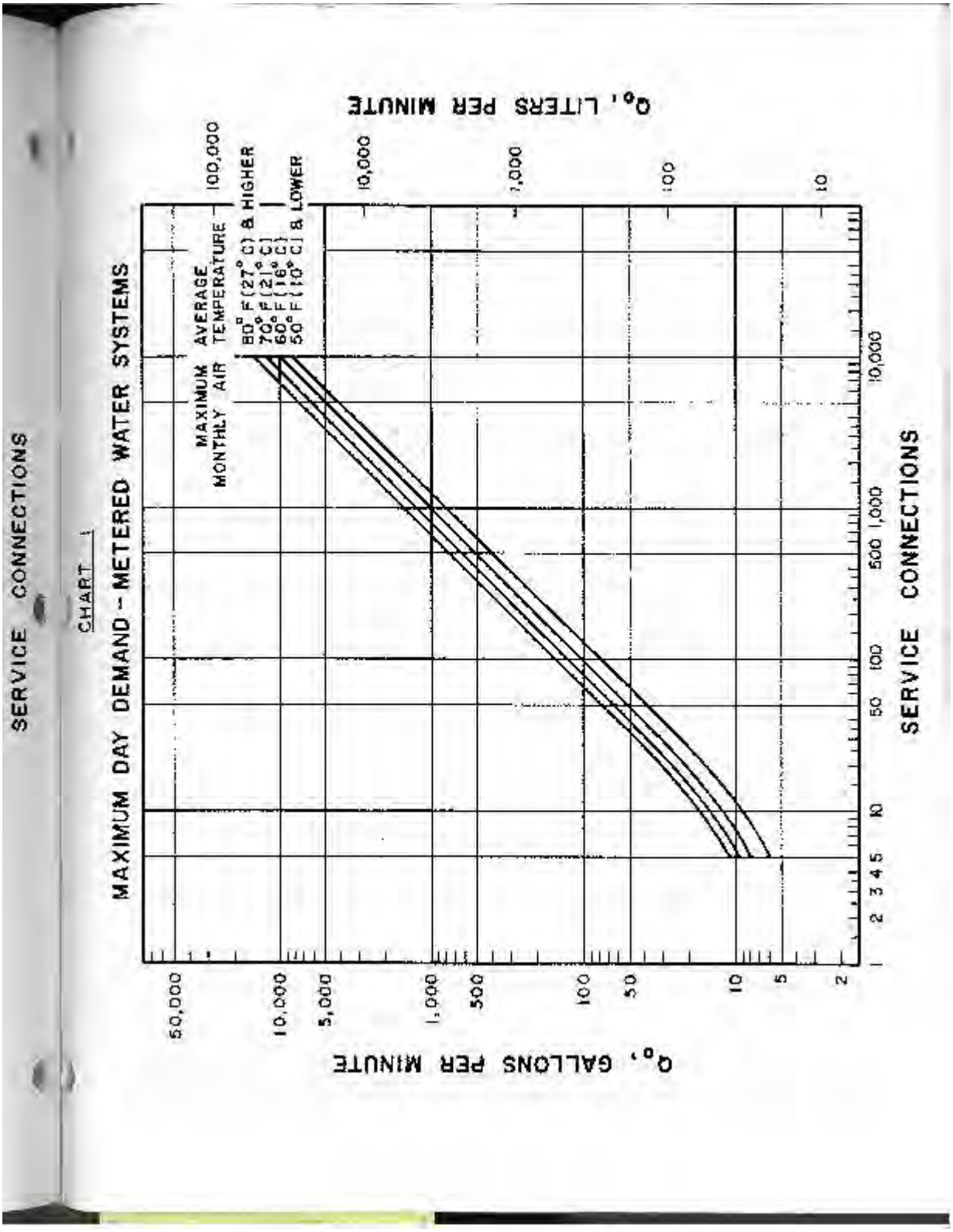
(2) When the total capacity of the existing sources equals the maximum day demand (Qo), the needed storage volume (Vo) to meet peak demand during the day shall be determined from Chart 3 or Chart 4.

(3) When the total storage volume of the existing reservoirs (V) is less than the needed storage volume (Vo), the existing sources shall be supplemented so that the needed source capacity (Q) is met. For a metered water system, $Q = Qo\ (2.5-1.5V/Vo)$ or for a flat rate water system, $Q = Qo\ (2-V/Vo)$.

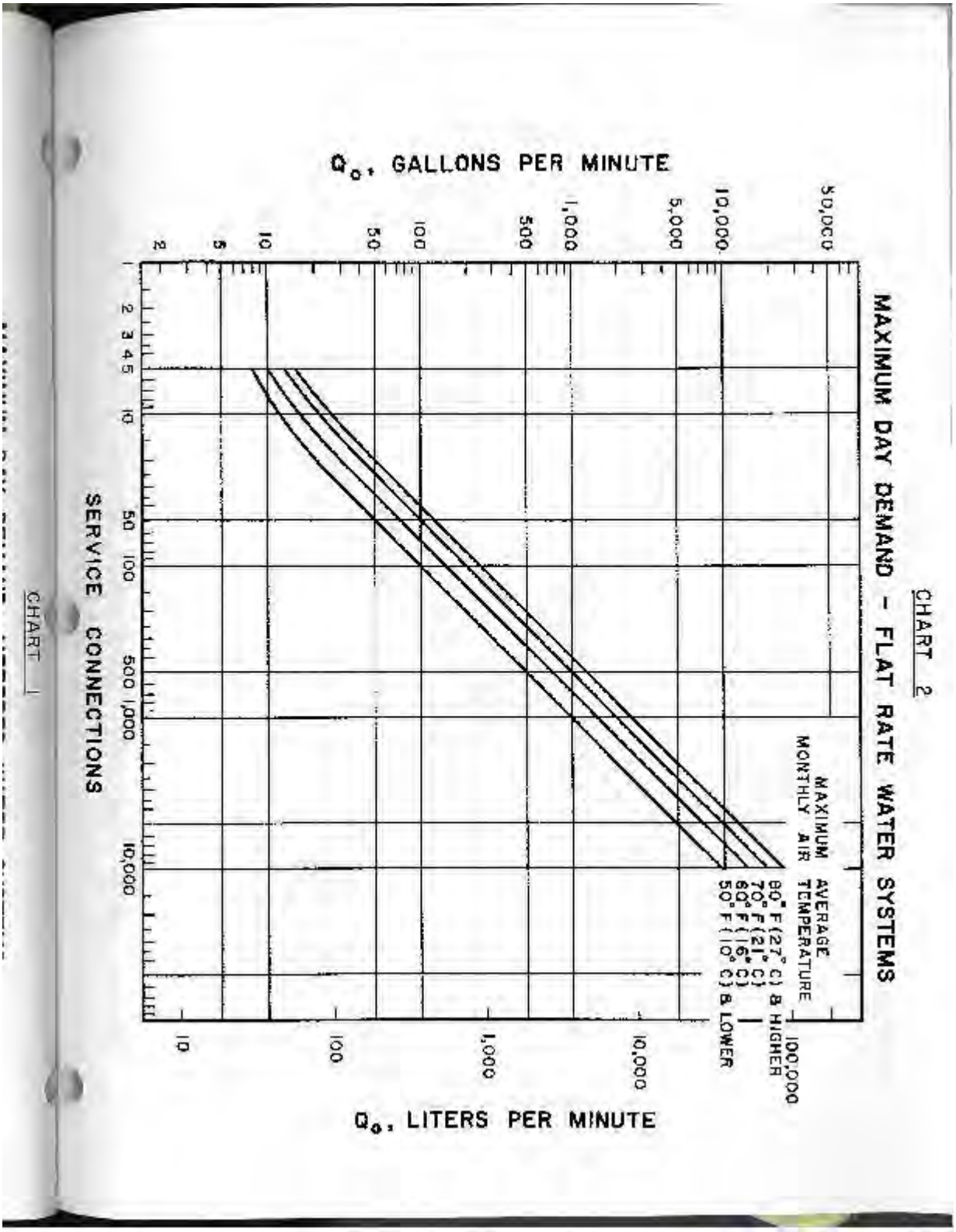
(c) The needed source capacity and needed storage volume determined under (b) may be modified, with the approval of the Department, to reflect local conditions such as climate, community type and kinds of users. Unless the Department's written approval is obtained, the needed source capacity shall not be less than the maximum day demand.

(d) The data used and the calculation made by the water supplier to determine whether sufficient water is available to accommodate additions to the systems must be kept and are subject to the Department review and approval at its discretion.

NOTE: This publication is meant to be an aid to the staff of the CDHS Drinking Water Program and cannot be relied upon by the regulated community as the State of California's representation of the law. The published codes are the only official representation of the law. Refer to the published codes whenever specific citations are required.



NOTE: This publication is meant to be an aid to the staff of the CDHS Drinking Water Program and cannot be relied upon by the regulated community as the State of California's representation of the law. The published codes are the only official representation of the law. Refer to the published codes whenever specific citations are required.



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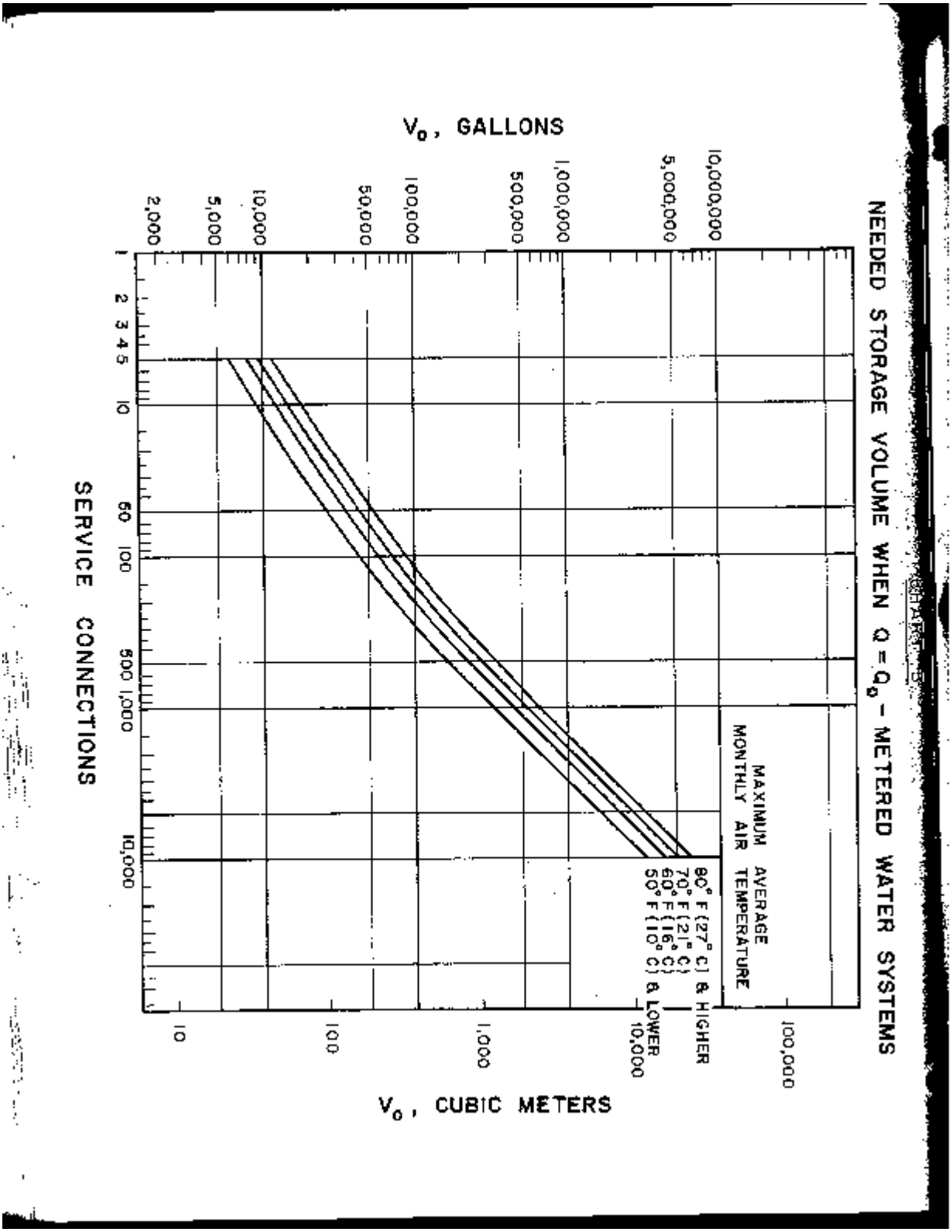


CHART 4

NEEDED STORAGE VOLUME WHEN $Q = Q_0$ - FLAT RATE WATER SYSTEMS

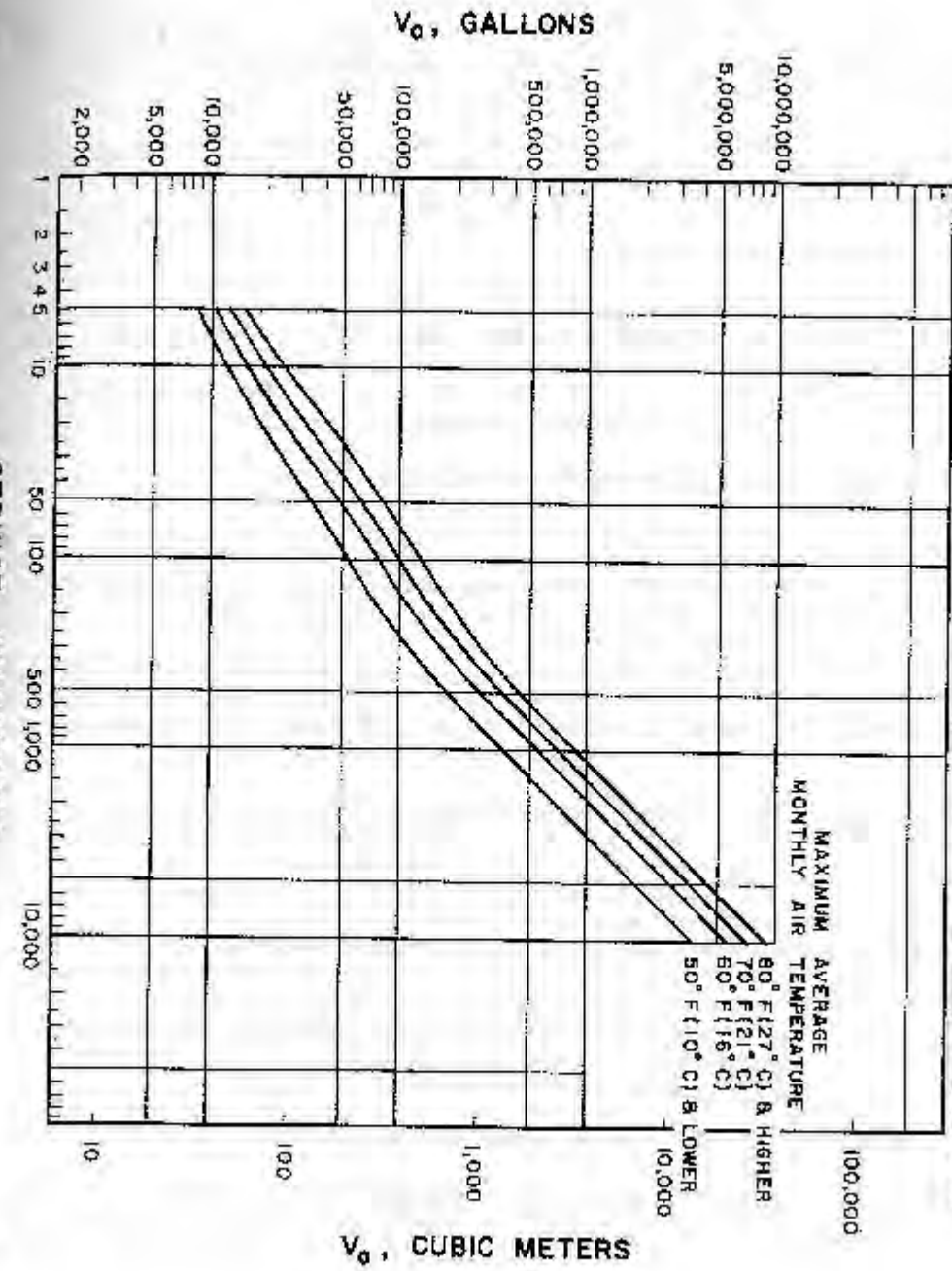


CHART 3

NEEDED STORAGE VOLUME WHEN $Q = Q_0$ - METERED WATER SYSTEMS

§64566. System Pressure.

(a) Changes in distribution systems shall be designed to maintain an operating pressure at all service connections of not less than 20 pounds per square inch gauge (psig) (140 kiloPascals gauge (kPag)) under the following demand conditions:

(1) User maximum hour demand.

(2) User average day demand plus design fire flow.

(b) In a public water system supplying users at widely varying elevations, a water supplier may furnish a service to a user which does not comply with (a) if the user is fully advised of the conditions under which minimum service may be expected and the user's agreement is secured in writing. This waiver shall be applicable only to individual service connections.

(c) Water mains shall be designed to have at least five psig (35 kPag) pressure throughout any buried length of the main except when the main is removed from service for repairs or maintenance. This requirement shall not apply to short lengths of water main near reservoir inlets and outlets provided:

(1) The water main is on premises owned, leased or controlled by the water supplier; or

(2) The prior review and written approval of the Department is obtained.

§64568. Conditions for Adding Service Connections.

A new service connection may be added to a distribution system only if the water system will comply with Section 64562 after the new service connection is added and adding the new service connection will not cause pressure at an existing service connection to be reduced below the standards set in Section 64566.

§64570. Internal Combustion Engines.

(a) Where water cooling jackets for internal combustion engines are connected to water mains, the jacket shall be designed so that the water pressure inside the water main at the cooling jacket will at all times be greater than the engine coolant pressure.

(b) Backflow protection of the public water system shall be provided wherever makeup water is supplied to the cooling system of an internal combustion engine.

Article 3. Distribution Reservoirs

§64600. Basic Design of Distribution Reservoirs.

(a) Distribution reservoirs shall be covered.

(b) Vents, overflows, drain outlets and other reservoir openings shall be located and constructed to protect the water stored in the reservoir from contamination. Vents and

overflows shall be screened. Vents shall not open upward. Overflows shall be large enough to dispose of reservoir overflow rates equal to the maximum reservoir filling rate.

(c) Provisions shall be made to facilitate removal of floating material from the free water surface and for dewatering the reservoir.

(d) Outlets shall be designed and constructed to minimize movement of sediment from the reservoir floor to the distribution system water mains.

(e) Provisions shall be made for isolating reservoirs and appurtenant facilities from the distribution system without causing violation of Section 64566.

(f) Unless the Department's approval is obtained, distribution reservoir sites shall not be used for nonwater works purposes that would:

(1) Result in unrestricted public access.

(2) Create a contamination hazard.

(g) Reservoirs shall be disinfected and sampled for bacteriological quality in accordance with the procedures described in "Methods for Disinfecting Tanks and Reservoirs," American Water Works Association Journal, 71(1):49-50 (January 1979).

§64602. Subsurface Distribution Reservoirs.

(a) Subsurface distribution reservoirs shall be lined and shall be located:

(1) Above maximum anticipated ground water level.

(2) At least 50 feet (15 meters) from the nearest sewer and at least 150 feet (45 meters) from all other sewerage facilities.

(b) The land adjacent to a subsurface distribution reservoir shall be graded to route surface water away from the reservoir.

§64604. Corrosion Protection.

Paints or other protective coatings shall comply with AWWA Standard D102-78.

Article 4. Pumping Stations

§64612. Water Sealed Pumps.

Seal water for water sealed pumps shall meet the water quality requirements of the Domestic Water Quality and Monitoring Regulations, Title 22, California Administrative Code, Chapter 15. Adequate drainage shall be provided for disposal of used seal water.

Article 5. Water Mains and Appurtenances

§64622. Water Main Materials.

(a) Water main materials shall meet the applicable standards listed in Table I.

(b) Cast iron and ductile iron pipe shall be cement mortar lined in accordance with AWWA Standard C104/A21.4-80.

(c) Steel pipe shall be protected from internal and external corrosion. Table II lists various acceptable protective coatings and linings with appropriate standards.

Table I
Material Standards

Pipe Material	*Standard*
Abestos-Cement	AWWA C400-80 or C402-77
Cast Iron	AWWA C106-75
Ductile Iron	AWWA C151/A21.51-81
Steel	AWWA C200-80
Copper	AWWA C800-66
Concrete	AWWA C300-82, C301-79, C302-74 or C303-78
Polybutylene	AWWA C902-78
Polyethylene	AWWA C901-78
Polyvinyl Chloride	AWWA C900-81
Glass Reinforced Thermosetting Resin	AWWA C950-81

Table II
Steel Pipe Coatings and Linings

Type of Coating or Lining	*Standard*
Cement Mortar Coating or Lining	AWWA C205-80 or Federal Specification SS-P-385a
Coal Tar Coating, Lining or Wrapping	AWWA C203-78
Asphalt Mastic Coating	Asphalt Institute M-2 CS-96
Extruded Plastic Coating	Federal Specification L-C-530B (1972)
Rubber-Alkyd Paint Coating	AWWA C204-75
Cold Applied Tape Coating	AWWA C209-76
Coal Tar-Epoxy Coating	AWWA C210-78
Asphalt Coating and Wrapping	Standard Specifications for Public Works Construction (1973), Section 207-10.4.4

§64624. Water Main Selection and Installation.

(a) Steel pipe shall be selected and installed in accordance with American Water Works Association (AWWA) Manual M-11 (1964), "Steel Pipe--Design and Installation." The design shall comply with Sections 6.1 and 6.2 of the manual, except that the minimum design pressure shall be at least the maximum anticipated system pressure, but in no case less than 150 psig (1,030 kPag).

(b) Asbestos-cement, cast iron and ductile iron pipe shall be selected and installed in accordance with the standards listed in Table III.

(c) Polyvinyl chloride pipe shall be selected and installed in accordance with Appendix A of AWWA Standard C900-81.

(d) Polybutylene pipe shall be selected and installed in accordance with Appendix A of AWWA Standard C902-81.

(e) Polyethylene pipe shall be selected and installed in accordance with Appendix A of AWWA Standard C901-81.

(f) Plastic pipe shall not be used in areas subject to contamination by petroleum distillates.

Table III
Pipe Selection and Installation Standards

Type of Pipe	*Standards*
Asbestos-Cement	AWWA C401-83, C403-78 and C603-78
Cast Iron	AWWA C600-82
Ductile Iron	AWWA C150/A21.5-81 and C600-82

§64626. Layout of Water Mains.

(a) Water mains should be laid out only in segmented grids and loops and should be located within streets. Dead-end water mains shall be installed only if:

(1) Looping or gridding is impractical due to topography, geology, pressure zone boundaries, unavailability of easements or locations of users; or

(2) The main is to be extended in the near future and the planned extension will eliminate the dead-end conditions.

§64628. Minimum Water Main Diameter and Length of Run.

(a) Water mains shall have a nominal inside diameter of at least four inches (100 mm).

(b) Dead-end water mains exceeding 1,000 feet (300 meters) in length shall be constructed of pipe with a nominal inside diameter of at least 6 inches (150 mm).

(c) Dead-end water mains exceeding 2,000 feet (600 meters) in length shall be constructed of pipe with a nominal inside diameter of at least 8 inches (200 mm).

(d) The requirements of (a), (b) and (c) shall not apply to water main installations meeting one of the following criteria:

(1) The installation is designed under the direction of a qualified registered engineer to meet the requirements of Section 64566.

(2) The installation is approved by the Department prior to construction.

§64630. Water Main Installation.

(a) Water mains shall be installed below the frost line or shall otherwise be protected to prevent freezing.

(b) Water mains shall not have less than 30 inches (0.75 meters) of cover over the top of the pipe except where necessary to avoid underground obstructions or rocky conditions.

(c) Water mains shall be installed at least:

(1) Ten feet (3 meters) horizontally from and 1 foot (0.3 meters) higher than sanitary sewers located parallel to the main.

(2) One foot (0.3 meters) higher than sanitary sewers crossing the main.

(3) Ten feet (3 meters), and preferably 25 feet (7.5 meters), horizontally from sewage leach fields, cesspools, seepage pits and septic tanks.

(d) Separation distances specified in (c) shall be measured from the nearest edges of the facilities.

(e) Where the requirements of (c) and (d) cannot be met due to topography, inadequate right-of-way or easements or conflicts with other provisions of these regulations, lesser separation is permissible if:

(1) The water main and the sewer are located as far apart as feasible within the conditions listed above.

(2) The water main and the sewer are not installed within the same trench.

(3) The water main is appropriately constructed to prevent contamination of the water in the main by sewer leakage.

(f) Water mains shall be disinfected according to AWWA Standard C601-81 before being placed in service.

(g) Installation of water mains near the following sources of potential contamination shall be subject to written approval by the Department on a case-by-case basis:

(1) Storage ponds or land disposal sites for waste water or industrial process water containing toxic materials or pathogenic organisms.

(2) Solid waste disposal sites.

(3) Facilities such as storage tanks and pipelines where malfunction of the facility would subject the water in the main to toxic or pathogenic contamination.

§64632. Water Main Valve Locations.

Sufficient valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs. In general, valves on water mains of 12 inches (300 mm)

and smaller diameter should be located such that water main lengths of not more than 1,000 feet (300 meters) can be isolated by valve closures.

§64634. Water Main Valve Construction Standards.

(a) Water main valves of the types listed in Table IV shall conform to the standards shown in Table IV.

(b) A valve box shall be installed over each valve stem to aid in locating and operating the valve.

Table IV
Water Main Valve Construction Standards

Type of Valve	*Construction Standard*
Gate Valve	AWWA C550-80
Butterfly Valve	AWWA C504-80
Ball Valve	AWWA C507-73
Swing Check Valve	AWWA C508-82

§64636. Air and Vacuum Relief and Air Release Valves.

(a) Vent openings for air and vacuum relief and air release valves shall be:

(1) Extended at least one foot (0.3 meters) above grade and above maximum recorded high water.

(2) Provided with a screened, downward facing vent opening.

(b) Where the requirements of (a) (1) cannot be practicably met, vent openings may be located in a subsurface chamber or pit under the following conditions:

(1) The pit is adequately drained.

(2) The pit drain is not connected by pipe or other closed conduit to a sewer or storm drain without an air gap separation.

§64638. Water Main Joints.

Joints and appurtenances shall safely withstand the same working pressures for which the water main is designed. Jute shall not be used as a backup gasket material.

§64640. Fire Hydrants.

Fire hydrant laterals shall be provided with shutoff valves.

§64642. Flushing Valves and Blowoffs.

(a) A flushing valve or blowoff shall be installed at the end of each dead-end water main where stagnant conditions are likely to develop.

(b) Flushing valves and blowoffs shall be capable of establishing the minimum continuous flushing flow in the main indicated by Table V.

(c) Flushing valves and blowoffs shall not discharge to a sewer without an air gap separation.

Table V
Minimum Water Main Flushing Flow

Nominal Inside Diameter		*Minimum Flushing Flow*	
Inches	*Millimeters*	*Gallons/Milnute*	*Liters/Second*
2	50	25	1.5
3	75	50	3.4
4	100	100	6.3
6	150	225	14
8	200	400	25
10	250	600	38

§64644. Service Connection Pipe.
Service connection pipe and fittings shall be designed for cold water working pressures of not less than 150 psig (1,030 kPag). Copper tubing shall be commercial designation type K or L. Plastic tubing and fittings shall be products tested and certified as suitable for use in potable water piping systems by the National Sanitation Foundation Testing Laboratory, the Canadian Standards Association Testing Laboratory or another testing agency acceptable to the Department.

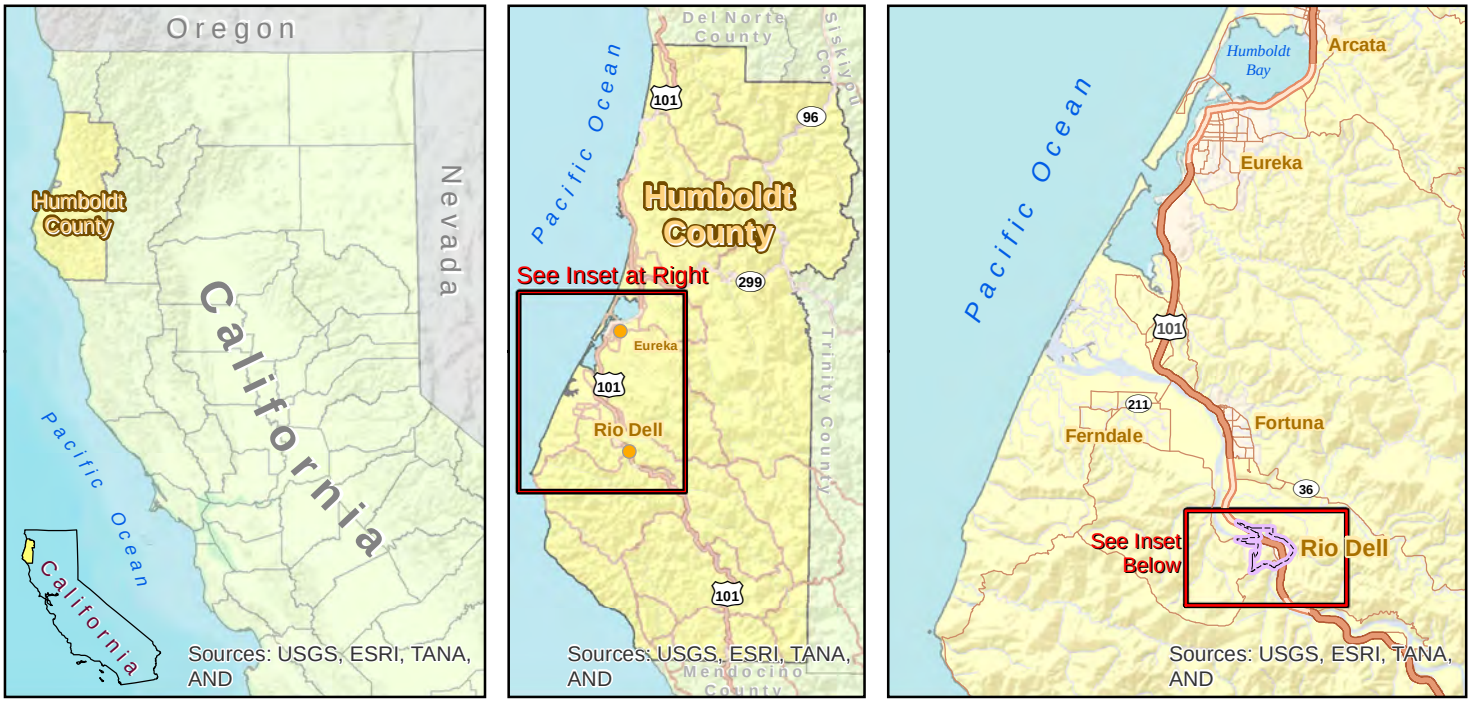
CHAPTER 17. SURFACE WATER TREATMENT

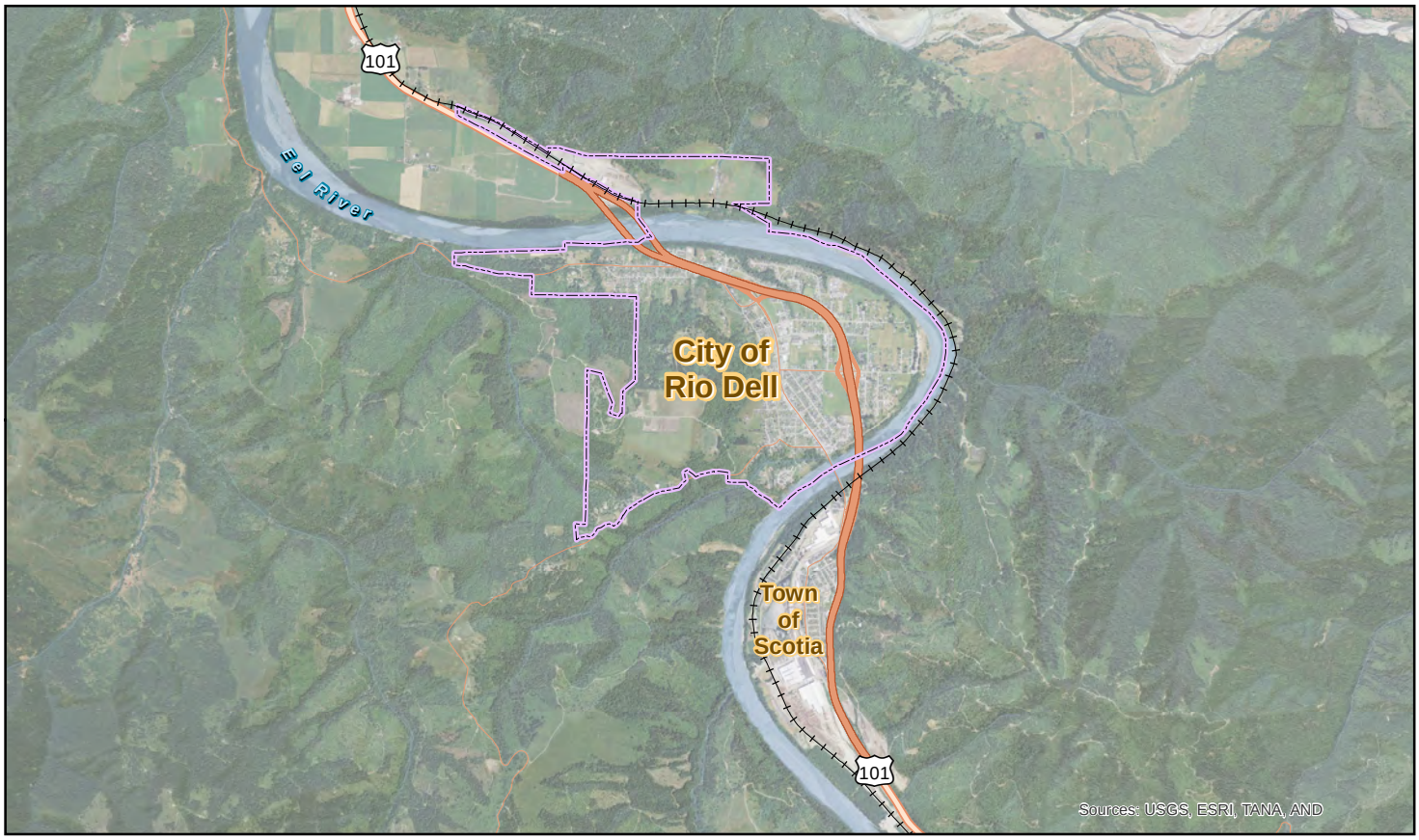
Article 1. General Requirements and Definitions

§64650. General Requirements.

(a) For a supplier using an approved surface water, as defined in section 64651.10, this chapter establishes treatment techniques in lieu of maximum contaminant levels for turbidity and the following microbial contaminants: Giardia lamblia (cysts), viruses, heterotrophic plate count bacteria, and Legionella.

(b) Each supplier using an approved surface water shall provide multibarrier treatment necessary to reliably protect users from the adverse health effects of microbiological contaminants and to comply with the requirements and performance standards prescribed in this chapter. A supplier that meets the requirements of section 64652.5 and wishes to not be required to provide multibarrier treatment shall submit an application to the Department. That application shall consist of comprehensive documentation that either demonstrates current compliance with the requirements in section 64652.5 or demonstrates that the water system will be in compliance within fifteen months from application submittal. Within 30 days, the Department will review the application and inform the applicant in writing that the application is complete and accepted for filing, or that the application is deficient and what specific information is required. Within 90 days from the date the application is accepted for filing, the





City of Rio Dell
Counties
Major Highways
Highways
Major Road
Humboldt County
Railroad
Eel River

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
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City of Rio Dell
2014 IRWM Drought Solicitation
Project Application

Rio Dell and Scotia CSD Emergency Water Intertie
Project Vicinity

Job Number	8410747.20
Revision	1
Date	02 Jul 2014

Figure 1

718 Third Street Eureka, CA 95501 T 707 443 8326 F 707 444 8330 E eureka@ghd.com W www.ghd.com

G:\01061 City of RioDell\8410747 RioDell City Engineer Services\04-Technical Work\20 Water System\NCRP_Drought_App\FIGURES\F1_Vicinity.mxd

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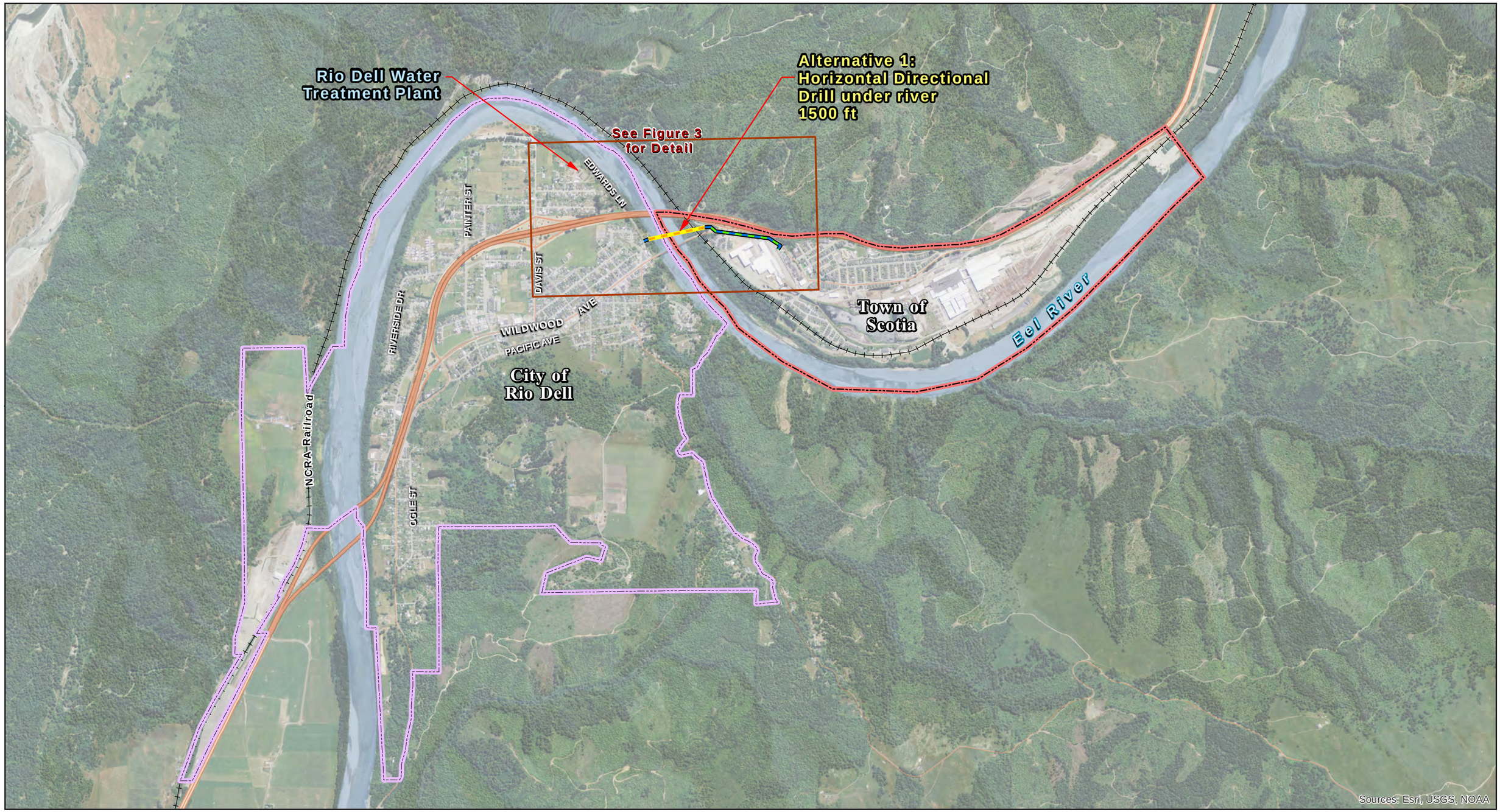
Data source: Bing Maps, Aerial Image, 2012; County of Humboldt,Rio Dell city Limits, 2011; Street Map USA, Highways, 2010; GHD, concept designs; 2012. Created by:gldavidson



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Directionally drilled 12 in. HDPE pipe

10 in. PVC pipe

Scotia CSD Service Area

Rio Dell Service Area

City of Rio Dell
2014 IRWM Drought Solicitation
Project Application

Job Number	8410747.20
Revision	A
Date	11 Jul 2014

Rio Dell and Scotia CSD Emergency Water Intertie Overview Map

Figure 2

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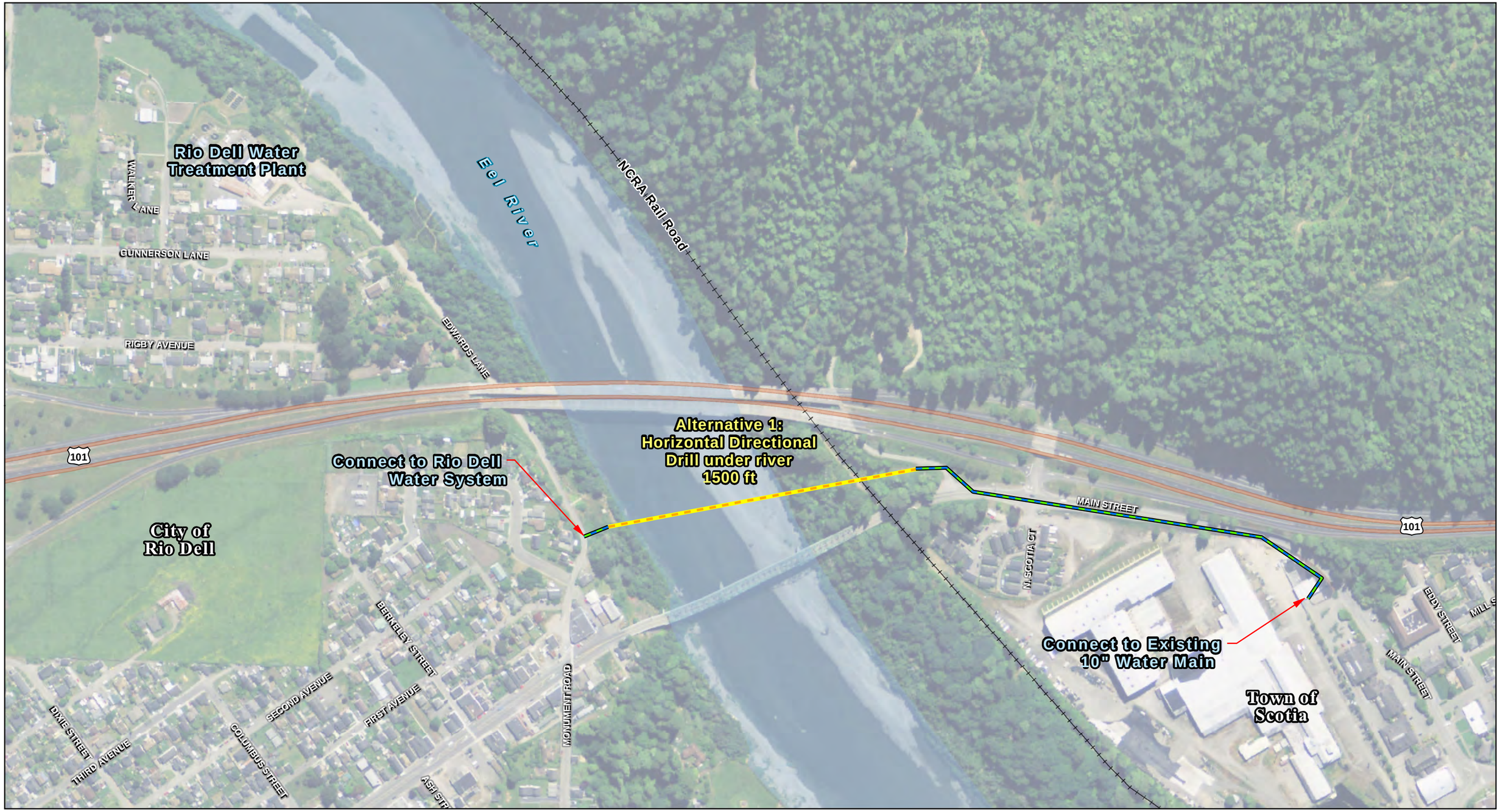

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Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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Directionally drilled 12 in. HDPE pipe

10 in. PVC pipe

Railroad

City of Rio Dell
2014 IRWM Drought Solicitation Project Application

Job Number	8410747.20
Revision	A
Date	11 Jul 2014

Rio Dell and Scotia CSD Emergency Water Intertie

Figure 3

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PART 2—
ANNEXES FOR MUNICIPALITIES

CHAPTER 3.
UNINCORPORATED HUMBOLDT COUNTY UPDATE ANNEX

3.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Mr. Dan Larkin, Emergency Services Coordinator
Humboldt County Office of Emergency Services
826 4th Street
Eureka, CA 95501
Telephone: (707) 268-2502
E-mail address: dlarkin@co.humboldt.ca.us

Alternate Point of Contact

Ms. Cybelle Immitt, Senior Planner
Humboldt County Public Works
1106 Second Street
Eureka, CA 95501
Telephone: (707) 445-7652
E-mail address: cimmitt@co.humboldt.ca.us

3.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**May 12, 1853
- **Current Population—**134,623 (2010)
- **Population Growth—**Based on the 2010 U.S. Census, the total population of Humboldt County was 134,623, which represents a population increase of 6.4% since the 2000 Census. Overall growth in incorporated areas was 5.8% from 2000 to 2010, while the unincorporated areas of the county grew 6.9% during the same time. With the exception of a population decline that occurred between the years 1960 and 1970 due to reductions in the local lumber industry, the countywide average annual growth rate has been approximately 0.75% per year over the last 30 years.
- **Location and Description**—Humboldt County is situated along the Pacific coast of Northern California, located approximately 200 miles north of San Francisco. The landscape is densely forested, mountainous, and rural, with more than 100 miles of coastline. The County is home to the state's second largest natural bay, Humboldt Bay, as well as two of California's three largest river systems, and over forty percent of all remaining old growth Coast Redwood forests. Most of these forests are protected or strictly conserved within dozens of national, state, and local forests and parks, totaling approximately 680,000 acres. Humboldt County also contains nearly 1,500,000 acres of combined public and private forest in production, producing twenty percent of the total volume and thirty percent of the total value of all forest products produced in California.

  Three of the County's seven cities have populations over 10,000: Arcata, Eureka, and Fortuna. Approximately one-third of the County's population resides in Eureka and Arcata, which encompass the Humboldt Bay region, and is the economic center of the County. Eureka is the county seat and site of the College of the Redwoods main campus, while Arcata is the site of Humboldt State University.

  In 1986, County Service Area #4—a dependent special district devoted to fire protection and governed by the Humboldt County Board of Supervisors—was established. Fire protection is provided by the California Department of Forestry and Fire Protection (CAL FIRE) through an "Amador" contract where the County pays for a portion of the actual fire protection costs.

The County Service Area #4 boundary borders the coastline, starting at Clam Beach near McKinleyville and running to the north end of Freshwater Lagoon. County Service Area #4 serves the communities of Crannell, Westhaven, Patrick's Point, Big Lagoon, Kane Road, and Stone and Freshwater Lagoons.

- **Brief History—**The original inhabitants of the area now known as Humboldt County include the Wiyot, Yurok, Hupa, Karuk, Chilula, Whilkut, and the southern Athabascans, including the Mattole and Nongat. The first recorded entry of Humboldt Bay by non-natives was an 1806 visit from a sea otter hunting party from Sitka employed by the Russian American Company. In 1850, Douglas Ottinger and Hans Buhne entered the bay, naming it Humboldt in honor of the great naturalist and world explorer, Baron Alexander von Humboldt; the county derived its name from Humboldt Bay. Humboldt County was formed in 1853 from parts of Trinity County.
- **Climate—**Humboldt County is an area of moderate temperatures and considerable precipitation. Temperatures along the coast vary only 10 degrees from summer to winter, although a greater range is found over inland areas. Temperatures of 32 degrees (Fahrenheit) or lower are experienced nearly every winter throughout the area, and colder temperatures are common in the interior. Maximum readings for the year often do not exceed 80 degrees on the coast, while 100 degree plus readings occur frequently in the mountain valleys. In most years, rainfall is experienced each month of the year, although amounts are negligible from June through August. Seasonal totals average more than 40 inches in the driest area, and exceed 100 inches in the zones of heavy precipitation.
- **Governing Body Format—**The County of Humboldt is a general law County. The Board of Supervisors, which serves as the legislative and executive body of County government and many special districts, is comprised of five full-time members elected by their respective districts. Pursuant to the California Government Code, the Board enacts legislation governing Humboldt County and determines overall policies for County departments and various special districts, adopts the annual budget, and fixes salaries. The Board also hears appeals from decisions of the Planning Commission and considers General Plan amendments.
- **Development Trends**—The Humboldt County planning area has experienced a relatively low rate of growth in past years (less than 1%/yr.). Considering these historic trends and future population projections produced by the State, anticipated development trends for the planning area are considered low, consisting primarily of residential development. Higher rates of growth tend to increase demand for new development. With this fact in mind, the hazard information contained in this risk assessment will be utilized as best available data to support wise land use decisions as development potential expands into known hazard areas.

  Humboldt County is subject to State general planning law and the California Coastal Act. The County and its cities have adopted critical areas and resources lands regulations pursuant to these laws. These processes govern land use decision and policy making within Humboldt County. Decisions on land use will be governed by these well established, state mandated programs, and not this plan. This plan will work together with these programs to support wise land use in the future.

3.3 ENERGY PROFILE

3.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Humboldt County acquires its electricity from PG&E.

- Propane—Propane for county operations is acquired from Sequoia Gas, Amerigas, and Blue Star.
- Liquid Fuel—Gasoline, diesel, and kerosene for county operations are purchased from Renner Petroleum.
- Natural Gas—Humboldt County acquires its natural gas from PG&E.

3.3.2 Local Energy Demand

Humboldt County's energy comes from a variety of sources. Natural gas and electricity are the primary energy sources, supplemented by propane, wood, solar, and liquid fuels. The following discussion breaks down energy usage by type and by residential and non-residential sectors. The non-residential sector includes a variety of segments composed primarily of commercial and municipal usages. County-owned facilities and special districts consume on average only 1-4% of total community energy usage.

The data presented for natural gas and electricity have been provided by PG&E and are for the calendar year 2012, and typically compare consumption during that year to the prior year (2011) as a year-over-year change. A second comparison is to PG&E's base line year, 2005. In this way, one can see both a long term (2005-2008) trend and a short term (2011) change in consumption. The following consumption values are for the entire County; the unincorporated County generally accounts for about 55% of total County combined electricity and natural gas consumption. When available, 2008 consumption values are cited for the unincorporated area.

Overall Humboldt County consumption of energy from natural gas and electricity in 2012 was 6,556,663 million British thermal units (MMBtu). This represents an overall 8.99% decrease in consumption since 2005 and a year-over-year increase from 2011 to 2012 of 0.9%. Natural gas made up 57% of the total energy consumed and electricity was 43%. Energy consumption for the unincorporated portion of the county in 2008 was 3,896,711 MMBtu.

Government operations use six primary energy sources: electricity, propane, wood, natural gas, solar, and liquid fuels (gasoline, diesel, and kerosene). Each is described below (no energy demand information is provided for transportation fuels).

Electricity

Humboldt County consumed 880,838,943 kilowatt-hours (kWh) of electricity in 2012 as compared to 830,538,858 kWh in 2005. This amounts to a 6.1% increase over that time span. The year-over-year change from 2011 to 2012 was a decrease of 0.4%. The 2008 electricity consumption for the unincorporated portion of the county was 479,867,245 kWh.

Non-Residential Sector

Forty-five percent of non-residential energy consumption was derived from electricity during 2012. There were eight segments that comprised 80% of all non-residential consumption: led by hospitality, retail, schools, offices, healthcare, manufacturing & transportation government and agriculture. Energy usage in this sector has decreased by 28.8% since 2005.

Residential Sector

Forty-one percent of residential energy consumption was derived from electricity during 2012. The average electrical use per single-family and multi-family residential customer was 632 and 350 kWh per month respectively. Electrical usage has gone up by about 28.4% since 2005.

Propane

Unincorporated Humboldt County consumes propane in the residential sector, primarily for heating and cooking. About 2,500 households use propane gas for an average total of nearly 2,380,000 gallons per year.

Wood

Unincorporated Humboldt County consumes wood in the residential sector, primarily for heating. On average, there are more than 5,000 households using a total of approximately 13,000 cords of wood per year.

Natural Gas

Humboldt County consumed 35,512,406 therms of natural gas in 2012, compared to 43,649,470 therms in 2005; an 18.6% decrease. Between 2011 and 2012, there was a 2.1% increase in consumption. The 2008 natural gas consumption for the unincorporated portion of the county was 22,594,035 therms.

Non-Residential Sector

Forty-five percent of non-residential energy consumption was derived from natural gas during 2012. Natural gas usage has decreased by 40.7% since 2005.

Residential Sector

Fifty-nine percent of residential energy consumption was derived from natural gas during 2012. The average natural gas use per single-family and multi-family residential customer was 42 and 32 therms per month respectively. Natural gas usage has increased by about 6.4% since 2005.

Solar

Non-Residential Sector

As of 2012, there were 532 kW of solar electricity being generated from 60 sites that are connected to the PG&E grid.

Residential Sector

Between 1999 and 2012, 541 photovoltaic systems, totaling 1,192 kW, were installed at residential sites and interconnected to the PG&E grid.

Liquid Fuels

Information not currently available

3.3.3 Community Key Assets Energy Profile

Humboldt County has identified 14 key assets for its energy profile:

- Information Technology Building, 839 4th Street, Eureka, CA
- Courthouse, 825 Fifth Street, Eureka, CA
- Correctional Facility, Phase I @ 826 4th Street, Eureka, CA
- Correctional Facility, Phase II @ 826 4th Street, Eureka, CA
- Arcata/Eureka Airport Terminal @ 3561 Boeing Avenue, McKinleyville, CA
- Rohnerville Airport @ 2330 Airport Road, Fortuna, CA
- Clark Complex (including County Planning and Building, Public Works Land Use, Elections, and Sempervirens Psychiatric Hospital) @ 3033 H Street, Eureka, CA
- Juvenile Hall @ 2002 Harrison Ave, Eureka, CA
- Juvenile Hall—Northern Regional Facility @ 2004 Harrison Ave, Eureka, CA
- Professional Building—Department of Health and Human Services @ 5th and F Streets, Eureka, CA
- Dept. Public Works Headquarters @ 1106 2nd Street, Eureka, CA
- Public Health Building @ 529 I Street, Eureka, CA
- Ferndale Fairgrounds, Ferndale, CA
- Humboldt County Animal Shelter, 980 Lycoming Avenue, McKinleyville, CA

Table 3-1 summarizes the energy profile for each key asset.

TABLE 3-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: Information Technology Building										
Information Technology		Electricity; Natural Gas		Detroit Diesel, Katolight D400FRX4		400 kW	Diesel	2,500	Y	
Key Asset #2: Courthouse (including Emergency Operations Center)										
Government Facility Emergency Services Communications		Electricity; Natural Gas		Cummins DSHAG-5778458			Diesel	2,500	Y	
Key Asset #3: Correctional Facility, Phase I @ 826 4th Street										
Government Facility		Electricity		Detroit Diesel, Katolight D400FRX4		400 kW	Diesel			
Key Asset #4: Correctional Facility, Phase II @ 826 4th Street										
Government Facility		Electricity		Cummins Onan 2000 Gen Set		350 kW		2,000	Y	
Key Asset #5: Arcata/Eureka Airport Terminal @ 3561 Boeing Avenue										
Transportation Systems		Electricity; Natural Gas		Unknown						
Key Asset #6: Rohnerville Airport @ 2330 Airport Road										
Transportation Systems		Electricity		Unknown						
Key Asset #7: Clark Complex (including County Planning and Building, Public Works Land Use, Elections, and Sempervirens Psychiatric Hospital) @ 3033 H Street										
Government Facility Healthcare and Public Health		Electricity; Natural Gas		Caterpillar D343A		175 kW		500	Y	
Key Asset #8: Juvenile Hall @ 2002 Harrison Ave.										
Government Facility		Electricity		Generac 97A03236-S		60 kW	Diesel	79	Y	
Key Asset #9: Juvenile Hall—Northern Regional Facility @ 2004 Harrison Ave.										
Government Facility		Electricity		Generac 97A03236-S		60 kW	Diesel	79	Y	

TABLE 3-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #10: Professional Building—Department of Health and Human Services @ 5th and F Streets.										
Government Facility Healthcare and Public Health Administration Information Technology		Electricity; Natural Gas		Unknown						
Key Asset #11: Dept. Public Works Headquarters @ 1106 2nd Street										
Government Facility Communications Emergency Services		Electricity; Natural Gas		No generator						
Key Asset #12: Public Health Building @ 529 I Street										
Healthcare and Public Health Emergency Services		Electricity; Natural Gas		Cummins DGFA-5630376		100.5 kW	Diesel	366	Y	
Key Asset #13: Ferndale Fairgrounds										
Undefined Category Emergency Services		Electricity; Natural Gas		Unknown						
Key Asset #14: Animal Shelter: McKinleyville										
Undefined Category Healthcare and Public Health		Electricity; Natural Gas		No generator						

3.3.4 Key Asset Energy Consumption and Backup Generator Analysis

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 3-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

TABLE 3-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: Information Technology Building								
Generator Capacity Analysis: _____						400	Diesel	2,500
Key Asset #2: Courthouse (including Emergency Operations Center)								
Generator Capacity Analysis: _____							Diesel	2,500
Key Asset #3: Correctional Facility, Phase I @ 826 4th Street								
Generator Capacity Analysis: _____						400	Diesel	
Key Asset #4: Correctional Facility, Phase II @ 826 4th Street								
Generator Capacity Analysis: _____						350		2,000
Key Asset #5: Arcata/Eureka Airport Terminal @ 3561 Boeing Avenue								
Generator Capacity Analysis: _____								
Key Asset #6: Rohnerville Airport @ 2330 Airport Road								
Generator Capacity Analysis: _____								
Key Asset #7: Clark Complex (including County Planning and Building, Public Works Land Use, Elections, and Sempervirens Psychiatric Hospital) @ 3033 H Street								
Generator Capacity Analysis: _____						175		500
Key Asset #8: Juvenile Hall @ 2002 Harrison Ave.								
Generator Capacity Analysis: _____						60	Diesel	79

TABLE 3-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #9: Juvenile Hall—Northern Regional Facility @ 2004 Harrison Ave.								
						60	Diesel	79
Generator Capacity Analysis: _____								
Key Asset #10: Professional Building—Department of Health and Human Services @ 5th and F Streets.								
Generator Capacity Analysis: _____								
Key Asset #11: Dept. Public Works Headquarters @ 1106 2nd Street								
Generator Capacity Analysis: _____								
Key Asset #12: Public Health Building @ 529 I Street								
						100.5	Diesel	366
Generator Capacity Analysis: _____								
Key Asset #13: Ferndale Fairgrounds								
Generator Capacity Analysis: _____								
Key Asset #14: Animal Shelter: McKinleyville								
Generator Capacity Analysis: _____								

3.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

Table 3-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 9
- Number of FEMA Identified Severe Repetitive Loss Properties: 0
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 2

TABLE 3-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Weather (Landslide)	N/A	3/30/2011	$20 million (County Roads)
Tsunami	N/A	3/11/2011	n/a
Tsunami	N/A	2/27/2010	n/a
Earthquake	N/A	1/9/2010	$3.3 million (County Roads)
Tsunami	N/A	9/29/2009	n/a
Drought	N/A	7/21/2009	n/a
Wildfire	N/A	6/20/2008	n/a
Other Hazard (Structural Instability)	N/A	12/6/2007	Estimated $5.6 million
Earthquake	N/A	2/26/2007	n/a
Tsunami	N/A	1/12/2007	n/a
Wildfire	N/A	2006	n/a
Fish Loss	N/A	2006	n/a
Earthquake	N/A	7/16/2006	n/a
Earthquake	N/A	3/25/2006	n/a
Flooding, severe winter storms, and landslides	M#1628	02/03/2006	$20,208,206
Wildfire	N/A	2005	n/a
Severe Weather (Storm Surge)	N/A	12/31/2005	n/a
Severe Weather (Landslide)	N/A	12/28/2005	n/a
Severe Weather (High Wind)	N/A	11/28/2005	n/a
Earthquake	N/A	6/14/2005	n/a
Severe Weather (Astronomical High Tide, King Salmon)	N/A	1/9/2005	n/a
Severe Weather (Heavy Snow, Inland Humboldt County)	N/A	1/2/2005	n/a
Wildfire	N/A	2004	n/a
Severe Weather (Thunderstorm, Wind, Orick)	N/A	2/25/2004	n/a

TABLE 3-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Wildfire	N/A	2003	n/a
Severe Weather (Funnel Cloud, Orick)	N/A	12/7/2003	n/a
Earthquake	N/A	8/15/2003	n/a
Fish Loss	N/A	2002	n/a
Wildfire	N/A	2002	n/a
Earthquake	N/A	6/17/2002	n/a
Wildfire	N/A	2001	n/a
Earthquake	N/A	9/20/2001	n/a
Earthquake	N/A	1/13/2001	n/a
Fish Loss	N/A	2000	n/a
Wildfire	N/A	2000	n/a
Severe Weather (Rip Currents, Shelter Cove)	N/A	3/25/2000	n/a
Earthquake	N/A	3/16/2000	n/a
Wildfire	E#3140	09/01/1999	n/a
Severe Weather (Urban/small stream flooding)	N/A	3/24/1999	n/a
Severe Weather (Funnel Cloud, Arcata Airport)	N/A	1/18/1999	n/a
Severe Weather (Urban/small stream flooding)	N/A	12/21/1998	n/a
Severe Weather (Urban/small stream flooding)	N/A	11/20/1998	n/a
Severe Weather (Rip Currents, Big Lagoon)	N/A	10/30/1998	n/a
Severe Weather (Urban/small stream flooding)	N/A	2/21/1998	n/a
Severe Weather (Beach erosion, Big Lagoon)	N/A	2/17/1998	n/a
Severe winter storms, flooding	M#1203	2/9/1998	$7.75 million
Severe Weather (Lightning, Loleta)	N/A	2/3/1998	n/a
Severe Weather (Hail, Honeydew)	N/A	1/29/1998	n/a
Severe Weather (Funnel cloud, Bridgeville, Fields Landing)	N/A	4/23/1997	n/a
Severe winter storms, flooding	M#1155	1/4/1997	$35 million
Severe Weather (urban/small stream flooding)	N/A	12/29/1996	n/a
Severe Weather (Wind damage, Fieldbrook)	N/A	10/25/1996	n/a
Severe Weather (Hail, Shelter Cove)	N/A	3/4/1996	n/a
Severe Weather (Water spout, Arcata Airport)	N/A	2/21/1996	n/a
Severe Weather (Flood)	N/A	12/29/1995	n/a
Severe Weather (Flooding)	N/A	12/12/1995	n/a

TABLE 3-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Weather (Orleans, Thunderstorm, Winds)	N/A	5/24/1995	n/a
Severe Weather (Shelter Cove, Hail)	N/A	3/20/1995	n/a
Severe winter storms, flooding	M#1046	3/12/1995	$1.3 million
Winter storms, flooding, landslides, mud flows	M#1044	1/9/1995	$15 million
Severe Weather (S of Honeydew; Heavy Rain)	N/A	12/06/1993	n/a
Tsunami	N/A	4/25/1992	n/a
Earthquake	M#943	04/04/1992	n/a
Flood	M#935	2/25/1992	n/a
Flood	M#758	2/21/1986	$5.0 million
Coastal Storms, Floods, Slides, Tornados	M#677	1/25/1983	$3.82 million
Severe Weather (Hail)	N/A	6/24/1982	n/a
Drought	E#3023	1975-1977	n/a
Severe storms, High Tides, flooding	M#364	2/8/1973	n/a

3.5 HAZARD RISK RANKING

TABLE 3-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	51
3	Flood	39
4	Wildfire	36
5	Landslide	33
6	Drought	14
7	Tsunami	12
8	Dam Failure	6

Table 3-4 presents the ranking of the hazards of concern.

3.6 CAPABILITY ASSESSMENT

3.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 3-5.

TABLE 3-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code	Y	N	N	Y
Comment: California Building Code as currently adopted by the California Building Standards Commission, currently operating under the 2010 code (This procedure authorized under 331-1 of County Code)				
Zoning	Y	N	N	Y
Comment: Humboldt County Zoning Regulations Adopted 9/10/85. Higher jurisdiction in coastal zone.				
Subdivisions	Y	N	N	N
Comment: Humboldt County Subdivision Regulations. Originally adopted 7/19/77. Last revised 10/26/94. Higher jurisdiction in coastal zone.				
Stormwater Management	Y	N	N	Y
Comment: County Ordinance in preparation (McKinleyville, Unincorporated Eureka, and Shelter Cove)				
Post Disaster Recovery	N	N	N	N
Comment: County Ordinance 1973 - Structural Repair Ordinance (adopted in 1992)				
Real Estate Disclosure	N	N	Y	Y
Comment: CA State Civil Code 1102 requires full disclosure on natural hazard exposure of the sale/re-sale of any and all real property.				
Growth Management	Y	N	N	Y
Comment: General Plan provides guidance for this. Last adopted in 1984				
Site Plan Review	Y	N	N	N
Comment: Through Building and Planning requirements.(Plot Plan and Construction Plan Checklists)				
Public Health and Safety	Y	N	N	N
Comment: Flood Damage Prevention Regulations County code section 335, 1982. State Responsibility Area Fire Safe Regulations, County Code 3111-1 1991. Grading, Erosion Control (County Code Section 331-14), Geological Hazards (County Code Section 336), Streamside Management Areas (County Code Section 314-61.1), and Related Ordinance Revisions (Board of Supervisors Approved Ordinances June 2002). Soil Reports for Building Permits (County Code Section 332-1) 1974.				
Environmental Protection	Y	N	N	N
Comment: Streamside Management Areas Ordinance. *(Critical/Sensitive Areas)*—County Code Section 314-61.1.				
Energy Code	Y	N	N	N
Comment: California *Energy Code* as currently adopted by the California Building Standards Commission (2010).				

TABLE 3-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Planning Documents				
General or Comprehensive Plan ***Comment:*** The current General Plan was adopted in 1984 and the County is currently going through a General Plan Update. The draft update contains language that links to this mitigation plan. Higher jurisdiction in coastal zone.	Y	N	N	Y
Floodplain or Basin Plan ***Comment:*** Regional Water Quality Control Board Basin Plan	N	N	N	N
Stormwater Plan ***Comment:*** Stormwater Management Plan—McKinleyville. Board of Supervisors to adopt updated plan in 2014. Erosion sediment control ordinance part of grading ordinance.	Y	N	N	N
Capital Improvement Plan ***Comment:*** There is an established list of capital improvement projects that is approved by the Board of Supervisors on an annual basis. This list includes deferred maintenance for buildings owned by the County and projects are supported by the general fund or a combination of funding sources. Other projects are supported by grant funds that arise periodically. These grants often come with specific allowable uses and capital improvement projects are designed with those uses in mind.	N	N	N	N
Habitat Conservation Plan	N	N	N	N
Economic Development Plan ***Comment:*** Prosperity! For Humboldt - an economic development strategy.	Y	N	N	N
Shoreline Management Plan ***Comment:*** Local Coastal Program per California Coastal Act.	N	N	N	N
Community Wildfire Protection Plan ***Comment:*** Humboldt County Community Wildfire Protection Plan. Updated 2013. Other local jurisdictions: Hoopa, Lower Mattole, Willow Creek, Orleans-Somes Bar.	Y	Y	Y	N
General Plan Energy Conservation Element or Energy Specific Plan ***Comment:*** In development as part of the General Plan Update due to be completed in 2014	Y	N	N	N
Climate Action Plan or Climate Adaptation Strategy ***Comment:*** In development as part of the General Plan Update due to be completed in 2014	Y	N	N	N
Response/Recovery Planning				
Comprehensive Emergency Management Plan ***Comment:*** Last updated in June, 2002	Y	N	N	Y
Threat and Hazard Identification and Risk Assessment ***Comment:***				
Terrorism Plan ***Comment:*** In development, due to be completed in 2014	Y	N	N	N
Post-Disaster Recovery Plan	N	N	N	N
Continuity of Operations Plan ***Comment:*** In development, due to be completed in 2014	Y	N	N	N
Public Health Plans ***Comment:*** 2013 Community Health Assessment draft produced by the Department of Health and Human Services	Y	N	N	N

3.6.2 Administrative and Technical Capability

TABLE 3-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	Humboldt County Planning and Building, Planners Humboldt County Public Works, Engineers
Engineers or professionals trained in building or infrastructure construction practices	Y	Humboldt County Planning and Building, Building Division, Building officials Humboldt County Public Works, Infrastructure Engineer
Planners or engineers with an understanding of natural hazards	Y	Humboldt County Planning and Building, Planners Geo tech.
Planners or engineers with an understanding of energy resilience or alternative energy technology	Y	Humboldt County Public Works, Architect
Staff with training in benefit/cost analysis	N	
Surveyors	Y	Humboldt County Public Works, Surveyors
Personnel skilled or trained in GIS applications	Y	Humboldt County Planning and Building, Planners. Planning (informal agreement with a few cities) countywide initiative training and software for HAZUS training)
Scientist familiar with natural hazards in local area	Y	Humboldt State University and College of the Redwoods faculty
Emergency manager	Y	Humboldt County Office of Emergency Services, Sheriff's Department, Emergency Services Coordinator
Grant writers	Y	Most County Departments have some grant writing capabilities.

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 3-6.

3.6.3 Fiscal Capability

TABLE 3-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	Yes

The assessment of the jurisdiction's fiscal capabilities is presented in Table 3-7.

3.6.4 National Flood Insurance Program Compliance

TABLE 3-8.
NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

What department is responsible for floodplain management in your community?	County Planning and Building
Who is your community's floodplain administrator (department/position)?	Todd Sobolik, Building Division, County of Humboldt Chief Building Official
Do you have any certified floodplain managers on staff in your community?	No (Not Certified)
What is the date of adoption of your flood damage prevention ordinance?	July 19, 1982 (updated January 9, 1995 (Ordinance #2102); last revision on February 2, 1999 (Board Resolution 99-15))
When was the most recent community assistance visit or community assistance contact?	June 25, 2008
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	No
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	Yes, however most of the County is in an un-numbered A Zone which makes it more difficult to establish the base flood elevation.
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	Yes (funding to support updates to the flood damage prevention ordinance as needed)

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 3-8.

3.6.5 Energy Resilience Capability

TABLE 3-9. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	Cybelle Immitt, Public Works
Have you performed an energy assurance gap analysis for your community?	Preliminary evaluation with much more work to do
Have you completed a vulnerability assessment of power sources to each key asset?	Preliminary evaluation with much more work to do
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	In place for some key assets but needed for others
Are emergency backup generators tested on a regular basis?	Yes
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Yes
Have you established a working relationship with your community's energy service providers?	Yes
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	Yes but much more exploration is needed
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	Yes/partial

Energy resiliency capabilities are presented in Table 3-9.

3.6.6 Community Mitigation Program Classifications

TABLE 3-10.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule	Yes	3	February 3, 2010
Public Protection	N/A	--	--
Storm Ready	Yes	Active	--
Firewise	Yes	Active	--
Tsunami Ready (if applicable)	Yes	Active	--

Classifications under various community mitigation programs are presented in Table 3-10.

3.7 HAZARD MITIGATION ACTION PLAN

Table 3-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-1—FEMA training in Benefit/Cost Analysis.							
New and Existing.	All Hazards	6, 7, 10, 12	County—OES and PW	Med	Grants—CAOES, FEMA—Hazard Mitigation Technical Assistance Program, Dept. Funds	Short Term	Yes
Initiative HC-2—Obtain Firewise Certification for as many Humboldt County communities at risk as possible.							
New and Existing.	Wildfire	2, 3, 5, 6, 8, 9	Humboldt County Fire Safe Council	Med	National Fire Plan Grant Program, County Payments Title III and other programs	Short Term	Yes, Revised
Initiative HC-3—Educate the public about evacuation preparedness. Create and distribute evacuation maps where specific impacts and mitigation actions can be pre-identified (such as Tsunami and Dam Break hazards).							
New and Existing.	All Hazards	1, 3, 5, 6, 7, 12	OES and Humboldt County Association of Governments (HCAOG)	Med	PDM Grant, HMGP, General Fund, CAOES	Long Term Depends on financing	Yes, Revised
Initiative HC-4—Identify priority locations for landslide mitigation projects along key access routes (such as Alderpoint Road and Mattole Road), as well as waterways (such as upstream of the City of Rio Dell's water supply intake on the Eel River). Move forward on implementing the most appropriate mitigation for each location. Mitigation could include building rock buttress (or other type of buttress fill) and retaining walls. Also, address the landslide hazard by mitigating subsurface and surface water in roadway prism (use culverts and ditching for surface water and under drains and interceptor trenches for subsurface water)							
New and Existing.	Landslide, Wildfire, Severe Weather, Earthquake	1, 2, 3, 7, 8, 9, 10, 11	PW, City of Rio Dell	Med	PDM Grant, HMGP, General Fund, Road Funds	Short Term Depends on financing	Yes, Revised

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-5—Develop and adopt a Post-Disaster Recovery Ordinance.							
New and Existing	All Hazards	1, 3, 4, 5, 8, 10, 12	Planning & Building, PW	Med	General Fund	Short Term	Yes, Revised
Initiative HC-6—Implement priority recommendations from the Humboldt County Community Wildfire Protection Plan.							
New and Existing	Wildfire, Landslide	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	Humboldt County Fire Safe Council	Med	Grant Funding (National Fire Plan Grant Program, PDM Grants and HMGP Grants, County Payments Title III and other programs)	Short Term	Yes, Revised
Initiative HC-7—Evaluate flood zones for the establishment of Base Flood Elevations in conjunction with other flood mitigation projects.							
New and Existing.	Flood, Tsunami	2, 3, 7, 8	Planning & Building, OES, PW	Med	Grant funding, General Fund	Long Term Depends on financing	Yes, Revised
Initiative HC-8—Adopt California Building Code pursuant to state mandate as soon as it is adopted by the State.							
New and Existing.	Earthquake, Wildfire, Flood, Severe Weather, Dam Failure, Landslide	2, 3, 8, 10, 11	Planning & Building	Med	General Fund, Building Funds	Short Term	Yes Revised
Initiative HC-9—Conduct a systematic assessment of all important/critical County buildings and infrastructure in high hazard zones, to identify their specific vulnerabilities and to identify cost effective mitigation solutions.							
Existing	Earthquake, Tsunami, Flood	1, 2, 3, 7, 8, 10,	PW, Planning & Building	Med	General Fund, PDM Grants, and other Grants.	Short Term	Yes.

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-10—Perform a detailed vulnerability assessment to identify priority road and bridge hazard mitigation projects and integrate the resulting list with the Humboldt Regional Transportation Plan. Candidates for priority projects include Blue Slide Rd. (Price Creek), roadway and culverts on Shelter Cove Rd., Upper and Lower Cappell Rds. near Hoopa (culvert needs), Ambrosini Ln. (Williams Creek), and King Salmon Ave. Move forward on implementing the most appropriate mitigation for each location.							
New and Existing.	Dam Failure, Earthquake, Landslide, Severe Weather, Tsunami, Wildfire	2, 3, 4, 5, 7, 8, 11	PW, Cities of Ferndale and Rio Dell, and HCAOG	Med	General Fund, PDM Grant, HMGP, Other State Grants, State Transportation Improvement Program	Short Term	Yes, Revised
Initiative HC-11—Inform owners of non-retrofitted, unreinforced masonry buildings that they must post a placard identifying the structure as not having been retrofitted (per the requirements of the 1986 Government Code 8875 et seq.).							
Existing.	Earthquake	3, 6, 10, 11	Planning & Building	Med	General Fund	Short Term	Yes, Revised
Initiative HC-12—Help as many communities as possible join the NOAA Tsunami Ready (Storm Ready) Program							
New and Existing.	Tsunami, Flood, Severe Weather	1, 3, 4, 5, 6, 7, 8, 12	NWS, County of Humboldt OES, Redwood Coast Tsunami Work Group	High	NOAA funding/support Grants	Short Term	Yes, Revised
Initiative HC-13—Develop probabilistic Tsunami Hazard Maps or other methodology suitable for flood insurance risk use and make available to public.							
New and Existing.	Tsunami	2, 3, 5, 6, 7, 9, 10	OES, Planning & Building, Redwood Coast Tsunami Work Group	High	PDM Grant, HMGP, Other State Grants	Long Term Depends on financing	Yes

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-14—Maintain the Tsunami Signage program.							
New and Existing.	Tsunami	3, 5, 6, 7, 8, 10, 12	OES, NOAA, PW, CalTrans, Arcata, Eureka, Trinidad, Redwood Coast Tsunami Work Group	Med	General Fund, other partner agency funding, and Grants	Short Term	Yes, Revised
Initiative HC-15—Support the State of California in its efforts to develop criteria, with guidance from an expert panel, for addressing the Tsunami hazard in local land use planning.							
New and Existing.	Tsunami	1, 3, 5, 7, 8, 10, 12	Board of Supervisors, Planning & Building, Redwood Coast Tsunami Work Group	Low	General Fund	Short Term	Yes
Initiative HC-16—Develop a tsunami warning and response system.							
New and Existing.	Tsunami	1, 3, 5, 6, 8, 12	OES, NOAA, Redwood Coast Tsunami Work Group	High	Donations, NOAA Grants, and One-time Development Fees	Long Term Depends on financing	Yes
Initiative HC-17—Provide training for appropriate staff within the County on the use of HAZUS-HM software.							
New and Existing.	All Hazards	2, 5, 6, 7, 8, 9, 10, 12	PW, Planning & Building	Med	General Fund, ESRI Grants, Emergency Management Performance Grants	Short Term	Yes
Initiative HC-18—Develop a public education program to demonstrate steps citizens can take to make their homes less vulnerable to natural hazard impacts and inform them about hazard mitigation and emergency preparedness via County website and other media sources.							
New and Existing.	All Hazards	3, 6, 7	OES	Med	General Fund, Grants, Partnership Funding	Short Term	Yes

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-19—Secure property interests (fee title or easements) for sediment retention and floodplain connectivity and develop these sites where excessive sediment is a primary cause of flooding (restore natural floodplain processes)							
New and Existing.	Flood	2, 3, 9, 10	PW	High	PDM Grant, Prop 84, other Grants.	Short Term	Yes, Revised
Initiative HC-20—Secure funding and authorization to include seismic upgrades to planned major repairs of County buildings, especially buildings critical to emergency response and recovery (including designs and feasibility studies associated with the construction project)							
Existing	Earthquake	1, 2, 4, 7, 11	PW	Med	General Fund, PDM, HMGP	Long Term Depends on financing	Yes
Initiative HC-21—Design and distribute building guides to help citizens comply with hazard mitigation code requirements.							
New	All Hazards	3, 6, 7, 8, 11	Planning & Building	Med	General Fund, HMGP, Building Funds	Short Term	Yes
Initiative HC-22—Expand landslide hazard mapping by following the California Division of Mines and Geology North Coast Watersheds Mapping project methodology, or similar acceptable mapping approach and make easily accessible to public.							
New and Existing.	Landslide	2, 3, 6, 7, 9, 10, 12	Planning & Building—GIS	Med	General Fund and Grant Funding	Long Term Depends on financing	Yes, Revised
Initiative HC-23—Establish an agreement with haulers to assist with the development of emergency plans for transporting and disposing of post-disaster event debris, ahead of a disaster.							
Existing.	All Hazards	1, 3, 4, 5, 8, 9, 12	EH, PW, CAO, Humboldt Waste Management Authority	Low	General Fund and State Post-Disaster Grants	Short Term	Yes, Revised
Initiative HC-24—Identify and develop adequate locations for the temporary storage of post disaster event debris.							
Existing.	All Hazards	1, 3, 4, 5, 8, 9, 12	PW, EH, Humboldt Waste Management Authority	Med	Grants, General Fund	Short Term	Yes, Revised

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-25—Secure funding for additional GIS staffing capacity to provide interagency coordination and consolidated, integrated GIS capabilities including all county departments and other applicable agencies.							
New and Existing.	All Hazards	5, 7, 8, 10	Applicable County Departments	Low	General Fund, ESRI Grants, DHS, Applicable County Department Funding Sources	Short Term	Yes
Initiative HC-26—Hardening and reinforcement of repeater sites (retrofit)							
Existing.	All Hazards.	1, 2, 3, 4, 5	CAO/Communications, OES, PW	High	DHS, HERSA/CDC Grants	Short Term	Yes
Initiative HC-27—Public education for identified isolated islands of humanity. This could include the development of Community Emergency Response Teams (CERTs).							
New and Existing.	All Hazards	3, 5, 6, 7	HSU, PH, OES	High	DHS, HERSA/CDC Grant, Volunteers	Short Term	Yes
Initiative HC-28—Enhance airports to prepare for receiving emergency aircraft.—Rohnerville, Arcata/Eureka, Murray Field.							
Existing.	All Hazards	1, 2, 3, 4, 5, 12	PW—Aviation	High	PDM Grants, HMGP, other Grants	Long Term Depends on financing	Yes, Revised
Initiative HC-29—Upgrade County Operations Plan for better integration and training coordination.							
New and Existing.	All Hazards	1, 4, 5, 8, 12	OES	Med	HERSA/CDC, CAOES, General Fund	Short Term	Yes
Initiative HC-30—Complete County Continuity of Operations Plan (COOP).							
New and Existing.	All Hazards	1, 2, 3, 4, 8, 12	CAO, PW, OES	Low	DHS, HERSA/CDC, General Fund, CAOES	Short Term	Yes, Revised
Initiative HC-31—Protect, relocate, and/or develop mobilization plans for PW maintenance yards with exposure to hazards (such as the heavy equipment and motor-pool facilities on Jacobs Ave.).							
Existing.	All Hazards.	1, 2, 3, 4, 8, 12	PW	Med	Grants, General Fund	Short Term	Yes, Revised

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-32—Relocate and digitize stored County records.							
Existing.	Flood, Earthquake, Tsunami, Severe Weather, Wildfire	1, 2, 3, 8	All County Departments CAO	Low	All Applicable County Department Funding Sources, and Grants	Short Term	Yes, Revised
Initiative HC-33—Establish alternate OES Emergency Operations Center.							
Existing.	All Hazards	1, 2, 3, 4, 5, 12	CAO, OES	Med	General Fund, State Funds, Grants	Long Term	Yes, Revised
Initiative HC-34—Work with Partners to prepare Redwood Acres and Humboldt County Fairgrounds for use as critical infrastructure for response and recovery activities (such as retrofitting facilities, establishing agreements, and improving communications infrastructure).							
Existing.	All Hazards	1, 3, 4, 5, 12	County of Humboldt - PW, and OES, City of Ferndale, California's 9th District Agricultural Association	Med	General Funds, State Funds, Grants	Long Term	Yes, Revised
Initiative HC-35—Upgrade/develop redundant interoperable communication systems (fiber optic, wireless, radio, other).							
New and Existing.	All Hazards	1, 2, 3, 4, 5, 12	CAO	High	State Funds, DHS, Partnership Funds	Short Term	Yes
Initiative HC-36—Include in Capital Improvements Plan --back-up emergency energy sources.							
New and Existing.	All Hazards	1, 2, 3, 4, 10	CAO, PW, OES	Med	General Fund, CAOES, DHS	Short Term	Yes
Initiative HC-37—Continue to support Environmental Health's program to provide regulatory oversight of high hazard facilities.							
Existing.	All Hazards	1, 3, 7, 8, 9, 10	EH	Med	Certified Unified Program Agency Funding	Long Term Depends on financing	Yes, Revised

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-38—Upgrade non-accredited federal flood control projects to meet current FEMA and Army Corps of Engineers standards (Redwood Creek, Eel River, Mad River).							
Existing.	Flood and Other Hazards (Fish Losses)	2, 3, 6, 7, 8, 9, 10	PW, City of Blue Lake, Orick Community Services District	Med	General Fund, Grants (FEMA, Army Corps of Engineers)	Long Term Depends on financing	Yes, Revised
Initiative HC-39—Work with private levee owners to upgrade levees to meet current design standards and mitigate flood risks.							
New and Existing.	Flood	2, 3, 4, 6, 7, 9, 11	PW	Med	HMGP, General Fund	Long Term	Yes, Revised
Initiative HC-40—Amend or enhance the Hazard Mitigation Plan on an "as needed" basis to comply with State or Federal mandates (i.e., CA Assembly Bill #2140) as guidance for compliance with these programs becomes available.							
New and Existing	All Hazards	All Objectives	PW, OES	Med	Ongoing programs, Grant Funding (depending on mandate)	Long Term	Yes
Initiative HC-41——Continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New and Existing.	Flood	2, 3, 6, 7, 8, 9, 10, 11	Planning & Building	Low	Funded through existing, ongoing programs	Short Term	Yes, Revised
Initiative HC-42—Update the floodplain ordinance to meet minimum National Flood Insurance Program requirements as needed.							
New & Existing	Flood	2, 3, 7, 9, 10, 11	County of Humboldt	Med	HMGP, PDM, General Fund	Short Term	No
Initiative HC-43—Pursue funding to enhance County assessor data to support future risk assessments for the planning area. Enhancements could include but are not limited to the following: • Obtain GIS-format data on all structures within the County. • Capture information such as date of construction, construction class, area, occupancy class, foundation type and building permit history. • Collect building photographs. • Create map interfaces intersecting hazard information with building information.							
New and Existing	All Hazards	7, 10, 11	County Assessor	Med	General Fund, HMGP	Long Term	No

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-44—Increase the current Benefit Assessment for County Service Area #4 to meet the rising cost of services.							
New and Existing	Wildfire	3, 4, 5	County of Humboldt, CAL FIRE	Med	County funds, grants, state funding	Short Term	No
Initiative HC-45—Enhance County Service Area #4 capability to provide adequate service by: increasing communication capabilities with additional repeaters, radios, phones, etc.; improving fire protection water supply by developing additional hydrants, water storage tanks, and obtaining a water tender, obtaining funding to include potable water at the fire station from City of Trinidad, and purchasing fire equipment (hose, nozzles, personal protective equipment, extrication equipment, ropes etc.) and other fire apparatus.							
New and Existing	Wildfire	1, 2, 3, 4, 5, 9, 12	County of Humboldt, CAL FIRE	High	Homeland Security grants, FEMA grants, local foundations	Long Term	No
Initiative HC-46—Recruit personnel with emergency preparedness and response capabilities to supplement County Service Area #4 task force. Recruit volunteers, fire academy students, CERT members, etc. Provide more training opportunities.							
New and Existing	ALL Hazards	1, 3, 4, 5, 6, 12	County of Humboldt, CAL FIRE	High	Grants and volunteer labor	Long Term	No
Initiative HC-47—Establish back-up energy sources including additional fuel storage for Information Technology Building to address deficiencies in the current system.							
Existing	All	1, 2, 3, 12	County of Humboldt	High	Capital improvement funding, California Energy Commission (CEC) grant, other grants	Long Term	No
Initiative HC-48—Conduct an assessment of the emergency back-up energy capabilities (how much power can be provided, and for how long) for Humboldt County key assets. Determine the energy needs of these key assets in the event of an extended power outage. Identify where gaps exist between the emergency energy needs and capabilities of key assets. Based on the assessment and gap analysis, identify potential projects (such as additional fuel storage, infrastructure enhancements, retrofits, etc.) and estimate project costs for reaching adequate energy assuredness for Humboldt County's key assets in the event of an extended power outage.							
Existing	All	1, 2, 3, 4, 5, 8, 12	County of Humboldt	Med	CEC grant, General Fund	Long Term	No

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-49—Participate in coordinated planning with partner jurisdictions to determine energy requirements and back-up capabilities during a disaster event for non-County owned key assets. Determine needs to mitigate impacts and ensure energy assurance in the event of an extended power outage (partners may include: Redwood Acres, College of the Redwoods, Tribes, cities, Humboldt Waste Management Authority, Humboldt Bay Municipal Water District, Humboldt Bay Recreation and Conservation District, Chevron fuel transfer station on the Bay, cogeneration facilities, transportation entities such as Humboldt Transit Authority, Humboldt County Association of Governments, and Cal Trans, food supply entities, fire departments, and local water districts.							
New and Existing	All	1, 2, 3, 4, 5, 7, 8, 12	County of Humboldt in partnership with other applicable jurisdictions	Med	Participating agency budgets, Sustainable Communities Planning Grant , CEC Grants	Long Term	No
Initiative HC-50—Investigate low/no-cost energy efficiency and conservation measures and innovative technologies such as micro-turbines and solar for Key Assets and other county-owned/operated assets in order to decrease their energy footprint thus reducing energy bills and the scale of needed back-up power. Also look into higher cost, advanced technologies such as micro-grids.							
New & Existing	All Hazards	1, 2, 3, 4, 7, 8, 9, 12	County of Humboldt	Med	Sustainable Communities Planning Grant, CEC Grant, General Fund	Short Term, ongoing	No
Initiative HC-51—Ensure that any future updates of the Humboldt County General Plan incorporate this Hazard Mitigation Plan as part of the Safety Element.							
New & Existing	All Hazards	All Objectives	County	Low	General Fund	Short Term, Ongoing	No
Initiative HC-52—Create subzones of the Humboldt County Flood Control District in critical areas and work with affected communities to establish associated revenue-generating mechanisms, such as benefit assessments and special taxes to support flood mitigation activities.							
New & Existing	Flood	2, 3, 6, 7, 9	County of Humboldt PW	Med	Grants—tax/assessment revenue	Short Term	No

TABLE 3-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative HC-53—Complete a detailed vulnerability assessment of the impacts of sea level rise on the Humboldt Bay region.							
New & Existing	Flood, Severe Weather, Tsunami	6, 7, 8, 10	County of Humboldt PW, Humboldt Bay Harbor, Recreation and Conservation District, City of Arcata, City of Eureka	Med	Grants—tax/assessment revenue	Short Term	No

3.8 PRIORITY OF RECOMMENDED INITIATIVES

Table 3-12 identifies the priority for each initiative.

TABLE 3-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
HC-1	4	Med	Med	Yes	Yes	Yes	High
HC-2	6	Med	Med	Yes	Yes	No	High
HC-3	6	Med	Med	Yes	Yes	Yes	High
HC-4	8	Med	Med	Yes	Yes	Yes	High
HC-5	7	Med	Med	Yes	No	Yes	Med
HC-6	11	High	Med	Yes	Yes	Yes	High
HC-7	4	Med	Med	Yes	Yes	Yes	Low
HC-8	5	Med	Med	Yes	No	Yes	Med
HC-9	6	Med	Med	Yes	Yes	Yes	High
HC-10	7	High	Med	Yes	Yes	Yes	High
HC-11	4	Low	Med	No	No	Yes	Low
HC-12	8	Med	High	No	Yes	No	Low
HC-13	7	Med	High	No	Yes	No	Low
HC-14	7	Med	Med	Yes	Yes	Yes	High
HC-15	7	Low	Low	Yes	No	Yes	Med
HC-16	6	High	High	Yes	Yes	No	Low
HC-17	8	Med	Med	Yes	Yes	Yes	High
HC-18	3	Med	Med	Yes	Yes	Yes	High
HC-19	4	Low	High	No	Yes	No	Low
HC-20	5	Med	Med	Yes	Yes	Yes	Low
HC-21	5	Med	Med	Yes	Yes	Yes	High
HC-22	7	Med	Med	Yes	Yes	Yes	Low
HC-23	7	Med	Low	Yes	Yes	Yes	High
HC-24	7	Med	Med	Yes	Yes	Yes	High
HC-25	4	Low	Low	Yes	Yes	Yes	High
HC-26	5	Med	High	No	Yes	No	Low
HC-27	4	Med	High	No	Yes	No	Low
HC-28	6	Med	High	No	Yes	No	Low
HC-29	5	Med	Med	Yes	Yes	Yes	High
HC-30	6	Med	Low	Yes	Yes	Yes	High

TABLE 3-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
HC-31	6	Med	Med	Yes	Yes	No	Med
HC-32	4	Low	Low	Yes	Yes	Yes	High
HC-33	6	Med	Med	Yes	Yes	Yes	Low
HC-34	5	Med	Med	Yes	Yes	Yes	Low
HC-35	6	Med	Med	Yes	Yes	No	Medium
HC-36	5	Med	High	No	Yes	Yes	Low
HC-37	6	Med	Med	Yes	No	Yes	Low
HC-38	7	Med	Med	Yes	Yes	Yes	Low
HC-39	7	Med	Med	Yes	Yes	Yes	Low
HC-40	12	Med	Med	Yes	Yes	Yes	Medium
HC-41	8	Med	Low	Yes	No	Yes	High
HC-42	6	Med	Med	Yes	Yes	Yes	High
HC-43	3	Med	Med	Yes	Yes	Yes	High
HC-44	3	Med	Med	Yes	Yes	Yes	High
HC-45	7	High	High	Yes	Yes	No	Med
HC-46	6	Med	High	No	Yes	No	Low
HC-47	4	Med	High	No	Yes	No	Low
HC-48	7	Med	Med	Yes	Yes	Yes	Low
HC-49	8	Med	Med	Yes	Yes	Yes	Low
HC-50	8	Low	Med	No	Yes	Yes	Low
HC-51	12	Med	Low	Yes	No	Yes	Med
HC-52	5	Med	Med	Yes	Yes	No	High
HC-53	4	Med	Med	Yes	Yes	No	High

a. See Chapter 1 for definitions of high, medium and low priorities.

3.9 ANALYSIS OF RECOMMENDED INITIATIVES

Table 3-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

TABLE 3-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	HC-1, HC-5, HC-8, HC-10, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-43, HC-48, HC-49, HC-50, HC-51	HC-10, HC-26, HC-28, HC-31, HC-47,	HC-3, HC-17, HC-18, HC-21, HC-27, HC-46	HC-23, HC-24, HC-37	HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-10, HC-36
Drought	HC-1, HC-5, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-43, HC-48, HC-49, HC-50, HC-51	HC-26, HC-28, HC-31, HC-47,	HC-3, HC-17, HC-18, HC-21, HC-27, HC-46	HC-23, HC-24, HC-37	HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-36
Earthquake	HC-1, HC-5, HC-8, HC-9, HC-10, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-43, HC-48, HC-49, HC-50, HC-51	HC-20, HC-26, HC-28, HC-31, HC-32, HC-47,	HC-3, HC-11, HC-17, HC-18, HC-21, HC-27, HC-46	HC-23, HC-24, HC-37	HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-4, HC-10, HC-36
Flood	HC-1, HC-5, HC-7, HC-8, HC-9, HC-12, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-41, HC-42, HC-43, HC-48, HC-49, HC-50, HC-51, HC-52, HC-53	HC-19, HC-26, HC-28, HC-31, HC-32, HC-38, HC-39, HC-47, HC-52, HC-53	HC-3, HC-12, HC-17, HC-18, HC-21, HC-27, HC-46, HC-53	HC-19, HC-23, HC-24, HC-37, HC-52, HC-53	HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-36

TABLE 3-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Landslide	HC-1, HC-5, HC-6, HC-8, HC-22, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-43, HC-48, HC-49, HC-50, HC-51	HC-6, HC-26, HC-28, HC-31, HC-47,	HC-3, HC-6, HC-17, HC-18, HC-21, HC-22, HC-27, HC-46	HC-6, HC-23, HC-24, HC-37	HC-6, HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-4, HC-10, HC-36
Severe Weather	HC-1, HC-5, HC-8, HC-10, HC-12, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-43, HC-48, HC-49, HC-50, HC-51, HC-53	HC-26, HC-28, HC-31, HC-32, HC-47, HC-53	HC-3, HC-12, HC-17, HC-18, HC-21, HC-27, HC-46, HC-53	HC-23, HC-24, HC-37, HC-53	HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-4, HC-10, HC-36
Tsunami	HC-1, HC-5, HC-7, HC-9, HC-10, HC-12, HC-13, HC-15, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-43, HC-48, HC-49, HC-50, HC-51, HC-53	HC-26, HC-28, HC-31, HC-32, HC-47, HC-53	HC-3, HC-12, HC-14, HC-17, HC-18, HC-21, HC-27, HC-46, HC-53	HC-23, HC-24, HC-37, HC-53	HC-16, HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-46	HC-10, HC-36
Wildfire	HC-1, HC-5, HC-6, HC-8, HC-10, HC-17, HC-25, HC-29, HC-30, HC-33, HC-34, HC-40, HC-45, HC-48, HC-49, HC-50, HC-51	HC-6, HC-26, HC-28, HC-31, HC-32, HC-47,	HC-2, HC-3, HC-6, HC-17, HC-18, HC-21, HC-27, HC-46	HC-6, HC-23, HC-24, HC-37	HC-6, HC-23, HC-24, HC-28, HC-30, HC-33, HC-34, HC-44, HC-45, HC-46	HC-4, HC-10, HC-36

a. See Chapter 1 for description of mitigation types.

3.10 STATUS OF PREVIOUS PLAN INITIATIVES

Table 3-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

TABLE 3-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
HC-1		X		**Ongoing, carried over as HC-1.** One Public Works staff member took the FEMA PDM Grant Training and BCA training in Sacramento on 8/30/10—9/02/10. More indepth trainnig is desired.
HC-2			X	**Removed.** Action not feasible with current staffing levels. Can only comply with the current federal regulations and county codes regarding the flood damage prevention program. This is not a priority for the County at this time.
HC-3		X		**In Progress/Ongoing, carried over as HC-2.** The County will continue to support this endeavor to help more communities become Firewise.
HC-4			X	**Removed.** Have not drafted a specific Post-Disaster Action Plan. This action item has been eliminated. Specific post disaster recover plans will be used on the departmental level.
HC-5		X		**Ongoing/Revised, carried over as HC-3.** Emphasis on the education component rather than the maps.
HC-6		X		**No Action, Revised, carried over as HC-4.** Revision directs focus to key access routes and adds waterways. This action item is dependent on funding availability.
HC-7		X		**No Action/Revised, carried over as HC-5.** No such ordinance in place. Action item revised to: "Develop and adopt a Post-Disaster Recovery Ordinance"
HC-8		X		**In Progress/Ongoing, carried over as HC-6.** The MFPP has been updated, renamed, and approved as the Humbldt County Community Wildfire Protection Plan. Significant steps have been taken and progress will continue on several of the Plan's recommendations.
HC-9		X		**In Progress/Ongoing, Revised, carried over as HC-7.** Progress made by private parties when filing for a LOMA with FEMA. The County is also working on studies on the Mad River (Blue Lake) and Redwood Creek (Orick).
HC-10		X		**Ongoing, Revised, carried over as HC-8.** Revision changes focus to the California Building Code (based on the International Building Code). Last adopted by the County on May 1, 2011. The 2013 addition of the California Building Code will be automatically adopted on January 1, 2014

TABLE 3-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
HC-11		X		**In Progress/Ongoing, carried over as HC-9.** The Courthouse is undergoing a seismic retrofit. Construction began in Spring 2013.
HC-12		X		**In Progress/Ongoing, Revised, carried over as HC-10.** Progress has been made on certain roads and bridges using federal and state transportation funding. More work remains to be done.
HC-13			X	**Removed.** Action is not a feasible project for the County of Humboldt due to funding and staffing constraints.
HC-14		X		**Ongoing, Revised, carried over as HC-11.** Revision emphasizes informing owners of need for placard identifying structure as non-retrofitted. An ordinance still needs to be adopted and more targeted outreach is planned. Due to funding and staffing levels this has not been possible.
HC-15		X		**In Progress/Ongoing/Revised, carried over as HC-12.** Revision emphasizes helping communities join program. Tsunami Ready recognition has been achieved for five communities in Humboldt County. The County will continue to support this effort.
HC-16		X		**In Progress/Ongoing, carried over as HC-13.**
HC-17		X		**In Progress/Ongoing, Revised, carried over as HC-14.** This has been a very successful program and resources will be sought to continue the work. Revision focuses on maintaining the existing program.
HC-18		X		**In Progress/Ongoing, carried over as HC-15.** The County has been heavily involved with State efforts to improve tsunami response support mechanisms. Continued involvement is desired.
HC-19		X		**In Progress/Ongoin, carried over as HC-16.** Eleven siren sites installed between 2010-2012. County's reverse calling system installed in 2008. Action is ongoing and continually needs updating to account for new tools being developed.
HC-20		X		**No Action, carried over as HC-17.** No action has been taken thus far due to a lack of funding.
HC-21		X		**In Progress/Ongoing, carried over as HC-18.** Public education is continually provided through multiple methods and it is a priority to improve ourteach programs.
HC-22	X			**Completed**. The Humboldt GIS Portal is a mapping tool available through the Humboldt County Planning and Building website: http://gis.co.humboldt.ca.us/.
HC-23		X		**No Action, Revised, carried over as HC-19.** Revision emphasizes restoring natural floodplain processes. Funding and staffing constraints.
HC-24		X		**No Action**, **carried over as HC-20.** Funding and staffing constraints.

TABLE 3-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
HC-25		X		**No Action, carried over as HC-21.** Funding and staffing constraints.
HC-26		X		**No Action, Revised, carried over as HC-22.** Revision emphasizes expanding mapping. Funding and staffing constraints.
HC-27		X		**No Action, carried over as HC-23.** Funding and staffing constraints.
HC-28		X		**No Action, carried over as HC-24.** Environmental Health will promote development of a list of locations through established solid waste work group meetings with Public Works, Humboldt Waste Management Authority and the CAO.
HC-29		X		**In Progress/Ongoing, carried over as HC-25.** Planning and Building GIS staff has provided services and some GIS training to multiple County departments. Extra funding has not yet been secured and this is still a priority.
HC-30		X		**In Progress/Ongoing, carried over as HC-26.** County IT has identified sites and integrated into a regular upgrade schedule. Equipment has been replaced. Hardening of sites is a priority.
HC-31		X		**In Progress/Ongoing, carried over as HC-27.** The leader in this effort is the Humboldt State University Regional Training Institute—Community Disaster Preparedness. Several public education classes and trainings have been completed with limited funding. More funding is needed.
HC-32		X		**No Action, Revised, carried over as HC-28.** Revision emphasizes enhancing airports to receive emergency aircraft. Funding constraints.
HC-33		X		**In Progress/Ongoing, carried over as HC-29.** Progress on updating County Operations Plan is 95% complete and is projected to be completed by late 2013.
HC-34		X		**In Progress/Ongoing, carried over as HC-30.** Two years of progress is underway. Effort projected to be completed by the end of 2013.
HC-35		X		**No Action, Revised, carried over as HC-31.** Revision emphasizes sites with exposure to hazards. Funding and staffing constraints.
HC-36		X		**In Progress/Ongoing, carried over as HC-32.** Countywide effort is underway. The Auditor's office, Planning and Building, and the Information Technology (IT) Departments have made significant progress.
HC-37		X		**No Action, carried over as HC-33.** Funding constraints.
HC-38		X		**No Action, Revised, carried over as HC-34.** Revision emphasizes working with Partners to prepare sites. Funding and staffing constraints.

TABLE 3-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
HC-39		X		**In Progress/Ongoing, carried over as HC-35.** A redundant fiber optic line is now serving Humboldt County. The County also installed a new 6.7 gigahertz microwave link from the Courthouse to Mt. Pierce. The County will continue to support this action.
HC-40		X		**In Progress/Ongoing, carried over as HC-36.** A plan to test the backup energy system is underway. This test will provide information for needed improvements and help develop cost estimates.
HC-41		X		Merged into new Initiative **HC-37** and crafted as an action item rather than a report of existing respopnsabilities.
HC-42		X		Merged into new Initiative **HC-37** and crafted as an action item rather than a report of existing respopnsabilities.
HC-43			X	**Removed;** No longer programmatically fesaible.
HC-44			X	**Removed;** No longer programmatically fesaible.
HC-45			X	**Removed;** No longer programmatically fesaible..
HC-46			X	**Removed;** No longer programmatically fesaible.
HC-47		X		**In Progress/Ongoing, Revised, carried over as HC-38.** Revision emphasizes supporting Environmental Health providing regulatory oversight. Geotechnical evaluation of Redwood Creek levee completed in 2011 did not identify structural deficiencies. Evaluations of hydraulic capacity and effects of sediment deposition are ongoing.
HC-48			X	**Removed.** Action is not a feasible project for the County of Humboldt due to funding and staffing constraints.
HC-49			X	**Removed;** Not a priority hazard mitigation action.
HC-50		X		**No Action, Revised, carried over as HC-39.** Revision emphasizes working with private landowners to upgrade to meet current design standards. Funding and staffing constraints.
HC-51		X		**In Progress/Ongoing, carried over as HC-40.** The County reconvened the Planning Partnership and Steering Committee to update the hazard mitigation plan. Plan update is 95% complete.
HC-52		X		**In Progress/Ongoing, carried over as HC-41.** Have maintained good standing in the National Flood Insurance Program and will continue to do so.

3.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Humboldt County needs County Assessor value assessment data on the building level. A countywide LIDAR flight would greatly facilitate multiple hazard mitigation planning efforts.

CHAPTER 4.
CITY OF ARCATA UPDATE ANNEX

4.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
Doby Class, Director of Public Works
736 F street
Arcata, CA 95521
Phone: 707-822-5957
e-mail: dclass@cityofarcata.org

Alternate Point of Contact
Karen Diemer, Dep. Director of Environ. Services
736 F street
Arcata, CA 95521
Phone: 707-822-8184
e-mail: kdiemer@cityofarcata.org

4.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**February 1858. The City of Arcata was incorporated as a General Law city. The city was not granted a separate charter, but operates under the general laws of the State of California.
- **Current Population—**17,836 as of January 1, 2013
- **Population Growth—**Based on data available from the State of California Department of Finance, the population of Arcata grew by 7 percent between 2000 and 2013. Population growth was 0.4 percent from 2012 to 2013, and this slow growth is expected to continue through the end of the decade.
- **Location and Description—**The City of Arcata is located on California's redwood coast, approximately 760 miles north of Los Angeles and 275 miles north of San Francisco. The nearest seaport is Eureka, five miles south on Humboldt Bay. Arcata is the home of Humboldt State University and is situated between the communities of McKinleyville to the north and Blue Lake to the east. It sits at the intersection of US Highway 101 and State Route 299.
- **Brief History—**As the California gold rush brought gold fever to the interior mountains of northern California, the Arcata area was settled in the 1850s as a supply center for miners. As the gold rush died down, timber and fishing became the major resource based economy of the area. Arcata was incorporated in 1858 and by 1913 the Humboldt Teachers College, a predecessor to today's Humboldt State University was founded in Arcata. Recently, the presence of the college has come to shape Arcata's population into a young, liberal, and educated crowd. In 1981 Arcata developed the Arcata Marsh and Wildlife sanctuary, an innovative, environmentally friendly, sewage treatment enhancement system. Its multiple uses include recreation, education, wildlife refuge along the Pacific Flyway, and wastewater treatment.
- **Climate—**Arcata's weather is typical of the Northern California coast, with mild http://arcatacityhall.org/weather_roads.htmlsummers and cool, wet winters. It rarely freezes in the winter and it is rarely hot in the summer. Annual average rainfall is over 40 inches, with 80 percent of that falling in the six-month period of November through April. The average year-round temperature is 59 degrees. Humidity averages between 72 and 87 percent. Prevailing winds are from the north, and average 5 mph.

- **Governing Body Format—**The City of Arcata is governed by a five-member City Council. The City consists of 6 departments: Finance, Environmental Services, Community Development, Public Works, Police and the City Manager's Office. The City has 13 Committees, Commissions and Task Forces, which report to the City Council.
- **Development Trends—**The City of Arcata, pursuant to California state law, participates in long-range planning. The current guiding document *Arcata General Plan: 2020* was adopted in October of 2000. According to the Community Vision Statement that was updated in 2008, the community hopes to achieve modest growth through 2020 while utilizing environmentally conscious development guidelines.

4.3 ENERGY PROFILE

4.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Arcata acquires its electricity from PG&E
- Propane—Propane for city operations is acquired from Sequoia Gas, Blue Star, and Amerigas
- Liquid Fuel—Gasoline, diesel, and kerosene are purchased from Renner
- Natural Gas—Arcata acquires its natural gas from PG&E

4.3.2 Local Energy Demand

Government operations use six primary energy sources: electricity, liquid fuels (gasoline, diesel, and kerosene), propane, wood, natural gas, and solar. Each is described below (no energy demand information is provided for transportation fuels).

Electricity

Arcata consumed 96,989,452 kWh of electricity in 2012 as compared to 120,633,737 in 2005. This amounts to a 19.6.5% decrease over that time span. The year-over-year change was a decrease of 2.8%.

Non-Residential Sector

Forty-four percent of non-residential energy consumption was derived from electricity during 2012. There were five segments that comprised 80% of non-residential consumption: schools, hospitality, retail, healthcare, and offices. Energy usage in this sector has decreased by 32.3% since 2005.

Residential Sector

Thirty-two percent of residential energy consumption was derived from electricity during 2012. The average electrical use per single-family and multi-family residential customer was 482 and 324 kWh per month respectively. Electrical usage has gone up by 7% since 2005.

Liquid Fuels

There is no liquid fuel consumption applicable to profile for Arcata.

Propane

Arcata consumes propane in the residential sector, primarily for heating and cooking. About 600 households use propane gas for an average total of approximately 585,000 gallons per year.

Wood

Arcata consumes wood in the residential sector, primarily for heating. On average, there are close to 1300 households using more than 3000 cords of wood per year.

Natural Gas

Arcata consumed 6,019,042 therms of gas in 2012 as compared to 6,174,861 therms in 2005. This amounts to a 2.5% decrease over that time span. The year-over-year change was an increase of 0.5%.

Non-Residential Sector

Fifty-six percent of non-residential energy consumption was derived from natural gas during 2012. There were five segments that comprised 80% of non-residential consumption: schools, hospitality, retail, healthcare, and offices. Natural gas usage has decreased by 11.2% since 2005.

Residential Sector

Sixty-eight percent of residential energy consumption was derived from natural gas during 2012. The average natural gas use per single-family and multi-family residential customer was 36 and 29 therms per month respectively. Natural gas usage has increased by 6.4% since 2005.

Solar

Non-Residential Sector

Between 2002 and 2012, 7 photovoltaic sites were installed at non-residential sites generating 134 kw interconnected to the PG&E grid.

Residential Sector

Between 1999 and 2012, 91 photovoltaic systems totaling 302 kW were installed at residential sites and interconnected to the PG&E grid.

4.3.3 Community Key Assets Energy Profile

TABLE 4-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: Wastewater Treatment Plant										
Wastewater		Electricity					Diesel	950		
Key Asset #2: Samoa Sewer Lift Station										
Wastewater		Electricity					Diesel	180		
Key Asset #3: Alliance Road Transfer Station										
Water		Electricity								
Key Asset #4: Alder Grove Road Intertie Station—Under construction										
Water		Electricity								

The City of Arcata has identified four key assets for its energy profile:

- Wastewater Treatment Plant
- Samoa Sewer Lift Station
- Alliance Road Transfer Station
- Alder Grove Road Intertie Station—Under construction

Table 4-1 summarizes the energy profile for each key asset.

4.3.4 Key Asset Energy Consumption and Backup Generator Analysis

TABLE 4-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: City Hall, Police Department, 736 F Street								
20,400	47							
Generator Capacity Analysis: _____								
Key Asset #2: Sewage Treatment Plant, 600 S. G Street								
98,100	196						Diesel	950
Generator Capacity Analysis: _____								
Key Asset #3: Sewage Treatment Plant, 600 S. G Street								
							CNG	
Generator Capacity Analysis: _____								
Key Asset #4: Corp Yard								
Generator Capacity Analysis: _____								
Key Asset #5: Mad River Fire Station, 3235 Janes Rd.								
1143	13							
Generator Capacity Analysis: _____								
Key Asset #6: Arcata Volunteer Fire Station , 631 19th Street								
546	13							
Generator Capacity Analysis: _____								
Key Asset #7: Alliance Water Intertie, 2815 Alliance								
Generator Capacity Analysis: _____								

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 4-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

4.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 4-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake	N/A	11/8/1980	Not Available
Severe Weather / Flood	N/A	1/18/1981	Not Available
Severe Weather / Flood	N/A	12/19/1981	Not Available
Severe Weather / Flood	N/A	3/31/1982	Not Available
Severe Weather / Flood	DR-677	1/25/1983	Not Available
Landslide	N/A	1983	$63,000
Severe Weather / Flood	N/A	12/25/1983	Not Available
Severe Weather / Flood	DR-758	2/16/1986	Not Available
Earthquake	DR-943	4/25/1992	Not Available
Severe Weather / Flood	DR-935	02/25/1992	Not Available
Severe Weather / Flood	N/A	1/20/1993	Not Available
Earthquake	N/A	12/26/1994	Not Available
Severe Weather / Flood	DR-1046	1/9/1995	Not Available
Severe Weather / Flood	DR-1046	3/1/1995	Not Available
Landslide	N/A	1/27/1995	$68,000
Severe Weather / Flood	N/A	12/11/1995	Not Available
Severe Weather / Flood	N/A	12/29/1995	Not Available
Landslide	N/A	12/15/1995	$75,000
Severe Weather / Flood	N/A	12/8/1996	$186,000
Severe Weather / Flood	DR-1155	1/2/1997	$5,000
Landslide	DR-1155	1/3/1997	$115,000
Severe Weather / Flood	DR-1203	1/27/1998	$5,000
Severe Weather / Flood	N/A	11/21/1998	$5,000
Severe Weather / Flood	N/A	12/27/2002	$35,000
Landslide	N/A	2003	$100,000
Severe Weather / Flood	DR-1628	12/31/2005	$3.5 million
Earthquake	N/A	1-9-2013	Not Available

Table 4-3 lists past occurrences of natural hazards in Arcata. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 1
- Number of FEMA Identified Severe Repetitive Loss Properties: 1
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 0

4.5 HAZARD RISK RANKING

TABLE 4-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Flood	42
3	Tsunami	42
4	Severe Weather	36
5	Dam Failure	11
6	Wildfire	8
7	Landslide	8
8	Drought	4
9	Volcano (Ash Fall)	3

Table 4-4 presents the ranking of the hazards of concern.

4.6 CAPABILITY ASSESSMENT

4.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 4-5.

TABLE 4-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** Uniform Building Code	Y	N	N	Y
Zoning ***Comments:*** Title 9, AMC December 1994	Y	N	N	Y
Subdivisions ***Comments:*** Title 9, AMC December 1994	Y	N	N	Y
Stormwater Management ***Comments:*** Title 9, AMC December 1994, Municipal Separated Stormwater System Permit	Y	N	N	Y
Post Disaster Recovery ***Comments:*** Incorporated into Emergency Response Plan	N	N	N	N
Real Estate Disclosure ***Comments:*** CA. State Civil Code 1102 requires full disclosure on Natural hazard Exposure of the sale/re-sale of any and all real property.	N	N	Y	Y
Growth Management ***Comments:*** General Plan 2020	Y	N	N	Y
Site Plan Review ***Comments:*** Title 9, AMC December 1994	Y	N	N	N
Public Health and Safety ***Comments:*** Title 3, 4,5 AMC 1994-2013	Y	N	Y	Y
Environmental Protection ***Comments:*** Land Use Code	Y	N	N	N
Energy Code ***Comments:*** Uniform Electrical Code	N	N	Y	Y
Planning Documents				
General or Comprehensive Plan ***Comments:*** http://www.cityofarcata.org/departments/building-planning/regulations/general-plan-2020	Y	N	Y	Y
Floodplain or Basin Plan ***Comments:*** FEMA, Regional Water Quality Control Board, Basin Plan	Y	Y	Y	Y
Stormwater Plan ***Comments:*** Municipal Separated Stormwater System Permit, Regional Water Quality Control Board, Basin Plan	Y	Y	Y	Y

TABLE 4-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Capital Improvement Plan ***Comments:*** City Infrastructure, 20 year plan, 5 year priorities, updated annually	Y	N	N	N
Habitat Conservation Plan	N	N	N	N
Economic Development Plan ***Comments:*** 2010- 2014 http://www.cityofarcata.org/sites/default/files/Final%20EDSP.pdf	Y	N	N	N
Shoreline Management Plan	N	N	N	N
Community Wildfire Protection Plan	N	N	N	N
General Plan Energy Conservation Element or Energy Specific Plan ***Comments:*** *2006,* http://www.cityofarcata.org/sites/default/files/files/document_center/Environmental%20Services/Energy/Greenhouse%20Gas%20Reduction%20Plan.pdf	Y	N	N	N
Climate Action Plan or Climate Adaptation Strategy ***Comments:*** Initial strategies outlined in the energy plan above	N	N	Y	N
Response/Recovery Planning				
Comprehensive Emergency Management Plan ***Comments:*** April 2006	Y	N	N	N
Threat and Hazard Identification and Risk Assessment	N	N	N	N
Terrorism Plan	N	N	N	N
Post-Disaster Recovery Plan ***Comments:*** April 2006	Y	N	N	N
Continuity of Operations Plan ***Comments:*** Incorporated into the Emergency Response Plan	N	N	N	N
Public Health Plans	N	N	Y	N

4.6.2 Administrative and Technical Capability

TABLE 4-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	Community Development Department
Engineers or professionals trained in building or infrastructure construction practices	Y	Public Works Department / Engineering
Planners or engineers with an understanding of natural hazards	Y	Community Development / Public Works
Planners or engineers with an understanding of energy resilience or alternative energy technology	Y	Environmental Services Department
Staff with training in benefit/cost analysis	Y	Environmental Services Department
Surveyors	N	Limited in Public Works
Personnel skilled or trained in GIS applications	Y	GIS Manager/Environmental Services Department
Scientist familiar with natural hazards in local area	Y	Humboldt State University
Emergency manager	Y	Police Chief / City Manager
Grant writers	Y	All Departments

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 4-6.

4.6.3 Fiscal Capability

TABLE 4-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Y
Capital Improvements Project Funding	Y
Authority to Levy Taxes for Specific Purposes	Y
User Fees for Water, Sewer, Gas or Electric Service	Y
Incur Debt through General Obligation Bonds	Y
Incur Debt through Special Tax Bonds	Y
Incur Debt through Private Activity Bonds	Y
Withhold Public Expenditures in Hazard-Prone Areas	Y
State Sponsored Grant Programs	Y
Development Impact Fees for Homebuyers or Developers	Y
Other	FEMA Grants

The assessment of the jurisdiction's fiscal capabilities is presented in Table 4-7.

4.6.4 National Flood Insurance Program Compliance

TABLE 4-8. NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE	
What department is responsible for floodplain management in your community?	Public Works
Who is your community's floodplain administrator (department/position)?	Public Works Director
Do you have any certified floodplain managers on staff in your community?	Yes, Public Works Director
What is the date of adoption of your flood damage prevention ordinance?	October 2008
When was the most recent community assistance visit or community assistance contact?	July 2009
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	Need to update our current floodplain Ordinance by adopting the "Model Ordinance"
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 4-8.

4.6.5 Energy Resilience Capability

TABLE 4-9. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	Environmental Services Deputy Director
Have you performed an energy assurance gap analysis for your community?	Y
Have you completed a vulnerability assessment of power sources to each key asset?	N
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	N
Are emergency backup generators tested on a regular basis?	Y
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Y
Have you established a working relationship with your community's energy service providers?	Y
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	Y
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	Y

Energy resiliency capabilities are presented in Table 4-9.

4.6.6 Community Mitigation Program Classifications

TABLE 4-10. COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	N	--	--
Building Code Effectiveness Grading Schedule	N		
Public Protection	Y	4/8B	
Storm Ready	Y	Flood Ready	2010
Firewise	N		
Tsunami Ready (if applicable)	N	Part of local working group	

Classifications under various community mitigation programs are presented in Table 4-10.

4.7 HAZARD MITIGATION ACTION PLAN

Table 4-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 4-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #A-1—Implement the City's Capital Improvement Plan							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-9	Public Works	5-year $14 million	Bonds, Rates, Grants	5 years	No
Initiative #A-2—Alliance Critical Circuit Separation and Long Term Emergency Operations							
Existing	All Hazards	O-1, O-2, O-4	ES	$60,000	CIP	5 years	N
Initiative #A-3—Wastewater Treatment Plant CNG Generator Repurposing							
Existing	All Hazards	O-1, O-2, O-4	ES	$10,000	N/A	2 years	N
Initiative #A-4—Aldergrove Intertie Critical Circuit Separation and Long Term Emergency Operations							
Existing	All Hazards	O-1, O-2, O-4	ES	$5,000	California Department of Public Health Grant	6 months	N
Initiative #A-5—Meadowbrook Stationary Generator							
Existing	All Hazards	O-1, O-2, O-4	ES/PW	$45,000	Bonds and Rates	Short Term	N
Initiative #A-6—Booster 4 Energy Demand Reduction Off-Peaking							
Existing	All Hazards	O-1, O-2, O-4	ES	$25,000	Utility	2 years	N
Initiative #A-7—Aldergrove / Renner Long Term Emergency Operations Fuel Supply Assurance							
Existing	All Hazards	O-1, O-2, O-4	ES/PW	$2,000	Annual Budget	2 years	N
Initiative #A-8—Mobil Generator Modernization							
Existing	All Hazards	O-1, O-2, O-4	ES/PW	$80,000	Bonds and Rates	Short Term	N
Initiative #A-9—Discrete Energy Usage Monitoring							
Existing and New	All Hazards	O-7	ES	$20,000	Grant	3 years	N
Initiative #A-10—Include Gap Analysis in all new projects							
New	All Hazards	O-1, O-2, O-4	ES/PW		Projects	Ongoing	N

TABLE 4-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #A-11—Continue to support the Hazard Mitigation Plan partnership as well as local hazard mitigation working groups (Tsunami, climate change)							
Existing	All Hazards	O-7, O-8, O-10, O-12	ES/PW/ APD	Staff Time	Annual Budget	Ongoing	N
Initiative #A-12 Improve hillside stability in landslide prone areas utilizing feasible approaches							
Existing	Landslide	O-6, O-9, O-11	ES/PW	Unknown	Grant	Ongoing	Y
Initiative #A-13—Investigate the use of rolling easements to avoid the costs of protecting low lands from rising sea changes.							
Existing & New	Flood, Tsunami	O-1, O-5, O-7, O-9	ES	$20,000	Grant	Short Term	N
Initiative #A-14—Continue to improve levees around risk critical facilities							
Existing	Flood, Tsunami	O-1, O-2, O-4,	ES/PW	Unknown	Grant	Long Term	Y
Initiative #A-15—Develop a list of seismic retrofits of critical facilities							
Existing	Earthquake	O-1, O-2, O-4, O-11	PW	$40,000	CIP	Short Term	N
Initiative #A-16—Perform preventive maintenance of Janes Creek and other drainage ways and raise flood prone areas in this region.							
Existing	Landslide, Flood, Severe Storms	O-9, O-6, O-4	ES/PW	Unknown	CIP Grants	Ongoing	Y
Initiative #A-17—Improve local radio communication on a designated shared channel							
Existing	All Hazards	O-1, O-4, O-12	ES/PW	$20,000	Annual Budget	Short Term	Y
Initiative #A-18—Develop detail (lists of shelters, food sources etc.) for the Emergency Response Plan							
Existing	All Hazards	O-1, O-4, O-5	All City Depts.	Staff Time	Annually	Long Term	Y
Initiative #A-19—Continue to support the development and ongoing training of Community Emergency Response Teams (CERT)							
Existing	All Hazards	O-4, O-5, O-12	ES/PW/PD	Staff Time	N/A	Ongoing	N
Initiative #A-20 Maintain updated Hazard and Emergency Preparedness information on the City's Website with a link to the County's Website; including community assembly point in emergencies.							
Existing	All Hazards	O-5, O-6, O-7, 0-12	IT	Staff Time	Annually	Ongoing	N
Initiative #A-21 Develop Annual City staff training in community emergency response							
Existing	All Hazards	O-12, O-5, O-1	All City Depts.	Staff Time	Annually	Ongoing	Y

TABLE 4-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #A-22:—Continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New and Existing	Flood	2, 3, 6, 7, 8, 9, 10, 11	Public Works	Low	General Fund	Ongoing	Y
Initiative #A-23—Incorporate this Hazard Mitigation Plan as part of the General Plan Safety Element. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	All Objectives	City Council	Low	General Fund	Short Term	No

4.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 4-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
A-1	5	High	High	Yes	Parts	Not Entirely	High
A-2	3	High	Medium	Yes	Yes	No	High
A-3	3	Medium	Low	Yes	No	No	Medium
A-4	3	High	Medium	Yes	Yes	No	High
A-5	3	High	Medium	Yes	Yes	No	High
A-6	3	Low	Low	Yes	Yes	Yes	Medium
A-7	3	High	Medium	Yes	No	No	Medium
A-8	3	High	Medium	Yes	Partial	No	High
A-9	1	Low	Low	Yes	Yes	No	Medium
A-10	3	Medium	Low	Yes	No	Yes	High
A-11	4	High	Low	Yes	No	Yes	High
A-12	3	High	High	Yes	No	No	Medium
A-13	4	High	Medium	Yes	Potentially	No	Medium
A-14	3	High	High	Yes	Yes	No	High
A-15	4	High	High	Yes	Yes	No	Medium
A-16	3	High	Medium	Yes	Partial	No	High
A-17	3	High	Low	Yes	Potentially	No	Medium
A-18	3	High	Low	Yes	No	Yes	High
A-19	3	High	Low	Yes	Partial	Yes	High
A-20	4	Low	Low	Yes	No	Yes	High
A-21	3	High	High	Yes	No	No	High
A-22	8	Medium	Low	Yes	No	Yes	High
A-23	12	Medium	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

Table 4-12 identifies the priority for each initiative.

4.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 4-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	A-1, A-14, A-23	A-1	A-11, A-18, A-19, A-20	A-1, A-13	A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-10, A-17, A-18	A-1, A-14
Drought	A-1, A-4, A-23	A-1, A-4	A-11, A-18, A-19, A-20	A-1	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18	A-1,
Earthquake	A-1, A-2, A-3, A-12, A-14, A-23	A-1, A-15	A-11, A-18, A-19, A-20	A-1	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18	A-1, , A-14, A-15
Flood	A-1, A-2, A-3, A-14, A-22, A-23	A-1, A-16, A-22	A-11, A-18, A-19, A-20, A-22	A-1, A-13, A-22	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18, A-22	A-1, A-14, A-22
Landslide	A-1, A-12, A-23	A-1, A-12	A-12, A-11, A-18, A-19, A-20	A-1, A-12	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18	A-1, A-12
Severe Weather	A-1, A-2, A-3, A-12, A-14, A-23	A-1, A-16	A-11, A-18, A-19, A-20	A-1, A-13	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18	A-1
Tsunami	A-1, A-2, A-3, A-14, A-23	A-1, A-16	A-11, A-18, A-19, A-20	A-1, A-13	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18	A-1, A-14
Wildfire	A-1, A-2, A-23	A-1	A-11, A-18, A-19, A-20	A-1	A-1, A-2, A-3, A-4 A-5, A-6, A-7, A-8 A-10, A-17, A-18	A-1

a. See Chapter 1 for description of mitigation types.

Table 4-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

4.10 STATUS OF PREVIOUS PLAN INITIATIVES

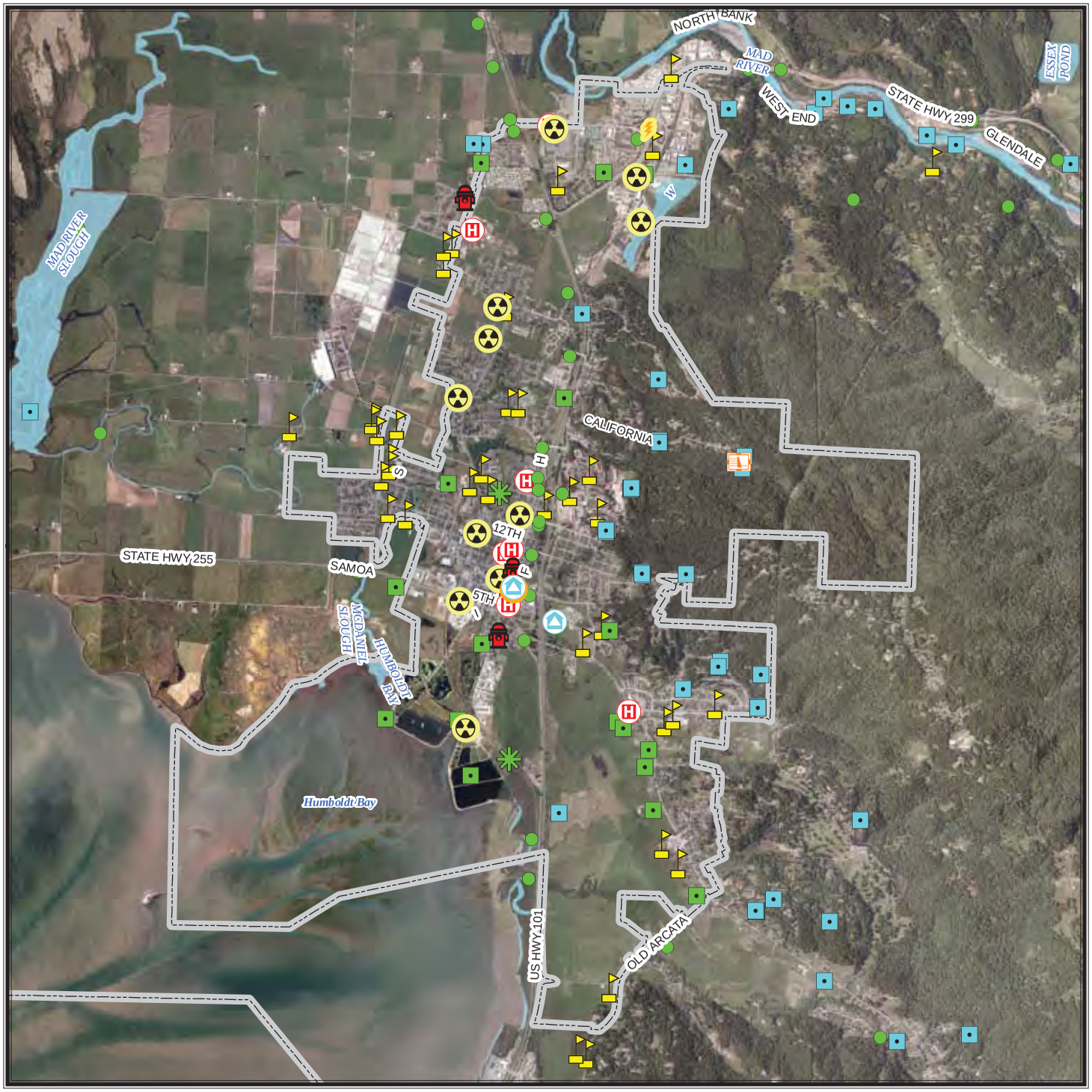
Table 4-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

TABLE 4-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
A-1	N	Y		Designate, prepare and announce Emergency Assembly Points throughout the City.
A-2	Y	N		Adopt a long-term capital improvement plan.
A-3	N	Y		Improve hillside stability in landslide-prone areas utilizing feasible approaches that provide the highest degree of benefit, for the least cost.
A-4	Y	N		Conduct an updated Dam Failure Flood Routing Analysis for City of Arcata Dam #2
A-5	N	Y		Prepare a Post Disaster Recovery Plan
A-6	Y	N		Install Emergency water inter-ties between neighboring jurisdictions
A-7	N	Y		Develop ring levees around at risk critical facilities
A-8	N	Y		Perform seismic retrofits of critical facilities
A-9	Y	Y		Work with the NOAA to attain the certifications of Storm Ready and Tsunami Ready.
A-10	Y	Y		Perform preventive maintenance of Jane's Creek and other drainage ways.
A-11	Y	N		Adopt International Building Code.
A-12	Y	Y		Improve alternative communication capabilities throughout the City, including acquisition of and licensing for HAM radios, satellite telephones, mobile backup dispatch devices and other communication devices.
A-13	Y	N		Adopt an updated Emergency Response Plan
A-14	Y	N		Establish a warning system for Dam Failure
A-15	Y	Y		Update City land use code for seismic setbacks/structural requirements and hillside development standards
A-16	Y	Y		Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Arcata
A-17	Y	Y		Carried over. Is now initiative A-22

TABLE 4-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
A-18	Y	Y		Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.
A-19	Y	Y		Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.
A-20	Y	Y		Obtain and distribute current information about local natural hazard risks and emergency preparedness, including creating and maintaining a hazard mitigation informational web page on the City of Arcata website.
A-21	N	Y		Raise flood prone areas adjacent to West End Rd. to an elevation that will not be inundated during flooding events.
A-22	Y	Y		For emergency preparedness, implement offsite parking for corporation yard equipment.



CITY OF ARCATA

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.5 1 Miles

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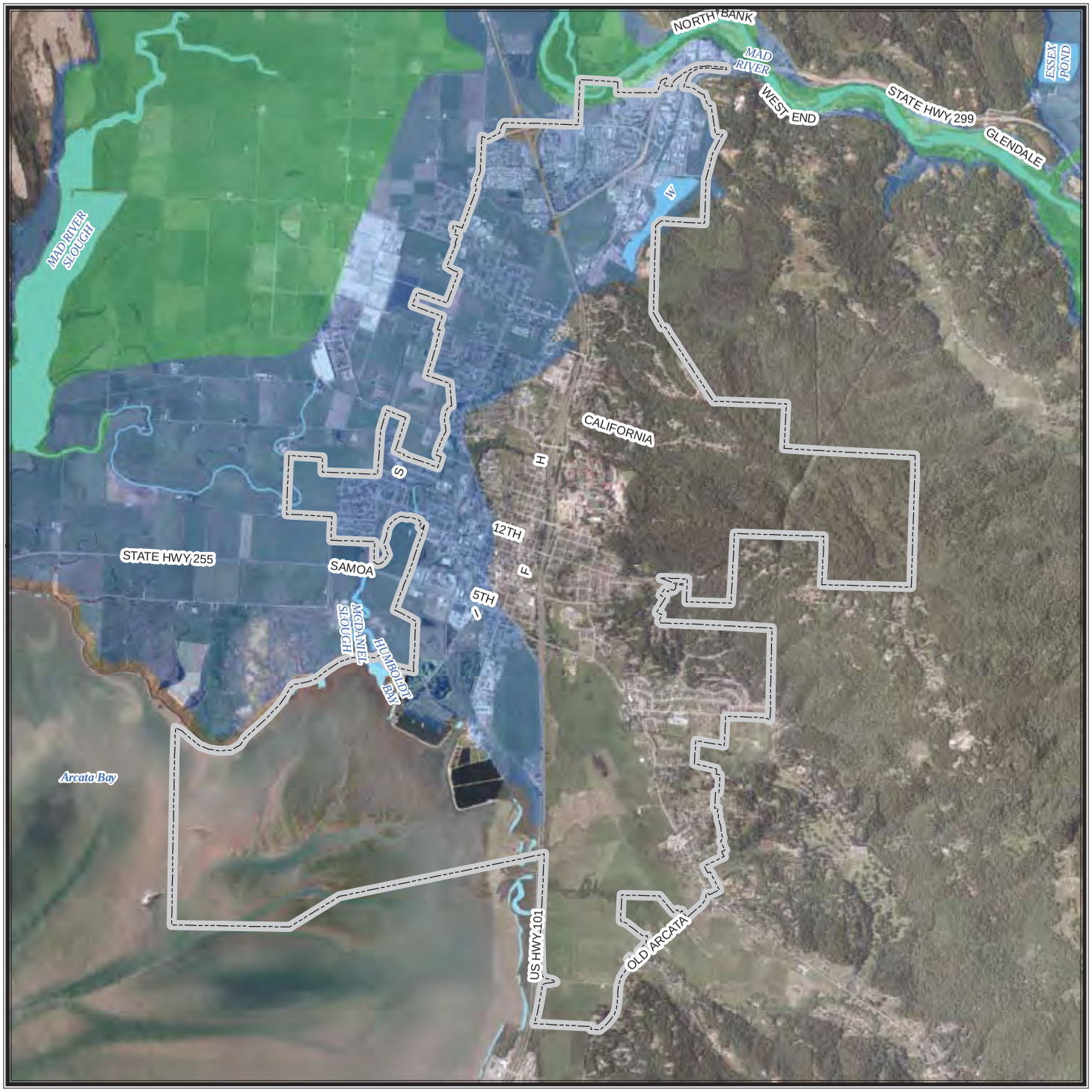


CITY OF ARCATA

Dam Failure Inundation Areas

Robert W. Matthews Dam

Summer flood inundation area

Winter flood inundation area

Robert W Matthews Dam inundation areas data from a model performed by Winzler & Kelly in 2000. Summer flood inundation area represents extent of a summer low-flow scenario dam breach from Matthews Dam to the mouth of the Mad River. Winter flood inundation area represents extent of a worst case scenario dam breach from Matthews Dam to the mouth of the Mad River. Winzler & Kelly/GHD; Steve Allen and Gary Davison.

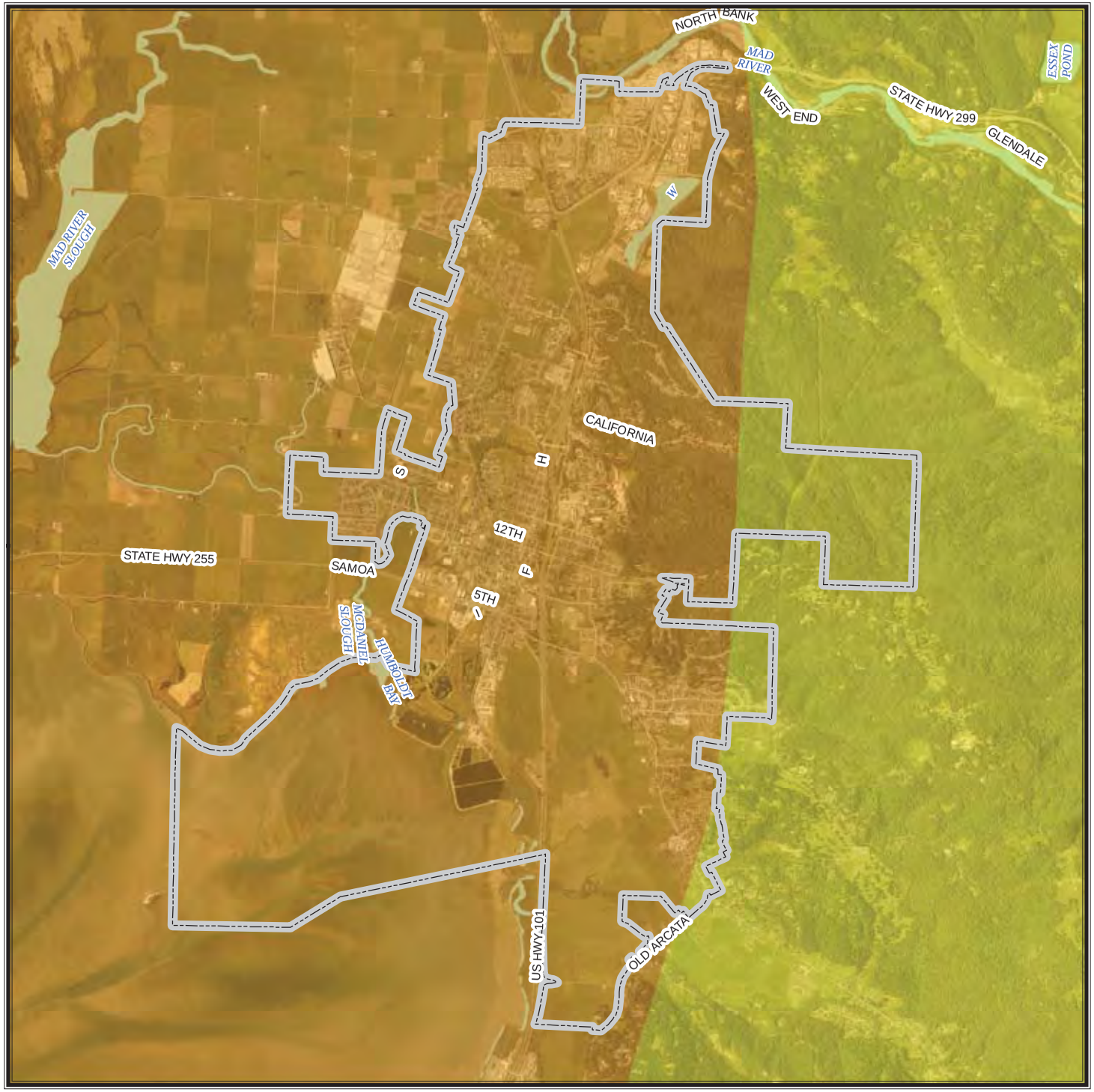
These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH

CITY OF ARCATA

Quaternanry & Younger Earthquake Faults

Proximate Faults

Mad River Fault Zone

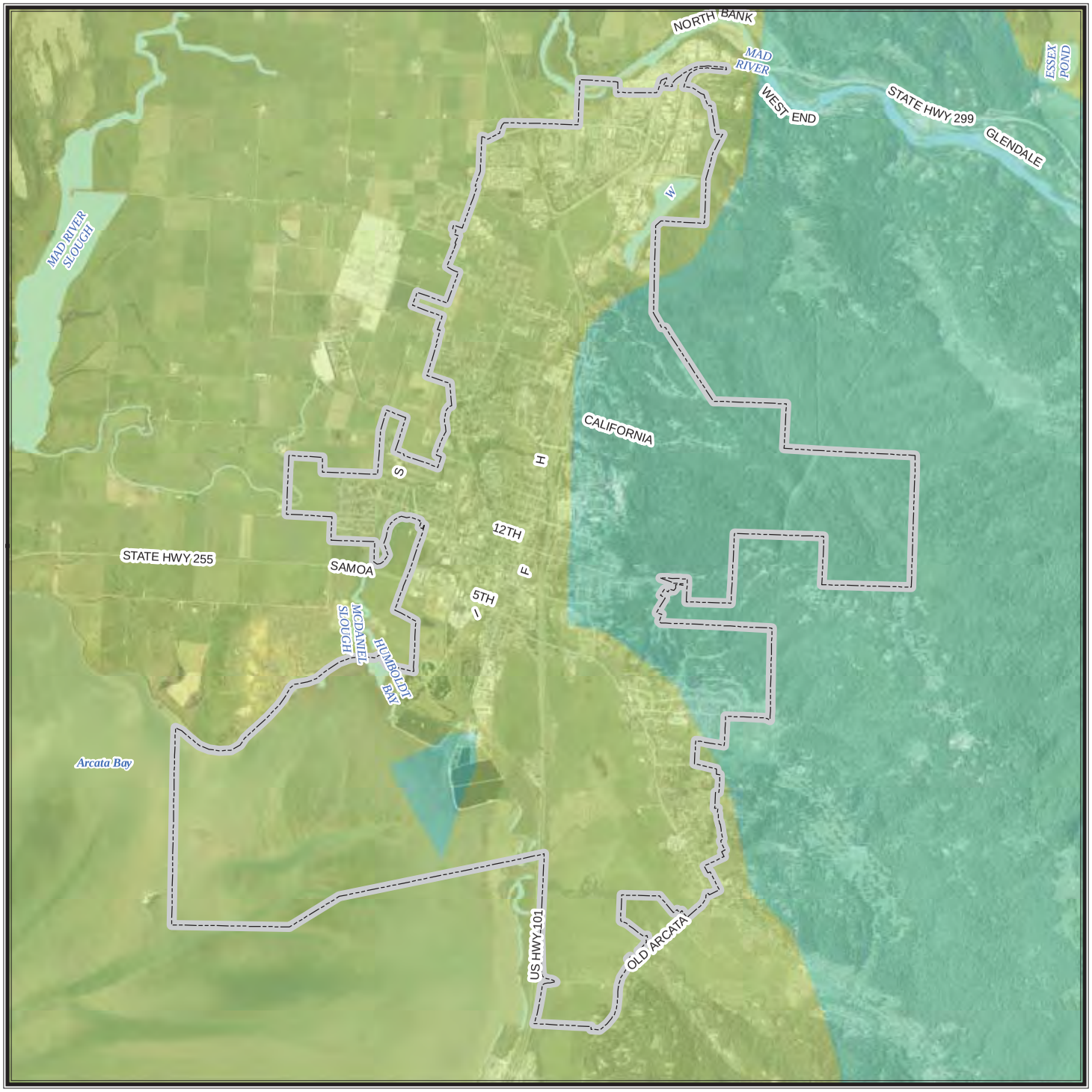
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

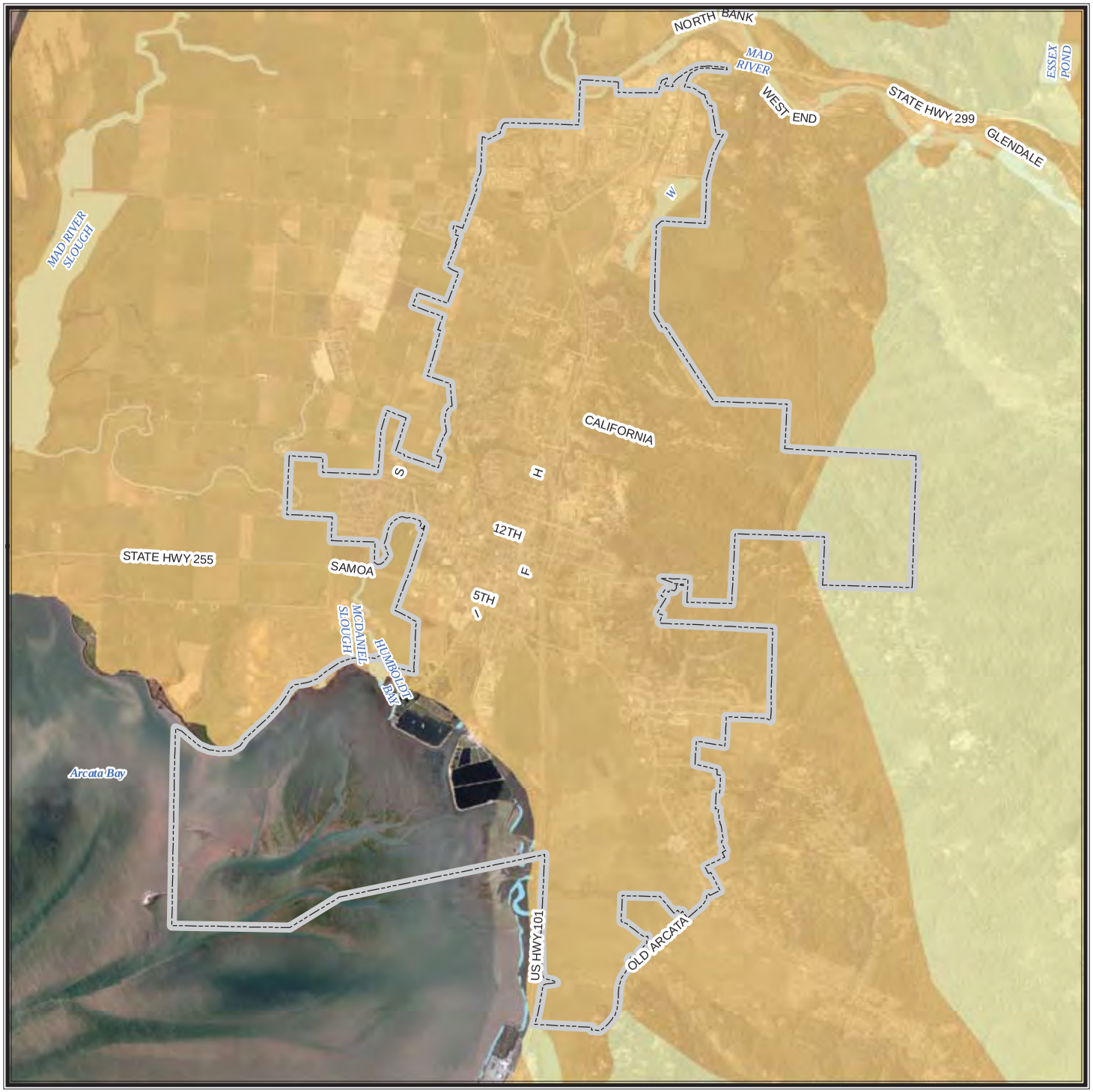
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

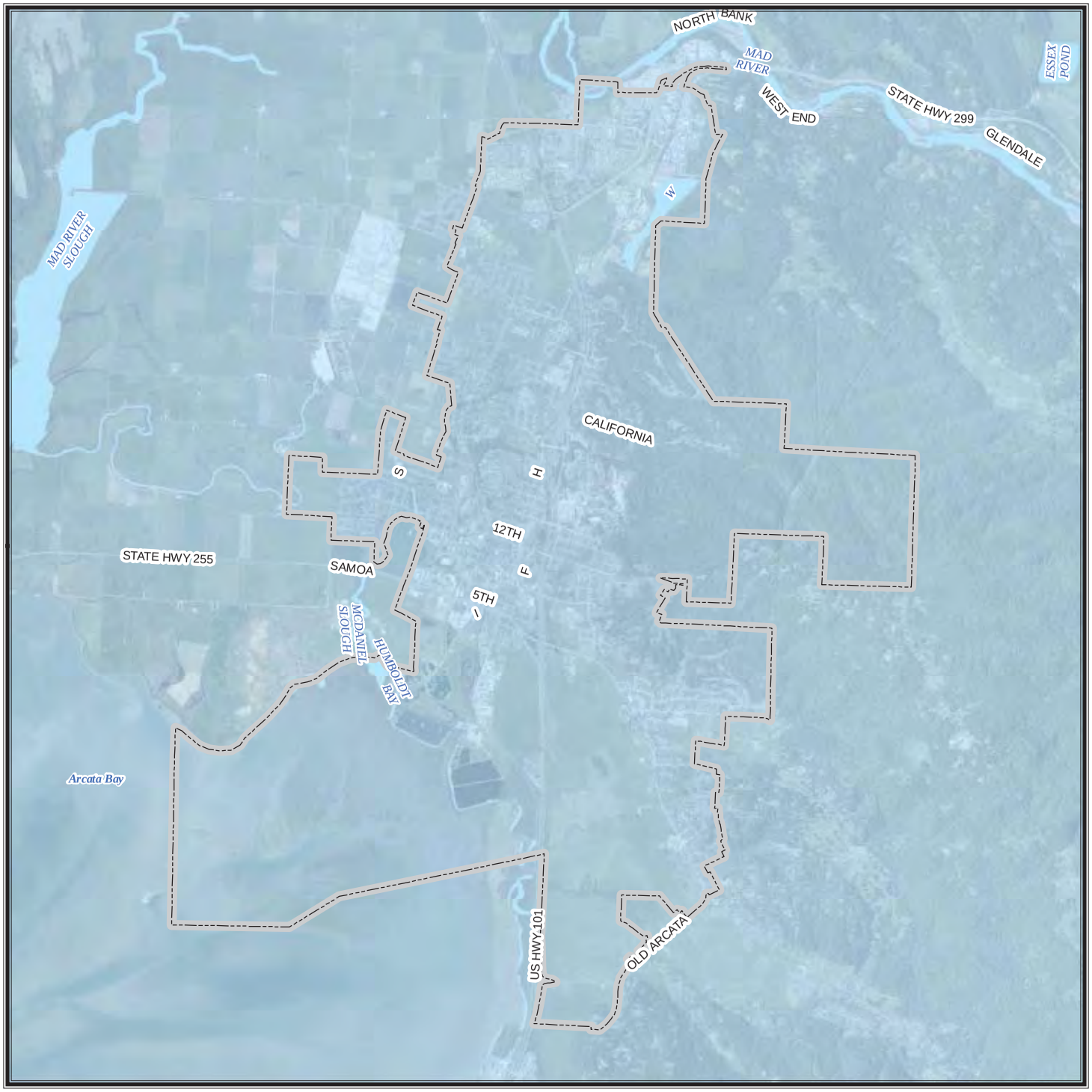
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

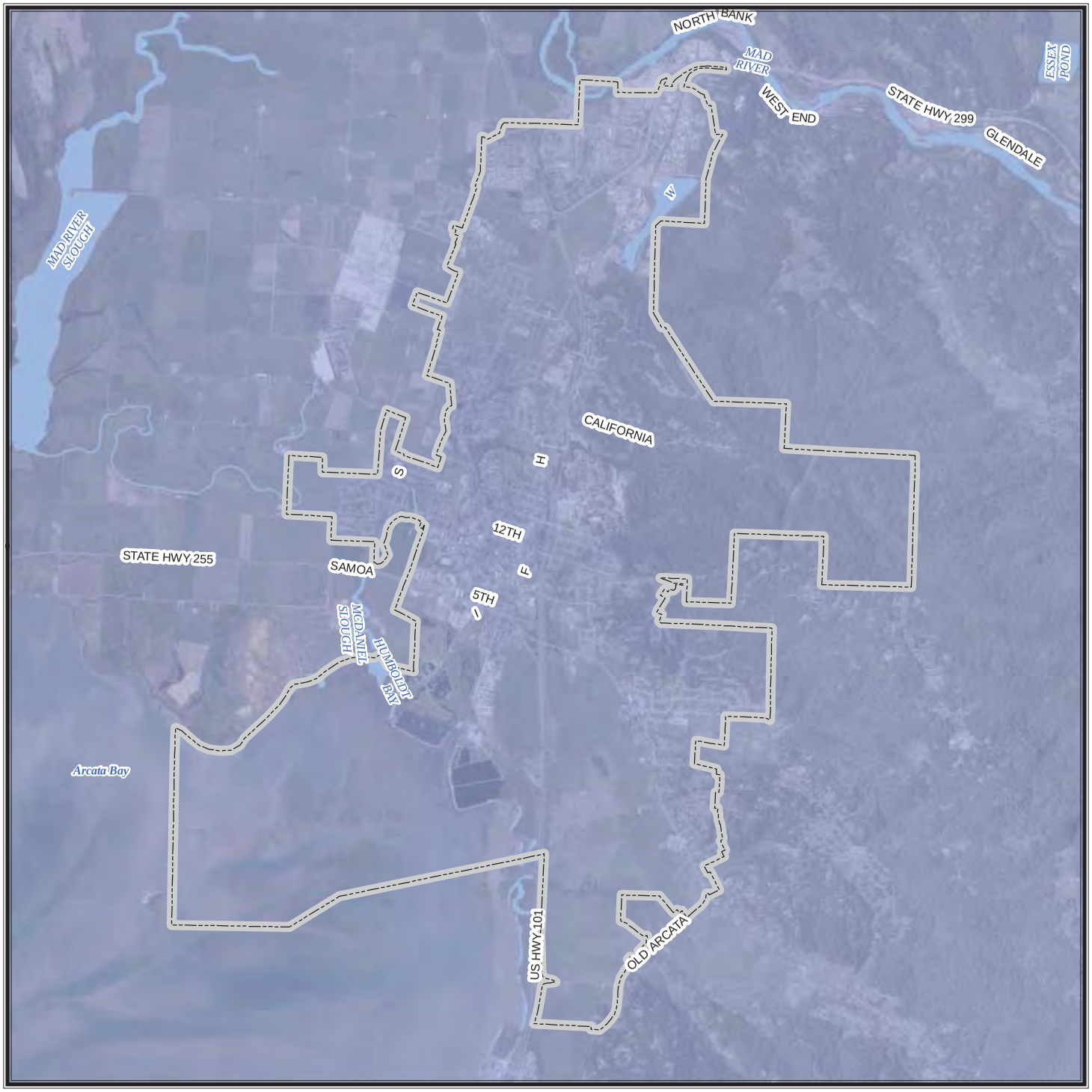
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

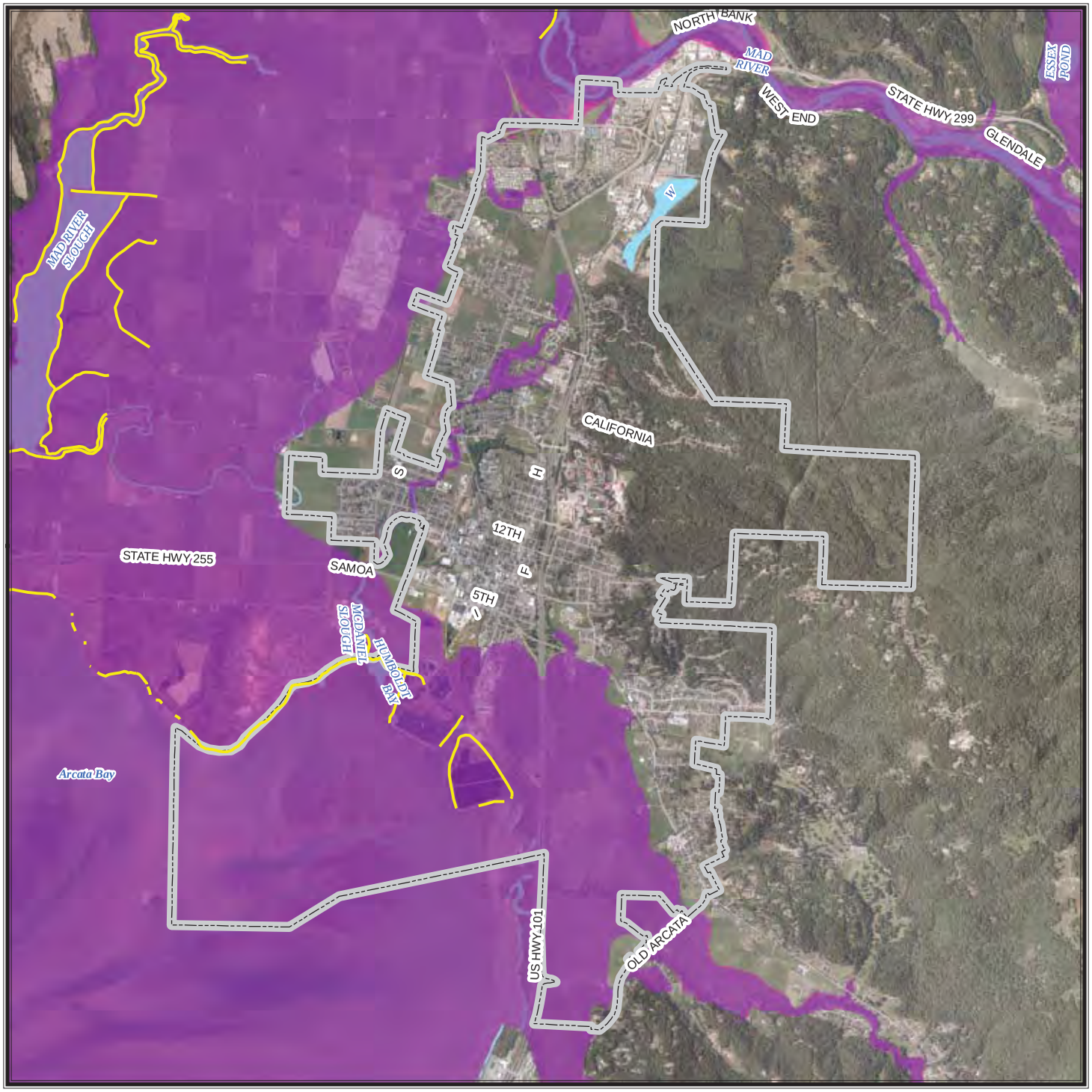
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

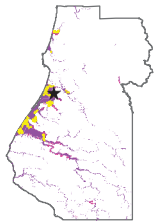
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

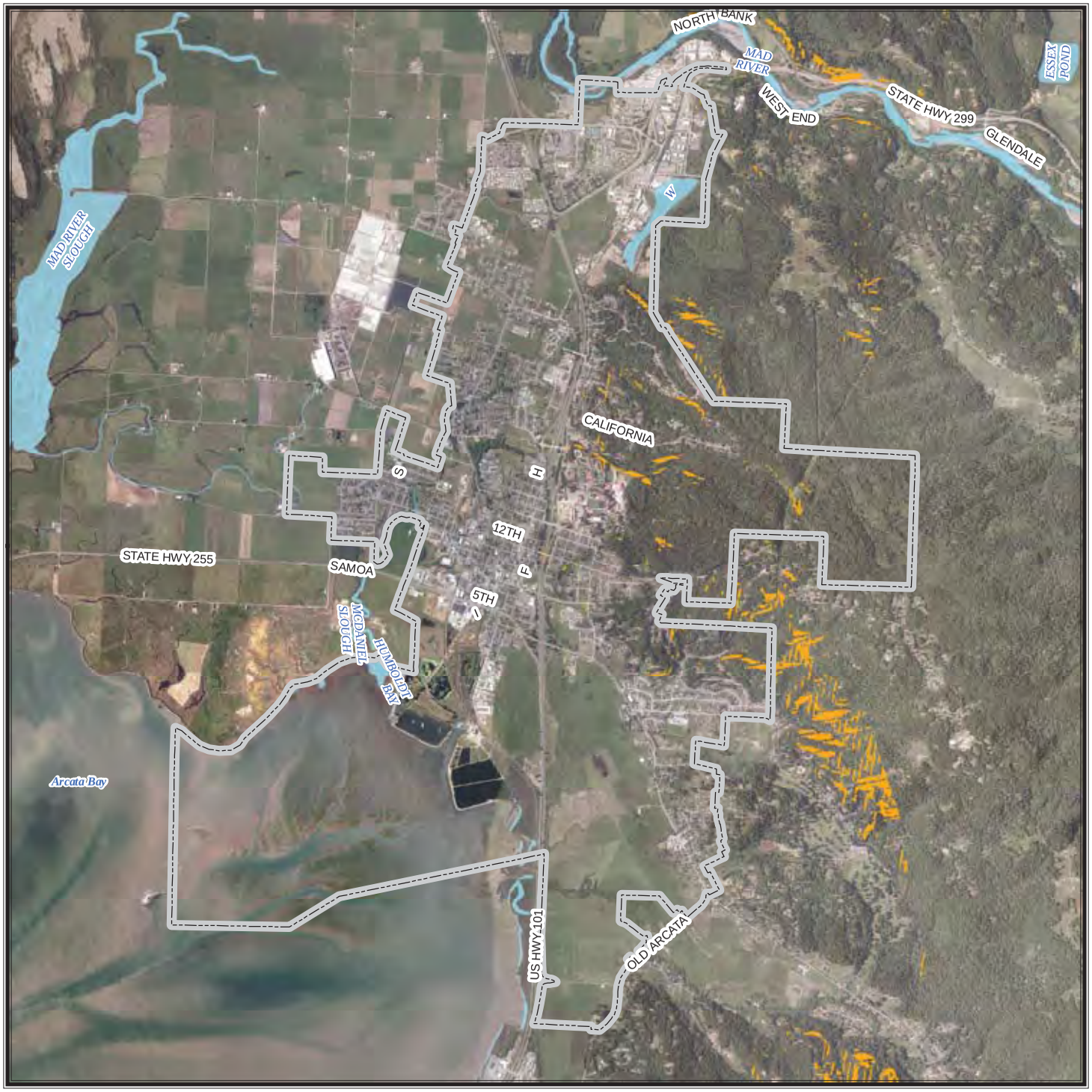
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH





CITY OF ARCATA

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH

CITY OF ARCATA

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

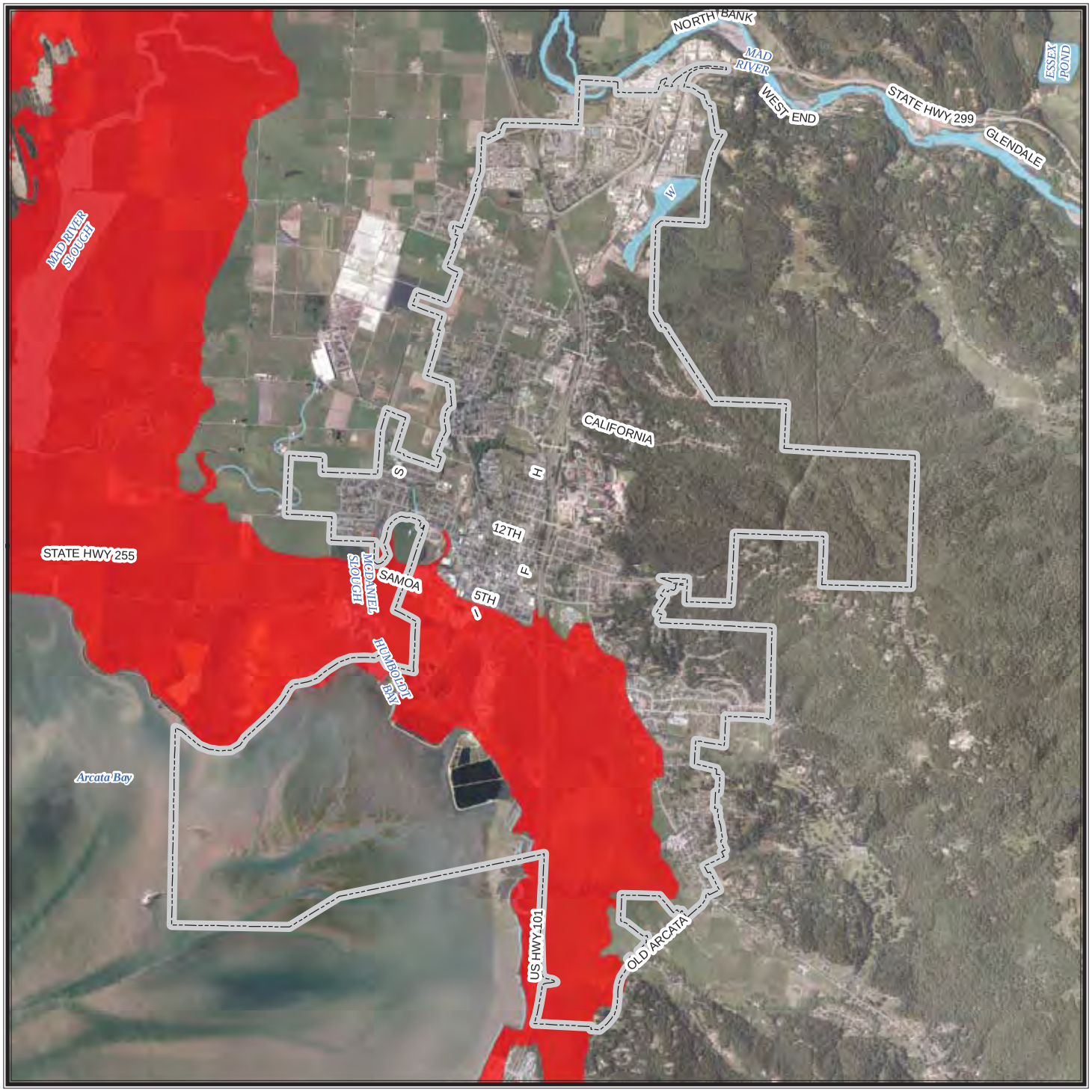
These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Tsunami Inundation Areas

Tsunami inundation area

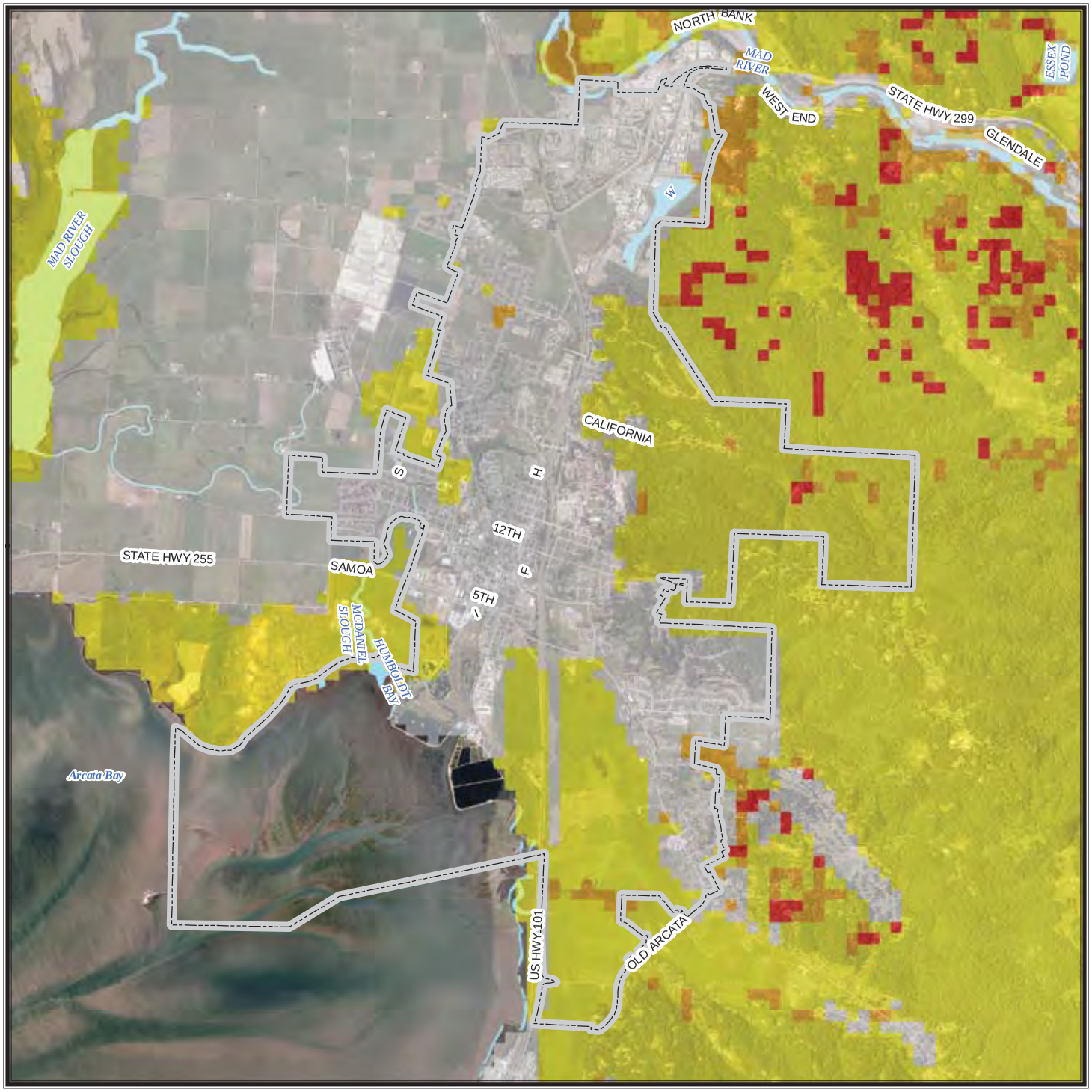
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

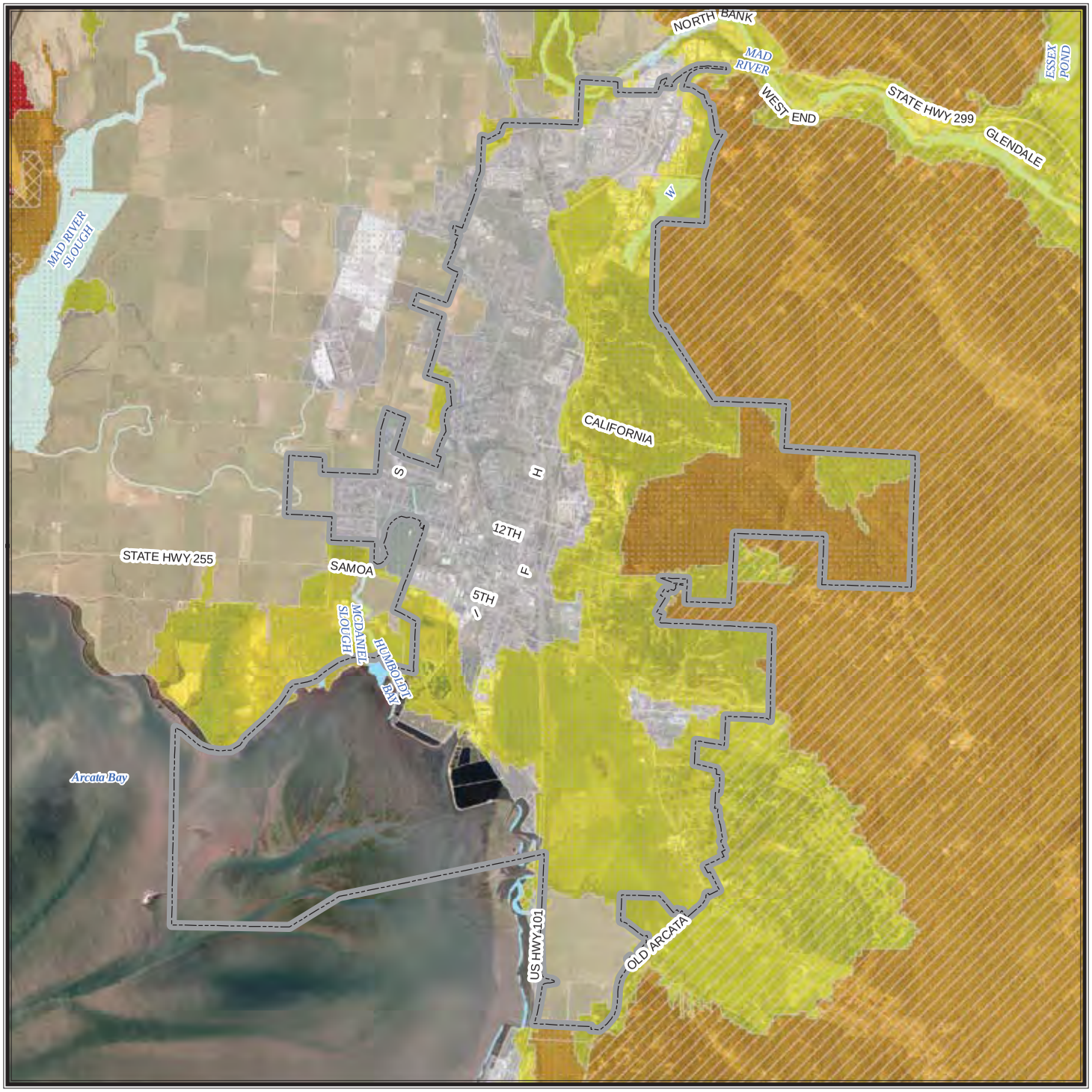
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Fire Hazard Severity Class

Hazard Class

- **Very High**
- **High**
- **Moderate**
- **Non-Wildland/Non-Urban**
- **Urban Unzoned**

Responsibility Areas

- **Federal (FRA)**
- **Local (LRA)**
- **State (SRA)**
- **None**

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH

CITY OF ARCATA

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH

CITY OF ARCATA

Fire Perimeters

Year of Fire

- 1908 - 1920
- 1921 - 1940
- 1941 - 1960
- 1961 - 1980
- 1981 - 2000
- 2001 - 2012

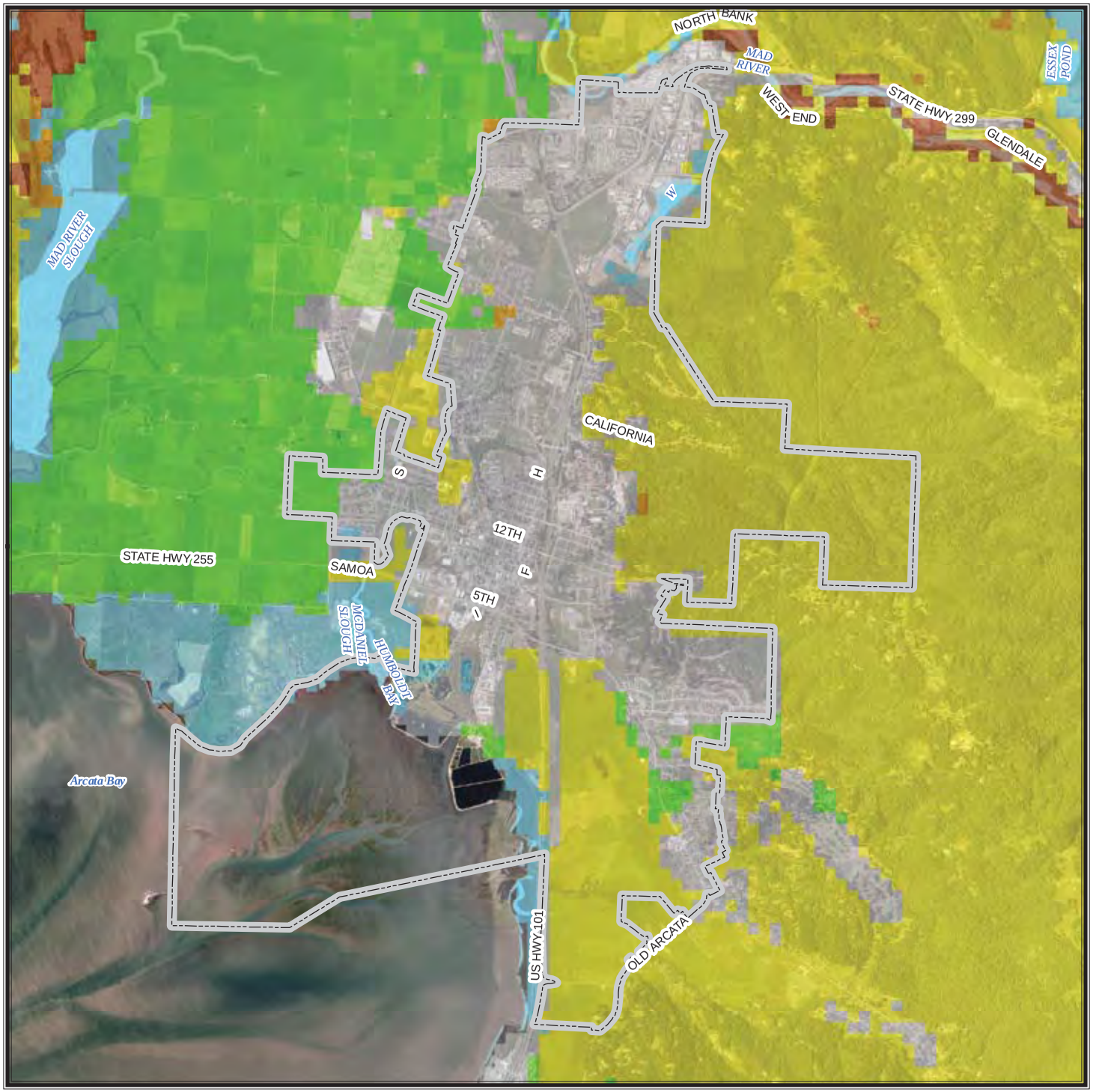
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH



CITY OF ARCATA

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH

CHAPTER 5.
CITY OF BLUE LAKE UPDATE ANNEX

5.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Glen Bernald, Public Works Supervisor
City of Blue Lake
Street Address
Blue Lake, CA 95525
Telephone: (707) 668-5655
e-mail Address: Gbernald@bluelake.ca.gov

Alternate Point of Contact

John Berchtold, City Manager
City of Blue Lake
Street Address
Blue Lake, CA 95525
Telephone: (707) 668-5655
e-mail Address: citymanager@bluelake.ca.gov

5.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**April 1910. Blue Lake was incorporated as a General Law municipal corporation. The City was not granted a separate charter, but operates under the general laws of the State of California.
- **Current Population—**1,260 as of January 1, 2013.
- **Population Growth—**Based on data from the California Department of Finance Demographic Research Unit, the City of Blue Lake has experienced a moderate rate of growth. The overall population increased by 11.4 percent between 2000 and 2013. The population growth rate from 2012 to 2013 was 0.4 percent.
- **Location and Description—**The City of Blue Lake is a small, rural town situated in the Mad River Valley on California's beautiful north coast. It is located a short and scenic drive from Eureka (15 miles north east) and Arcata (4 miles east) and is 300 miles north of San Francisco. The city has a small downtown business district and an industrial park, although most residents are employed outside of the city in neighboring cities. Additionally, the city is the gateway to the Mad River Fish hatchery located 2 miles southwest of the town.
- **Brief History—**In the late 1880s and into the 1950s, Blue Lake was part of the lumber supply industry. During the last 25-year period, Blue Lake has made the final shift from being a "mill town" with jobs in or near Blue Lake to a "bedroom community." In this latter role Blue Lake represents a desirable residential location for persons employed in Arcata, Eureka and McKinleyville, and for students attending Humboldt State University (Arcata).
- **Climate—**Located slightly inland along the Mad River, the characteristic heavy coastal fog is tempered so that Blue Lake enjoys more hours of sunshine and warmer temperatures during the summer than neighboring communities. Average yearly rainfall is 45 inches. Winter days of 45—50 degrees and summer days of 65—70 degrees are most common.
- **Governing Body Format—**The City of Blue Lake is governed by a five-member City Council, which establishes overall policies for the city. Annually, the council selects a member to serve as mayor and another to serve as mayor pro-tem. The City consists of 5 departments: Business Office, Public Works, Parks and Recreation, Police and the City Manager's Office.

- **Development Trends—**The City of Blue Lake occupies .6 square miles. Since 2000, there were approximately 16 permit applications for the construction of new, single-family homes. According to the *2013—2018 City of Blue Lake Strategic Plan*, the City aims to promote Blue Lake as a destination for both businesses and consumers. Pursuant with California state law, the City of Blue Lake engages in long-range comprehensive planning. In 2009 the Land Use and Housing elements of the comprehensive plan were updated. The remaining elements have not been updated since 1986.

5.3 ENERGY PROFILE

5.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Blue Lake acquires its electricity from PG&E
- Propane—Propane for city operations is acquired from Sequoia Gas. Blue Star, and Blue Lake Rancheria.
- Liquid Fuel—Gasoline, diesel, and kerosene are purchased from Renner Petroleum.
- Natural Gas—Blue Lake acquires its natural gas from PG&E

5.3.2 Local Energy Demand

Government operations use five primary energy sources: electricity, natural gas, wood, propane, and solar. Each is described below (no energy demand information is provided for transportation fuels).

Electricity

Blue Lake consumed 5,583,051 kWh of electricity in 2012 as compared to 5,681,101 kWh in 2005. This amounts to a 1.7% decrease over that time span. The year-over-year change was a decrease of 2.8%.

Non-Residential Sector

Twenty-three percent of non-residential energy consumption was derived from electricity during 2012. There were two segments that comprised 80% of all non-residential consumption: chemicals & materials and food processing. Energy usage in this sector has decreased by 20.4% since 2005.

Residential Sector

Thirty-two percent of residential energy consumption was derived from electricity during 2012. The average electrical use per single-family and multi-family residential customer was 500 and 194 kWh per month respectively. Electrical usage has gone up by about 13.3% since 2005.

Natural Gas

Blue Lake consumed 767,724 therms of natural gas in 2012 as compared to 639,881 therms in 2005, a 20% increase. Between 2011 and 2012, there was a 9% increase in consumption.

Non-Residential Sector

Seventy-seven percent of non-residential energy consumption was derived from natural gas during 2012. Natural gas usage has increased by 32.9% since 2005.

Residential Sector

Sixty-eight percent of residential energy consumption was derived from natural gas during 2012. The average natural gas use per single-family and multi-family residential customer was 38 and 27 therms per month respectively. Natural gas usage has decreased by about 0.3% since 2005.

Wood

Blue Lake consumes wood in the residential sector, primarily for heating. On average, there are approximately 80 households using a total of approximately 200 cords of wood per year.

Propane

Blue Lake consumes propane in the residential sector, primarily for heating and cooking. About 40 use propane gas for an average total of nearly 40,000 gallons per year.

Solar

Non-Residential Sector

As of 2012, there were 3 kW of solar electricity being generated from one site that is connected to the PG&E grid.

Residential Sector

Between 2006 and 2009, 4 photovoltaic systems totaling 11 kW were installed at residential sites and interconnected to the PG&E grid.

5.3.3 Community Key Assets Energy Profile

TABLE 5-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: Wastewater Treatment Operations										
Wastewater Treatment		Electricity					Natural Gas			N
Key Asset #2: Water Booster Station										
Water		Electricity					Diesel			Y
Key Asset #3: City Hall										
City Management		Electricity					Natural Gas			N
Key Asset #4: Public Works Corporation Yard										
Public Works		Electricity					Natural Gas			N
Key Asset #5: Monda Way Sewer Lift										
Wastewater Treatment		Electricity					Gasoline			Y

The City of Blue Lake has identified five key assets for its energy profile:

- Wastewater Treatment Operations
- Water Booster Station
- City Hall
- Public Works Corporation Yard
- Monda Way Sewer Lift

Table 5-1 summarizes the energy profile for each key asset.

5.3.4 Key Asset Energy Consumption and Backup Generator Analysis

TABLE 5-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: Wastewater Treatment Operations								
14,612	20							
Generator Capacity Analysis: _____								
Key Asset #2: Water Booster Station								
10898	34							
Generator Capacity Analysis: _____								
Key Asset #3: City Hall								
2468								
Generator Capacity Analysis: _____								
Key Asset #4: Public Works Corporation Yard								
1006	4							
Generator Capacity Analysis: _____								
Key Asset #5: Monda Way Sewer Lift								
Generator Capacity Analysis: _____								

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 5-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

5.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 5-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake	N/A	11/8/1980	Not Available
Severe Weather / Flood	N/A	1/18/1981	Not Available
Severe Weather / Flood	N/A	12/19/1981	Not Available
Severe Weather / Flood	N/A	3/31/1982	Not Available
Severe Weather / Flood	DR-677	1/25/1983	$3.82 million countywide
Severe Weather / Flood	N/A	12/25/1983	Not Available
Severe Weather / Flood	DR-758	2/16/1986	Over $5 million countywide
Earthquake	N/A	4/25/1992	Not Available
Severe Weather / Flood	N/A	12/31/1992	Not Available
Severe Weather / Flood	N/A	1/20/1993	Not Available
Earthquake	N/A	12/26/1994	Over $5 million countywide
Severe Weather / Flood	DR-1044	1/9/1995	$15 million countywide
Severe Weather / Flood	DR-1046	3/1/1995	$1.3 million countywide
Severe Weather / Flood	N/A	12/11/1995	Not Available
Severe Weather / Flood	N/A	12/29/1995	$252,255
Severe Weather / Flood	N/A	12/8/1996	Not Available
Severe Weather / Flood	DR-1155	1/2/1997	$35 million countywide
Severe Weather / Flood	DR-1203	1/27/1998	Over $6 million countywide
Severe Weather / Flood	N/A	11/21/1998	Not Available
Severe Weather / Flood	N/A	12/27/2002	Not Available
Severe Weather / Flood	N/A	12/31/2005	Not Available
Earthquake	N/A	1/9/2010	Not Available
Landslide (Glendale Road)	N/A	3/2011	Not Available

Table 5-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 0
- Number of FEMA Identified Severe Repetitive Loss Properties: 0
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 0

5.5 HAZARD RISK RANKING

TABLE 5-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Storm	54
3	Flood	45
4	Drought	18
5	Wildland Fire	18
6	Dam Failure	17
7	Landslide	12
8	Volcano (Ash Fall)	12
9	Tsunami	6

Table 5-4 presents the ranking of the hazards of concern.

5.6 CAPABILITY ASSESSMENT

5.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 5-5.

TABLE 5-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** Uniform Building Code	Y	N	N	Y
Zoning ***Comments:*** Ordinance #478 Adopted 11/9/2004	Y	N	N	Y
Subdivisions ***Comments:*** Ordinance # 435 Adopted 5/9/1995	Y	N	N	N
Stormwater Management ***Comments:*** Ordinance #478 Adopted 11/9/2004	Y	N	N	N
Post Disaster Recovery ***Comments:*** In 2010, City adopted a Strategic Plan containing policies to periodically update the City Emergency Operations Plan (EOP). In 2011, City adopted an updated EOP containing a section on Recovery Operations.	Y	N	N	N
Real Estate Disclosure ***Comments:*** CA. State Civil Code 1102 requires full disclosure on Natural hazard Exposure of the sale/re-sale of any and all real property.	N	N	Y	Y
Growth Management ***Comments:*** General Plan 1986 Housing Element 2009	Y	N	N	Y
Site Plan Review	Y	N	N	N
Public Health and Safety	N	N	N	N
Environmental Protection	N	N	N	N
Energy Code	N	N	N	N
Planning Documents				
General or Comprehensive Plan ***Comments:*** General Plan 1986	Y	N	N	Y
Floodplain or Basin Plan	N	N	N	N
Stormwater Plan ***Comments:*** Storm Drainage Master Plan 4/1980	Y	N	N	N
Capital Improvement Plan ***Comments:*** Expected adoption 12/2014	N	N	N	N

TABLE 5-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Habitat Conservation Plan	N	N	N	N
Economic Development Plan	Y	N	N	N
Shoreline Management Plan	N	N	N	N
Community Wildfire Protection Plan	N	N	N	N
General Plan Energy Conservation Element or Energy Specific Plan	N	N	N	N
Climate Action Plan or Climate Adaptation Strategy ***Comments:*** Funding obtained; expected CAP completion 3/132014	N	N	N	N
Response/Recovery Planning				
Comprehensive Emergency Management Plan ***Comments:*** Emergency Management Plan Adopted 10/2005; updated annually	Y	N	N	N
Threat and Hazard Identification and Risk Assessment	N	N	N	N
Terrorism Plan	N	N	N	N
Post-Disaster Recovery Plan ***Comments:*** In 2010, City adopted a Strategic Plan containing policies to periodically update the City Emergency Operations Plan (EOP). In 2011, City adopted an updated EOP containing a section on Recovery Operations.	Y	N	N	N
Continuity of Operations Plan	N	N	N	N
Public Health Plans	N	N	N	N

5.6.2 Administrative and Technical Capability

TABLE 5-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	Planning (Contract Services)
Engineers or professionals trained in building or infrastructure construction practices	Y	Engineer (Contract Services)
Planners or engineers with an understanding of natural hazards	Y	Engineer and Planner (Contract Services)
Planners or engineers with an understanding of energy resilience or alternative energy technology	Y	Engineer and Planner (Contract Services)
Staff with training in benefit/cost analysis	Y	Engineer and Planner (Contract Services)
Surveyors	Y	Engineer (Contract Services)
Personnel skilled or trained in GIS applications	Y	Planning (Contract Services)
Scientist familiar with natural hazards in local area	Y	Humboldt State University
Emergency manager	Y	City Manager
Grant writers	Y	Engineer and Planner (Contract Services)

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 5-6.

5.6.3 Fiscal Capability

TABLE 5-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Y
Capital Improvements Project Funding	Y
Authority to Levy Taxes for Specific Purposes	Y
User Fees for Water, Sewer, Gas or Electric Service	Y
Incur Debt through General Obligation Bonds	Y
Incur Debt through Special Tax Bonds	Y
Incur Debt through Private Activity Bonds	Y
Withhold Public Expenditures in Hazard-Prone Areas	Y
State Sponsored Grant Programs	Y
Development Impact Fees for Homebuyers or Developers	Y
Other	

The assessment of the jurisdiction's fiscal capabilities is presented in Table 5-7.

5.6.4 National Flood Insurance Program Compliance

TABLE 5-8.
NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

What department is responsible for floodplain management in your community?	Building Department
Who is your community's floodplain administrator (department/position)?	John Berchtold, City Manager
Do you have any certified floodplain managers on staff in your community?	No
What is the date of adoption of your flood damage prevention ordinance?	9/28/1982; amended 11/19/1996
When was the most recent community assistance visit or community assistance contact?	7/25/2012
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	Yes; update the current floodplain ordinance to comply to meet minimum NFIP requirements.
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 5-8.

5.6.5 Energy Resilience Capability

TABLE 5-9.
ENERGY RESILIENCE CAPABILITIES

Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	City Manager
Have you performed an energy assurance gap analysis for your community?	No
Have you completed a vulnerability assessment of power sources to each key asset?	No
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	No
Are emergency backup generators tested on a regular basis?	Yes
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Yes
Have you established a working relationship with your community's energy service providers?	No
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	No
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	Yes

Energy resiliency capabilities are presented in Table 5-9.

5.6.6 Community Mitigation Program Classifications

TABLE 5-10.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule	Yes	9/9	--
Public Protection	Yes	5/8	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	N/A	N/A	N/A

Classifications under various community mitigation programs are presented in Table 5-10.

5.7 HAZARD MITIGATION ACTION PLAN

Table 5-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 5-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #BL-1—Adopt a long-term capital improvement plan, which provides the City the financial capability to fund capital projects that could include hazard mitigation projects.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	$10,000	Water Fund, Sewer Fund, General Fund	Short term	Yes
Initiative #BL-2—Continue to periodically update Emergency Operations Plan, including Recovery Operations.							
New & Existing	All Hazards	O-1, O-4, O-5	City Manager's Office	$500	General Fund	Short term	No
Initiative #BL-3—Adopt the International Building Code once ratified by the State of California as the State Building Code.							
New & Existing	All Hazards	O-2, O-3, O-10, O-11	City Manager's Office	$1,000	General Fund	Short term	No
Initiative #BL-4—Investigate Emergency water inter-ties between neighboring jurisdictions							
New & Existing	Earthquake, Severe Storm, Drought, Dam Failure	O-2, O-8, O-9	Public Works	Medium	Water Fund, PDM	Long term	Yes
Initiative #BL-5—Support countywide initiatives in the Humboldt Operational Area Hazard Mitigation Plan.							
New & Existing	All Hazards	All Objectives	City Manager's Office	$500	General Fund	Long term	Yes
Initiative #BL-6—Prepare Greenhouse Gas Inventory and Climate Action Plan. Integrate findings, objectives, and actions into General Plan Land Use, Circulation, and Housing Element updates. Prepare Energy Element.							
New & Existing	All Hazards	O-1, O-2, O-4, O-6, O-7	City Manager	$134,000	Sustainable Communities Planning Grant, General Fund	Short Term	No

TABLE 5-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #BL-7—Request information (energy use, backup generator make/model/size) from key assets and determine energy assurance gaps.							
Existing	All Hazards	O-1, O-2, O-4, O-7	City Manager's Office	$1,500	Water Fund, Sewer Fund	Short term	No
Initiative #BL-8—Evaluate the need for more, or more properly sized, generators for the key assets and other important facilities.							
Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	$1,000	Water Fund, Sewer Fund	Long term	No
Initiative #BL-9—Evaluate the need for fuel storage tanks on-site at Key Asset facilities and other important facilities.							
Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	Low	General Fund, Water Fund, Sewer Fund	Long term	No
Initiative #BL-10—Coordinate with the Blue Lake Rancheria to obtain priority supply of gasoline and diesel in the event of an energy interruption.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	$500	General Fund	Long term	No
Initiative #BL-11—Investigate low-no cost energy efficiency and conservation measures and innovative technologies such as micro-turbines for Key Assets and other city-owned/operated assets in order to decrease their energy footprint thus reducing energy bills and the scale of needed back-up power. Also look into higher cost, advanced technologies such as micro-grids.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	High	Sustainable Communities Planning Grant, CEC Grant, General Fund	Short term	No
Initiative #BL-12—Implement energy efficiency and conservation measures. Assure any implemented measures are considered in generator sizing decisions.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	High	Sustainable Communities Planning Grant, CEC Grant, General Fund	Short term	No

TABLE 5-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #BL-13—Continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New & Existing	Flood	O-2, 0-3, 0-9, O-10	City Manager's Office, Public Works	Medium	HMGP, PDM, General Fund	Short term	No
Initiative #BL-14—Implement Army Corps of Engineers recommended remedial actions at identified during 10/17/2012 levee inspection.							
New & Existing	Flood	O-2, O-3	Public Works	High	HMGP, PDM, General/Water/ Sewer Funds	Short term	No
Initiative #BL-15—Obtain a generator for the Public Works Yard.							
New & Existing	Flood	O-1, O-2, O-4	Public Works	High	General Fund	Long term	No
Initiative #BL-16—Incorporate this Hazard Mitigation Plan as part of the General Plan Safety Element. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	All Objectives	City Council	Low	General Fund	Short Term	No

5.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 5-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
BL-1	3	Medium	Medium	Yes	No	Yes	High
BL-2	3	Medium	Low	Yes	No	Yes	High
BL-3	4	Medium	Low	Yes	No	Yes	High
BL-4	3	Medium	Medium	Yes	Yes	No	Medium
BL-5	12	Low	Low	Yes	No	Yes	High
BL-6	5	Medium	Low	Yes	Yes	Yes	High
BL-7	4	Medium	Medium	Yes	No	No	Low
BL-8	3	Medium	Medium	Yes	No	No	Low
BL-9	3	Medium	Low	Yes	No	No	Low
BL-10	3	High	Low	Yes	No	Yes	High
BL-11	3	Medium	High	No	Yes	No	Low
BL-12	3	Medium	High	No	Yes	No	Low
BL-13	4	High	Medium	Yes	Yes	No	High
BL-14	2	High	High	Yes	Yes	No	High
BL-15	3	High	High	Yes	No	No	Low
BL-16	12	Medium	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

Table 5-12 identifies the priority for each initiative.

5.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 5-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	BL-1, BL-3, BL-5, BL-6, BL-16	BL-5, BL-11, BL-12, BL-14	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12
Drought	BL-1, BL-3, BL-5, BL-6, BL-16	BL-5, BL-11, BL-12	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12
Earthquake	BL-1, BL-3, BL-5, BL-6, BL-16	BL-5, BL-11, BL-12	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12
Flood	BL-1, BL-3, BL-5, BL-6, BL-13, BL-16	BL-5, BL-11, BL-12, BL-16	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12, BL-16	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12, BL-16
Landslide	BL-1, BL-3, BL-5, BL-6, BL-16	BL-5, BL-11, BL-12	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12
Severe Weather	BL-1, BL-3, BL-5, BL-6, BL-13, BL-16	BL-5, BL-11, BL-12	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12
Tsunami	BL-1, BL-3, BL-5, BL-6, BL-16	BL-5, BL-11, BL-12	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12
Wildfire	BL-1, BL-3, BL-5, BL-6, BL-16	BL-5, BL-11, BL-12	BL-5, BL-16	BL-5, BL-6, BL-11, BL-12	BL-2, BL-5, BL-7, BL-8, BL-9, BL-10, BL-11, BL-12, BL-15	BL-4, BL-5, BL-11, BL-12

a. See Chapter 1 for description of mitigation types.

Table 5-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

5.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 5-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
BL-1		X		Adopt a long-term capital improvement plan
BL-2	X			Prepare a Post Disaster Recovery Plan
BL-3	X			Adopt International Building Code 2008
BL-4		X		Install Emergency water inter-ties between neighboring jurisdictions
BL-5		X		Support countywide initiatives in the Humboldt Operational Area Hazard mitigation Plan
BL-6		X		Now BL-13

Table 5-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

CITY OF BLUE LAKE

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.25 Miles

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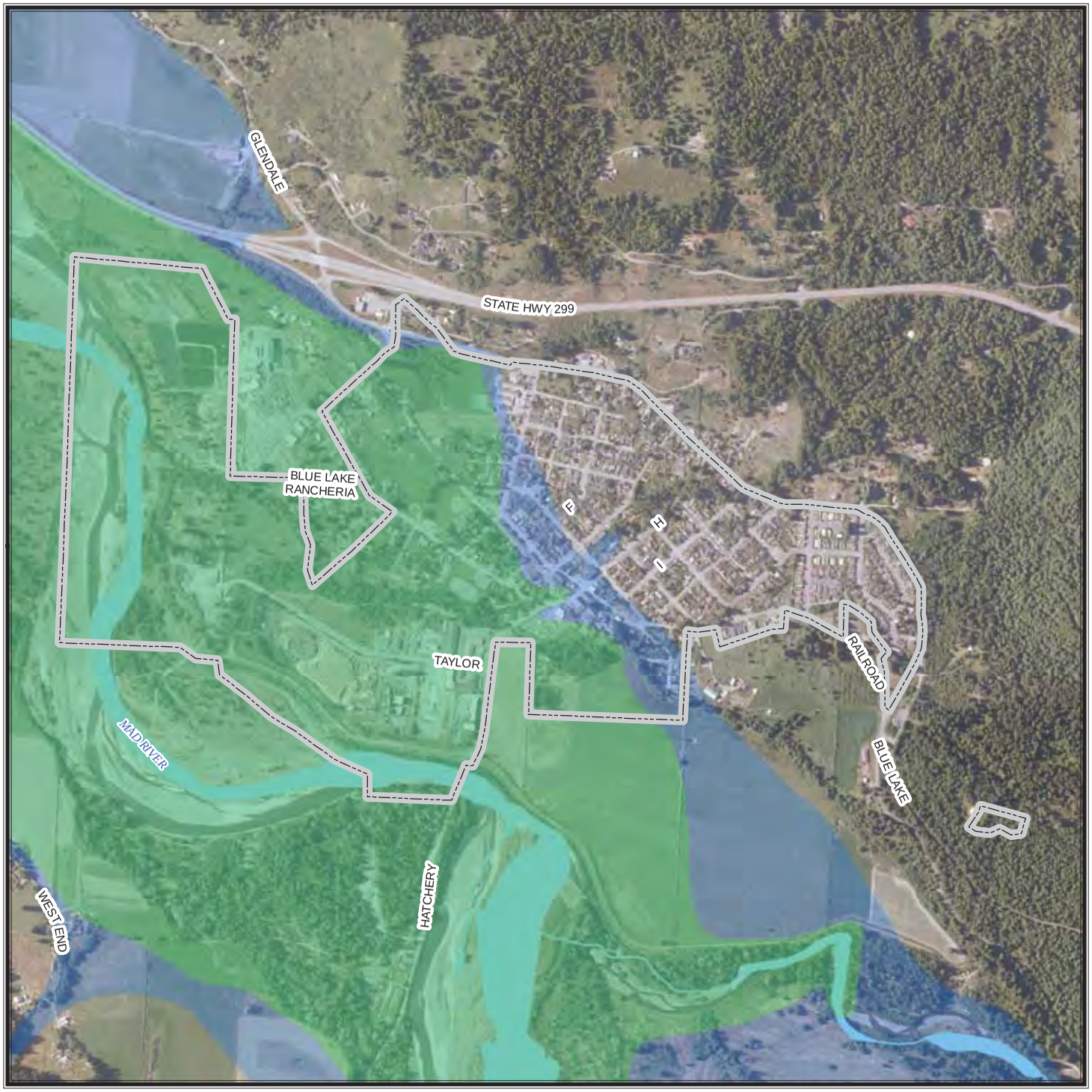

CITY OF BLUE LAKE

Dam Failure Inundation Areas

Robert W. Matthews Dam

Summer flood inundation area

Winter flood inundation area

Robert W Matthews Dam inundation areas data from a model performed by Winzler & Kelly in 2000. Summer flood inundation area represents extent of a summer low-flow scenario dam breach from Matthews Dam to the mouth of the Mad River. Winter flood inundation area represents extent of a worst case scenario dam breach from Matthews Dam to the mouth of the Mad River. Winzler & Kelly/GHD; Steve Allen and Gary Davison.

These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

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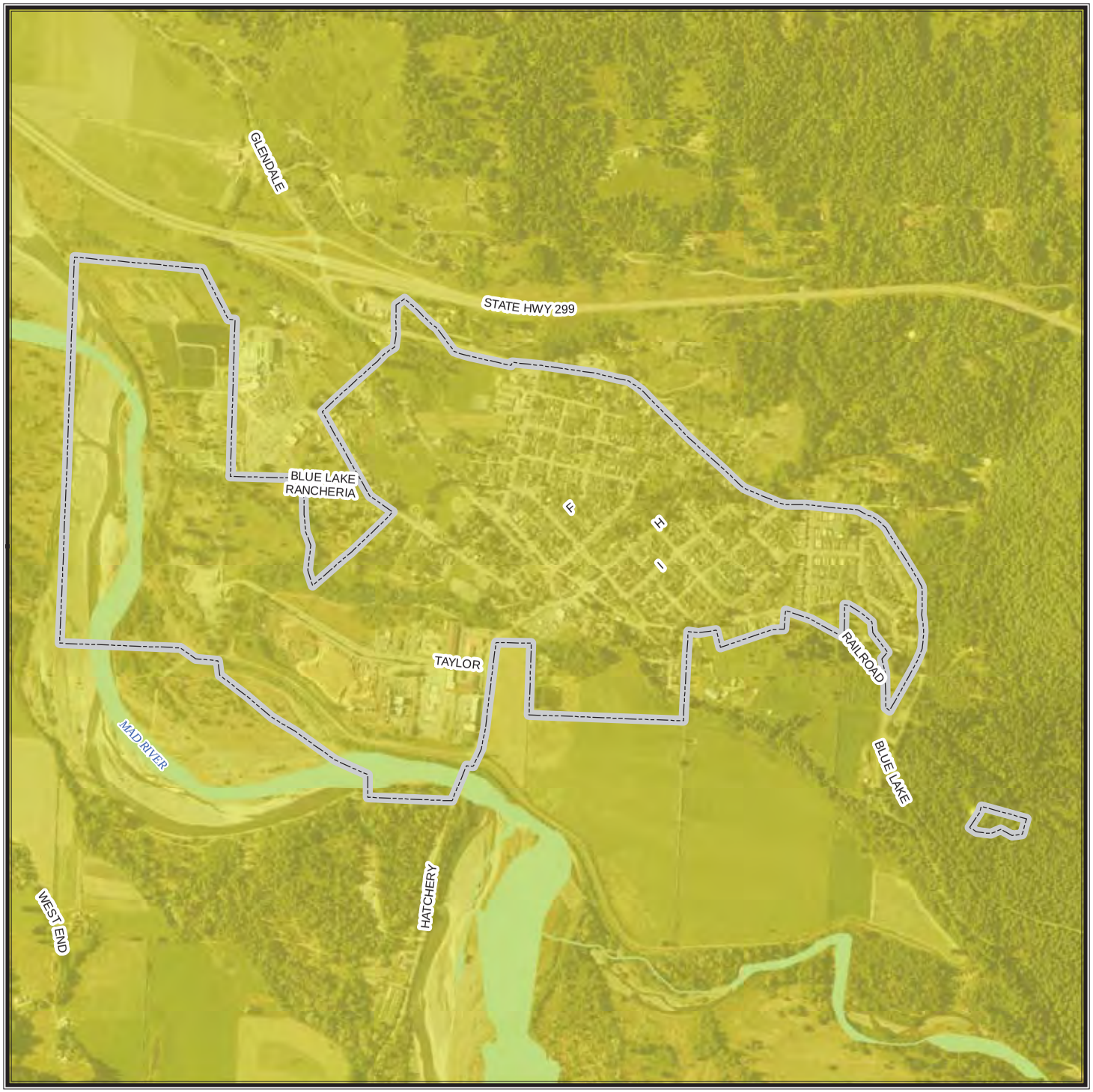


CITY OF BLUE LAKE

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF BLUE LAKE

Quaternanry & Younger Earthquake Faults

Proximate Faults

Mad River Fault Zone

Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF BLUE LAKE

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

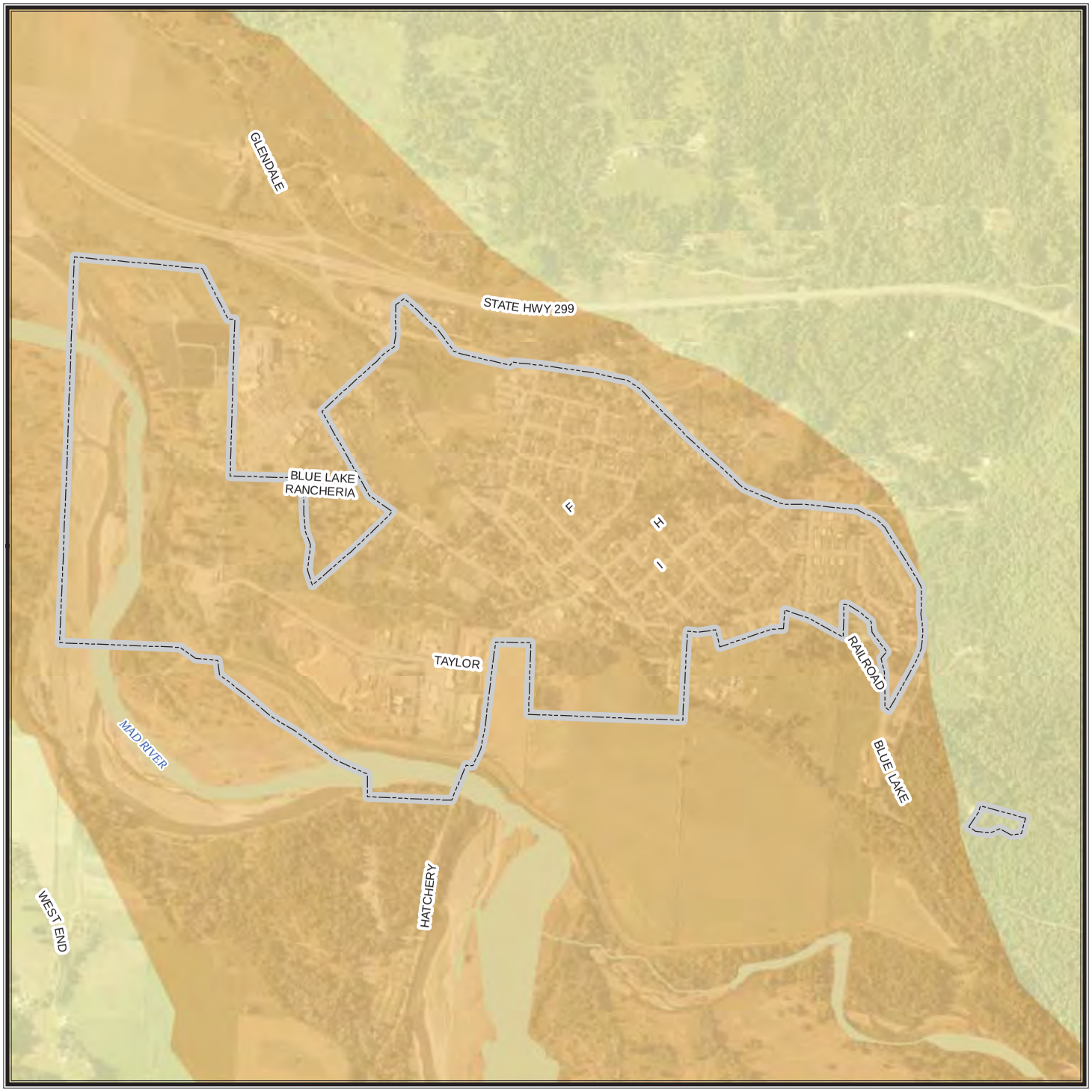
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF BLUE LAKE

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

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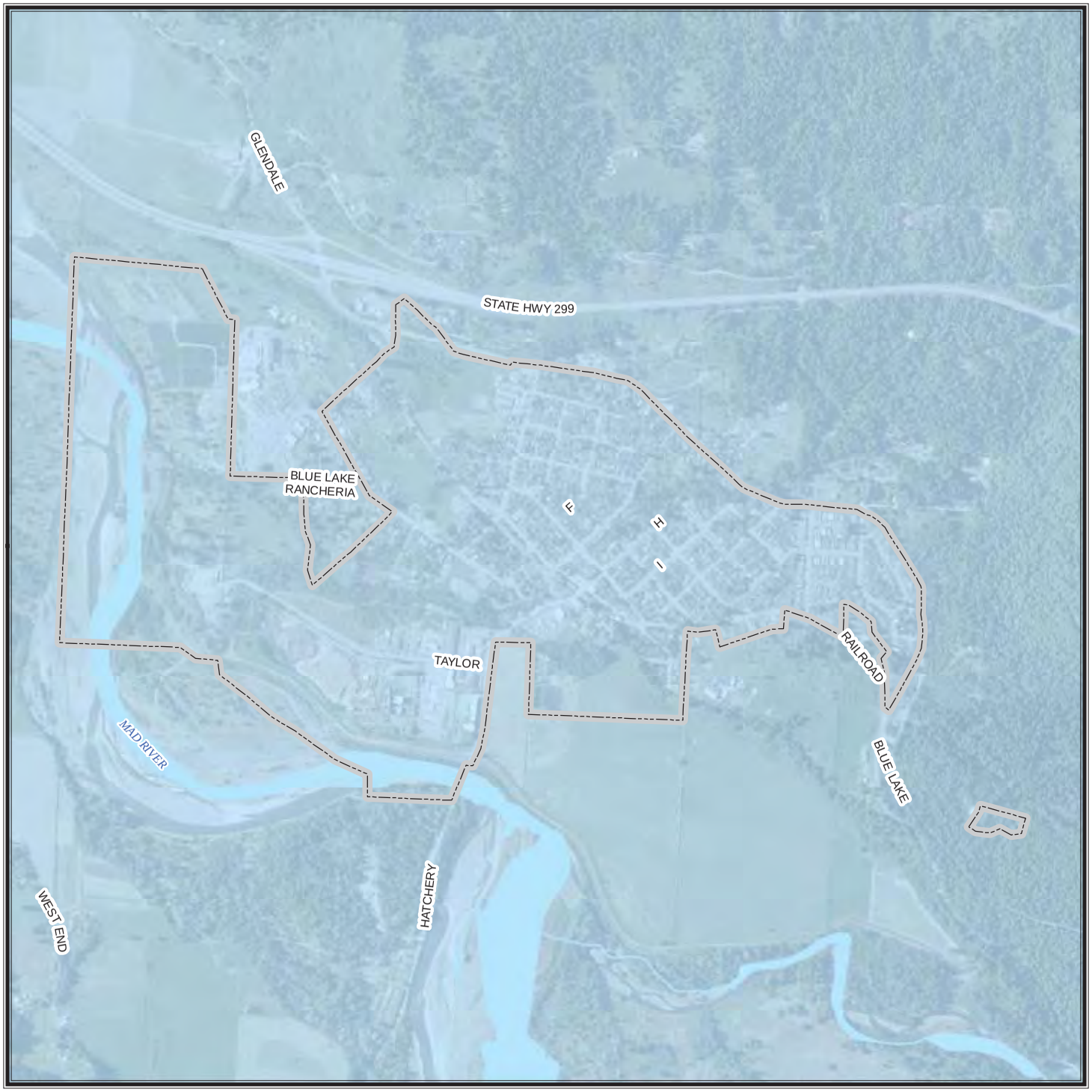


CITY OF BLUE LAKE

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

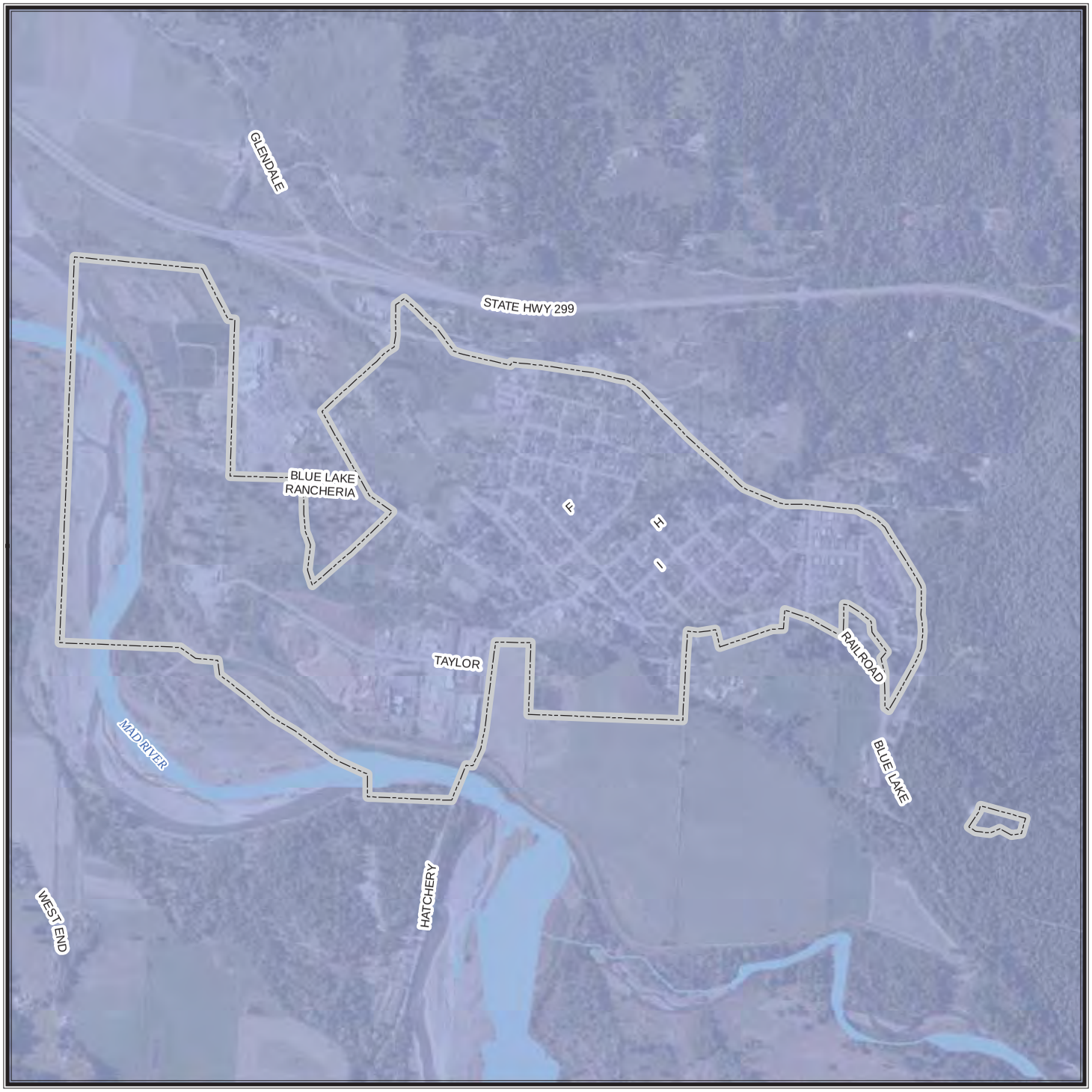
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF BLUE LAKE

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

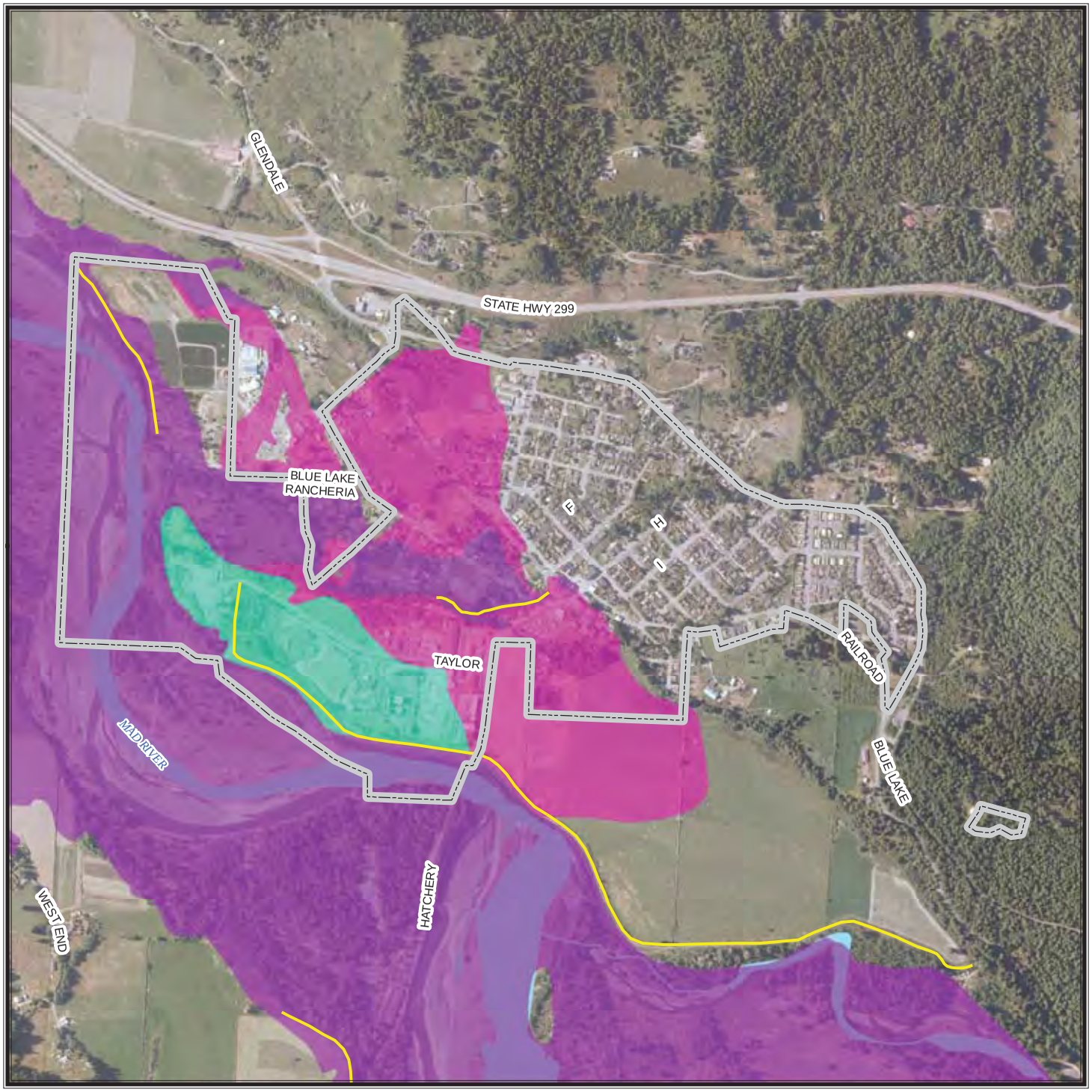
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF BLUE LAKE

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

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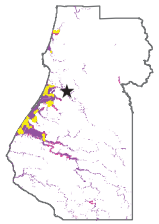

CITY OF BLUE LAKE

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

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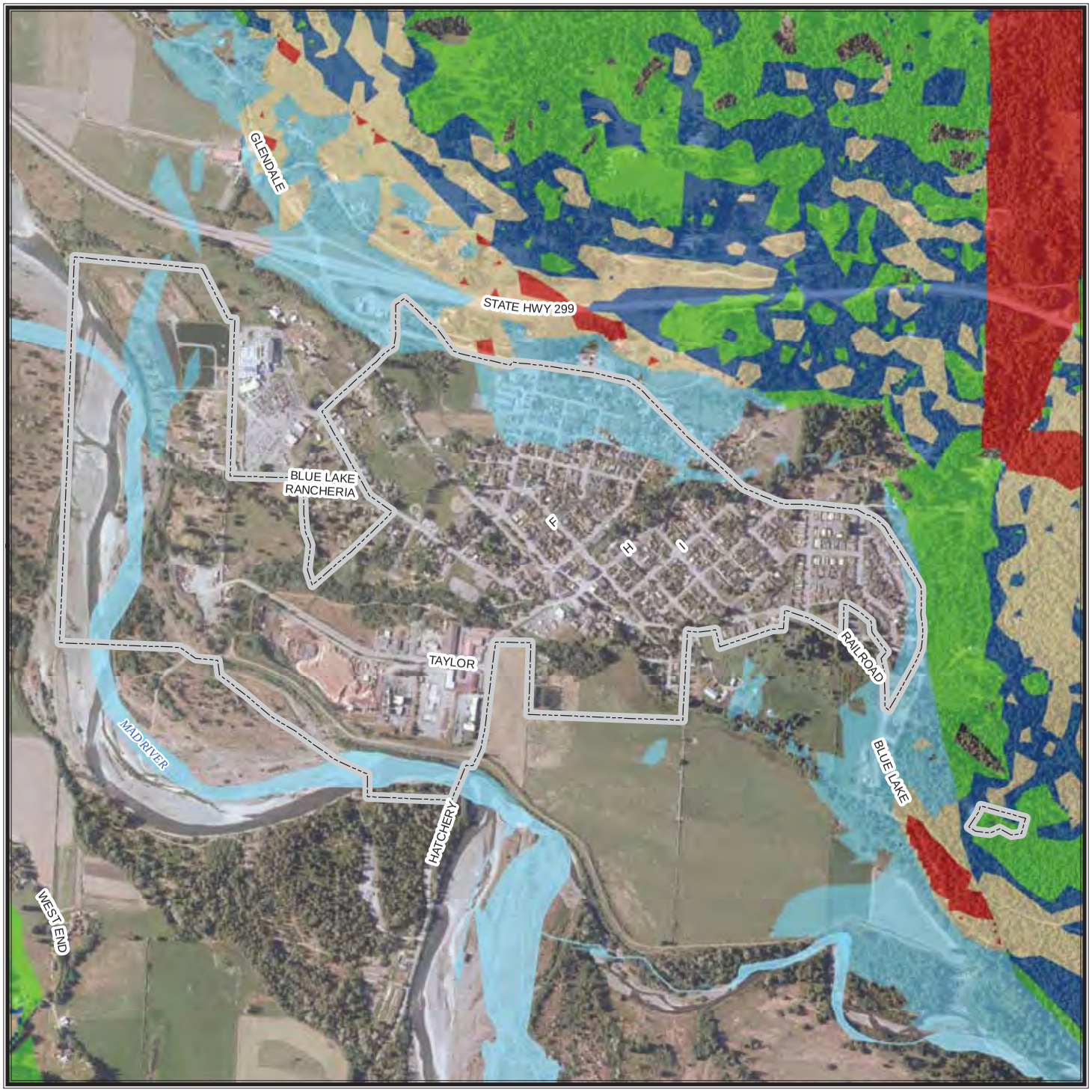

CITY OF BLUE LAKE

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF BLUE LAKE

Tsunami Inundation Areas

Tsunami inundation area

Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

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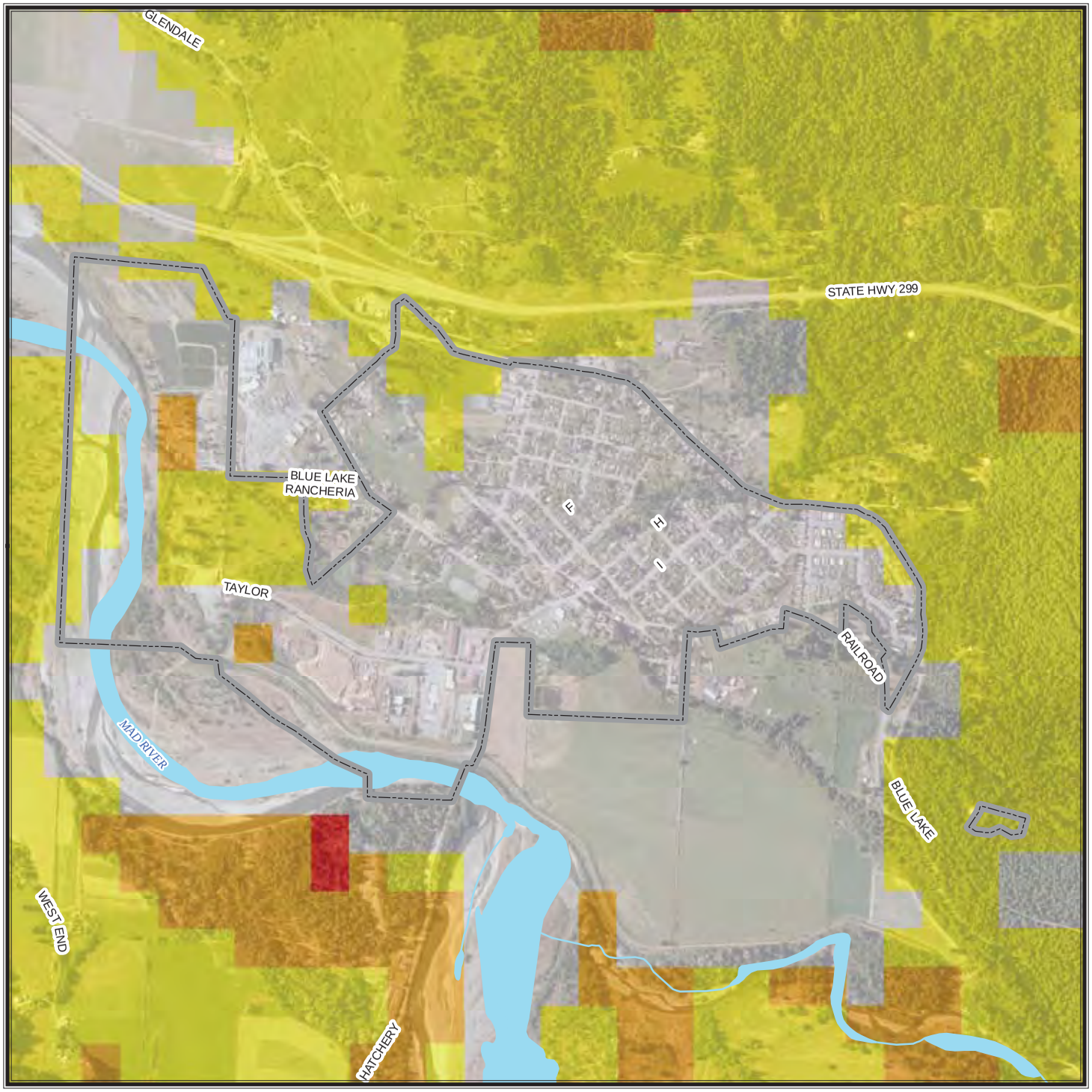

CITY OF BLUE LAKE

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

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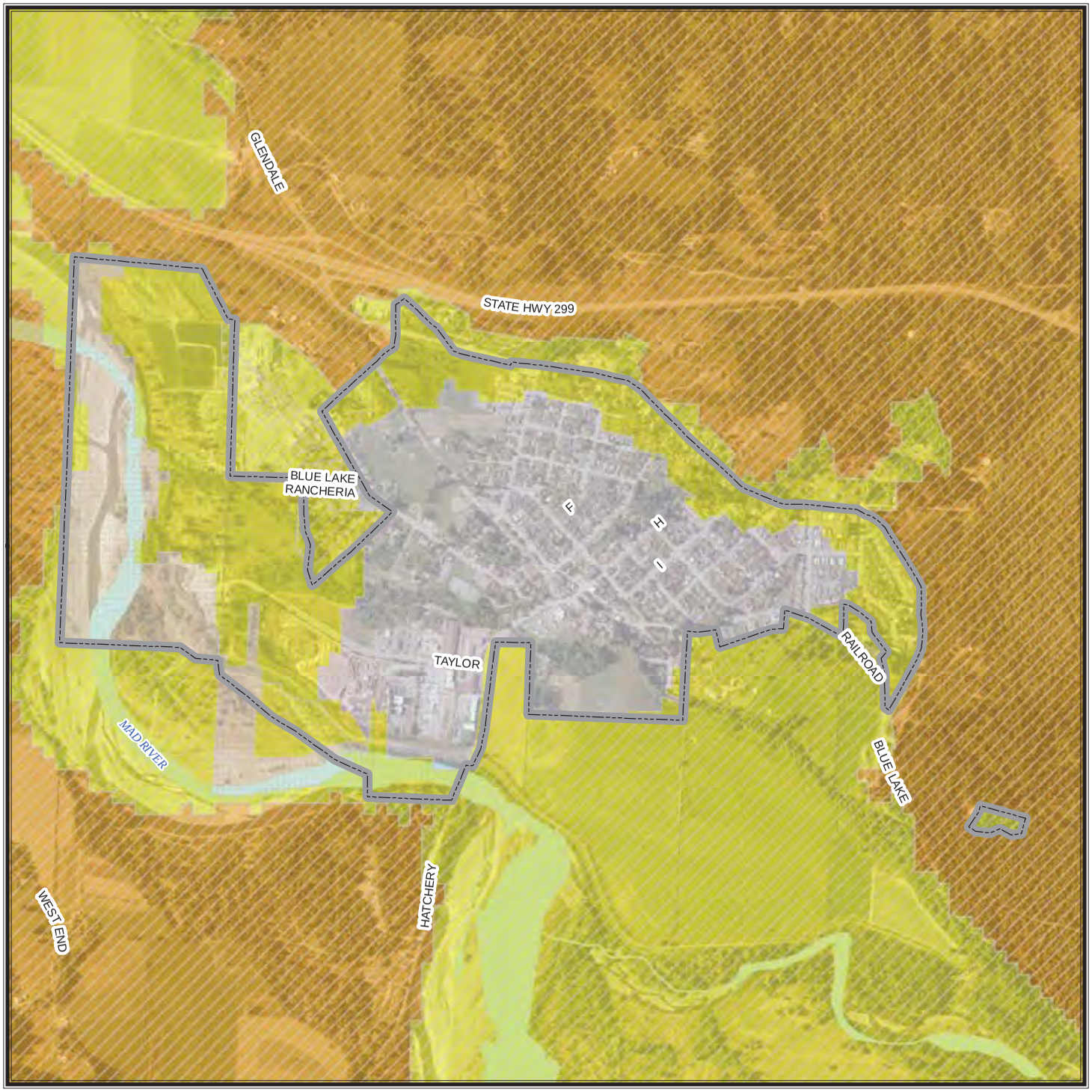

CITY OF BLUE LAKE

Fire Hazard Severity Class

Hazard Class

- **Very High**
- **High**
- **Moderate**
- **Non-Wildland/Non-Urban**
- **Urban Unzoned**

Responsibility Areas

- **Federal (FRA)**
- **Local (LRA)**
- **State (SRA)**
- **None**

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF BLUE LAKE

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH

CITY OF BLUE LAKE

Fire Perimeters

Year of Fire

- **1908 - 1920**
- **1921 - 1940**
- **1941 - 1960**
- **1961 - 1980**
- **1981 - 2000**
- **2001 - 2012**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

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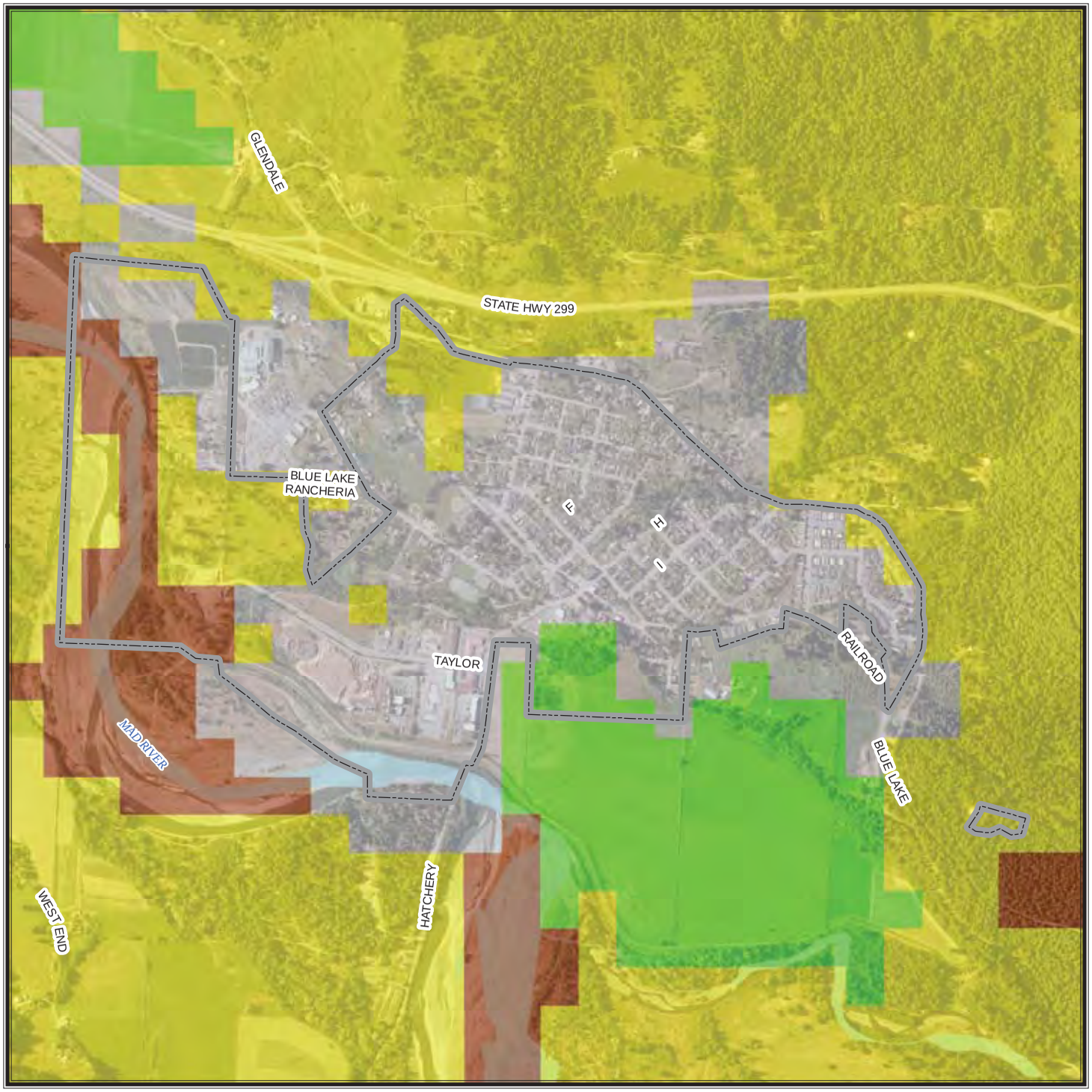

CITY OF BLUE LAKE

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CHAPTER 6.
CITY OF EUREKA UPDATE ANNEX

6.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Bill Gillespie, Assistant Chief
Humboldt Bay Fire
533 C Street
Eureka, CA 95501
707-441-4000
bgillespie@hbfire.org

Alternate Point of Contact

Bruce Young, Public Works Director
City of Eureka
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6.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**April 1956. The City of Eureka is a chartered city.
- **Current Population—**27,021 as of January 1, 2013.
- **Population Growth—**According to data from the California Department of Finance, the population of Eureka increased by 3.4 percent from 2000 to 2013. The growth rate between 2012 and 2013 was 0.1 percent.
- **Location and Description—**Eureka is the Humboldt County seat and is located on the Pacific seacoast approximately 280 miles north of San Francisco. Within the continental United States, Eureka is the largest coastal city north of San Francisco, and has the largest protected deep-water port between San Francisco Bay and Puget Sound. Eureka's climate is characterized by mild, rainy winters and cool, dry summers, with an average temperature of 55 degrees Fahrenheit. The city serves as the regional center for health care, commerce, trade, and the arts for the north coast of California.

  Eureka is ideally situated within California's Redwood Empire region due to its proximity to exceptional natural resources. These include the spectacular coast of the Pacific Ocean, Humboldt Bay, and several rivers in addition to Redwood National Park and various state parks including Humboldt Redwoods State Park. Located adjacent to Humboldt Bay, Eureka is renowned for the magnificent coastal redwoods. These trees are among the oldest living things on Earth and have played a vital role in fashioning Eureka's heritage.
- **Brief History—**The history of Eureka starts with the indigenous Wiyot people. Perhaps never numbering more than a few thousand, they had lived in the region for many centuries, and are particularly known for their basketry and fishery management. The initial Europeans arrived on Humboldt Bay in the early 1800s and encountered the indigenous Wiyot. The Wiyot were eventually supplanted by Europeans, as gold seekers and others arrived.

  As the city of Eureka grew, it quickly became an important port city for northern California's logging, gold mining and commercial fishing industries, and by 1850 the vast potential for industry on the bay was soon realized. After only four years, there were seven mills processing lumber in Eureka. Within five years, 140 lumber schooners operated in Humboldt Bay, supplying lumber to other booming cities along the coast. Salmon fisheries sprang up as

early as 1851, and within seven years, 50,000 pounds of smoked salmon were processed and shipped out of Humboldt Bay annually. The bay is also the site of one of the west coast's largest oyster farming operations, which began in the nineteenth century. The Bay remains the home port to more than 200 fishing boats in two modern marinas which can berth at least 400 boats within the city limits of Eureka.

- **Climate—**The climate of Eureka is completely maritime, with high humidity prevailing throughout the year. The rainy season lasts from October through April, accounting for about 90 percent of the annual precipitation. The dry season, lasting from May through September, is typically marked by regular intrusions of low clouds and fog. Temperatures are quite moderate, and the annual range is one of the smallest in the lower 48 states.

  The record high in Eureka is 87 degrees while the record low is 20 degrees. During a typical year, the colder lows are in the mid-30s and the warmer highs will reach the mid-70s. The reason for the small temperature range is the close proximity of Eureka to the Pacific Ocean. The prevailing northwest wind blows across the cold up-welling water that is almost always present along the Humboldt County coast. While the immediate coast is largely affected by the cold California current, locations inland can have a much greater range of temperature. Areas just over the coastal mountains, or about 40 miles east of Eureka, can experience winter lows in the single digits and teens and summer highs from 100 to 110 degrees!

  During the warm season, typically from June to October, northerly winds prevail over the coastal waters as a semi-permanent ridge dominates over the Eastern Pacific and a semi-permanent Heat Low develops over interior California. In the cool season, the North Coast periodically sees strong southerly winds as East Pacific storms make landfall.

- **Governing Body Format—**The City of Eureka has a Mayor-Council system of governance. Primary power lies with the five council members, divided into five wards. The Mayor has the power to appoint, as well as ceremonial duties, though the job includes presiding over council meetings, and meeting visiting dignitaries. Official city business is administered by the Office of the City Manager.

  Development Trends—The timber industry and the Pacific Northwest fisheries have declined steadily since the 1950s. Increased regulation and the creation of more parkland to preserve the remnants of once extensive virgin forests, rivers, and fisheries led to diminished profits and massive layoffs of blue collared mill workers and fisherman, beginning in earnest by the 1970s. Competition from other timber markets outside the nation only hastened the process of decline in logging and related industries. The challenge resulting from this economic and social upheaval remains significant in the lives of many Eureka and North Coast residents. Both the local fishing industry and the timber industry remain important in the local and state economy, although it is in a diminished capacity as compared to their historical importance.

  Today, the major industries are tourism, timber (in value), and healthcare services (in number of jobs). Major employers today in Eureka include the following governmental entities: College of the Redwoods, County of Humboldt, and the Humboldt County Office of Education. St. Joseph Hospital in Eureka is now the largest private employer in Eureka.

  Pursuant to California state law, the City of Eureka engages in long-range planning. The current general plan was adopted in 1997 and the Housing element was updated and adopted in 2010. Through an analysis of current housing stock and population trends, the plan estimates that 800 new residences will need to be constructed between 2007 and 2014 to account for increased demand.

6.3 ENERGY PROFILE

6.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Pacific Gas & Electric Company (PG&E)
- Natural Gas—Pacific Gas & Electric Company (PG&E)

6.3.2 Local Energy Demand

Government operations use five primary energy sources: electricity, natural gas, wood, propane, and solar. Each is described below (no energy demand information is provided for transportation fuels).

Electricity

Eureka consumed 187,561,815 kWh of electricity in 2012 as compared to 184,043,947 in 2005. This amounts to a 1.95% increase over that time span. The year-over-year change was a decrease of 1%.

Non-Residential Sector

Fifty-one percent of non-residential energy consumption was derived from electricity during 2012. There were six segments that comprised 80% of non-residential consumption: retail, hospitality, healthcare, government, offices, and manufacturing & transportation. Electricity usage has decreased by 5% since 2005.

Residential Sector

Twenty-seven percent of residential energy consumption was derived from electricity during 2012. The average electrical use per single-family and multi-family residential customer was 454 and 260 kWh per month respectively. Electrical usage has gone up by 17.2% since 2005.

Natural Gas

Eureka consumed 10,343,384 therms of natural gas in 2012 as compared to 9,452,202 therms in 2005. This amounts to an 8.4% increase over that time span. The year-over-year change was an increase of 1.4%.

Non-Residential Sector

Forty-nine percent of non-residential energy consumption was derived from natural gas during 2012. There were five segments that comprised 80% of non-residential consumption: retail, hospitality, healthcare, government, offices, and manufacturing & transportation. Natural gas usage has increased by 13.3% since 2005.

Residential Sector

Seventy-three percent of residential energy consumption was derived from natural gas during 2012. The average natural gas use per single-family and multi-family residential customer was 43 and 26 therms per month respectively. Natural gas usage has increased by 5.1% since 2005.

Wood

Eureka consumes wood in the residential sector, primarily for heating. On average, there are about 1900 households using more than 4700 cords of wood per year.

Propane

Eureka consumes propane in the residential sector, primarily for heating and cooking. 950 households use propane gas for an average total of approximately 867,000 gallons per year.

Solar

Non-Residential Sector

Between 2001 and 2011, 16 photovoltaic sites were installed at non-residential sites generating 266 kw interconnected to the PG&E grid.

Residential Sector

Between 2000 and 2012, 91 photovoltaic systems totaling 179 kW were installed at residential sites and interconnected to the PG&E grid.

6.3.3 Community Key Assets Energy Profile

The City of Eureka has identified 20 key assets for its energy profile:

- City Hall
- Humboldt Bay Fire HQ
- Humboldt Bay Fire Station 11
- Humboldt Bay Fire Station 12
- Humboldt Bay Fire Station 4
- Humboldt Bay Fire Station 3
- Eureka Police Department
- Drinking Water Treatment and Distribution
- Drinking Water Distribution
- Elk River Wastewater Treatment Plant
- Sewer Lift Stations
- Corporation Yard
- Donna Drive Repeater Site
- Fire Training Building
- St. Joseph Hospital
- City Ambulance of Eureka
- City Ambulance of Eureka, Station #2
- Humboldt County Correctional Facility
- Chevron
- Renner Petroleum Cardlock Locations

Table 6-1 summarizes the energy profile for each key asset.

TABLE 6-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: City Hall, 531 K Street										
Alternate EOC		Electricity								
Key Asset #2: Humboldt Bay Fire HQ, 533 C Street										
EOC, Fire Protection, 1st Responder		Electricity				125 kW	Diesel	1000 (Shared with EPD)	Y	N
Key Asset #3: Humboldt Bay Fire Station 11, 3455 Harris Street										
Fire Protection, 1st Responder		Electricity				15 kW	Natural Gas		N	N
Key Asset #4: Humboldt Bay Fire Station 12, 755 Herrick Avenue										
Fire Protection, 1st Responder		Electricity				25 kW	Diesel	500	Y	N
Key Asset #5: Humboldt Bay Fire Station 4, 1016 Myrtle Avenue										
Fire Protection, 1st Responder		Electricity				25 kW	Diesel	10	Y	N
Key Asset #6: Humboldt Bay Fire Station 3, 2905 Ocean Avenue										
Fire Protection, 1st Responder		Electricity				25 kW	Diesel	10	Y	Y

TABLE 6-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #7: Eureka Police Department, 604 C Street										
Public Safety		Electricity				100 kW	Diesel	1000 (Shared with HBF)	Y	N
Key Asset #8: Drinking Water Treatment and Distribution, 3575 W Street										
Water Distribution		Electricity				250 kW				N
Key Asset #9: Drinking Water Distribution, Harris & L Streets										
Water Distribution		Electricity				200 kW	Diesel	240	Y	N
Key Asset #10: Elk River Wastewater Treatment Plant, 4301 Hilfiker Lane										
Wastewater Treatment, Meet Drinking Water Standards		Electricity								
Key Asset #11: Sewer Lift Stations, Various Locations										
Sewer Lift Stations		Electricity								
Key Asset #12: Corporation Yard, 945 W. 14th Street										
Public Works		Electricity				100 kW	Diesel	100	Y	N
Key Asset #13: Donna Drive Repeater Site										
Fire Communications		Electricity				15 kW	Diesel			N
Key Asset #14: Fire Training Building, 3030 L Street										
Firefighter Training, Alternate EOC		Electricity								
Key Asset #15: St. Joseph Hospital, 2700 Dolbeer										
Health		Electricity								
Key Asset #16: City Ambulance of Eureka, 137 W. 7th										
Health		Electricity								
Key Asset #17: City Ambulance of Eureka, Station #2, 320 Spruce Street										
Health		Electricity								
Key Asset #18: Humboldt County Correctional Facility, 826 4th Street										
Public Safety		Electricity					Diesel	2000	Y	N
Key Asset #19: Chevron, 3400 Christie										
Fuel Arrivals		Electricity								
Key Asset #20: Renner Petroleum Cardlock Locations, Eureka										
Fuel Distribution		Electricity				UNK				Y

6.3.4 Key Asset Energy Consumption and Backup Generator Analysis

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 6-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

TABLE 6-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: City Hall, 531 K Street								
12,400								
Generator Capacity Analysis: _____								
Key Asset #2: Humboldt Bay Fire HQ, 533 C Street								
11,280							Diesel	1000 (shared with EPD)
Generator Capacity Analysis: _____								
Key Asset #3: Humboldt Bay Fire Station 11, 3455 Harris Street								
2,823								
Generator Capacity Analysis: _____								
Key Asset #4: Humboldt Bay Fire Station 12, 755 Herrick Avenue								
1,668							Diesel	500
Generator Capacity Analysis: _____								
Key Asset #5: Humboldt Bay Fire Station 4, 1016 Myrtle Avenue								
1,284							Diesel	10
Generator Capacity Analysis: _____								
Key Asset #6: Humboldt Bay Fire Station 3, 2905 Ocean Avenue								
2,060							Diesel	10
Generator Capacity Analysis: _____								
Key Asset #7: Eureka Police Department, 604 C Street								
30,560							Diesel	1000 (shared with HFD)
Generator Capacity Analysis: _____								
Key Asset #8: Drinking Water Treatment and Distribution, 3575 W Street								
Generator Capacity Analysis: _____								
Key Asset #9: Drinking Water Distribution, Harris & L Streets								
31,820							Diesel	240
Generator Capacity Analysis: _____								

TABLE 6-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #10: Elk River Wastewater Treatment Plant, 4301 Hilfiker Lane								
94,186								
Generator Capacity Analysis: _____								
Key Asset #11: Sewer Lift Stations, Various Locations								
Generator Capacity Analysis: _____								
Key Asset #12: Corporation Yard, 945 W. 14th Street								
5,400							Diesel	
Generator Capacity Analysis: _____								
Key Asset #13: Donna Drive Repeater Site								
							Diesel	100
Generator Capacity Analysis: _____								
Key Asset #14: Fire Training Building, 3030 L Street								
Generator Capacity Analysis: _____								
Key Asset #15: St. Joseph Hospital, 2700 Dolbeer								
Generator Capacity Analysis: _____								
Key Asset #16: City Ambulance of Eureka, 137 W. 7th								
Generator Capacity Analysis: _____								
Key Asset #17: City Ambulance of Eureka, Station #2, 320 Spruce Street								
Generator Capacity Analysis: _____								
Key Asset #18: Humboldt County Correctional Facility, 826 4th Street								
							Diesel	2000
Generator Capacity Analysis: _____								
Key Asset #19: Chevron, 3400 Christie								
Generator Capacity Analysis: _____								
Key Asset #20: Renner Petroleum Cardlock Locations, Eureka								
Generator Capacity Analysis: _____								

6.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 6-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Storm/Flood	N/A	12/21/2012	Information Not Available
Severe Storm/Flood	N/A	11/30/2012	Information Not Available
Severe Storm/Flood	N/A	03/16/2012	Information Not Available
Severe Storm/Flood	N/A	03/30/2012	Information Not Available
Tsunami	N/A	03/10/2011	Information Not Available
Earthquake	N/A	01/09/2010	$28 million in City of Eureka
Severe Storm/Wind	N/A	12/21/2008	Information Not Available
Severe Storm/Wind	N/A	10/30/2008	Information Not Available
Severe Storm/Wind	N/A	01/30/2008	$16,235 countywide reported
Severe Storm/Wind	N/A	04/05/2006	Information Not Available
Severe Storm/Wind/Flood	DR-1628	12/31/2005	$20,208,206 countywide
Severe Storm/Wind/Flood	N/A	12/2005	Information Not Available
Severe Storm/Wind/Flood	DR-1203	02/09/1998	Over $6 million countywide
Severe Storm/Wind/Flood	DR-1155	01/04/1997	$35 million countywide
Severe Storm/Wind/Flood	N/A	12/1996	Information Not Available
Earthquake	N/A	12/26/1994	Over $5 million countywide
Severe Storm/Wind/Flood	N/A	01/1993	$635,613 countywide
Earthquake	DR-943	04/25/1992	$10 million
Severe Storm/Wind/Flood	DR-758	02/21/1986	$5 million countywide
Severe Storm/Wind/Flood	DR-677	01/25/1983	$3.82 million countywide
Severe Storm/Wind	N/A	12/22/1982	$1,041,667 countywide
Severe Storm/Wind/Flood	N/A	11/30/1982	$50,000 countywide
El Nino/Salmon Industry	DR-1038	05/01/1994	Information Not Available
Severe Storm/Flood/Tide	DR-651	12/19/1981	Information Not Available
Severe Storm/Wind/Flood	N/A	11/11/1981	Information Not Available
Severe Storm/Wind/Flood	N/A	12/01/1980	Information Not Available
Earthquake	N/A	11/08/1980	$3 million

Table 6-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 0
- Number of FEMA Identified Severe Repetitive Loss Properties: 0
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 0

6.5 HAZARD RISK RANKING

TABLE 6-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	39
3	Tsunami	30
4	Flood	27
5	Landslide	18
6	Drought	12
7	Wildfire	9
8	Dam Failure	6
9	Volcano (Ash Fall)	6

Table 6-4 presents the ranking of the hazards of concern.

6.6 CAPABILITY ASSESSMENT

6.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 6-5.

TABLE 6-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** 2010 Building Code (ICC)	Y	N	N	Y
Zoning ***Comments:*** Adopted 10-06-66; Ord. #80-CS	Y	N	N	Y
Subdivisions ***Comments:*** Adopted 12-06-84; Ord. #416-CS	Y	N	N	N
Stormwater Management ***Comments:*** Adopted 01-24-06; Ord. #705-CS	Y	N	N	N
Post Disaster Recovery	N	N	N	N
Real Estate Disclosure ***Comments:*** CA. State Civil Code 1102 requires full disclosure on Natural Hazard Exposure of the sale/re-sale of any and all real property.	N	N	Y	Y
Growth Management ***Comments:*** General Plan, Feb. 1999	Y	N	N	Y
Site Plan Review ***Comments:*** Adopted with Zoning Ordinance 10-06-66; Ord. #80-CS	Y	N	N	N
Public Health and Safety ***Comments:*** General Plan, Feb. 1999	Y	N	N	N
Environmental Protection				
Energy Code				
Planning Documents				
General or Comprehensive Plan ***Comments:*** Adopted Feb. 1999	Y	N	N	Y
Floodplain or Basin Plan ***Comments:*** Adopted 04-19-11; Ord. 767-C.S.	N	N	N	N
Stormwater Plan ***Comments:*** Adopted 01-24-06; Ord. #705-CS	Y	N	N	N

TABLE 6-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Capital Improvement Plan ***Comments:*** *Types of capital facilities addressed:* City facilities and infrastructure Five Year CIP adopted annually as required by California Government Code Section 65401, Article 8, Chapter 3, Title 7 and Eureka Municipal Code Section 152.01 (B) (6)	N	N	N	N
Habitat Conservation Plan	N	N	N	N
Economic Development Plan	Y	N	N	N
Shoreline Management Plan ***Comments:*** Adopted with General Plan Feb. 1999	Y	N	N	N
Community Wildfire Protection Plan	N	N	N	N
General Plan Energy Conservation Element or Energy Specific Plan				
Climate Action Plan or Climate Adaptation Strategy				
Response/Recovery Planning				
Comprehensive Emergency Management Plan ***Comments:*** Adopted December 2004	Y	N	N	N
Threat and Hazard Identification and Risk Assessment				
Terrorism Plan				
Post-Disaster Recovery Plan	N	N	N	N
Continuity of Operations Plan				
Public Health Plans ***Comments:*** General Plan, Feb. 1999	Y	N	N	N

6.6.2 Administrative and Technical Capability

TABLE 6-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	Engineering and Community Development Departments/staff
Engineers or professionals trained in building or infrastructure construction practices	Y	Engineering and Public Works Departments/staff
Planners or engineers with an understanding of natural hazards	Y	Engineering and Community Development Departments/staff
Planners or engineers with an understanding of energy resilience or alternative energy technology	Y	Engineering Division
Staff with training in benefit/cost analysis	Y	Engineering Division
Surveyors	Y	Engineering and Public Works Departments/staff
Personnel skilled or trained in GIS applications	Y	Community Development Department/Planning Division/Senior Planner/GIS
Scientist familiar with natural hazards in local area	N	
Emergency manager	Y	City Manager and Fire Chief
Grant writers	Y	Economic Development

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 6-6.

6.6.3 Fiscal Capability

TABLE 6-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State Sponsored Grant Programs	No
Development Impact Fees for Homebuyers or Developers	No
Other	

The assessment of the jurisdiction's fiscal capabilities is presented in Table 6-7.

6.6.4 National Flood Insurance Program Compliance

TABLE 6-8.
NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

What department is responsible for floodplain management in your community?	City Manager/Community Development
Who is your community's floodplain administrator (department/position)?	City Manager
Do you have any certified floodplain managers on staff in your community?	No
What is the date of adoption of your flood damage prevention ordinance?	04-19-2011
When was the most recent community assistance visit or community assistance contact?	06-11-2009
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	No
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 6-8.

6.6.5 Energy Resilience Capability

TABLE 6-9. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	No Formal Designated Position
Have you performed an energy assurance gap analysis for your community?	No
Have you completed a vulnerability assessment of power sources to each key asset?	No
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	Non-formal contingency plan for jurisdiction key assets
Are emergency backup generators tested on a regular basis?	Yes, Most
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Yes
Have you established a working relationship with your community's energy service providers?	Yes
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	No
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	Yes

Energy resiliency capabilities are presented in Table 6-9.

6.6.6 Community Mitigation Program Classifications

TABLE 6-10. COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule	Yes	4/4	N/A
Public Protection	Yes	3/9	
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 6-10.

6.7 HAZARD MITIGATION ACTION PLAN

Table 6-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-1—Replace/retrofit Eureka Fire Main Station and Emergency Operations Center (same location) to provide seismic strengthening to maintain essential emergency services.							
Existing	All Hazards	O-1, O-2, O-3, O-4, O-5	Public Works	$13.31 million	General Fund, OES, FEMA, HMGP, PDM	Short	Yes
Initiative #E-2—Reconstruct Dock B to provide seismic strengthening to reduce risk of structural failure and sustain needed economic infrastructure.							
Existing	Earthquake, Severe Weather, Tsunami	O-2, O-12	Public Works	13.3 million	Harbor District, General Fund, EDA Grant, HMGP, PDM	Long	Yes
Initiative #E-3—Construct Corporation Yard improvements to reduce risk of structural failure and increase efficiency and operations during natural disaster.							
New & Existing	Earthquake, Flood, Severe Weather, Tsunami	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$910,000	General Fund, OES, City Water & Sewer Fund, HMGP, PDM	Short	Yes
Initiative #E-4—Construct Eureka Municipal Airport improvements to provide for increased use, safety and security of airport during a natural disaster.							
Existing	Earthquake, Severe Weather, Tsunami	O-2, O-4, O-5-O-12	Public Works	$1.68 million	Hangar Rental revenues, EDA Grants, Cal Trans Aeronautics	Long	Yes
Initiative #E-5—Construct a Fire Manipulative Training Facility in a central location to train emergency responders.							
New & Existing	All Hazards	O-4, O-5, O-8	Public Works	$1.39 million	General Fund, FEMA, Other Fire Service	Short	Yes
Initiative #E-6—Construct Fire Station 3 and 4 replacement/retrofit improvements to increase capacity for emergency apparatus and equipment and personnel.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5	Public Works	$8.24 million	General Fund, OES, FEMA, HMGP, PDM	Short	Yes

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-7—Construct Martin Slough Enhancement Project to reduce property and environmental damage caused by flooding.							
New & Existing	Earthquake, Flood, Severe Weather	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$6.01 million	CA Department of Water Resources, CA Coastal Conservancy, CA Regional Water Quality Control Board, HMGP, PDM, General Fund	Short	Yes
Initiative #E-8—Construct Police Station Modifications to improve security and efficiency.							
Existing	All Hazards	O-1, O-2, O-3, O-4, O-5	Public Works	$245,000	General Fund, Drug Asset Forfeitures.	Short	Yes
Initiative #E-9—Install, replace, repair or relocate Storm Drainage facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding.							
New & Existing	Earthquake, Flooding, Severe Weather	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$1.7 million	General Fund, Gas Tax, Assessment District, Grants	Short	Yes
Initiative #E-10—Repair and replace Sewer Lift Station facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding. Explore backup power supply for all lift stations.							
Exiting	Earthquake, Severe Weather	O-1, O-2, O-3, O-4, O-5	Public Works	$950,000	Sewer Revenues	Short	Yes
Initiative #E-11—Construct Martin Slough Sewer Interceptor to protect and improve efficiency, safety and reliability of wastewater collection and transport system.							
New & Existing	Earthquake, Flooding, Severe Weather	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$22.7 million	Wastewater Revenues, User Fees, EPA Grants, CA Prop 50 Grant	Short	Yes
Initiative #E-12—Construct Standby Emergency Power Generator Project to ensure wastewater treatment plant is operational during critical emergencies and disasters.							
New & Existing	Earthquake, Severe Weather	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$460,000	Wastewater Revenues	Short	Yes

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-13—Construct Extended Fuel Storage Facilities to provide adequate fuel storage at additional locations during periods of extended power outage.							
New & Existing	Earthquake, Severe Weather, Flooding, Tsunami	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$580,000	Water and Sewer Revenues, General Fund	Long	Yes
Initiative #E-14—Construct Mad River Water Pipeline project to strengthen system and ensure safe and reliable provision of public water to citizens and emergency service agencies.							
New & Existing	Earthquake, Tsunami	O-1, O-2, O-3, O-4, O-5	Public Works	$5.88 million	Water Bond Proceeds	Short	Yes
Initiative #E-15—Construct Water Reservoir Maintenance and Security Improvement Project for seismic strengthening and to improve security and safety for Eureka's emergency water supply.							
New & Existing	Earthquake, Severe Weather, Drought	O-1, O-2, O-3, O-4, O-5	Public Works	$25,000	Water Bonds, Fund 501, HMGP, PDM	Short	Yes
Initiative #E-16—Implement and maintain Storm Water Management Plan to educate public about controlling/improving flooding events and water quality in the City.							
New & Existing	Flooding, Severe Weather, Drought	O-6, O-7, O-9, O-10	Public Works	$50,000	General Fund	Short	Yes
Initiative #E-17—Create and maintain a hazard mitigation informational web page on the City's website.							
New & Existing	All Hazards	O-6, O-7	City Manager	$3,000	General Fund	Short	Yes
Initiative #E-18—Support countywide initiatives to promote public education on the impacts of natural hazards and the risks they pose by emphasizing awareness, preparation, mitigation, response and recovery alternatives.							
New & Existing	All Hazards	O-6, O-7, O-8, O-10	City Manager	$10,000	General Fund	Short	Yes
Initiative #E-19—Partner with Humboldt County Emergency Service office in disaster response and preparedness, including updates to the Emergency Operations Plan, a post disaster action plan, training and support.							
New & Existing	All Hazards	O-6, O-7, O-8, O-10	City Manager, Fire Department	$10,000	General Fund	Short	Yes

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-20—Enhance building codes and/or adopt International Building Code to improve and strengthen new construction to withstand the impacts of natural disasters and lessen the impact of that development on the environment.							
New & Existing	All Hazards	O-11	Public Works	$10,000	General Fund, HMGP	Short	Yes
Initiative #E-21—Construct Eureka Public Marina safety and security improvements to increase safety and operational sustainability.							
New & Existing	Earthquake, Tsunami, Severe Weather	O-1, O-2, O-8, O-12	Public Works	$80,000	Harbor Funds, General Fund	Short	No
Initiative #E-22—Replace/retrofit/upgrade and cleanup fuel terminal facility to improve safety, minimize environmental impacts, and provide a more reliable fuel system.							
New & Existing	Earthquake, Severe Weather, Tsunami	O-1, O-2, O-3, O-4, O-5, O-8, O-12	Public Works	$930,000	General Fund, Bay Revenues, HMGP, PDM	Short	Yes
Initiative #E-23—Construct/repair embankment at 14th & P Streets and at Sunny Avenue to prevent further landslip and failure of major roadway and water/sewer infrastructure, and to protect adjoining properties.							
New & Existing	Earthquake, Severe Weather, Landslide	O-1, O-2, O-3, O-4,	Public Works	$767,000	Unknown	Long	No
Initiative #E-24—Construct roadway safety improvements to identified hazard areas, including emergency vehicle pre-empt at signals, guardrails, and pedestrian enhancements.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5	Public Works	$2.47 million	HSIP Grant, OTS Grant, Gas Tax, State Transportation Improvement Program, Prop 1B, Co. Development Fees	Short	No
Initiative #E-25—Construct City Hall Emergency Power Project to allow facility operation during times of disaster and power failure, maintain critical services, ensure operation of communication and IT capabilities, and provide for backup Emergency Operations Center location.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$460,000	General Fund	Short	No

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-26—Construct/repair/replace wastewater collection system infrastructure, including the Cross Town Sewer Interceptor, for seismic strengthening, reliability of wastewater collection and transport, and increased community and environmental safety.							
New & Existing	Earthquake, Tsunami, Severe Weather, Flooding	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$160,000	Wastewater Reserves	Short	No
Initiative #E-27—Construct Solids Thickening Facility at the Elk River Wastewater Treatment Facility to improve efficiency, increase longevity of existing facility infrastructure, and increase environmental safety of the neighboring Elk River estuary and Humboldt Bay.							
New & Existing	Earthquake, Severe Weather, Tsunami, Flooding	O-1, O-2, O-3, O-4, O-5, O-9, O-12	Public Works	$2.1 million	Wastewater Bonds, Wastewater Reserves	Short	No
Initiative #E-28—Construct/replace Elk River Wastewater Treatment Plant heat and power co-generation units to improve efficiency and reliability, strengthen facility reliability by reducing dependency on grid supplied power, and insure continued operation during times of disaster.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$890,000	Wastewater Reserves	Short	No
Initiative #E-29—Repair/replace/upgrade water distribution system and pump station infrastructure to strengthen system and ensure safe and reliable provision of public water to citizens and emergency service agencies.							
New & Existing	Earthquake, Severe Weather, Flooding, Drought, Landslide, Wildfire	O-1, O-2, O-3, O-4, O-5, O-12	Public Works	$6.6 million	Water Bonds, Water Revenues, Water Reserves,	Short	No
Initiative #E-30—Update and maintain Emergency Operation Plan.							
New & Existing	All Hazards	O-1, O-4, O-5, O-12	City Manger	Low	General Fund	Short	No

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-31—Continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New & Existing	Flood	O-2, O-3, O-8, O-9	City Manager, Community Develop-ment	Low	General Fund	Short	No
Initiative #E-32—Integrate Local Hazard Mitigation Plan into the Safety Element of the General Plan. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	O-4, O-5, O-6, O-7, O-11, O-12	City Manager	Low	General Fund	Short	No
Initiative #E-33—Explore new and existing backup/emergency energy options for critical key asset facilities to determine most effective emergency energy source.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5	Public Works	Low	General Fund	Short	No
Initiative #E-34—Explore hybrid, electric, and flex fuel vehicles for some city fleet uses, where adequate and applicable to reduce dependence on conventional liquid fuels. Identify vehicles classes and department uses where these vehicles would be feasible. Compare cost feasibility.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4	Public Works	Low	General Fund	Short	No
Initiative #E-35—Collaborate with private fuel supplier to explore and identify backup/emergency power source to maintain critical key fuel receiving and distribution facility in times of grid failure or emergency/disaster.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-8, O-12	Private, Undetermin ed Public Agency	High	Private Funding, Grant	Long	No
Initiative #E-36—Explore alternative or "Green" energy options for COE facilities to reduce dependency/load on conventional grid source energies.							
New & Existing	All Hazards	O-1, O-2, O-4, O-5, O-8, O-9,	City Manager	Low	General Fund	Short	No

TABLE 6-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #E-37—Establish an Energy Assurance Plan and identify program coordinator/department, perform energy gap analysis and energy vulnerability assessment for community.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5,	City Manager	Low	General Fund	Short	No
Initiative #E-38—Increase Emergency Operations Center efficiency and effectiveness through staff training and preparation to respond to all hazard events and after event recovery.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-7, O-12	City Manager, Fire	Low	General Fund, OES, FEMA Grant, EMI Funded Training	Short	No
Initiative #E-39—Develop Emergency Communications Center Computer Aided Dispatch (CAD) Project to evaluate current CAD program and coordinate upgrade/replacement of current CAD system to increase efficiency and communications operability, and increase community and emergency responder safety.							
New & Existing	All Hazards	O-1, O-2, O-4, O-5, O-12	Fire, Police	Medium	General Fund	Short	No
Initiative #E-40—Support countywide initiatives in the Humboldt Operational Area Hazard Mitigation Plan.							
New & Existing	All Hazards	All Objectives	City Manager	Low	General Fund	Short	No
Initiative #E-41—Continue to participate not only in general mutual-aid agreements, but also in agreements with adjoining jurisdictions for cooperative response to all hazards and disasters							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-12	Fire, Police, Public Works, City Manager	Low	General Fund	Short	No

6.8 PRIORITY OF RECOMMENDED INITIATIVES

Table 6-12 identifies the priority for each initiative.

TABLE 6-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
E-1	5	High	High	Yes	Yes	No	High
E-2	2	Medium	High	No	Yes	No	Low
E-3	6	High	Medium	Yes	Yes	No	High
E-4	4	High	High	Yes	Yes	No	Medium
E-5	3	High	High	Yes	Yes	No	High
E-6	5	High	High	Yes	Yes	No	High
E-7	6	High	High	Yes	Yes	No	High
E-8	5	High	Low	Yes	No	Yes	Medium
E-9	6	Medium	High	No	Yes	No	Medium
E-10	5	High	Medium	Yes	No	Yes	High
E-11	6	High	High	Yes	Yes	Yes	High
E-12	6	High	Medium	Yes	No	Yes	High
E-13	6	High	Medium	Yes	No	No	Medium
E-14	5	High	High	Yes	No	Yes	High
E-15	5	High	Low	Yes	Yes	Yes	High
E-16	4	Medium	Low	Yes	No	Yes	High
E-17	2	Medium	Low	Yes	No	Yes	High
E-18	4	High	Low	Yes	No	Yes	High
E-19	4	Medium	Low	Yes	No	Yes	High
E-20	1	High	Low	Yes	Yes	Yes	High
E-21	4	Medium	Medium	Yes	No	No	Medium
E-22	7	High	High	Yes	Yes	No	High
E-23	4	High	Medium	Yes	No	No	Medium
E-24	5	High	High	Yes	Yes	No	High
E-25	6	High	Medium	Yes	No	No	High
E-26	6	High	Medium	Yes	No	Yes	High
E-27	7	High	High	Yes	No	No	High
E-28	6	High	Medium	Yes	No	No	High
E-29	6	High	High	Yes	No	No	High
E-30	4	Medium	Low	Yes	No	Yes	High

TABLE 6-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
E-31	4	Medium	Low	Yes	No	Yes	High
E-32	6	Medium	Low	Yes	No	Yes	High
E-33	5	Medium	Low	Yes	No	Yes	Medium
E-34	4	Low	Low	Yes	No	Yes	Medium
E-35	7	High	Medium	Yes	No	No	Medium
E-36	6	Low	Low	Yes	No	Yes	High
E-37	5	Medium	Low	Yes	No	Yes	High
E-38	7	High	Low	Yes	Yes	Yes	High
E-39	5	High	Medium	Yes	No	No	High
E-40	12	Low	Low	Yes	No	Yes	High
E-41	6	High	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

6.9 ANALYSIS OF RECOMMENDED INITIATIVES

Table 6-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

TABLE 6-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	E-20, E-30, E-32, E-40	E-2, E-14, E-15, E-24, E-32, E-33, E-35, E-37, E-40	E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-9, E-33, E-34, E-36, E-37, E-40	E-1, E-3, E-4, E-5, E-6, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-24, E-25, E-28, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-24, E-40
Drought	E-16, E-20, E-30, E-32, E-40	E-14, E-15, E-24, E-32, E-33, E-35, E-37, E-40	E-16, E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-16, E-33, E-34, E-36, E-37, E-40	E-1, E-5, E-6, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-24, E-28, E-29, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-15, E-24, E-40
Earthquake	E-20, E-30, E-32, E-40	E-1, E-2, E-3, E-4, E-6, E-14, E-15, E-21, E-22, E-23, E-24, E-32, E-33, E-35, E-37, E-40	E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-9, E-10, E-11, E-12, E-22, E-23, E-26, E-27, E-33, E-34, E-36, E-37, E-40	E-1, E-3, E-4, E-5, E-6, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-21, E-23, E-24, E-25, E-26, E-27, E-28, E-29, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-15, E-23, E-24, E-40
Flood	E-16, E-20, E-30, E-31, E-32, E-40	E-2, E-7, E-9, E-14, E-15, E-21, E-22, E-24, E-31, E-32, E-33, E-35, E-37, E-40	E-16, E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-9, E-10, E-11, E-12, E-16, E-22, E-26, E-27, E-33, E-34, E-36, E-37, E-40	E-1, E-3, E-4, E-5, E-6, E-7, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-21, E-24, E-25, E-26, E-27, E-28, E-29, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-7, E-24, E-40

TABLE 6-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Landslide	E-20, E-30, E-32, E-40	E-14, E-15, E-23, E-24, E-32, E-33, E-35, E-37, E-40	E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-9, E-10, E-11, E-23, E-33, E-34, E-36, E-37, E-40	E-1, E-3, E-4, E-5, E-6, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-23, E-24, E-25, E-28, E-29, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-23, E-24, E-40
Severe Weather	E-16, E-20, E-30, E-32, E-40	E-2, E-3, E-4, E-6, E-7, E-9, E-14, E-15, E-21, E-22, E-23, E-24, E-32, E-33, E-35, E-37, E-40	E-16, E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-9, E-10, E-11, E-12, E-16, E-22, E-23, E-26, E-27, E-33, E-34, E-36, E-37, E-40	E-1, E-3, E-4, E-5, E-6, E-7, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-21, E-23, E-24, E-25, E-26, E-27, E-28, E-29, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-7, E-15, E-23, E-24, E-40
Tsunami	E-20, E-30, E-31, E-32, E-40	E-2, E-3, E-4, E-7, E-9, E-14, E-15, E-21, E-22, E-24, E-31, E-32, E-33, E-35, E-37, E-40	E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-9, E-10, E-11, E-12, E-22, E-26, E-27, E-33, E-34, E-36, E-37, E-40	E-1, E-3, E-4, E-5, E-6, E-7, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-21, E-24, E-25, E-26, E-27, E-28, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-7, E-24, E-40
Wildfire	E-20, E-30, E-32, E-40	E-14, E-15, E-24, E-32, E-33, E-35, E-37, E-40	E-17, E-18, E-24, E-32, E-37, E-38, E-40	E-10, E-11, E-33, E-34, E-36, E-37, E-40	E-1, E-5, E-6, E-8, E-10, E-11, E-12, E-13, E-14, E-15, E-19, E-24, E-25, E-28, E-29, E-30, E-32, E-33, E-35, E-37, E-38, E-39, E-40, E-41	E-24, E-40

a. See Chapter 1 for description of mitigation types.

6.10 STATUS OF PREVIOUS PLAN INITIATIVES

Table 6-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

TABLE 6-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
E-1	**No**	**Yes**		Replace/retrofit Eureka Fire Main Station and Emergency Operations Center (same location) to provide seismic strengthening to maintain essential emergency services. **Progress:** Seismic Retrofit and some sheer wall construction and structural reinforcement completed November 2012. Initiative carried over as Initiative #E-1.
E-2	**No**	**Yes**		Reconstruct Dock B to provide seismic strengthening to reduce risk of structural failure and sustain needed economic infrastructure. **Progress:** Business relocated from Dock B to Fisherman's Terminal following 2010 earthquake event. Initiative carried over as Initiative #E-2.
E-3	**No**	**Yes**		Construct Corporation Yard improvements to reduce risk of structural failure and increase efficiency and operations during natural disaster. **Progress:** Seismically damaged building (2010 earthquake) being replaced with modern building Summer 2013. Initiative carried over as Initiative #E-3.
E-4	**No**	**Yes**		Construct Eureka Municipal Airport improvements to provide for increased use, safety and security of airport during a natural disaster. **Progress:** Planning discussion for replacement/addition of modern hangers. Initiative carried over as Initiative #E-4.
E-5	**No**	**Yes**		Construct a Fire Manipulative Training Facility in a central location to train emergency responders. **Progress:** Training facility partially completed on Hilfiker Lane, under temporary use permit. Additional development of site needed, including paver roadway, parking area, and training surface. Site accredited as a State Rescue Systems 1 & 2 training site. Pursuing land use change under City of Eureka General Plan update process. Initiative carried over as Initiative #E-5.
E-6	**No**	**Yes**		Construct Fire Station 3 and 4 improvements to increase capacity for emergency apparatus and equipment and personnel. **Progress:** Fire Station 3 & 4 received fire suppression sprinkler and alarm systems through FEMA AFG grant funding 2013. Station 3 received new heating system and interior sleeping area improvement. Initiative carried over as Initiative #E-6.
E-7	**No**	**Yes**		Replace/retrofit/upgrade and cleanup fuel terminal facility to improve safety, minimize environmental impacts, and provide a more reliable fuel system. **Progress:** Fuel terminal dock plumbing upgraded. Initiative carried over as Initiative #E-22.

TABLE 6-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
E-8	**No**	**Yes**		Construct Martin Slough Enhancement Project to reduce property and environmental damage caused by flooding. **Progress**: Project ongoing, establishing/securing funding source. Initiative carried over as Initiative #E-7.
E-9	**No**	**Yes**		Construct Police Station Modifications to improve security and efficiency. **Progress**: Electronic door access security system installed. Access system also in service on Dispatch Doors. Initiative carried over as Initiative #E-8.
E-10	**No**	**Yes**		Install, replace and repair or relocate Storm Drainage facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding. **Progress**: Storm drains provided with labeling to reduce dumping into drain system by educating the public on drainage path to Bay. Initiative carried over as Initiative #E-9.
E-11	**No**	**Yes**		Repair and replace Sewer Lift Station facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding. **Progress**: Ongoing annual funding and maintenance of existing facilities. Initiative carried over as Initiative #E-10.
E-12	**No**	**Yes**		Construct Martin Slough Sewer Interceptor to protect and improve efficiency, safety and reliability of wastewater collection and transport system. **Progress**: Ongoing major project. Phase 1 completed, Phase 2 ongoing. Initiative carried over as Initiative #E-11.
E-13	**No**	**Yes**		Construct Standby Emergency Power Generator to ensure wastewater treatment plant is operational during critical emergencies and disasters. **Progress**: Installation of emergency power generator in progress. Initiative carried over as Initiative #E-12.
E-14	**No**	**Yes**		Construct Extended Fuel Storage Facilities to provide adequate fuel storage at additional locations during periods of extended power outage. **Progress:** None. Initiative carried over as Initiative #E-13
E-15	**No**	**Yes**		Construct Mad River Water Pipeline project to strengthen system and ensure safe and reliable provision of public water to citizens and emergency service agencies. **Progress:** Ongoing major project to strengthen water distribution system through new transmission piping installation. Phases 1, 2, 3, & 4 completed. Phase 5 in progress summer 2013. Final phase (6) scheduled 2014. Initiative carried over as Initiative #E-14.

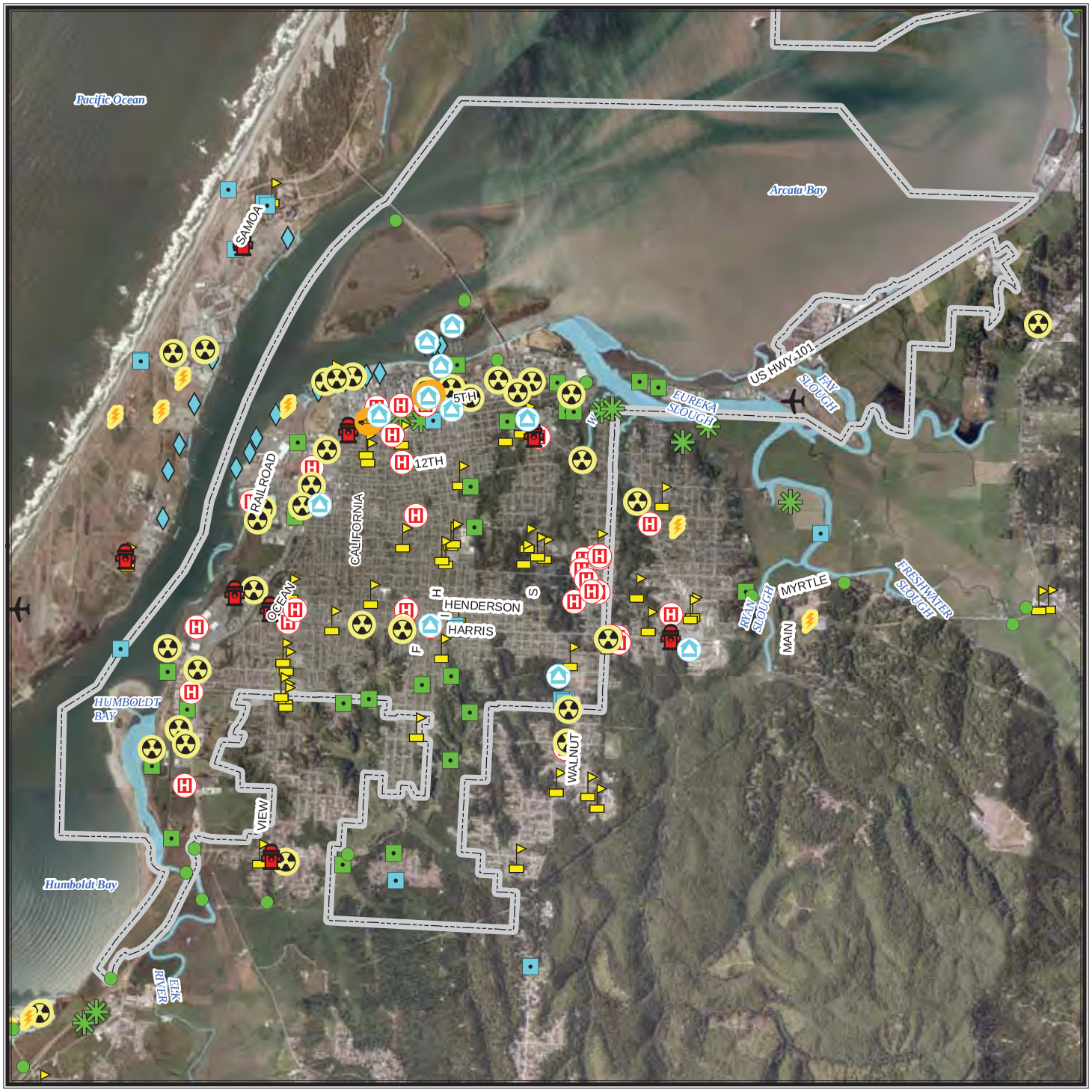
TABLE 6-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
E-16	**No**	**Yes**		Construct Water Reservoir Maintenance and Security Improvement Project for seismic strengthening and to improve security and safety for Eureka's emergency water supply. **Progress:** Facility security enhancements installed. Significant maintenance performed on 20 million gallon reservoir roof structure 2012. Nearing project completion. Initiative carried over as Initiative #E-15.
E-17	**No**	**Yes**		Implement Storm Water Management Plan to educate public about controlling/improving flooding events and water quality in the City. **Progress:** Ongoing educational project. Webpage with educational information developed on City of Eureka Website. Initiative carried over as Initiative #E-16.
E-18	**Yes**	**Yes**		Create and maintain a hazard mitigation informational web page on the City's website. **Progress**: Webpage competed within Fire Department web page. Information presented about City EOC, earthquake, tsunami, winter storms, terrorism and weapons of mass destruction. Helpful links included on each page. Initiative carried over as Initiative #E-17.
E-19	**Yes**	**Yes**		Support countywide initiatives to promote public education on the impacts of natural hazards and the risks they pose by emphasizing awareness, preparation, mitigation, response and recovery alternatives. **Progress:** Ongoing participation. Website on COE Fire Department webpage provides hazard information and helpful links. Participation in community events, public service announcements, and press releases ongoing. Participation in Hazard Mitigation Plan Update Steering Committee. Initiative carried over as Initiative #E-18.
E-20	**No**	**Yes**		Partner with Humboldt County Emergency Service office in disaster response and preparedness, including updates to the Emergency Operations Plan, a post disaster action plan, training and support. **Progress:** Participation in joint training for Emergency Operations and Incident Management System positions. Participation in large scale natural disaster training drills. Ongoing discussion on EOC interoperability and further training. Initiative carried over as Initiative #E-19.
E-21	**Yes**	**Yes**		Enhance building codes and/or adopt International Building Code to improve and strengthen new construction to withstand the impacts of natural disasters and lessen the impact of that development on the environment. **Progress:** Ongoing participation in program. Initiative carried over as Initiative #E-20.

6.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

In addition to identifying vulnerable structures and facilities, it may be helpful to evaluate the needs of vulnerable populations or those particularly at risk residing within the jurisdiction(s). These may include children, the elderly, and persons with disabilities, the homeless/transient population, and non-English speaking groups. Eureka has a significant portion of the population that could fit into one or more of the listed categories. It may be beneficial for emergency managers and municipal planners to better understand the needs of their vulnerable populations in an emergency situation. This could involve identifying groups of people deemed to be among the "most vulnerable" to the effects of disaster events, their general locations within the community if identifiable, and their expected capacity to respond or recover from disasters

New to this Hazard Mitigation Planning process if the Community Energy component, which illustrates energy usage within the overall community, identifies "Key Assets" (facilities critical to ongoing operation during times of disaster, and emergency backup power capability at "Key Asset" locations. This plan annex includes the data that was available at the time of completion. To better understand our community's energy vulnerability and needs, a full Energy Assurance Plan process would be beneficial. Included with such a project would be the establishment of the program coordinator and department responsible for the project, formation of a working group committee, and completion of an energy gap analysis and energy vulnerability assessment for community.



CITY OF EUREKA

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH

CITY OF EUREKA

Dam Failure Inundation Areas

Robert W Matthews Dam

Summer flood inundation area

Winter flood inundation area

Dam failure inundation area data from 2007 provided by California Emergeny Management Agency Dam Safety Program.

These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

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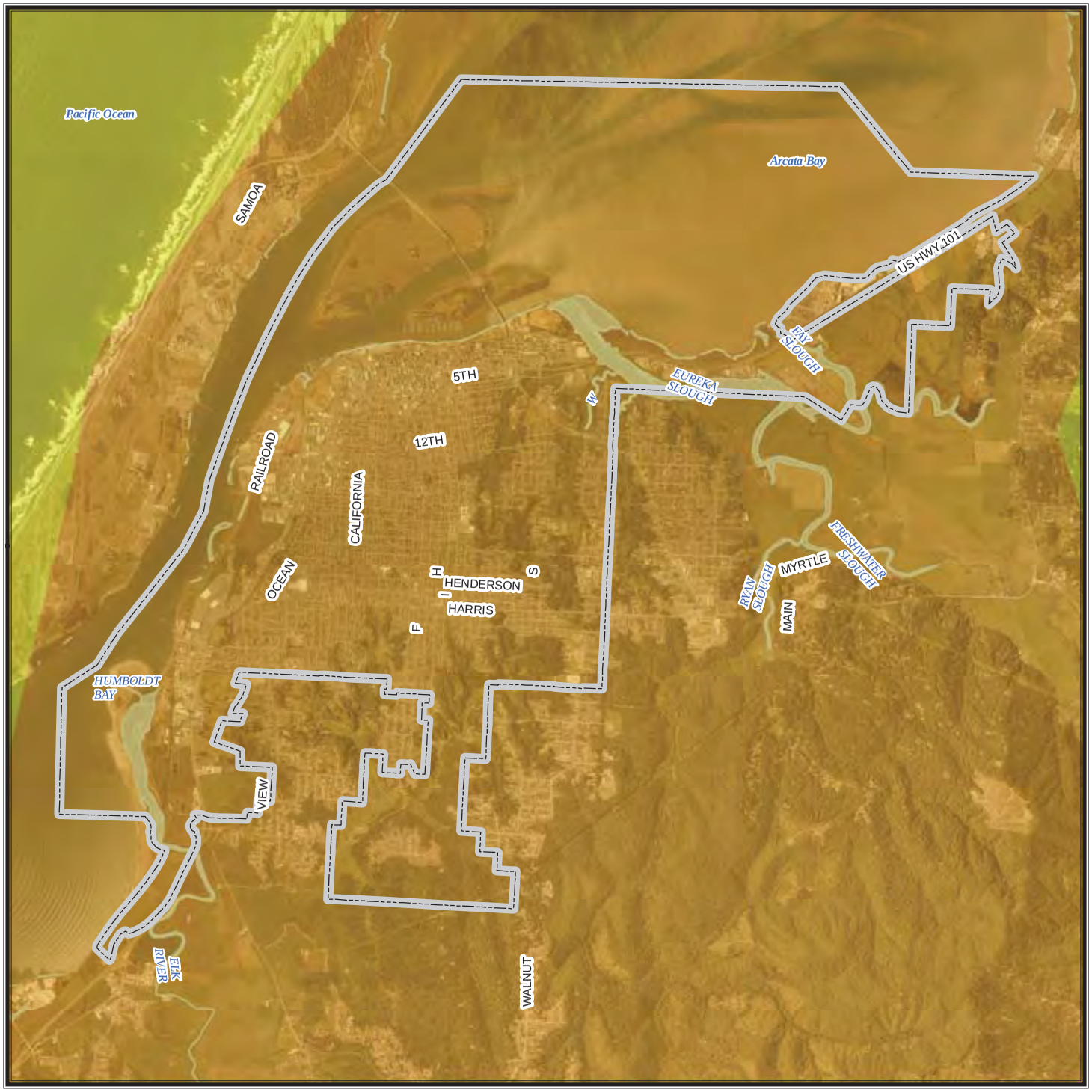


CITY OF EUREKA

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

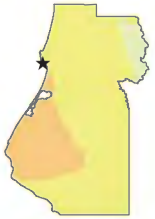
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

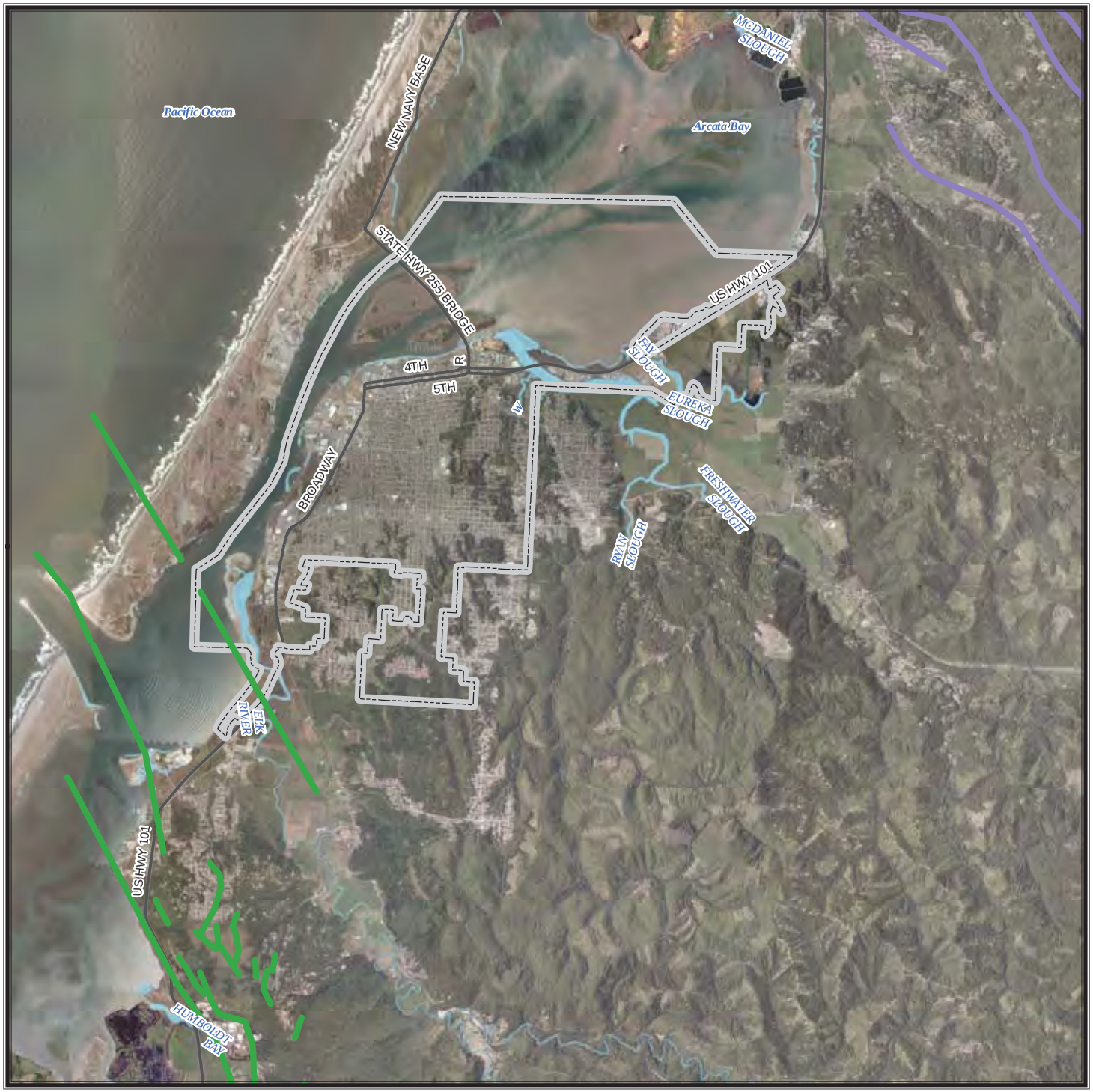
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH





CITY OF EUREKA

Quaternanry & Younger Earthquake Faults

Proximate Faults

Little Salmon Fault Zone

Mad River Fault Zone

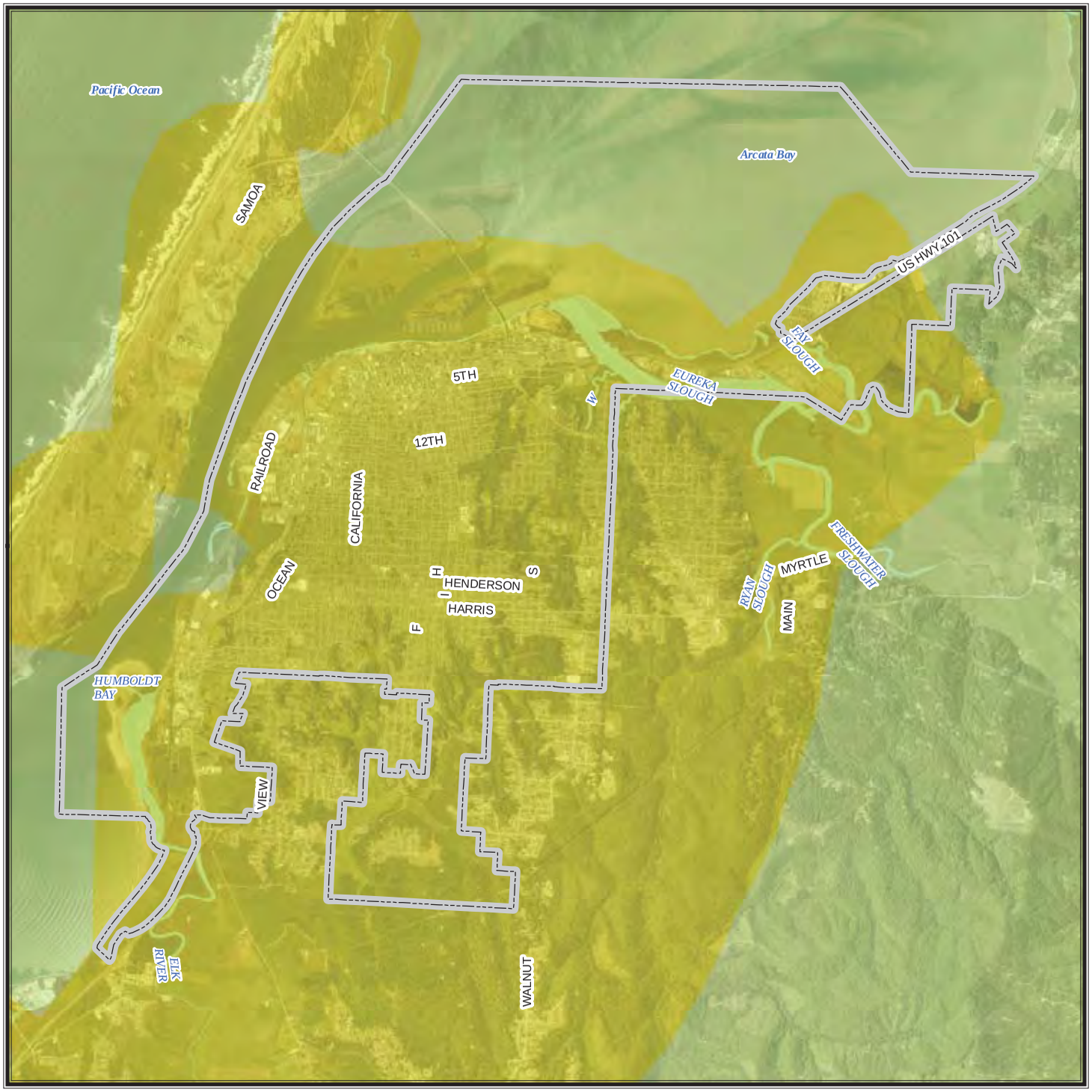
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH



CITY OF EUREKA

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

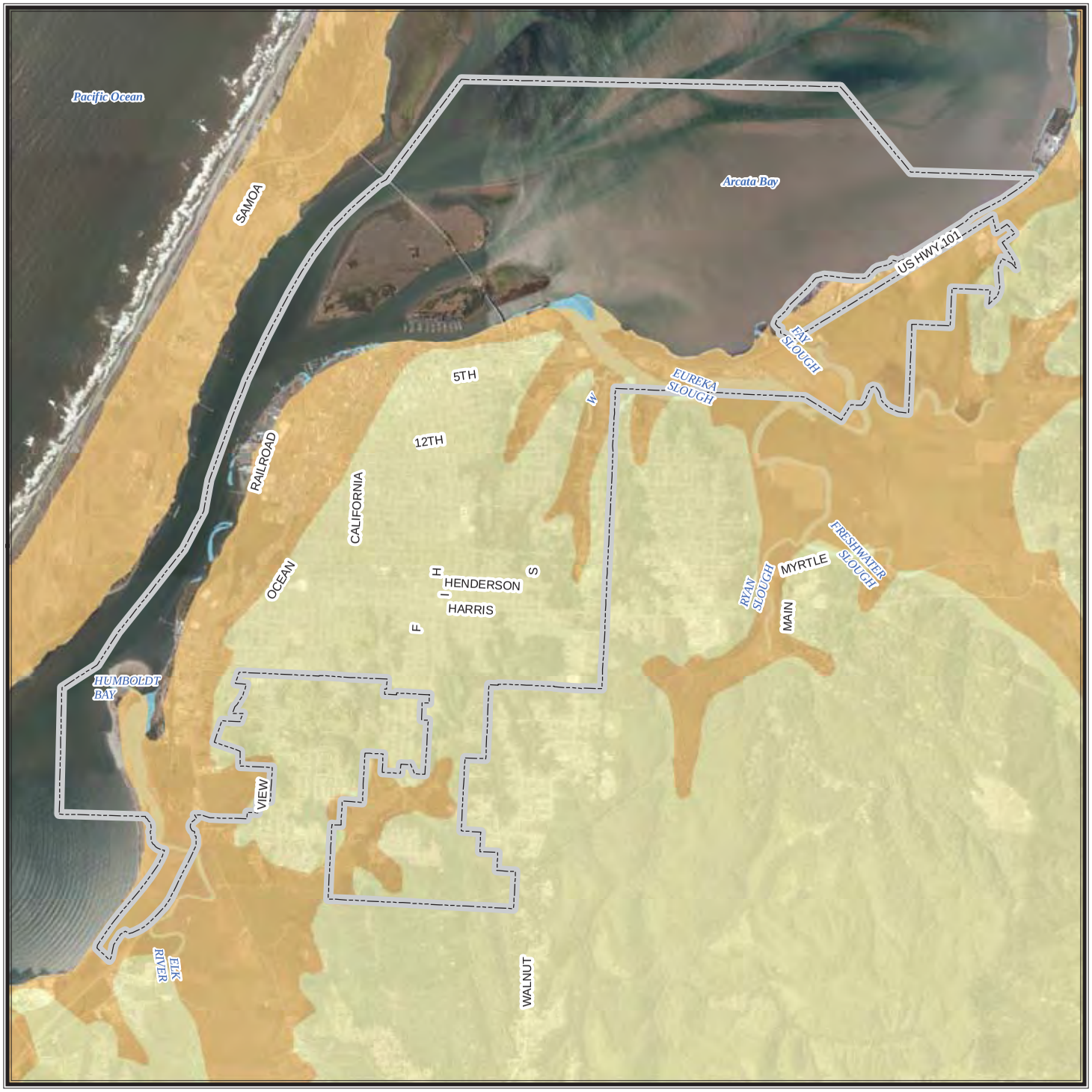
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF EUREKA

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH

CITY OF EUREKA

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

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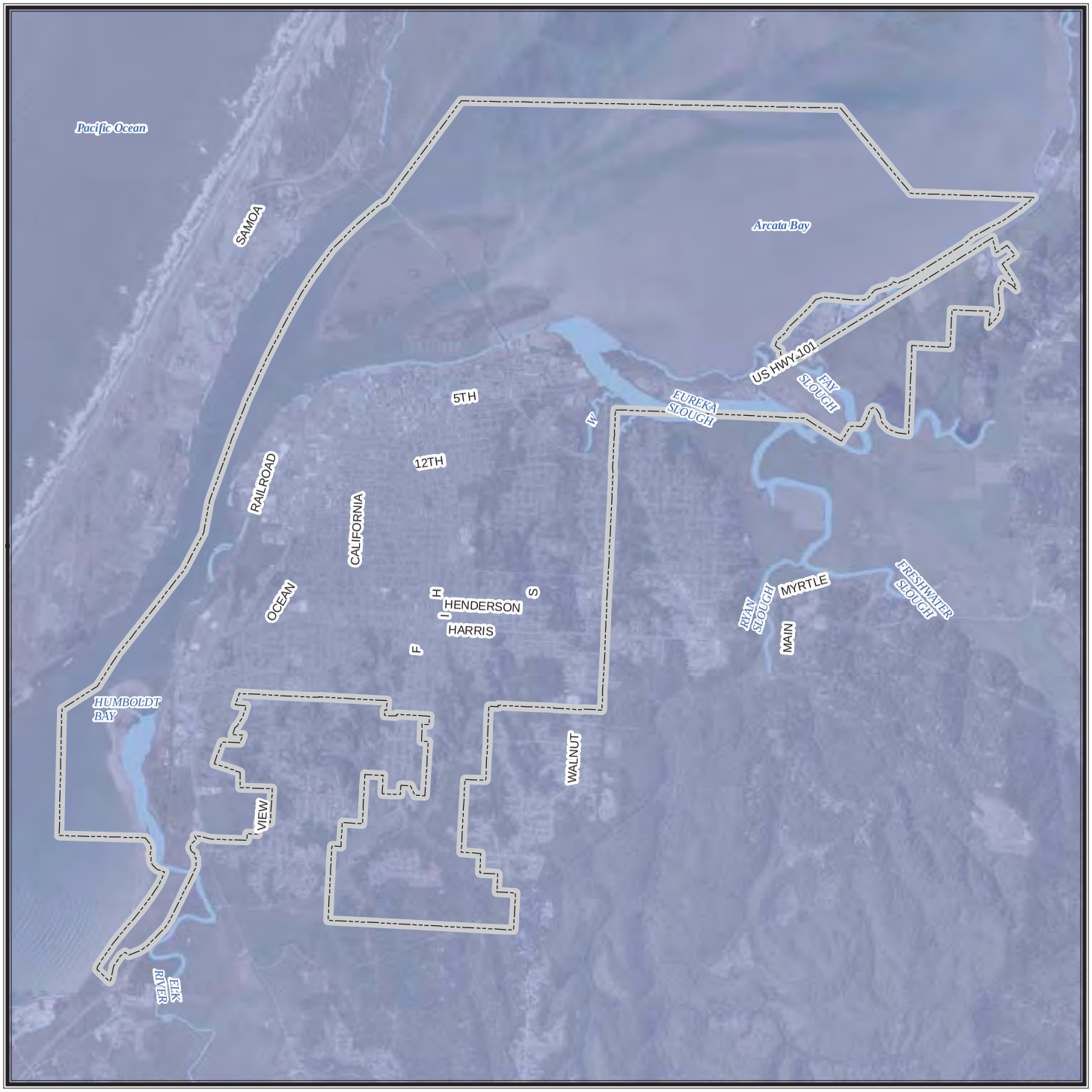

CITY OF EUREKA

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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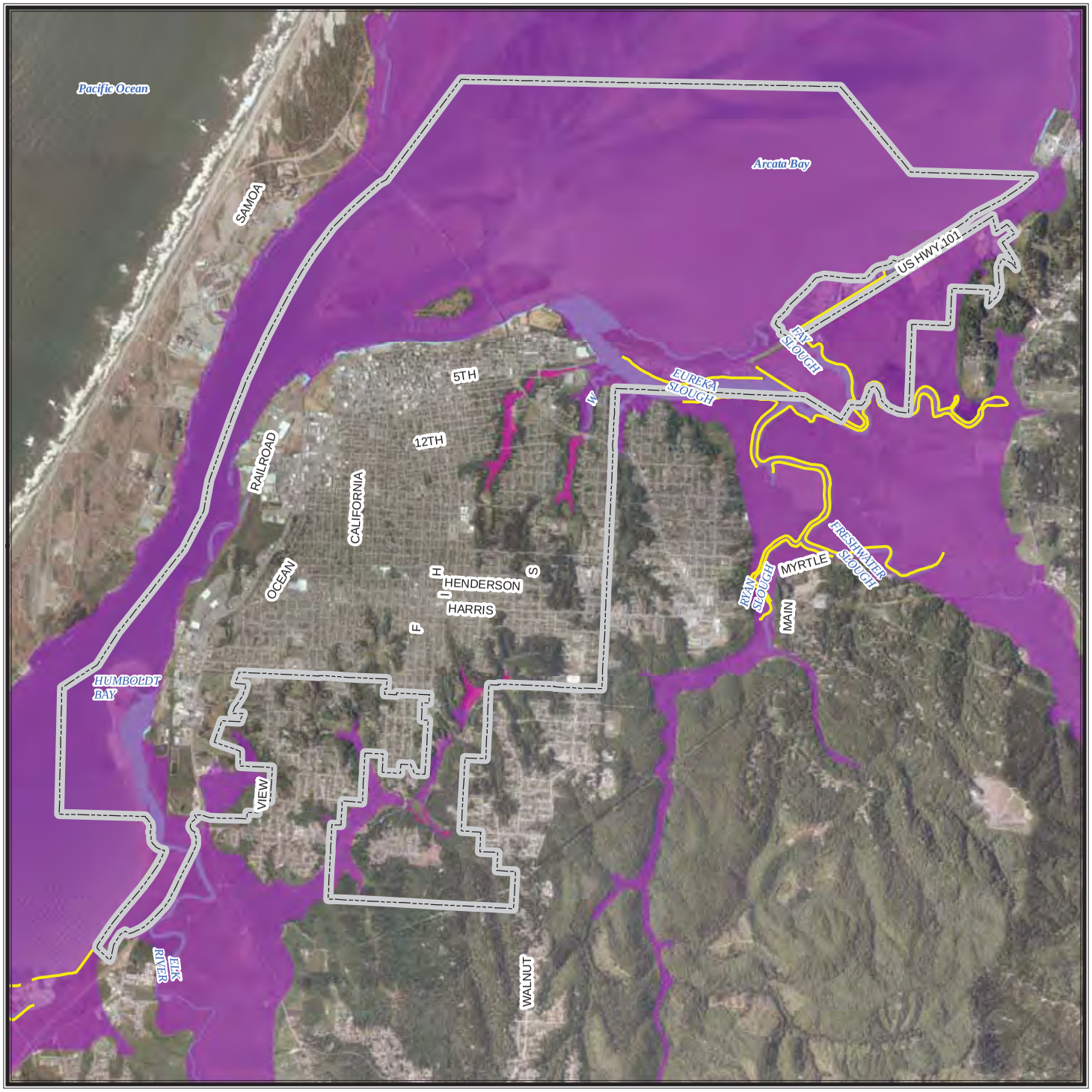

CITY OF EUREKA

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

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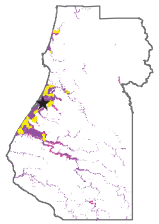

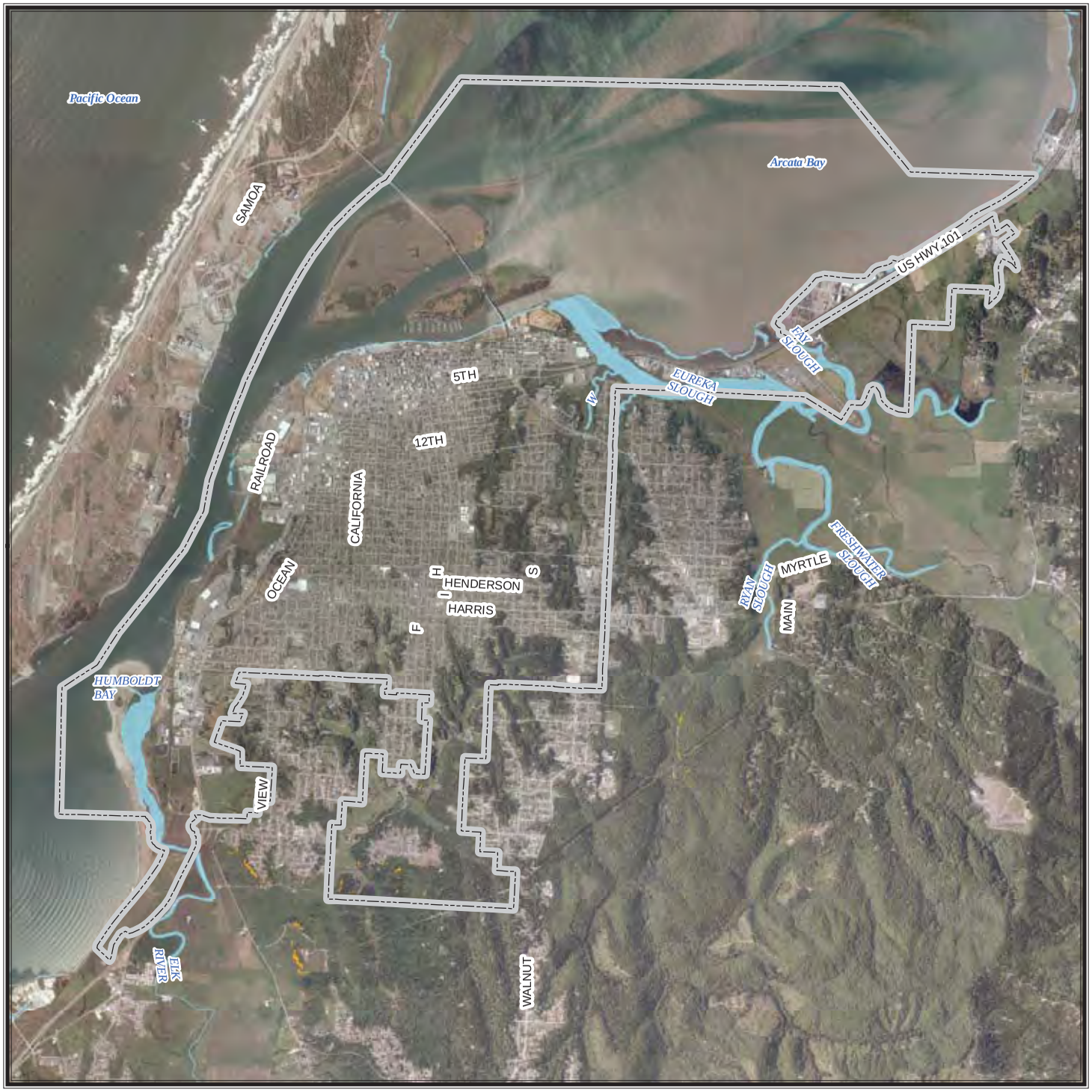

CITY OF TRINIDAD

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

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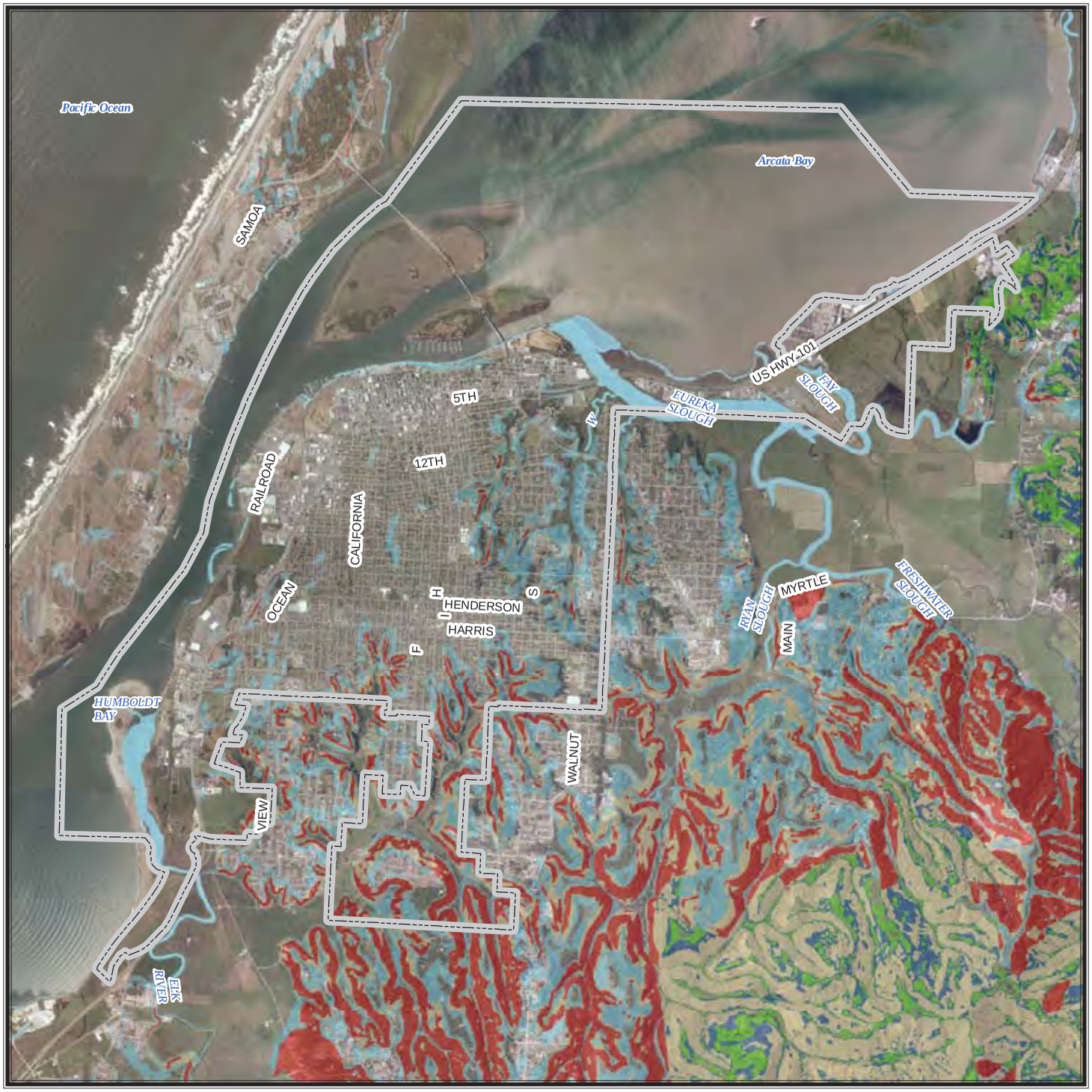

CITY OF EUREKA

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

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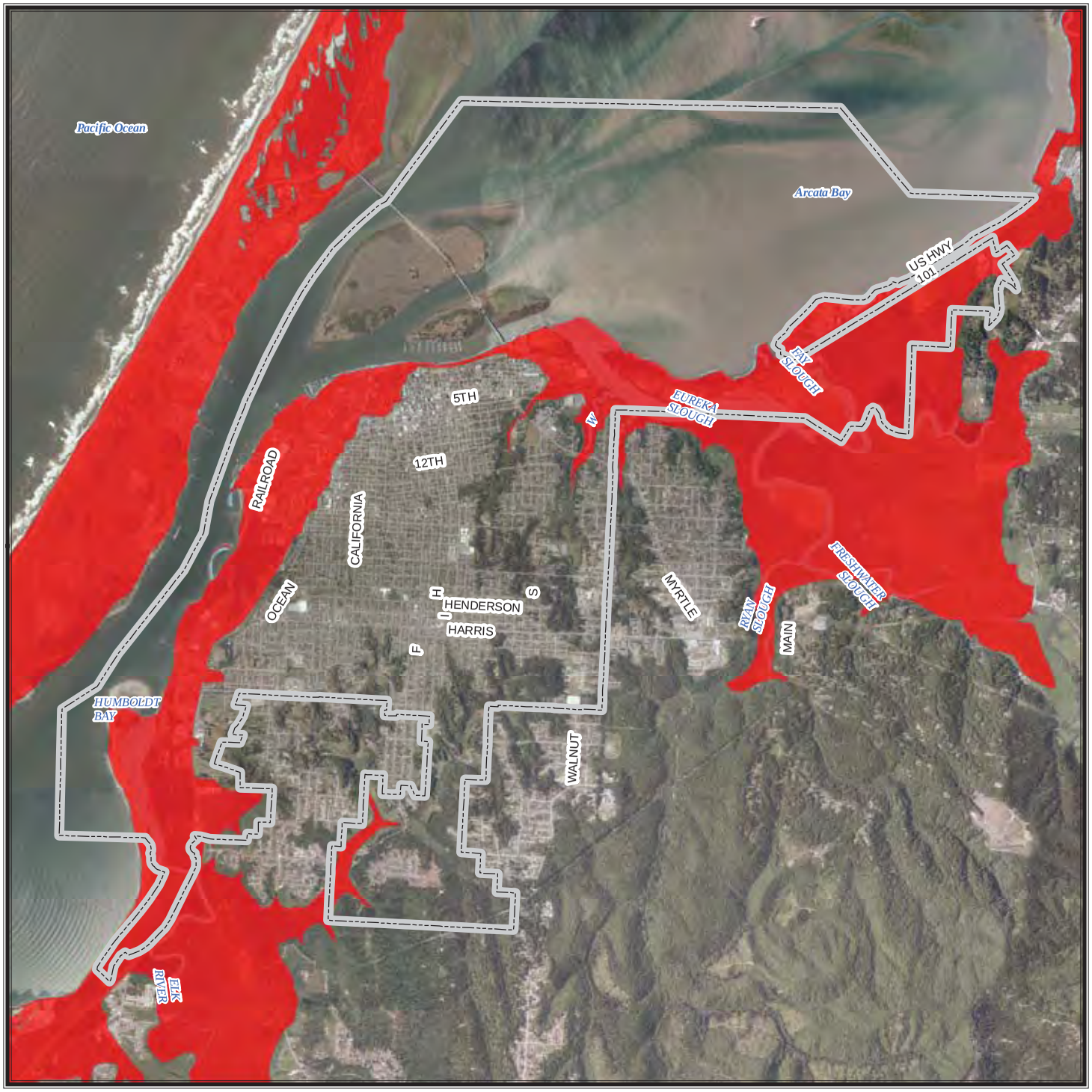

CITY OF EUREKA

Tsunami Inundation Areas

Tsunami inundation area

Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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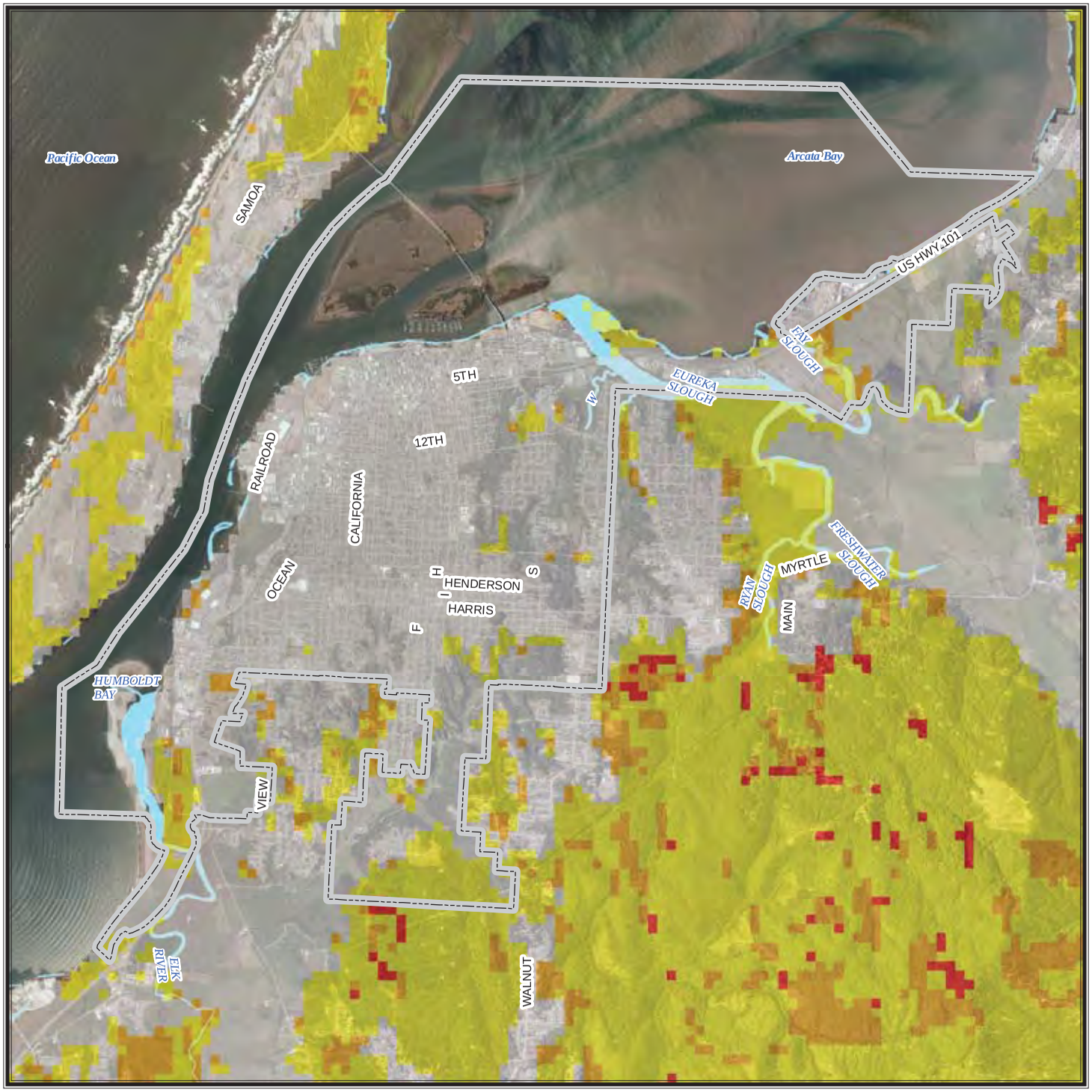

CITY OF EUREKA

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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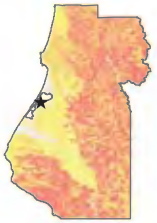

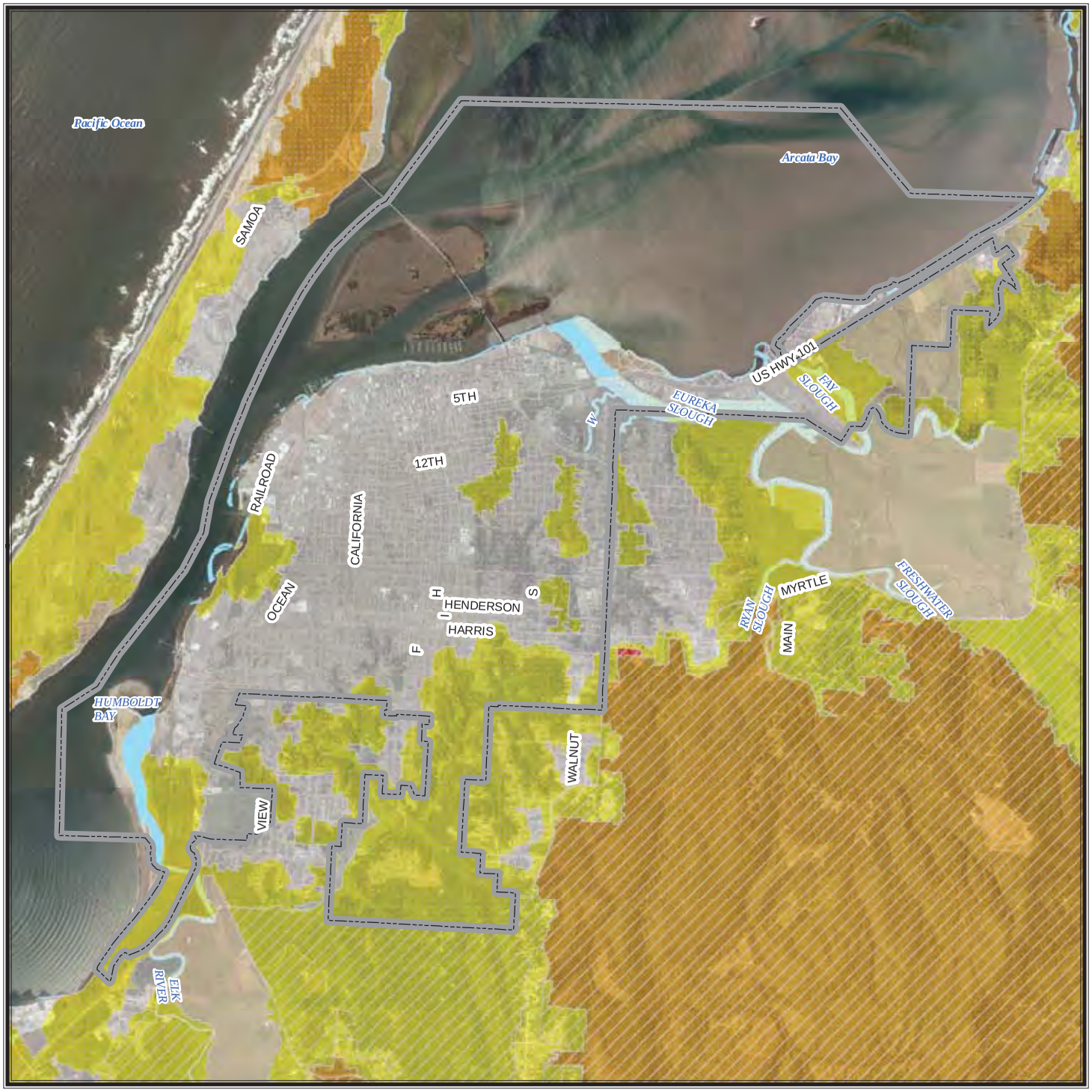

CITY OF EUREKA

Fire Hazard Severity Class

Hazard Class

- Very High
- High
- Moderate
- Non-Wildland/Non-Urban
- Urban Unzoned

Responsibility Areas

- Federal (FRA)
- Local (LRA)
- State (SRA)
- None

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CITY OF EUREKA

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CITY OF EUREKA

Fire Perimeters

Year of Fire

- 1908 - 1920
- 1921 - 1940
- 1941 - 1960
- 1961 - 1980
- 1981 - 2000
- 2001 - 2012

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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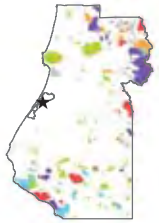

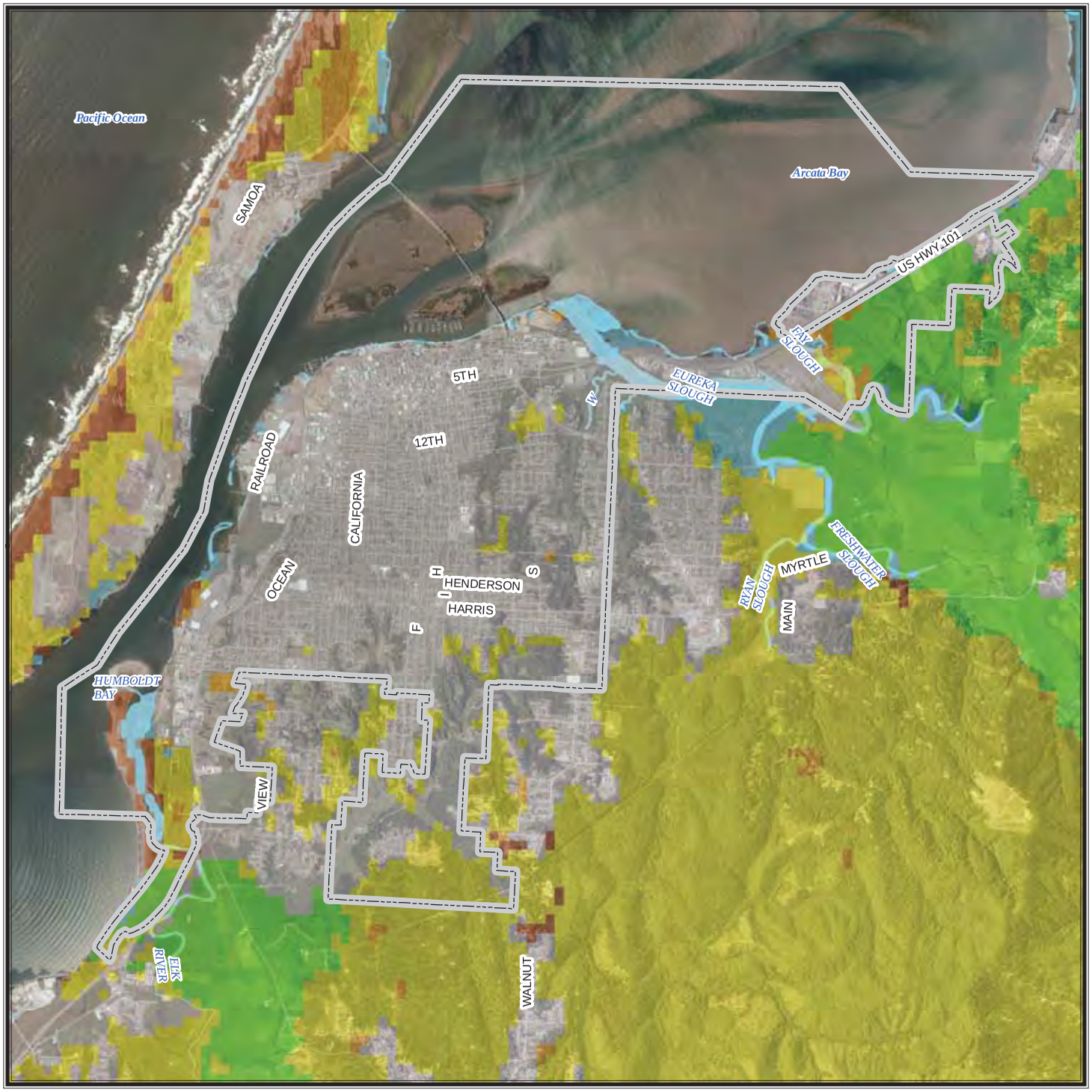

CITY OF EUREKA

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.5 1 Miles

TETRA TECH

CHAPTER 7.
CITY OF FERNDALE UPDATE ANNEX

7.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Jay Parrish. City Manager
City of Ferndale
834 Main St.
Ferndale, CA 95536
Telephone: (707)786-4224
e-mail Address: Citymanager@ci.ferndale.ca.us

Alternate Point of Contact

Melanie Rheaume, Contract City Planner
Planwest Partners, INC.
1125 16th Street, Suite 200
Arcata, CA, 95521
Telephone: (707) 825-8260
e-mail Address: melanier@planwestpartners.com

7.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**August 1893. Ferndale was incorporated as a General Law city. That is, the city was not granted a separate charter but falls under the General Law of the California statute.
- **Current Population—**1,366 as of January 1, 2013
- **Population Growth—**Based on data from the California Department of Finance Demographic Research Unit, the City of Ferndale has experienced a static rate of growth. The overall population decreased by 1.2 percent between 2000 and 2013, averaging an annual change of -0.08 percent during this time.
- **Location and Description—**Ferndale is about 8 miles south of Eureka and about 2 miles west of Fortuna. Highway 211 west from Highway 101 runs directly through the middle of town. Ferndale is the northern gateway to California's Lost Coast. Sited on the edge of a wide plain near the mouth of the Eel River, the city is near the extensive Coast Redwood forests.

  Ferndale is on the southern edge of the Eel River Valley, just above the historical flood limits of the Eel River. It lies on the alluvial plain created by Francis Creek, which runs through the city. Francis Creek originates in steep, mountainous terrain to the south and flows north to the Salt River. The city is surrounded by forested mountains to the south and flat agricultural lands to the west, north and east. Ferndale's cultural landscape includes natural elements as well as agricultural features shaped by people over many generations, including fields, barns and homesteads.
- **Brief History—**Ferndale gets its name from the presence of large ferns along Francis Creek found by early settlers of the Humboldt County region. The city was founded to support area farming, and farming was the reason for its early prosperity. Between 1852 and 1915, Danes, Swiss, Canadians, Americans, Italians, English, Chinese, Irish, Germans, Italian-Swiss, and Portuguese arrived in various numbers top populate the city. The new arrivals pursued dairying, cattle and sheep ranching, crop growing, road building and the railroad. Dairy farming in the Eel River Valley began with the Danes who arrived in the 1870s and brought practices from their homeland. Each small neighborhood of dairymen formed its own cooperative creamery. By 1890 there were 11 creameries operating in the immediate Ferndale

area. Ferndale butter was considered the finest in the state, bringing premium prices in San Francisco. Ferndale acquired its first nickname, "Cream City." Shortly after 1900, many of the small creameries consolidated into larger creameries. The Central Creamery, located on north Main Street, became the mother plant of the Golden State Creamery, one of the largest in the state. Ferndale's pioneer creameries were responsible for a number of innovations in dairy processing and dairy management, which helped revolutionize the dairy industry. Dairying is still one of the largest local industries.

Dairying gave Ferndale a stable industry, but it was not the sole reason for the town's growth and prosperity. During the last half of the 19th century, Ferndale became an important transportation center. It had its own port for sea-going vessels on the Salt River and was the terminus for stagecoach lines to the Bear River and Mattole regions to the south, with other daily stages going to Eureka and towns to the north and east.

Throughout the 20th century, the dairy industry remained strong and a mainstay of the local economy as it moved to produce more value-added products such as ice cream, butter, and organic products. After World War II, the Navy developed housing in support of the Centerville Naval Station. Many current residents of Ferndale were originally stationed at the naval base and returned to Ferndale upon exiting the military. Following closure of the Centerville base, the housing was used by the Coast Guard for several more years. Most recently, the community voted to accept the housing from the Navy and convert it to affordable housing for low- and moderate-income residents. Over time, the demographics of the Ferndale community have continued to change, with many people moving to Ferndale from out of the area, slowly adding to the multigenerational origins of native residents.

- **Climate—**Ferndale's weather is typical of the Northern California coast, with mild summers and cool, wet winters. It rarely freezes in the winter and it is rarely hot in the summers. Annual average rainfall is over 40 inches, with 80% of that falling in the six-month period of November through April. The average year-round temperature is 59 degrees. Humidity averages between 72 and 87 percent. Prevailing winds are from the north and average about 5 mph.
- **Governing Body Format—**The City of Ferndale is governed by a five-member City Council. The City Council sets policy while the City Manager runs the day-to-day business of the City. The mayor is elected separately from the City Council, and has appointive powers, subject to the approval of council. The City also has a City Clerk and Deputy Clerk, as well as a Police Department, Public Works Department, Planning Department, and a Wastewater Operations Department. The City has a variety of commissions and committees.
- **Development Trends—**The City of Ferndale has implemented a multi-year General Plan Update process. The Housing Element Update and Historical & Cultural Resources Element are complete and have been adopted. The Safety Element and the Noise & Air Quality Element are in progress. The General Plan is the City's comprehensive policy document that defines the type, amount, and location of future growth and development, and keeping it current is vital for implementing community goals and policies.

  With a static rate of growth experienced over the past 13 years, the City's development trends have remained equally static. According to the 2012 General Plan Housing Element, three new subdivisions were approved between 2004 and 2009. The total new buildable parcels proposed are 13. These are all located in single-family zones. There is limited land available in Ferndale because the City has maintained its one square mile of city limits; however, there is still sufficient available land to exceed the City's Regional Housing Needs Assessment. At this time, the City does not plan to annex additional land.

7.3 ENERGY PROFILE

7.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Ferndale acquires its electricity from PG&E.
- Propane—Propane for city operations is acquired from Sequoia Gas.
- Liquid Fuel—Gasoline, diesel, and kerosene are purchased from Renner Petroleum.
- Natural Gas—There is no natural gas available.

7.3.2 Local Energy Demand

Government operations use five primary energy sources: electricity, liquid fuels, wood, propane, and solar. Each is described below (no energy demand information is provided for transportation fuels). The following discussion breaks down energy usage by type and by residential and non-residential sectors. The non-residential sector includes commercial, industrial, agricultural and municipal usages.

Electricity

Figure 7-1 shows the breakdown of electrical energy consumption for 2012. The aggregate consumption of electricity for all facilities and uses was 469,357 kilowatt-hours (kWh). Over three-quarters of Ferndale's electricity usage goes toward the wastewater treatment facility. The second highest demand comes from an amalgam of uses such as pumps, the public works garage, the community center, library and a restroom, together making up about 10 percent of demand. Lighting is third on the list at 9 percent, followed by the police department and City Hall.

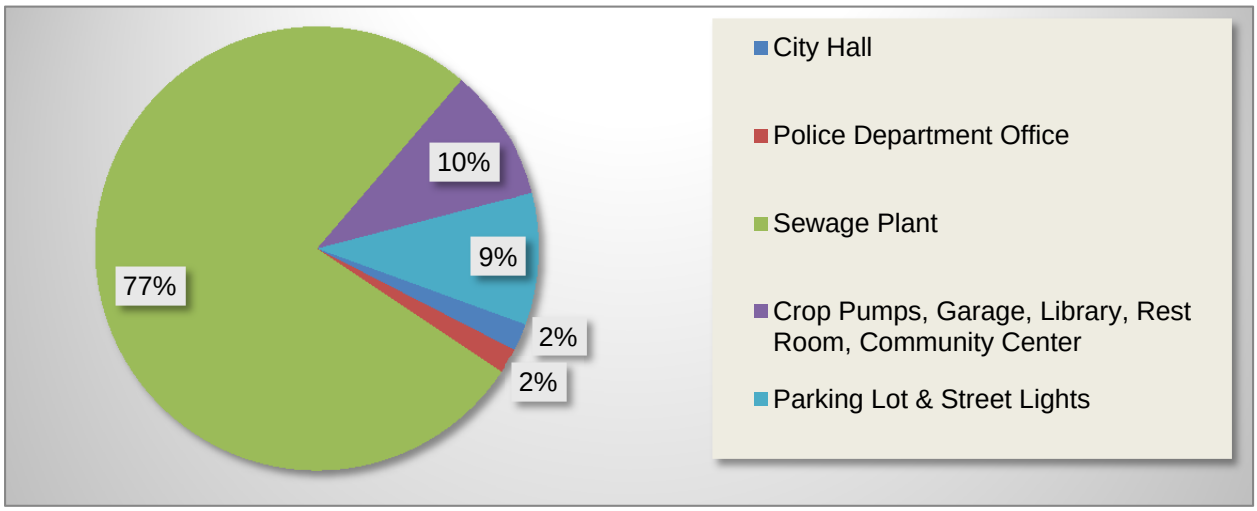


Figure 7-1. Government Electrical Energy Consumption for 2012 (Kilowatt-Hours)

In 2012, the peak uses of electricity were as follows:

- City Hall and parking lot lights in January
- The library in February
- The police department in March
- The garage and Community Center in April

- The treatment plant and crop pumps in May
- Streetlights in July
- Rest rooms in October.

The uses for electricity range from heating, ventilation and cooling (HVAC), to plug-in load for computers, appliances and the like, to lighting. Back-up generators that produce electricity for emergency operations are fueled by diesel (treatment plant) and gasoline (police department and public works garage) and thus are not included in these figures.

It is important to note that city governmental electrical energy consumption accounts for only 1 percent of all electrical energy consumed in Ferndale. Special district and County facilities within the City of Ferndale account for 4 percent of electrical demand each, commercial electrical demand accounts for 1 percent, and the bulk of electricity demand is from residential uses. Figure 7-2 shows community electricity consumption by sector as defined by PG&E for 2011. The District category includes school districts, hospital districts, water or sewer districts, fire districts, junior college districts, public utility districts, community service districts, cemetery districts, mosquito abatement districts and park districts.

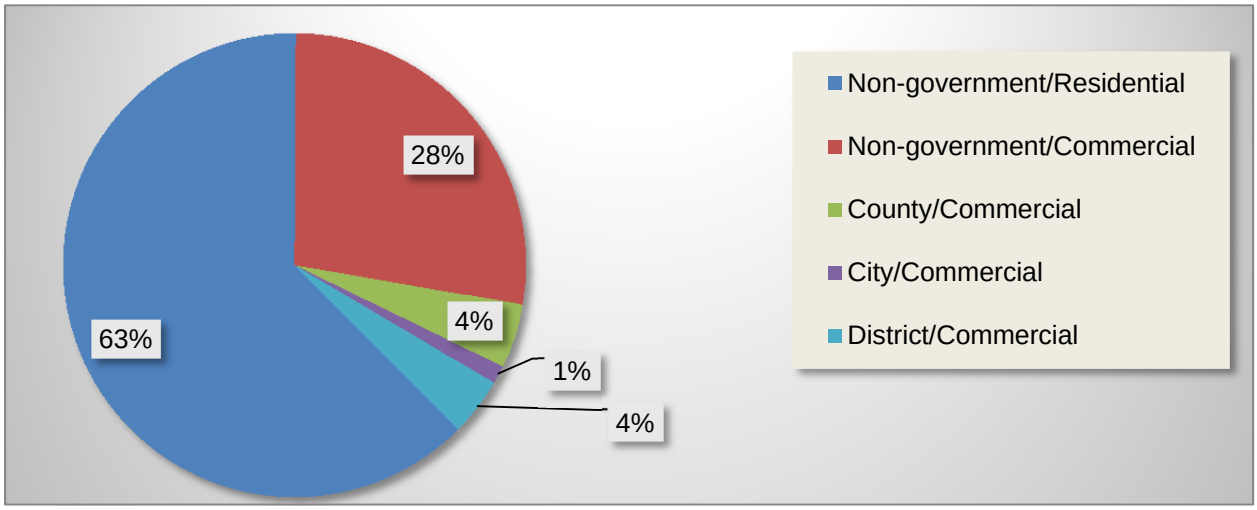


Figure 7-2. Electrical Energy Consumption by Sector for 2011 (Kilowatt-Hours)

Liquid Fuels

Liquid-fuel consumption includes gasoline, diesel and kerosene. Diesel fuel is primarily used for fire trucks and the 600-kW backup generator for the wastewater treatment plant. Gasoline powers vehicles and to a limited extent is used as fuel for two 7.5-kW gas-powered backup generators at the public works garage and police department. Kerosene is used to heat the City Hall offices and the police department building.

The peak use for gasoline and diesel fuel in 2012 was in April for all three facilities. March was the peak use period for kerosene. The aggregate consumption of the three liquid fuels during 2012 was as follows:

- Gasoline: 5,455 gallons
- Diesel fuel: 1,121 gallons
- Kerosene: 170 gallons.

Figure 7-3 shows the breakdown of liquid fuels energy consumption for 2012.

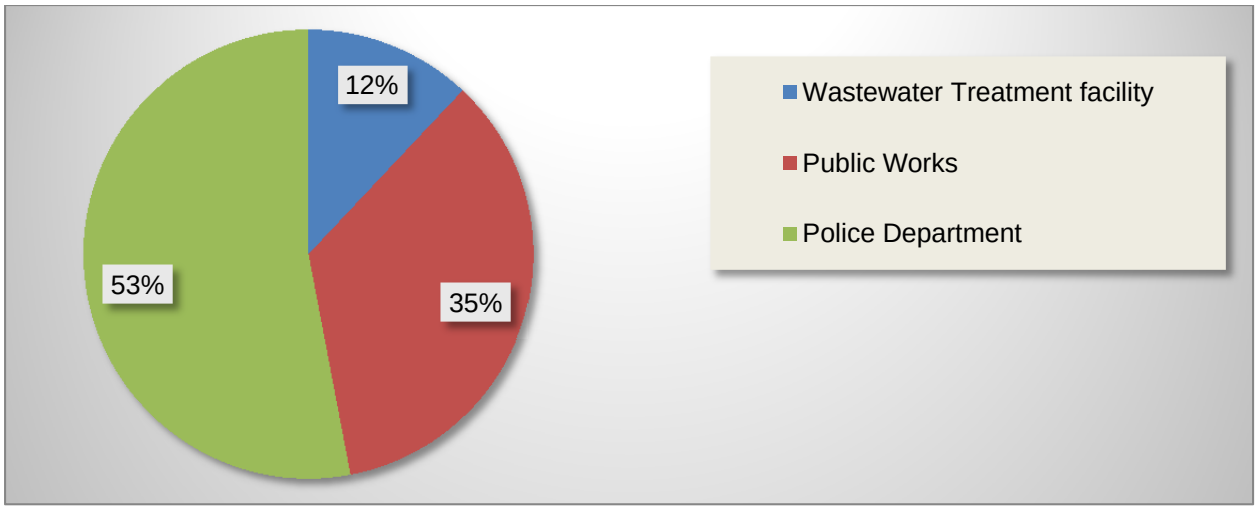


Figure 7-3. Liquid Fuels Energy Consumption for 2012 (Gallons of Gasoline, Kerosene, Diesel)

Wood

Ferndale consumes wood in the residential sector, primarily for heating. On average, there are approximately 100 households using a total of approximately 250 cords of wood per year.

Propane

Uses for propane include cooking and heating. The peak use for propane is for the City Hall and library in January and for the community center in June. The aggregate consumption of propane for the three facilities during 2012 was 4,155 gallons. Figure 7-4 shows the breakdown of propane energy consumption for 2012.

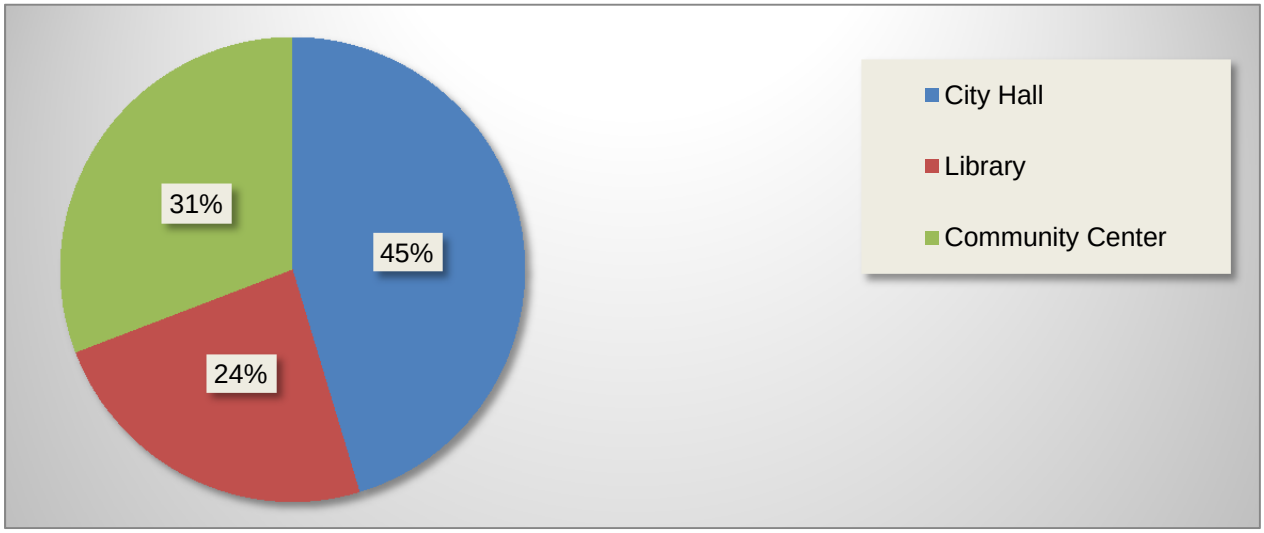


Figure 7-4. Propane Energy Consumption for 2012 (Gallons)

Solar

Between 2002 and 2010, 5 photovoltaic systems totaling 22 kW were installed at residential sites and interconnected to the PG&E grid.

7.3.3 Agreements and Contracts

The following agreements and contracts apply to energy use in Ferndale:

- Ferndale has an informal agreement with Sequoia Gas to provide propane. Sequoia provides storage tanks and fills them as needed.
- Renner Petroleum provides gasoline, diesel and kerosene under an informal agreement.
- A franchise agreement between PGE and the City has been in effect since 1954 under Ordinance 198 and the Franchise Act of 1937. The franchise has an indeterminate length and returns to the City 2 percent of gross annual receipts from electricity sales in the City.

7.3.4 Community Key Assets Energy Profile

The City of Ferndale has identified nine key assets for its energy profile:

- Humboldt County Fairgrounds
- City Hall
- Wastewater treatment facility
- Police department
- Fire department
- Del Oro Water Company
- Public works garage
- Lost Coast Communications
- Ferndale High School

Table 7-1 summarizes the energy profile for each key asset.

TABLE 7-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: Humboldt County Fairgrounds										
Emergency Shelter/ Emergency Operations Center	—	—	—	—	—	—	—	—	Yes	—
Key Asset #2: City Hall										
Day-to-Day City Management	PG&E/ Sequoia Gas	Electric/ propane	Franchise (PG&E)	None	—	—	—	—	—	—
Key Asset #3: Ferndale Wastewater Treatment Facility										
Wastewater Treatment	Renner/ PG&E	Gasoline, diesel, kerosene/ electric	None	1 Brand-Cummins	—	—	Renner/ PG&E	—	None	1 Brand-Cummins
Key Asset # 4: Ferndale Police Department										
Emergency Services	Renner/ PG&E	Gasoline, diesel, kerosene/ electric	None	Power Quip Model OHV110	7.5	6.5 kW, 13 hp	Gas	5	Yes	Yes
Key Asset # 5: Ferndale Fire Department										
Emergency Services	PG&E	Electric	—	Yes	—	—	—	—	—	—
Key Asset # 6: Del Oro Water Company										
Drinking Water	—	—	—	—	—	—	—	—	—	—
Key Asset #7: Public Works Garage										
Public Works	—	—	—	Power Quip Model: OHV110	7.5	6.5 kW, 13 hp	Gas	5	Yes	Yes
Key Asset # 8: Lost Coast Communications										
Communication	—	—	—	—	—	—	—	—	—	—
Key Asset #9: Ferndale High School										
Emergency Shelter	—	—	—	—	—	—	—	—	—	—

7.3.5 Key Asset Energy Consumption and Backup Generator Analysis

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the

event of an energy disruption. Table 7-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

TABLE 7-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: Humboldt County Fairgrounds								
—	—	—	—	—	—	—	—	—
Generator Capacity Analysis: Generator information not available at this time.								
Key Asset #2: City Hall								
1,100 (HVAC)	—	—	—	—	372	—	—	—
Generator Capacity Analysis: No generator in place								
Key Asset #3: Ferndale Wastewater Treatment Facility								
39,960		84	27	12	—	600	Diesel	200
Generator Capacity Analysis: 39,960 kWh-month/720 hours-month = 55.5 kW; assume 60 kW. This represents a load factor equal to 10 percent of the peak generator output of 600 kW. Generator consumes 43 gallons/hour at full load and 4.3 gallons/hour at 10-percent load; thus, 200 gallons will last 47 hours v. 72 hours needed for energy assurance.								
Key Asset #4: Ferndale Police Department								
938	—	370	117	54	—	7.5	Gas	5
Generator Capacity Analysis: All-Power 7.5 kW; 6 kW continuous/13 hp; storage 5 gallons; 0.64 gallons/hour at full load.								
Key Asset #5: Ferndale Fire Department								
—	—	—	—	—	—	—	—	—
Generator Capacity Analysis: Generator information not available at this time.								
Key Asset #6: Del Oro Water Company								
—	—	—	—	—	—	—	—	—
Generator Capacity Analysis: Generator information not available at this time.								
Key Asset #7: Public Works Garage								
1,344	—	244	74	36		7.5	Gas	5
Generator Capacity Analysis: All-Power 7.5 kW; 6 kW continuous/13 hp; storage 5 gallons; 0.64 gallons/hour at full load.								
Key Asset #8: Lost Coast Communications								
—	—	—	—	—	—	—	—	—
Generator Capacity Analysis: Generator information not available at this time.								
Key Asset #9: Ferndale High School								
—	—	—	—	—	—	—	—	—
Generator Capacity Analysis: Generator information not available at this time.								

7.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 7-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake	N/A	11/18/1980	Not Available
Severe Weather/Flood	N/A	1/18/1981	Not Available
Severe Weather/Flood	N/A	12/19/1981	Not Available
Severe Weather/Flood	N/A	3/31/1982	Not Available
Severe Weather/Flood	DR-677	1/25/1983	$3.82 countywide
Severe Weather/Flood	N/A	12/25/1983	Not Available
Severe Weather/Flood	DR-758	2/16/1986	$5 million countywide
Earthquake	DR-943	4/25/1992	Not Available
Severe Weather/Flood	N/A	12/31/1992	Not Available
Severe Weather/Flood	N/A	1/20/1993	Not Available
Earthquake	N/A	12/26/1994	Over $5 million countywide
Severe Weather/Flood	DR-1044	1/9/1995	$15 million countywide
Severe Weather/Flood	DR-1046	3/1/1995	$1.3 million countywide
Severe Weather/Flood	N/A	12/11/1995	Not Available
Severe Weather/Flood	N/A	12/29/1995	Not Available
Severe Weather/Flood	N/A	12/8/1996	Not Available
Severe Weather/Flood	DR-1155	½/1997	$35 million countywide
Severe Weather/Flood	DR-1203	1/27/1998	Over $6 million countywide
Severe Weather/Flood	N/A	11/21/1998	Not Available
Severe Weather/Flood	N/A	12/27/2002	Not Available
Severe Weather/Flood	DR-1628	12/31/2005	$20,208,206 for County
Severe Weather/Flood	N/A	12/2006	Not Available
Earthquake	N/A	1/9/2010	$40,000
Landslide	N/A	3/2011	Not Available
Severe Weather/Flood	N/A	11/30/2012	Not Available

Table 7-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: None
- Number of FEMA Identified Severe Repetitive Loss Properties: None
- Number of Repetitive Flood Loss/Severe Repetitive Loss Properties that have been mitigated: None

7.5 HAZARD RISK RANKING

TABLE 7-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Storm	54
3	Flood	54
4	Landslide	24
5	Wildland Fire	14
6	Drought	14
7	Volcano (Ash Fall)	12
8	Tsunami	2
9	Dam Failure	1

Table 7-4 presents the ranking of the hazards of concern.

7.6 CAPABILITY ASSESSMENT

7.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 7-5.

TABLE 7-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** Ordinance 11-01 Adopted 02/03/11	Y	N	N	Y
Zoning ***Comments:*** Ordinance 02-02 Adopted 08/12/02	Y	N	N	Y
Subdivisions ***Comments:*** Ordinance 99-04 Adopted 10/11/99	Y	N	N	N
Stormwater Management ***Comments:*** Ordinance 94-01 Adopted 01/03/94	Y	N	N	N
Post Disaster Recovery	N	N	N	N
Real Estate Disclosure ***Comments:*** CA. State Civil Code 1102 requires full disclosure on Natural hazard Exposure of the sale/re-sale of any and all real property.	N	N	Y	Y
Growth Management ***Comments:*** Housing Element Feb 2012	Y	N	N	Y
Site Plan Review ***Comments:*** Council adopted 2/10/03	Y	N	N	N
Public Health and Safety	N	N	N	N
Environmental Protection	N	N	N	N
Energy Code	N	N	N	N
Planning Documents				
General or Comprehensive Plan ***Comments:*** Draft Safety Element complete; links to Hazard Mitigation Plan.	Y	N	N	Y
Floodplain or Basin Plan ***Comments:*** Ordinance 08-02 adopted 5/12/08	N	N	N	N
Stormwater Plan ***Comments:*** Ordinance Stormwater 314 Jan. 1991	Y	N	N	N
Capital Improvement Plan ***Comments:*** Expected adoption 2013	N	N	N	N

TABLE 7-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Habitat Conservation Plan	N	N	N	N
Economic Development Plan	Y	N	N	N
Shoreline Management Plan	N	N	N	N
Community Wildfire Protection Plan	N	N	N	N
General Plan Energy Conservation Element or Energy Specific Plan	N	N	N	N
Climate Action Plan or Climate Adaptation Strategy	N	N	N	N
Response/Recovery Planning				
Comprehensive Emergency Management Plan ***Comments:*** Emergency Operations Plan October 4, 2004	Y	N	N	N
Threat and Hazard Identification and Risk Assessment	N	N	N	N
Terrorism Plan	N	N	N	N
Post-Disaster Recovery Plan	N	N	N	N
Continuity of Operations Plan	N	N	N	N
Public Health Plans	N	N	N	N

7.6.2 Administrative and Technical Capability

TABLE 7-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	Planner and City Manager Public Works, Building inspector and City Engineer
Engineers or professionals trained in building or infrastructure construction practices	Y	City Engineer and Public Works Lead person
Planners or engineers with an understanding of natural hazards	Y	City Engineer and Public Works Lead person
Planners or engineers with an understanding of energy resilience or alternative energy technology	Y	City Engineer
Staff with training in benefit/cost analysis	Y	City Engineer
Surveyors	Y	City Engineer
Personnel skilled or trained in GIS applications	Y	Planning Department
Scientist familiar with natural hazards in local area	Y	City Engineer
Emergency manager	Y	City Manager
Grant writers	Y	City Manager, City Engineer, and Wastewater Operator

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 7-6.

7.6.3 Fiscal Capability

TABLE 7-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	No
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	

The assessment of the jurisdiction's fiscal capabilities is presented in Table 7-7.

7.6.4 National Flood Insurance Program Compliance

TABLE 7-8. NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE	
What department is responsible for floodplain management in your community?	City Engineer's Office
Who is your community's floodplain administrator (department/position)?	Annjanette Dodd, PE (Floodplain Administrator, City Engineer's Office)
Do you have any certified floodplain managers on staff in your community?	Yes
What is the date of adoption of your flood damage prevention ordinance?	May 12, 2008
When was the most recent community assistance visit or community assistance contact?	March 4, 2008
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	No
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	No. Sedimentation in Francis Creek may have increased the bed elevation of the creek, resulting in a higher, and possibly broader, flood risk than indicated by the existing flood hazard maps.
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 7-8.

7.6.5 Energy Resilience Capability

TABLE 7-9. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	City Planner
Have you performed an energy assurance gap analysis for your community?	Yes
Have you completed a vulnerability assessment of power sources to each key asset?	No
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	No
Are emergency backup generators tested on a regular basis?	Unknown
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Unknown
Have you established a working relationship with your community's energy service providers?	No
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	No
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	No

Energy resiliency capabilities are presented in Table 7-9.

7.6.6 Community Mitigation Program Classifications

TABLE 7-10. COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	10	N/A
Building Code Effectiveness Grading Schedule	Yes	9/9	Unknown
Public Protection	Yes	5/8	Unknown
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 7-10.

7.7 HAZARD MITIGATION ACTION PLAN

Table 7-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 7-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #F1—Ensure that Key Assets are properly wired for correct backup generator.							
Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	Medium	General Fund	Long term	No
Initiative #F2—Evaluate the need for and obtain more, or more properly sized, generators for the key assets and other important facilities.							
Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	High	General Fund	Long term	No
Initiative #F3—Obtain formal agreement with County for use of Fairgrounds as EOC and Emergency Shelter.							
Existing	All Hazards	O-1, O-2, O-4	City Manager's Office, County OES	Low	General Fund	Short term	No
Initiative #F4—Maintain and update the City's Energy Assurance Plan and implement Energy Assurance Plan actions and projects, including requesting information (energy use, backup generator make/model/size, fuel storage) from key assets and determining energy assurance gaps.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office	Medium	General Fund	Long term	No
Initiative #F5—Investigate the viability of renewable and distributed generation technologies that can be city-owned and serve a dual purpose of primary and stand-by power/energy. Work with the California Energy Commission and other sources to ID advanced technologies, systems, and financing options.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office, Public Works	High	General Fund, CEC grant	Long term	No
Initiative #F6—Investigate low-no cost energy efficiency and conservation measures and innovative technologies such as micro-turbines for KA and other city-owned/operated assets in order to decrease their energy footprint thus reducing energy bills and the scale of needed back-up power. Also look into higher cost, advanced technologies such as micro-grids.							
New & Existing	All Hazards	O-1, O-2, O-4	City Manager's Office, Public Works	High	General Fund, CEC grant	Long term	No

TABLE 7-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #F7—Continue involvement in Eel River Valley Emergency Preparedness Team to enhance emergency preparedness in the Eel River Valley.							
	All Hazards	O-1, O-2, O-4, O-5	City Manager's Office	Low	General Fund, REMS grant	Short term	Yes
Initiative #F8 Maintain and update the City's Emergency Operations Plan and implement Emergency Operations Plan actions and projects.							
New & Existing	All Hazards	O-1, O-2, O-4, O-5	City Manager's Office	Medium	General Fund	Short term	No
Initiative #F9—Prepare energy emergency response procedures for the Ferndale Emergency Operations Plan.							
New & Existing	All Hazards	O-1, O-4, O-5	City Manager's Office, Public Works, Police	Medium	General Fund	Short term	No
Initiative #F10—Prepare a Post Disaster Recovery Plan.							
New & Existing	All Hazards	O-1, O-4, O-5, O-6, O-12	City Manager's Office	Medium	General Fund	Short term	Yes
Initiative #F11—Coordinate with the County and Rio Dell to stabilize Blue Slide Road hillside and road surface from Ferndale to Rio Dell.							
New & Existing	Landslide	O-3, O-8, O-9, O-12	County, Rio Dell, City Manager's Office	Low	General Fund	Short term	No
Initiative #F12—Continue to work closely with Ferndale Volunteer Fire Department.							
New & Existing	All Hazards	O-1, O-4, O-5, O-8, O-12	City Manager's Office, Police	Low	General Fund	Short term	Yes
Initiative #F13—Adopt a long-term capital improvement plan, which provides the City the financial capability to fund capital projects that could include hazard mitigation projects.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-6, O-7, O-9	City Manager's Office, Public Works	Low	General Fund	Short term	Yes
Initiative #F14—Improve hillside stability in landslide-prone areas by improving drainage and planting plants that protect soil and retaining walls where needed.							
New & Existing	Landslide, Flood	O-2, O-3, O-9	Public Works	Medium	Public Works, PDM	Short term	Yes

TABLE 7-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #F15—Perform Seismic retrofits of critical facilities, such as the public works facility.							
Existing	Earthquake	O-1, O-2, O-3, O-4	Public Works	High	General Fund, Public Works, HMGP, PDM	Long term	Yes
Initiative #F16—Work with NOAA to attain the certificates of Storm Ready and Tsunami Ready.							
New & Existing	Severe Storm, Tsunami	O-3, O-4, O-5, O-6, O-7, O-8	City Manager's Office	Medium	General Fund	Long term	Yes
Initiative #F17 Perform Preventative Maintenance for Francis Creek.							
New & Existing	Flood	O-2, O-3, O-9	Public Works	Low	Public Works, PDM, HMGP	Short term	Yes
Initiative #F18—Establish redundant communication capabilities throughout the city.							
New & Existing	All Hazards	O-1, O-4, O-5	Police	Medium	General Fund	Long term	Yes
Initiative #F19—Update City Land Use Code for seismic setbacks/structural requirements and hillside development standards.							
New & Existing	Earthquake, Landslide, Flood	O-2, O-3, O-9, O-10	City Manager's Office	Medium	General Fund, PDM	Long term	Yes
Initiative #F20—Update floodplain mapping throughout the City.							
New & Existing	Flood	O-7	City Manager's Office, Public Works	Medium	Public Works, NFIP	Long term	Yes
Initiative #F21—Maintain National Incident Management System and Incident Command System training for City staff.							
New & Existing	All Hazards	O-5	City Manager's Office, Public Works, Police	Low	General Fund	Short term	Yes
Initiative #F22—Obtain and distribute current information about local natural hazards risk and emergency preparedness including creating and maintaining current website information.							
New & Existing	All Hazards	O-6, O-7	City Manager's Office	Low	General Fund	Short term	Yes

TABLE 7-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #F23—Incorporate this Hazard Mitigation Plan as part of the General Plan Safety Element and implement policies and programs. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	All Objectives	City Manager's Office	Low	General Fund	Short term	No
Initiative #F24—Adopt the International Building Code once ratified by the State of California as the State Building Code.							
New & Existing	All Hazards	O-2, O-3, O-10, O-11	City Manager's Office	Low	General Fund	Short term	N
Initiative #F25—Continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New & Existing	Flood	O-2, O-3, O-8, O-9	City Manager's Office, Public Works	Low	Funded through existing, ongoing programs	Short term	Y

7.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 7-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
F1	3	High	Medium	Yes	No	No	Low
F2	3	High	High	Yes	No	No	Low
F3	3	High	Low	Yes	No	Yes	High
F4	3	Medium	Medium	No	No	No	Low
F5	3	Medium	High	No	Yes	No	Low
F6	3	Medium	High	No	Yes	No	Low
F7	4	High	Low	Yes	No	Yes	High
F8	4	High	Medium	Yes	No	No	Medium
F9	3	Medium	Medium	Yes	No	No	Medium
F10	3	Low	Medium	No	No	No	Low
F11	3	Low	Low	Yes	No	Yes	High
F12	5	Low	Low	Yes	No	Yes	High
F13	3	Medium	Low	Yes	No	Yes	High
F14	3	High	Medium	Yes	Yes	No	High
F15	4	High	High	Yes	Yes	No	High
F16	2	Medium	Medium	Yes	No	No	Low
F17	3	High	Low	Yes	Yes	Yes	High
F18	3	Medium	Medium	Yes	No	No	Low
F19	4	Medium	Medium	Yes	Yes	No	High
F20	1	Medium	Medium	Yes	Yes	No	High
F21	1	Medium	Low	Yes	No	Yes	High
F22	2	Medium	Low	Yes	No	Yes	High
F23	12	High	Low	Yes	No	Yes	High
F24	4	Medium	Low	Yes	No	Yes	High
F25	4	Medium	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

Table 7-12 identifies the priority for each initiative.

7.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 7-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	N/A	N/A	N/A	N/A	N/A	N/A
Drought	F23	F13, F23	F22, F23	F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F18, F21	F13, F23
Earthquake	F13, F19, F23, F24	F13, F23	F22, F23	F11, F14, F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F18, F21	F11, F13, F14, F15, F23
Flood	F13, F16, F19, F20, F23, F24, F25	F13, F16, F17, F23, F25	F16, F20, F22, F23, F25	F11, F13, F14, F16, F17, F23, F25	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F16, F18, F21, F25	F11, F13, F14, F16, F17, F23, F25
Landslide	F13, F19, F23, F24	F13, F23	F22, F23	F11, F14, F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F18, F21	F11, F13, F14, F23
Severe Weather	F13, F23, F24	F13, F23	F22, F23	F11, F13, F14, F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F18, F21	F11, F13, F14, F23
Tsunami	F13, F16, F23, F24	F13, F16, F23	F16, F22, F23	F16, F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F16, F18, F21	F13, F16, F23
Wildfire	F12, F13, F23, F24	F13, F23	F22, F23	F12, F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F18, F21	F13, F23
Other Hazards of Concern	F13, F23, F24	F13, F23	F22, F23	F23	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F12, F18, F21	F13, F23

a. See Chapter 1 for description of mitigation types.

Table 7-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

7.10 STATUS OF PREVIOUS PLAN INITIATIVES

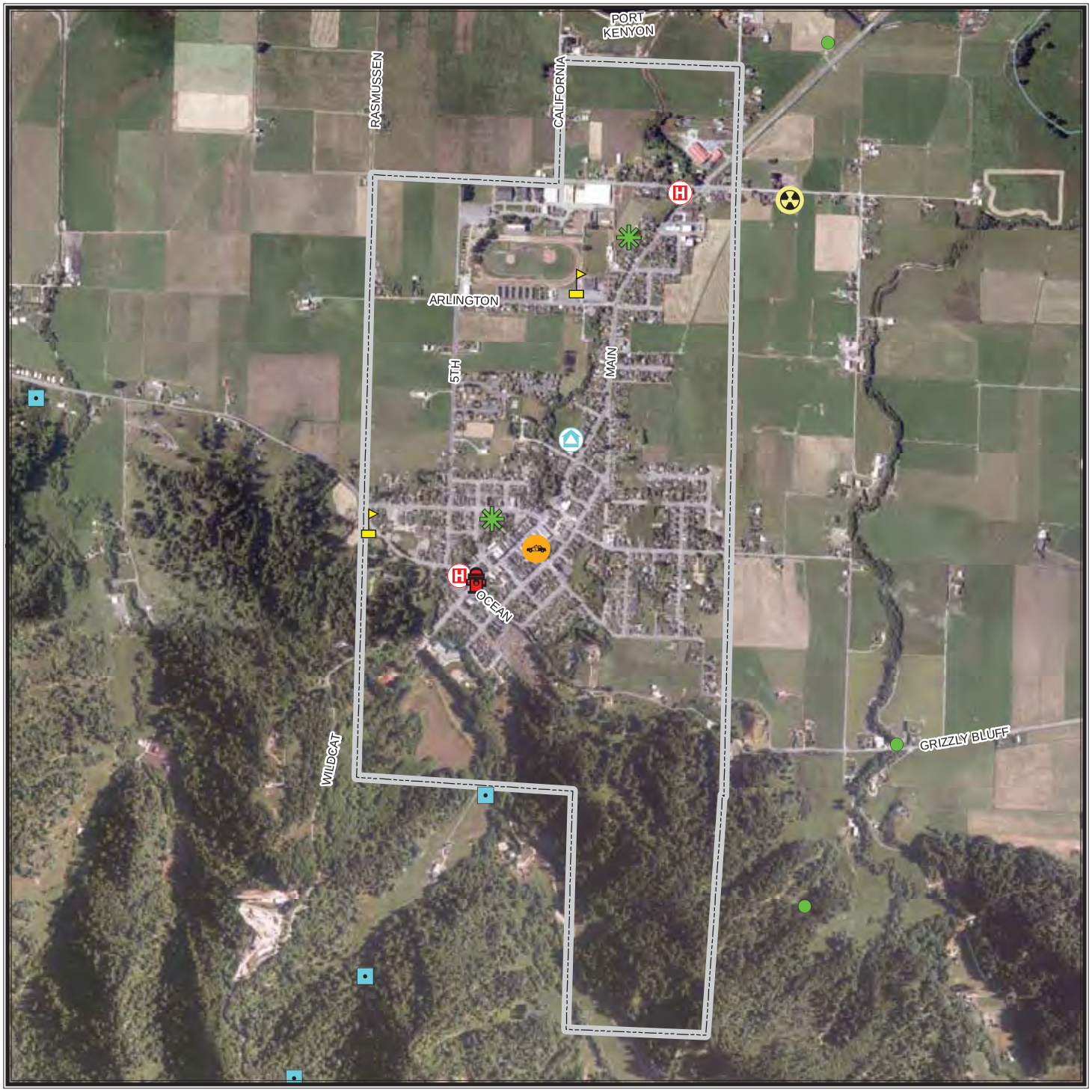
Table 7-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

TABLE 7-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
F-1		X		Included in Draft General Plan Safety Element Update Policy 6.4 and Programs 6.a and 6.h. County Fairgrounds informally designated as assembly point and command central.
F-2		X		Included in Draft General Plan Safety Element Update Programs 6.b and 6.o. City is currently drafting Capital Improvement Plan; anticipated adoption in 2013.
F-3		X		Included in Draft General Plan Safety Element Update Policy 1.4 and Program 1.c. Permits have been granted to private citizens for stream channel stabilization.
F-4		X		Included in Draft General Plan Safety Element Update Policy 6.1 and Program 6.a. The City of Ferndale Disaster Council created to develop and recommend for adoption by the City Council all emergency and mutual aid plans and agreements.
F-5		X		Included in Draft General Plan Safety Element Update Policy 2.7 and Program 2.i. New wastewater treatment facility raised 5 feet above floodplain.
F-6		X		Included in Draft General Plan Safety Element Update Policy 1.6 and Program 1.e. New wastewater treatment facility engineered to withstand seismic activity.
F-7		X		Included in Draft General Plan Safety Element Update Policy 6.2 and associated programs
F-8		X		Included in Draft General Plan Safety Element Update Program 2.j. Preventive maintenance done annually. Salt River Restoration Project underway; will improve Francis Creek.
F-9	X			
F-10		X		Included in Draft General Plan Safety Element Update Program 6.c.
F-11		X		Included in Draft General Plan Safety Element Update Policy 6.1 and Program 6.a. City's current EOP updated in 2006.
F-12		X		Included in Draft General Plan Safety Element Update Policy 1.1 and Programs 1.a-1.c.

TABLE 7-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
F-13		X		Included in Draft General Plan Safety Element Update Policies 2.1 and 2.3 and Program 2.a. Updated floodplain maps included in Draft Safety Element. City has continued participation in National Flood Insurance Program.
F-14		X		Included in Draft General Plan Safety Element Update Policy 6.1 and Programs 6.b and 6.e. Select staff have completed training courses.
F-15		X		Included in Draft General Plan Safety Element Update Programs 2.k, 3.e, 6.h, and 6.j.
F-16		X		Included in Draft General Plan Safety Element Update Policy 2.1. City has continued participation in National Flood Insurance Program.



CITY OF FERNDALE

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

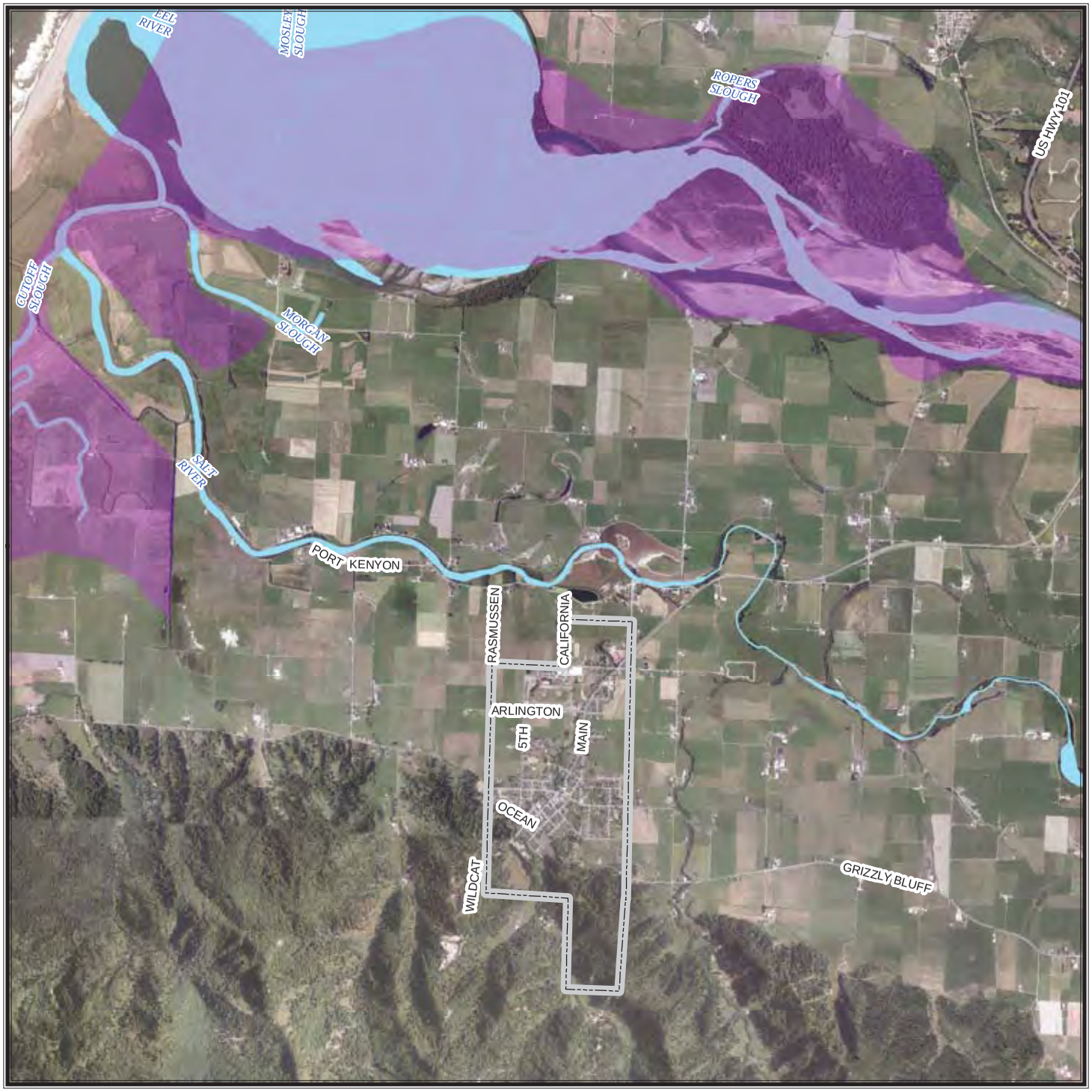
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Dam Failure Inundation Areas

Scott Dam

Scott Dam inundation area

Dam failure inundation area data from 2007 provided by California Emergeny Management Agency Dam Safety Program.

These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

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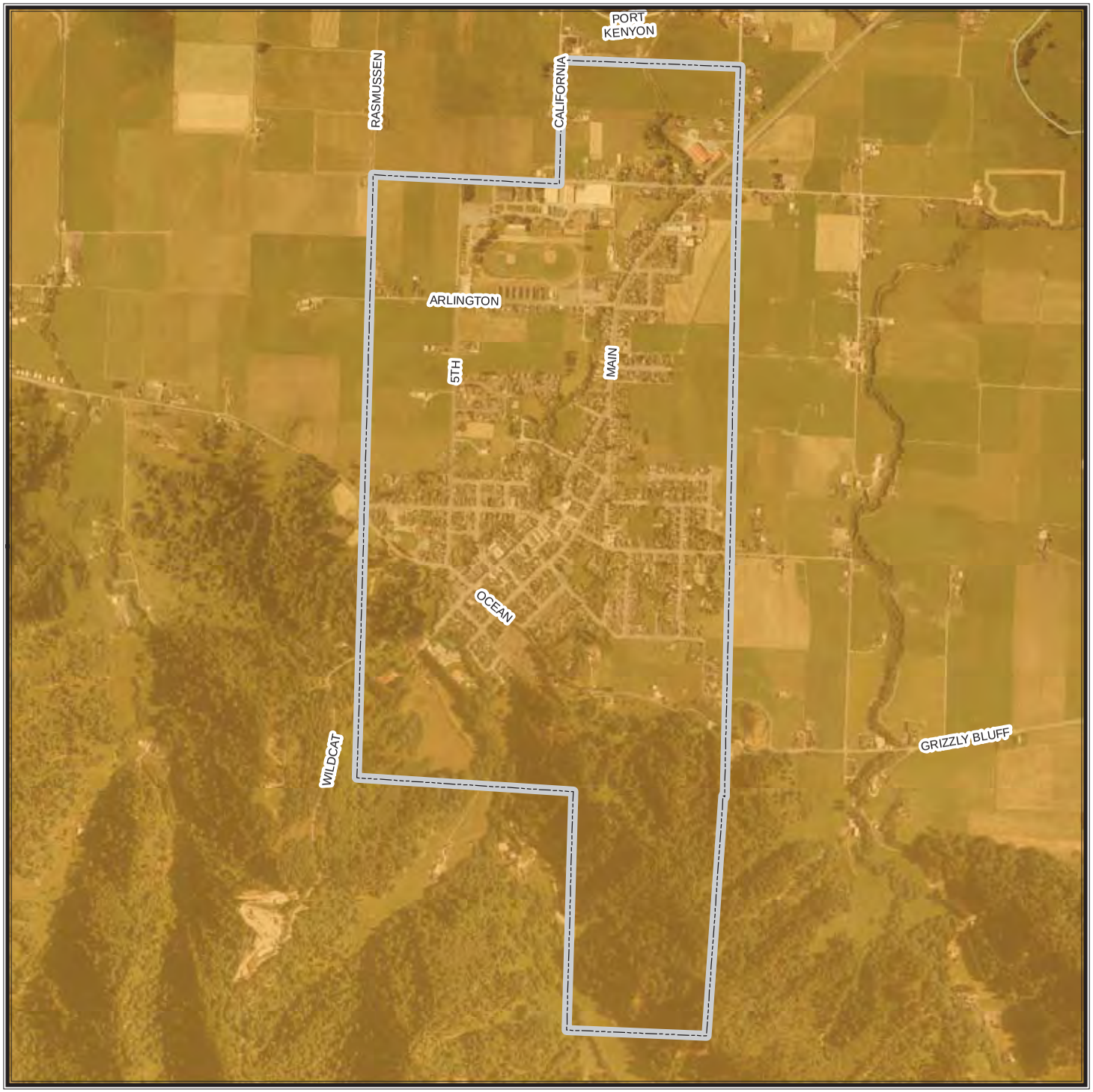


CITY OF FERNDALE

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

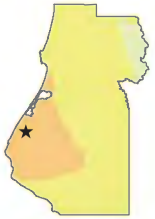
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.25 Miles

TETRA TECH



CITY OF FERNDALE

Quaternanry & Younger Earthquake Faults

Proximate Faults

- **Bear River Fault Zone**
- **Little Salmon Fault Zone**
- **Russ Fault Zone**

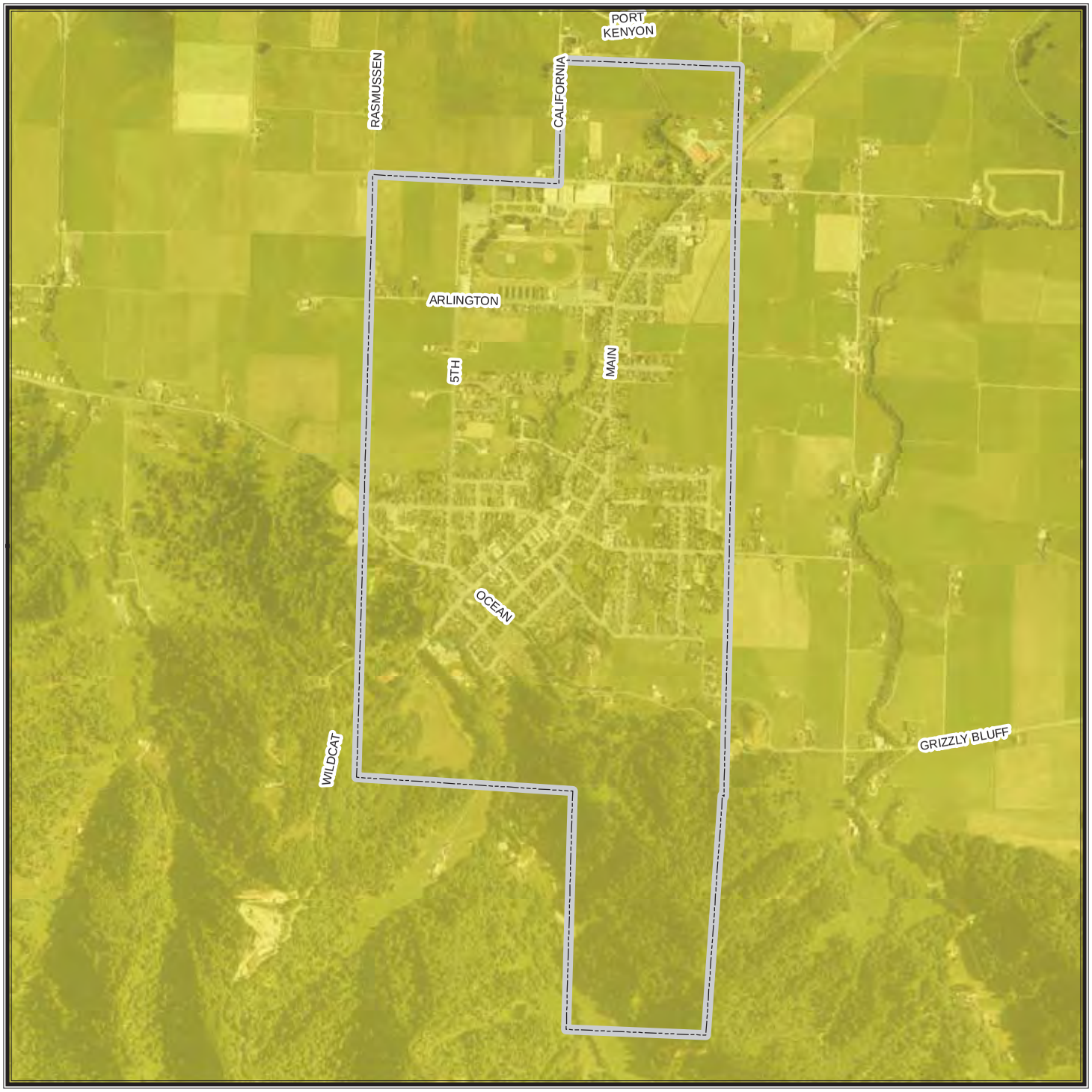
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

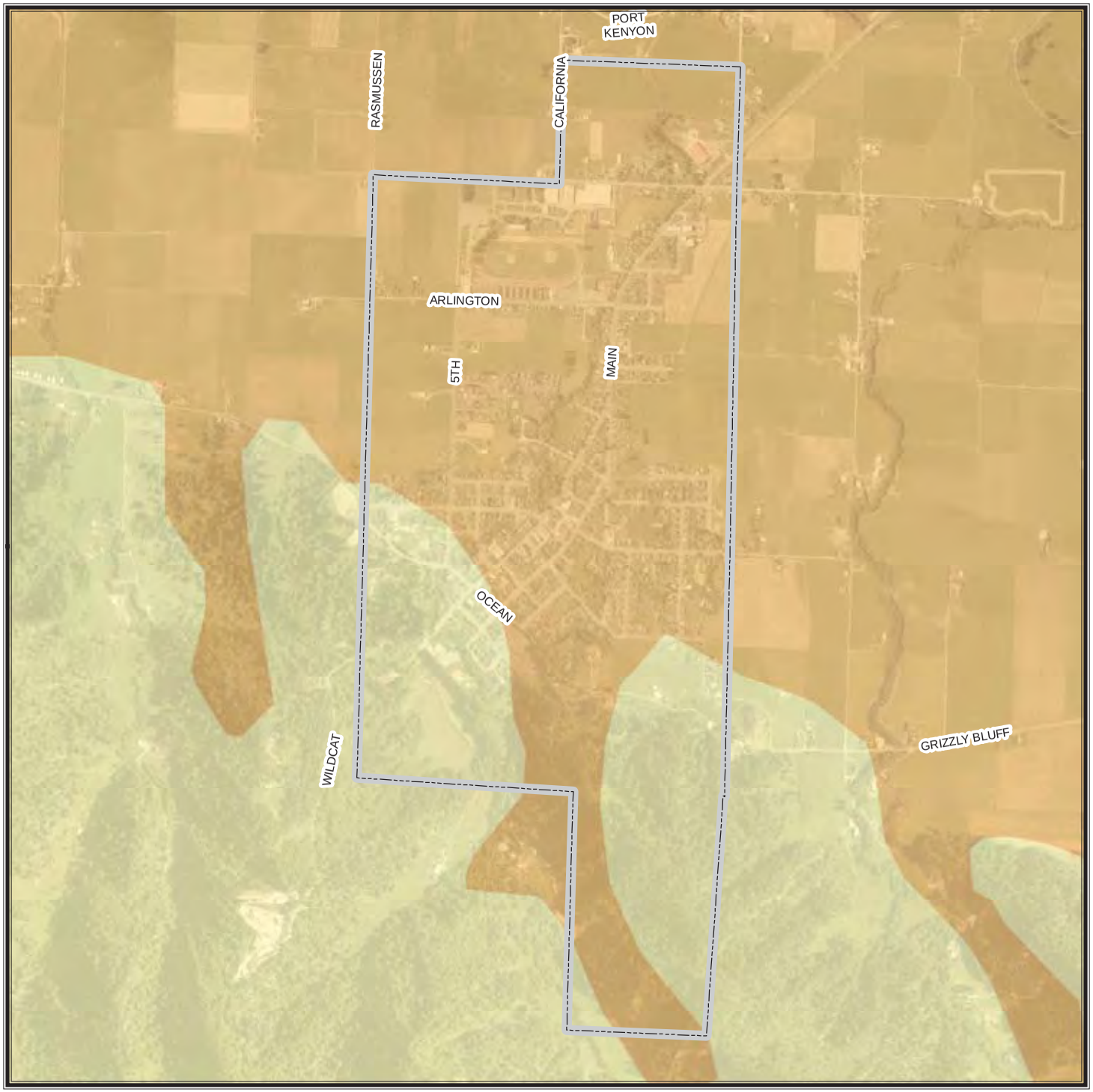
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

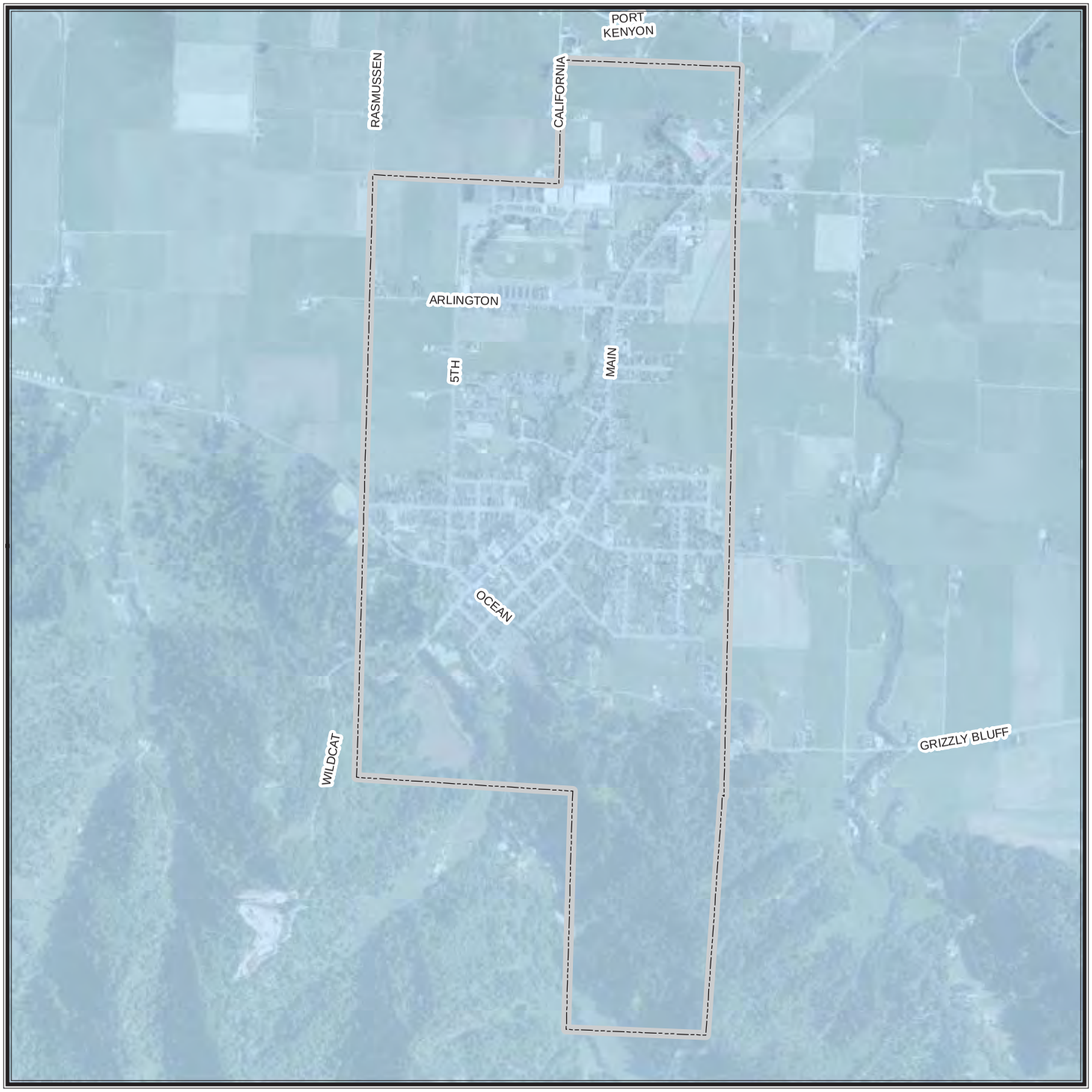
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

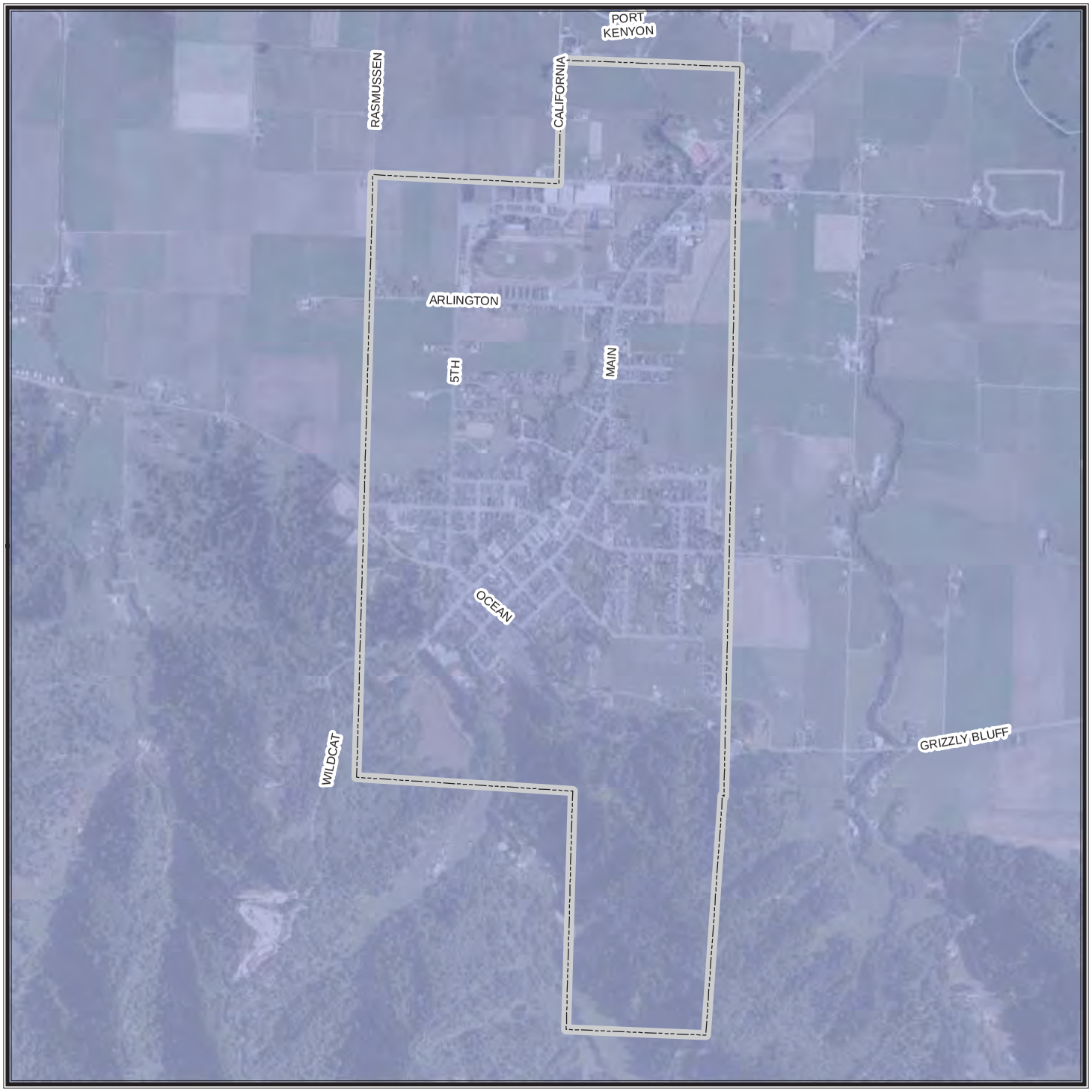
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

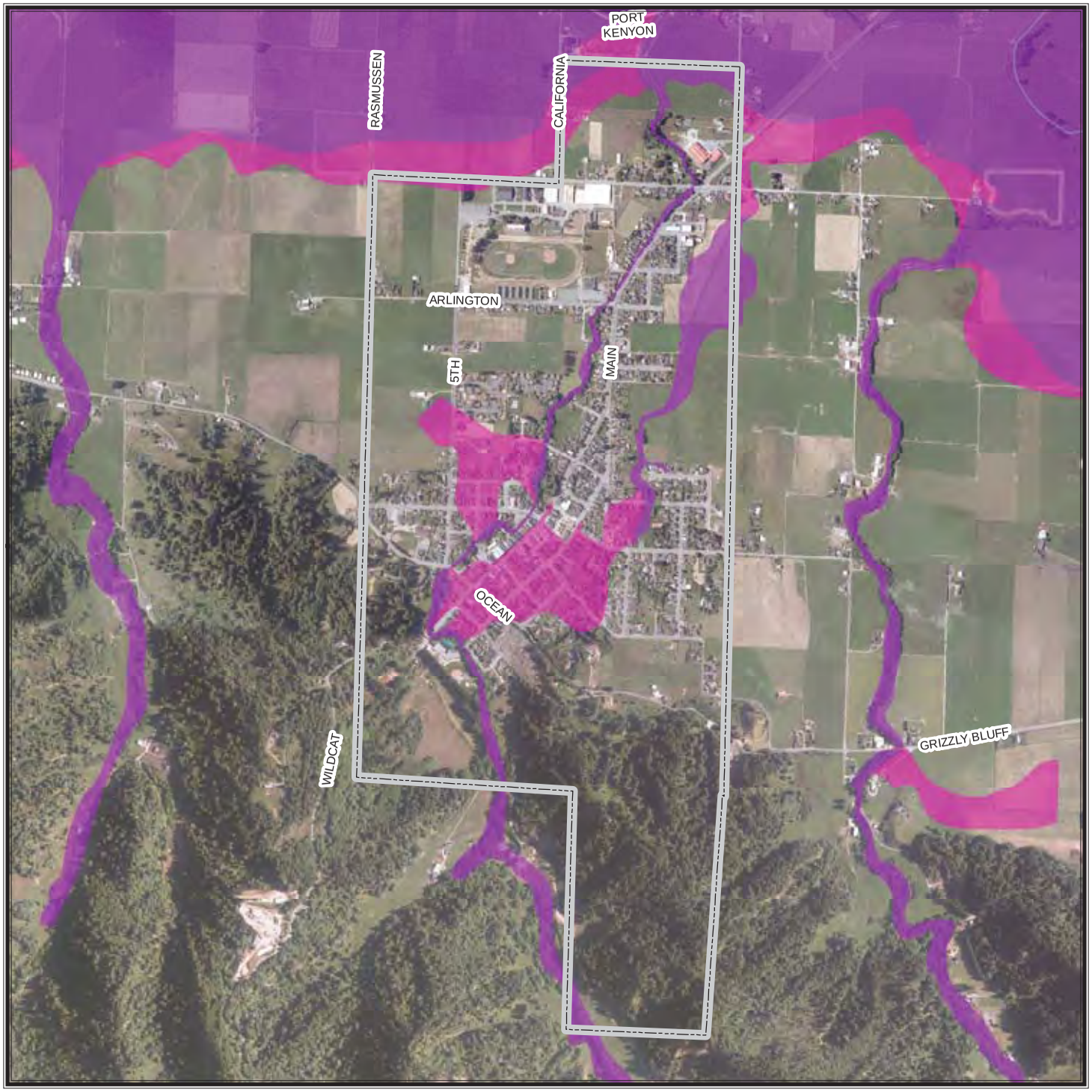
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.25 Miles

TETRA TECH



CITY OF FERNDALE

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

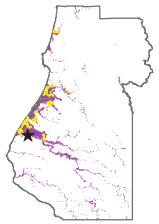
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

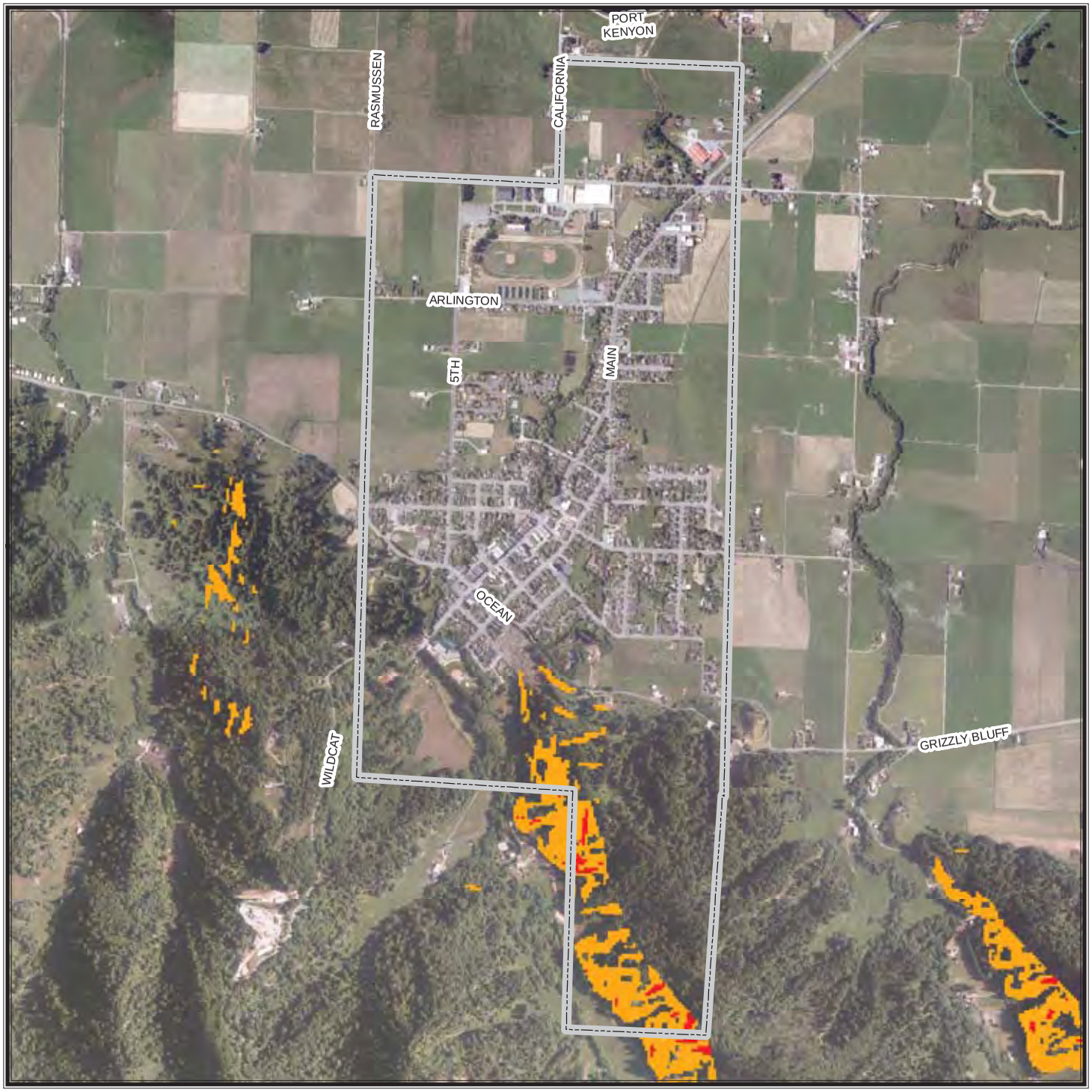
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH





CITY OF FERNDALE

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

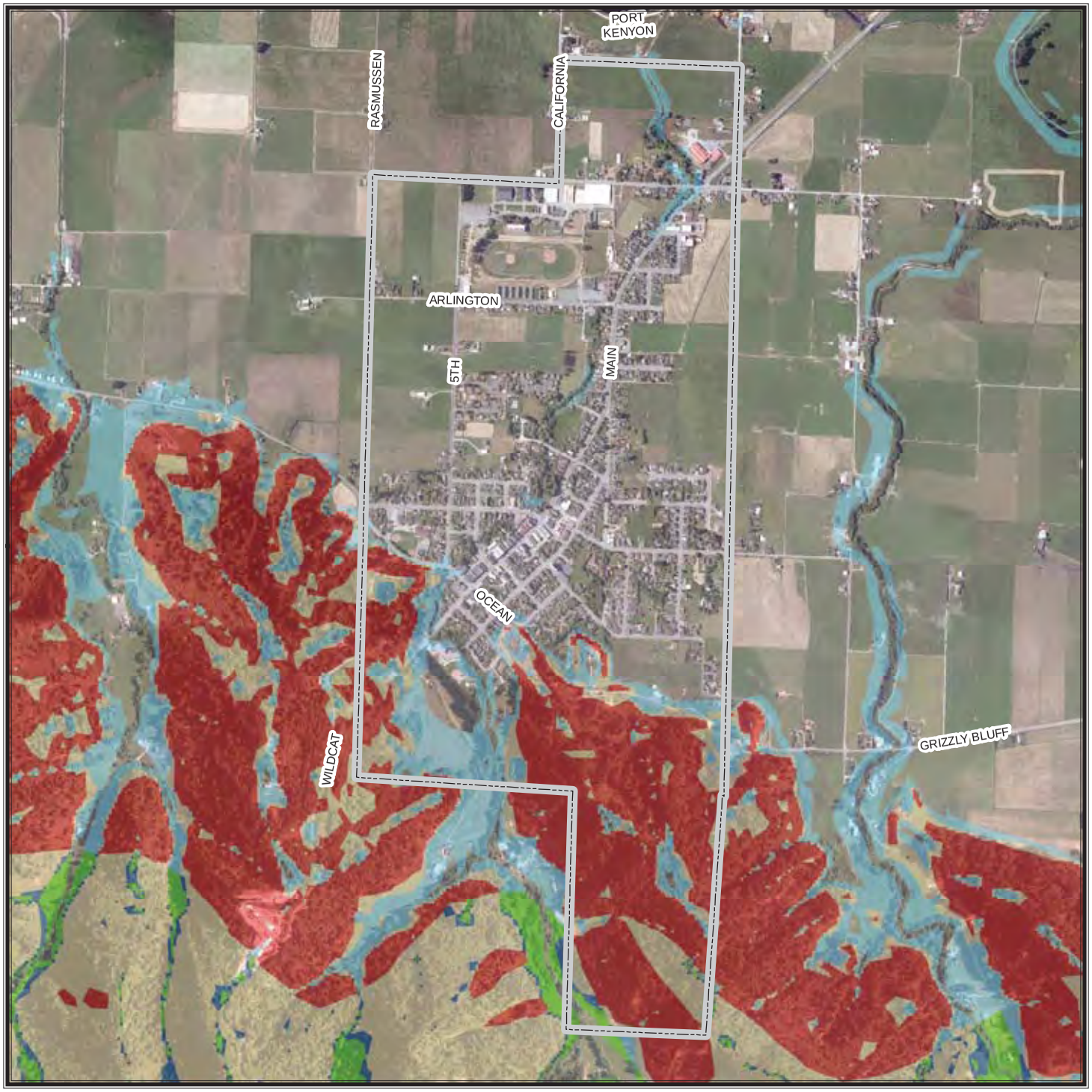
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

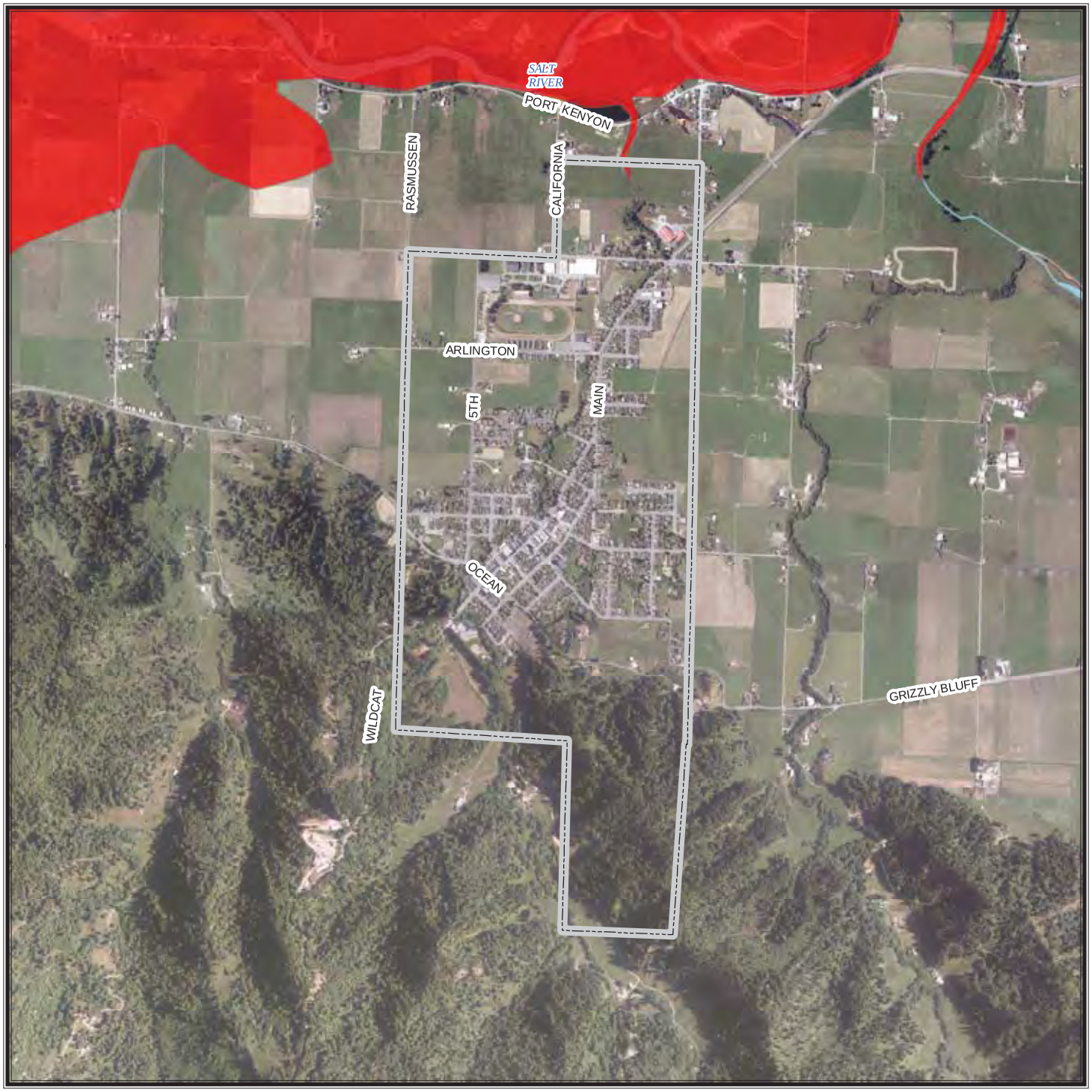
These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF FERNDALE

Tsunami Inundation Areas

Tsunami inundation area

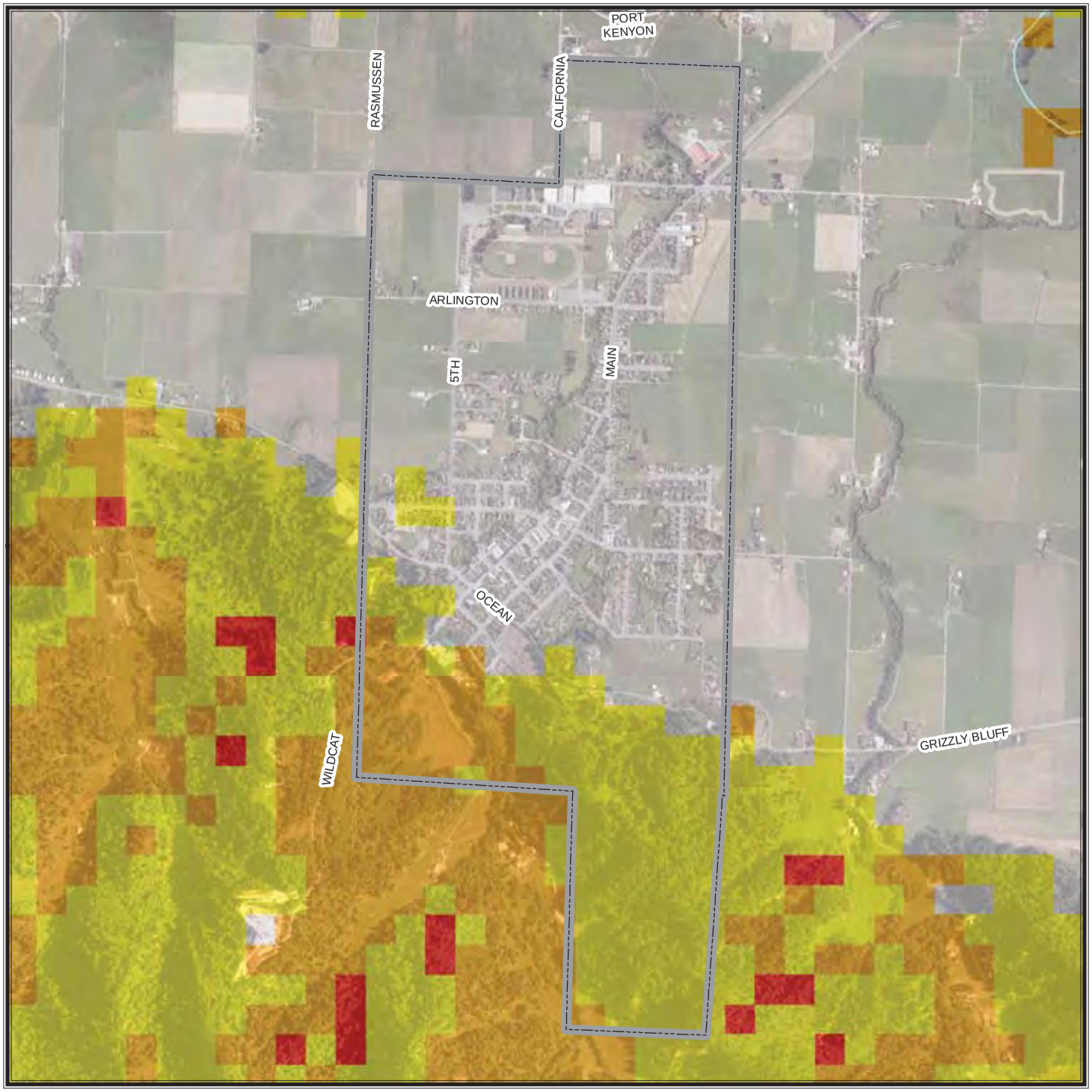
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N
W E
S

TETRA TECH



CITY OF FERNDALE

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

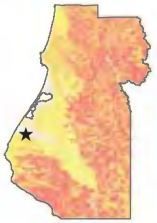
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

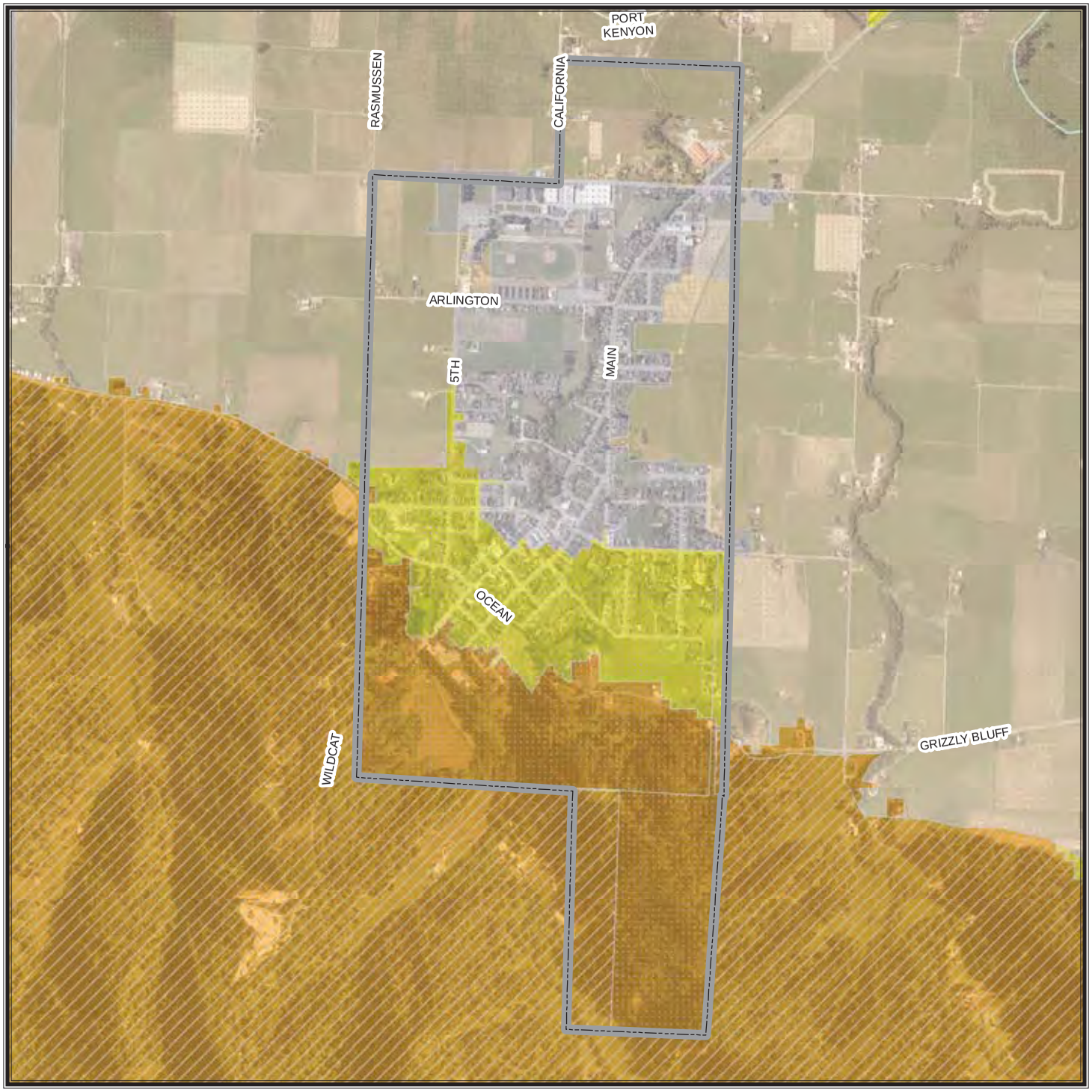
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.25 Miles

TETRA TECH





CITY OF FERNDALE

Fire Hazard Severity Class

Hazard Class

- **Very High**
- **High**
- **Moderate**
- **Non-Wildland/Non-Urban**
- **Urban Unzoned**

Responsibility Areas

- **Federal (FRA)**
- **Local (LRA)**
- **State (SRA)**
- **None**

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CITY OF FERNDALE

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CITY OF FERNDALE

Fire Perimeters

Year of Fire

- 1908 - 1920
- 1921 - 1940
- 1941 - 1960
- 1961 - 1980
- 1981 - 2000
- 2001 - 2012

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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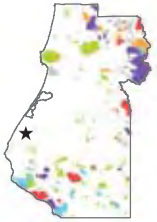
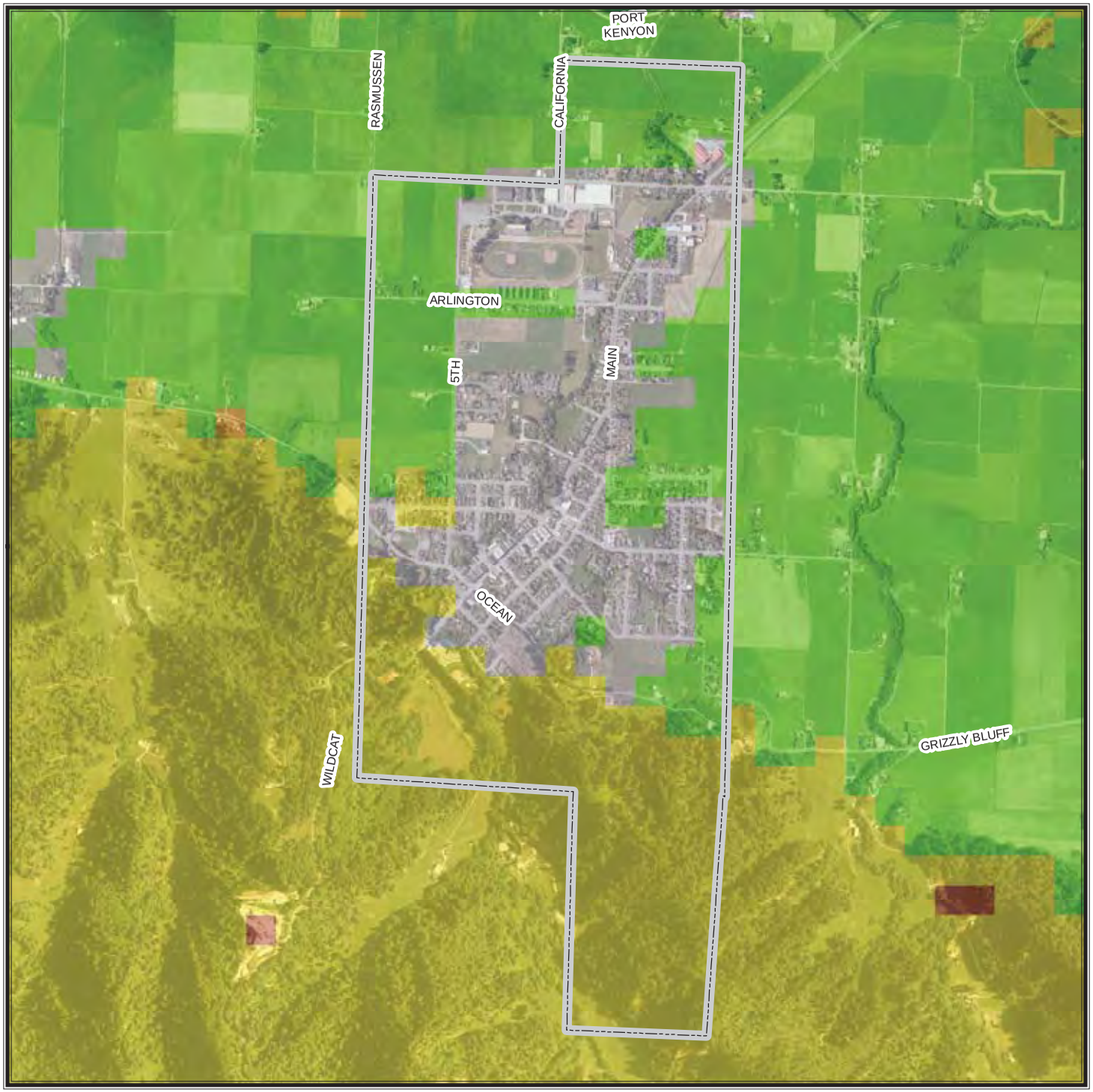
TETRA TECH





CITY OF FERNDALE

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CHAPTER 8.
CITY OF FORTUNA UPDATE ANNEX

8.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Kevin Carter, Engineering Technician III
City of Fortuna
621 11th Street
Fortuna, CA 95540
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Alternate Point of Contact

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City of Fortuna
621 11th Street
Fortuna, CA 95540
Telephone: 707-725-7600
e-mail Address: lshorey@ci.fortuna.ca.us

8.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**January 1906. The City of Fortuna is a chartered city.
- **Current Population—**11,885 as of January 1, 2013
- **Population Growth—**According to data from the California Department of Finance, the City of Fortuna had a moderate 13.2 percent increase in population from 2000 to 2013. The population growth was 0.3 percent from 2012 to 2013.
- **Location and Description—**The City of Fortuna is located 7 miles from the Pacific coast within the Eel River Valley of Humboldt County in Northwest California. The community is affected by coastal weather patterns with the Pacific Ocean to the west. Fortuna is served by Highway 101, which provides direct access to San Francisco 253 miles to the south and to Eureka (County Seat) 15 miles to the north. The western terminus of Highway 36 intersects Highway 101 one-mile south of the city limits. Fortuna is the gateway to the Sequoia Giant Redwood forests of Northern California. The City is surrounded by National, State and County Redwood parks.
- **Brief History—**Fortuna, which was first platted in 1875, was originally known to the residents as Springville. When the first post office was built in the town, the name Springville was already being used by another jurisdiction, so the town was referred to as "Slide" in reference to landslides that had occurred in the area. In 1884, the citizens petitioned the California Legislature to change the name of the city to Fortuna, meaning "good fortune," because of its ideal location close to the redwood forests, Eel River Valley and the Pacific Ocean. The request was granted in 1888.

  The timber industry played a major role in the development of Fortuna. From 1865—1930 timber harvesting, milling and shipping was the major source of employment in the area. At one point during this period, there were eight lumber mills in the area, each operating their own rail system.

  In addition to being known for its history with the timber and lumber industry and proximity to the redwood forests, the area was widely known for its excellent agricultural and resource lands, which provided fisheries, berries and vegetable crops. Additionally many apples were

produced and dried in the area. Agricultural and natural resource industries continue to be important to the economy of Fortuna.

- **Climate—**Fortuna enjoys a relatively mild climate with average daily temperatures ranging from the 40s into the mid-70s. In the winter months temperatures usually drop into the 30s and can reach into the 90s during July and August. Annual precipitation is around 40 inches, with substantially less frequent rainfall in the late summer months.
- **Governing Body Format—**The City of Fortuna is a Council/Manger form of government. The five-member Council sets policy and gives direction on all matters concerning the City operations. The City Manager is responsible for carrying out Council policy, directing City staff, and overseeing the day-to-day operations of the City.
- **Development Trends—**Pursuant with California state law, the City of Fortuna engages in long-range planning efforts. The current guiding document, *Fortuna General Plan 2030*, was adopted by the City Council in October of 2010. According to this plan, the community is interested in protecting the small-town character of Fortuna. However, the City has experienced relatively high population growth. Additionally, the community has expressed a desire for greater employment and shopping opportunities within the City. These two factors could lead to additional development within the City.

  The plan also notes that most of the favorable, stable ground in the City has already been developed. This may lead to future development occurring in less desirable areas, such as those with steep slopes. Several of the policies identified in the plan address the need to encourage development to occur as infill or on underutilized properties.

8.3 ENERGY PROFILE

8.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Pacific Gas & Electric Company (PG&E)
- Natural Gas—Pacific Gas & Electric Company (PG&E)

8.3.2 Local Energy Demand

Government operations use four primary energy sources: electricity, wood, propane, and natural gas. Each is described below (no energy demand information is provided for transportation fuels).

The following discussion breaks down energy usage by type and by residential and non-residential sectors. The non-residential sector includes primarily commercial and municipal usages.

The data presented for natural gas and electricity have been provided by PG&E and are for the calendar year 2012 and typically compare consumption during that year to the prior year (2011) as a year-over-year change. A second comparison is to PG&E's base line year, 2005. In this way, one can see both a long term (2005-2008) trend and a short term (2011) change in consumption.

Overall consumption of energy from natural gas and electricity in 2012 was 497,327 MMBtu. This figure represents an overall 1% increase in consumption since 2005 and a year-over-year increase from 2011 to 2012 of 2.1%. In 2012, natural gas comprised 64% of the total energy consumed and electric was 36%.

Electricity

Fortuna consumed 52,980,246 kWh of electricity in 2012 as compared to 53,025,922 kWh in 2005. This amounts to a 0.1% decrease over that time span. The year-over-year change was a decrease of 0.5%.

Non-Residential Sector

Fifty percent of non-residential energy consumption was derived from electricity during 2012. There were five segments that comprised 80% of non-residential consumption led by retail, hospitality, healthcare, schools and offices. Energy usage in this sector has decreased by 18.9% since 2005.

Residential Sector

Twenty-nine percent of residential energy consumption was derived from electricity during 2012. The average electrical use per single-family and multi-family residential customer was 483 and 292 kWh per month respectively. Electrical usage has gone up by 21.2% since 2005.

Wood

Fortuna consumes wood in the residential sector, primarily for heating. On average, there are approximately 850 households using a total of over 2000 cords of wood per year.

Propane

Fortuna consumes propane in the residential sector, primarily for heating and cooking. About 400 households use propane gas for an average total of approximately 389,000 gallons per year.

Natural Gas

Fortuna consumed 3,165,587 therms of natural gas in 2012 as compared to 3,115,140 therms in 2005, a 1.6% increase. Between 2011 and 2012, there was a 2.9% decrease in consumption.

Non-Residential Sector

Fifty percent of non-residential energy consumption was derived from natural gas during 2012. There were five segments that comprised 80% of non-residential consumption led by retail, hospitality, healthcare, schools and offices. Natural gas usage has decreased by 7.5% since 2005.

Residential Sector

Seventy-one percent of residential energy consumption was derived from natural gas during 2012. The average natural gas use per single-family and multi-family residential customer was 42 and 46 therms per month respectively. Natural gas usage has increased by 5.1% since 2005.

8.3.3 Community Key Assets Energy Profile

TABLE 8-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: Wastewater Treatment Plant										
Wastewater Treatment		Electricity					Diesel		Y	N
Key Asset #2: Main Water Well Site/Corrosion Control Facility										
Water		Electricity				175 kW	Diesel		Y	N
Key Asset #3: City Hall										
City Management		Electricity								
Key Asset #4: Strongs Creek Lift Station										
Wastewater		Electricity				125 kW	Diesel		Y	N
Key Asset #5: Kenmar Pump Station										
Water		Electricity					Diesel			Y

The City of Fortuna has identified five key assets for its energy profile:

- Wastewater Treatment Facility
- Main Water Well Site/Corrosion Control Facility
- City Hall
- Strong Creek Sewer Lift Station
- Kenmar Water Pump Station

Table 8-1 summarizes the energy profile for each key asset.

8.3.4 Key Asset Energy Consumption and Backup Generator Analysis

TABLE 8-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: Wastewater Treatment Plant								
Generator Capacity Analysis: _____							Diesel	
Key Asset #2: Main Water Well Site/Corrosion Control Facility								
Generator Capacity Analysis: _____						175	Diesel	
Key Asset #3: City Hall								
Generator Capacity Analysis: _____								
Key Asset #4: Strongs Creek Lift Station								
Generator Capacity Analysis: _____						125	Diesel	
Key Asset #5: Kenmar Pump Station								
Generator Capacity Analysis: _____							Diesel	

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 8-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

8.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 8-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Weather/Flood	DR-677	1/25/1983	Localized Flooding on Fortuna Blvd. No known damage assessments.
Earthquake	DR-943	4/25/1992	89-106 homes damaged @ $1.2 million estimate 41 commercial buildings @ $1.6 million estimate Public facilities @ $1.0 million estimate. $3.8 to $4.0 million total damage in Fortuna
Severe Weather/Flood	DR-1046	1/9/1995	Streets Flooded—minor damage. $1.3 million countywide
Windstorm/Flood	N/A	12-13-1995	1,000 homes without power

Table 8-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 0
- Number of FEMA Identified Severe Repetitive Loss Properties: 0
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 0

8.5 HAZARD RISK RANKING

TABLE 8-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Severe Weather	42
2	Earthquake	33
3	Flood	27
4	Wildfire	12
5	Dam Failure	8
6	Drought	6
7	Other Hazards of Concern	3
8	Landslide	0
9	Tsunami	0

Table 8-4 presents the ranking of the hazards of concern.

8.6 CAPABILITY ASSESSMENT

8.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 8-5.

TABLE 8-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** 2010 Calif. Bldg. Code	Y	N	N	Y
Zoning ***Comments:*** Zoning Ordinance: Ord. 2011-692	Y	N	N	Y
Subdivisions ***Comments:*** Subdivision Ordinance: Ord. 79-426	Y	N	N	N
Stormwater Management	Y	N	N	N
Post Disaster Recovery	N	N	N	N
Real Estate Disclosure ***Comments:*** CA State Civil Code 1102	N	N	Y	Y
Growth Management	Y	N	N	Y
Site Plan Review	Y	N	N	N
Public Health and Safety	N	N	N	N
Environmental Protection	N	N	N	N
Energy Code	N	N	N	N
Planning Documents				
General or Comprehensive Plan ***Comments:*** General plan adopted per ord. 2010-46	Y	N	N	Y
Floodplain or Basin Plan	N	N	N	N
Stormwater Plan ***Comments:*** Stormwater Management Plan: Ord. 2006-661	Y	N	N	N
Capital Improvement Plan ***Comments:*** All Public infrastructure addressed in plan: Updated Annually	Y	N	N	N
Habitat Conservation Plan	Y	N	N	N
Economic Development Plan ***Comments:*** Successor Agency	Y	N	N	N

TABLE 8-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Shoreline Management Plan	N	N	N	N
Community Wildfire Protection Plan	N	N	N	N
General Plan Energy Conservation Element or Energy Specific Plan ***Comments:*** General plan Element 5, adopted 2010	Y	N	N	N
Climate Action Plan or Climate Adaptation Strategy	N	N	N	N
Response/Recovery Planning				
Comprehensive Emergency Management Plan	Y	N	N	N
Threat and Hazard Identification and Risk Assessment	N	N	N	N
Terrorism Plan	N	N	N	N
Post-Disaster Recovery Plan	Y	N	N	N
Continuity of Operations Plan	N	N	N	N
Public Health Plans	N	N	N	N

8.6.2 Administrative and Technical Capability

TABLE 8-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	Community Development Department/Planning & Engineering Divisions/Senior & Assistant Planner and City Engineer
Engineers or professionals trained in building or infrastructure construction practices	Y	Community Development Department & Public Works Department/City Engineer & Deputy Directors of Public Works
Planners or engineers with an understanding of natural hazards	Y	Community Development Department/Planning & Engineering Divisions/Senior & Assistant Planner and City Engineer
Planners or engineers with an understanding of energy resilience or alternative energy technology	N	No current program for Alternative Energy.
Staff with training in benefit/cost analysis	Y	City Manager/Director of Finance/City Engineer
Surveyors	Y	Consultant City Land Surveyor & In-house surveying capabilities via Community Development Department/Engineering Division/City Engineer & Engineering Technician
Personnel skilled or trained in GIS applications	Y	Engineering Division/Engineering Technician
Scientist familiar with natural hazards in local area	Y	Available as required through consulting services.
Emergency manager	Y	Chief of Police
Grant writers	Y	City Manager/Senior Planner/City Engineer/Consultants

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 8-6.

8.6.3 Fiscal Capability

TABLE 8-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	No
State Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	Yes

The assessment of the jurisdiction's fiscal capabilities is presented in Table 8-7.

8.6.4 National Flood Insurance Program Compliance

TABLE 8-8. NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE	
What department is responsible for floodplain management in your community?	Engineering Division
Who is your community's floodplain administrator (department/position)?	City Engineer/ Engineering Div.
Do you have any certified floodplain managers on staff in your community?	Yes / City Engineer
What is the date of adoption of your flood damage prevention ordinance?	Ordinance 2008-675
When was the most recent community assistance visit or community assistance contact?	June 3rd, 2008
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	No
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 8-8.

8.6.5 Energy Resilience Capability

TABLE 8-9. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	No
Have you performed an energy assurance gap analysis for your community?	No
Have you completed a vulnerability assessment of power sources to each key asset?	No
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	Yes
Are emergency backup generators tested on a regular basis?	Yes
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Yes
Have you established a working relationship with your community's energy service providers?	Yes
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	Yes
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	No

Energy resiliency capabilities are presented in Table 8-9.

8.6.6 Community Mitigation Program Classifications

TABLE 8-10. COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule	Yes	9-9	--
Public Protection	5/8B	5/8B	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	NA	NA	NA

Classifications under various community mitigation programs are presented in Table 8-10.

8.7 HAZARD MITIGATION ACTION PLAN

Table 8-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 8-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
FO-1 –Localized detention basin @ Strongs Creek Headwaters. CIP 9603							
Existing	Severe Storms/Flooding	2,5	City	$173,000	Bond financing /development impact fees/PDM	Short	Yes
FO-2 –Construct flap gate valves at various locations throughout the City							
Existing	Severe Storms/Flooding	2,5	City	$150,000	Bond/PDM	Short	Yes
FO-3—Increase channel capacity at localized regions of repetitive flooding incidents. CIP 9704							
Existing	Severe Storms/Flooding	2,5	City	$500,000	Bond/PDM	Short	Yes
FO-4—Stabilize hillsides from mass landslide movements at or adjacent to street rights of way.							
Existing	Severe Storms/ Landslides	4,5	City	$426,000	Street CIP funds/PDM	Short	Yes
FO-5—New 48" storm drain pipe (3rd St. at Stockyard) . CIP 9702							
New	Severe Storms/Flooding	2,5	City	$110,000	Bond/PDM	Short	Yes
FO-6—Detention basin on Mill Creek at APN 202-411-002. CIP 9804							
New	Severe Storms/Flooding	2,5	City	$170,000	Bond/PDM	Short	Yes
FO-7 –Elevate control panels at Water Supply facility above 100-year Flood Elevation. CIP							
Existing	Severe Storms/Flooding	2,5	City	$30,000	Bond/PDM	Short	No
FO-8 –Circle Levee @ Water supply/Treatment Facility above 100-year Flood Elevation							
Existing	Severe Storms/Flooding	2,5	City	$150,000	Bond/PDM	Short	Yes
FO-9—Seismic Retrofit of at grade water storage tanks (250,000 and 1 Mill Gallons)							
Existing	Earthquake/ Wildfire	1,3	City	$300,000	Bond/PDM	Short	Yes
FO-10—Dinsmore Drive flood control. CIP 9502							
Existing	Severe Storms/Flooding	2,5	City	$309,000	Bond/PDM	Short	Yes

TABLE 8-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
FO-11—P Street (12th to 14th) bank stabilization. CIP 9656							
Existing	Earthquake/ Wildfire/ Landslide	1,3,4	City	$250,000	PDM	Short	No
FO-12—Continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New and Existing	Flood	O-2, O-3, O-8, O-9	Engineering Division	Low	General Fund	Ongoing	Yes
FO-13—Incorporate this Hazard Mitigation Plan as part of the General Plan Safety Element. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	All Objectives	City Council	Low	General Fund	Short Term	No

8.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 8-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
FO1	2	High	High	Yes	Yes	No	Med
FO2	2	Med	Med	Yes	Yes	No	Med
FO3	2	Med	Med	Yes	Yes	No	Med
FO4	2	High	High	Yes	Yes	No	High
FO5	2	Med	Med	Yes	Yes	No	Med
FO6	2	Med	Med	Yes	Yes	No	Med
FO7	2	High	Low	Yes	Yes	Yes	High
FO8	2	High	High	Yes	Yes	No	Med
FO9	2	High	High	Yes	Yes	No	High
FO10	2	Med	Med	Yes	Yes	No	Med
FO11	3	High	Med	Yes	Yes	No	High
FO-12	4	Medium	Low	Yes	No	Yes	High
FO-13	12	Medium	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

Table 8-12 identifies the priority for each initiative.

8.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 8-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	FO13					
Drought	FO13					
Earthquake	FO9, FO11, FO13	FO9, FO11		FO9, FO11	FO9, FO11	FO9, FO11
Flood	FO12, FO13	FO1, FO2, FO5, FO7, FO8, FO12	FO12	FO1, FO2, FO3, FO5, FO6, FO10, FO12	FO7, FO8, FO10, FO11, FO12	FO1, FO2, FO3, FO10, FO11, FO12
Landslide	FO13	FO4, FO11		FO4, FO11	FO11	FO4, FO11
Severe Weather	FO13	FO1, FO2, FO5, FO7, FO8		FO1, FO2, FO3, FO5, FO6, FO10	FO7, FO8, FO10, FO11	FO1, FO2, FO3, FO10, FO11
Tsunami	FO13	--	--	--	--	--
Wildfire	FO13	FO9, FO11		FO9, FO11	FO9, FO11	FO9, FO11

a. See Chapter 1 for description of mitigation types.

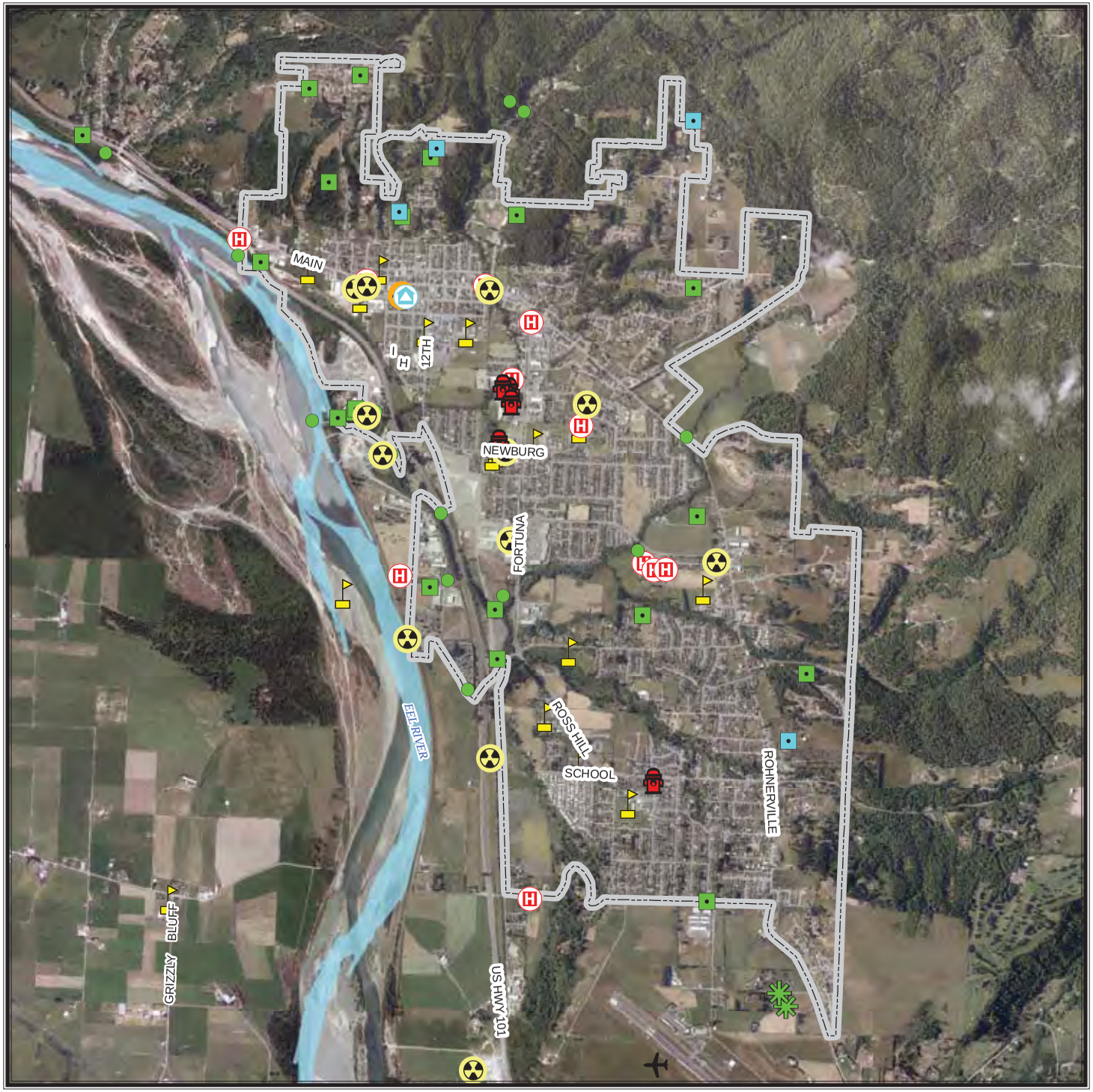
Table 8-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

8.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 8-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
FO-1	X			Protect City's major water supply storage from landslides and earthquake damage. CIP Project #s 9124 & 9327
FO-2		X		Localized Detention Basin @ Strongs Creek headwaters. CIP Project #9603
FO-3			X	Localized Detention Basin @ Rohner Creek headwaters. CIP Project #9602
FO-4		X		Construct flap gate valves at various locations throughout City to prevent backwater inundation from major creek channel high water conditions.
FO-5		X		Increase channel capacity through bank elevation improvements at localized regions of repetitive flooding incidents. CIP Project #9704
FO-6			X	Vegetation clearing of existing drainage courses including ditches and creek channels. CIP Project 9709
FO-7		X		Stabilize hillsides from mass landslide movements at or adjacent to street right-of-ways.
FO-8	X			Rohner Creek by-pass. CIP Project #9601
FO-9	X			Rohner Creek widening. CIP Project #9600
FO-10		X		New 48" storm drain at Third St. @ Stockyard. CIP Project #9702.
FO-11		X		Detention Basin on Mill Creek. CIP Project #9804
FO-12			X	Detention basin cleaning. CIP Project #9601
FO-13		X		Dinsmore Drive flood control. CIP Project #9502
FO-14	X			Elevate emergency generator @ water supply/treatment facility above 100 year flood elev.
FO-15			X	Strong's Creek bypass @ US 101 box culvert to Riverwalk Detention Basin.
FO-16		X		Circle levee @ water supply/treatment facility above 100 year flood elev.
FO-17		X		Seismic retrofit of at-grade water storage tanks (250,000 & 1 million gallons).
FO-18		X		Now initiative FO12

Table 8-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.



CITY OF FORTUNA

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

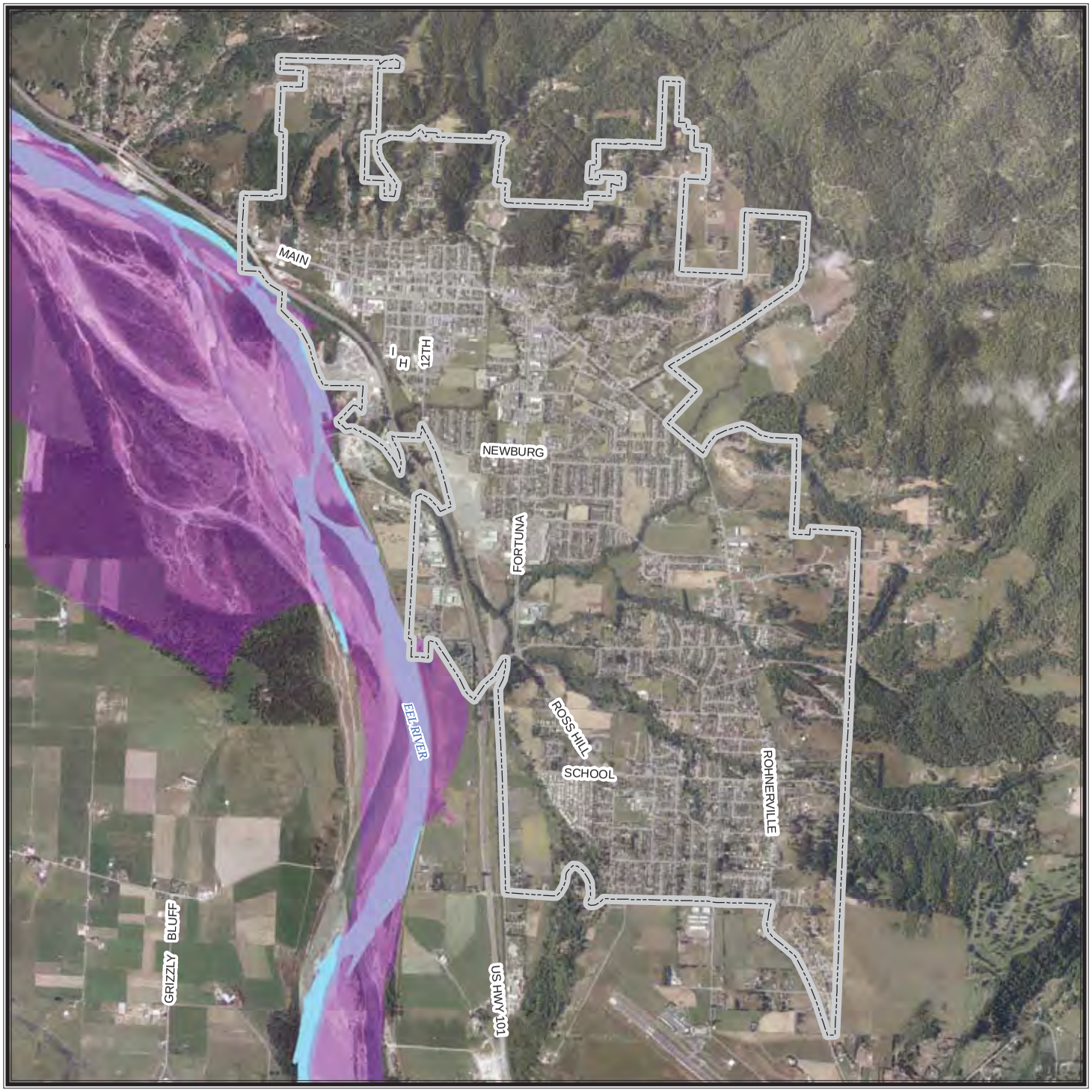
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Dam Failure Inundation Areas

Scott Dam

Scott Dam inundation area

Dam failure inundation area data from 2007 provided by California Emergeny Management Agency Dam Safety Program.

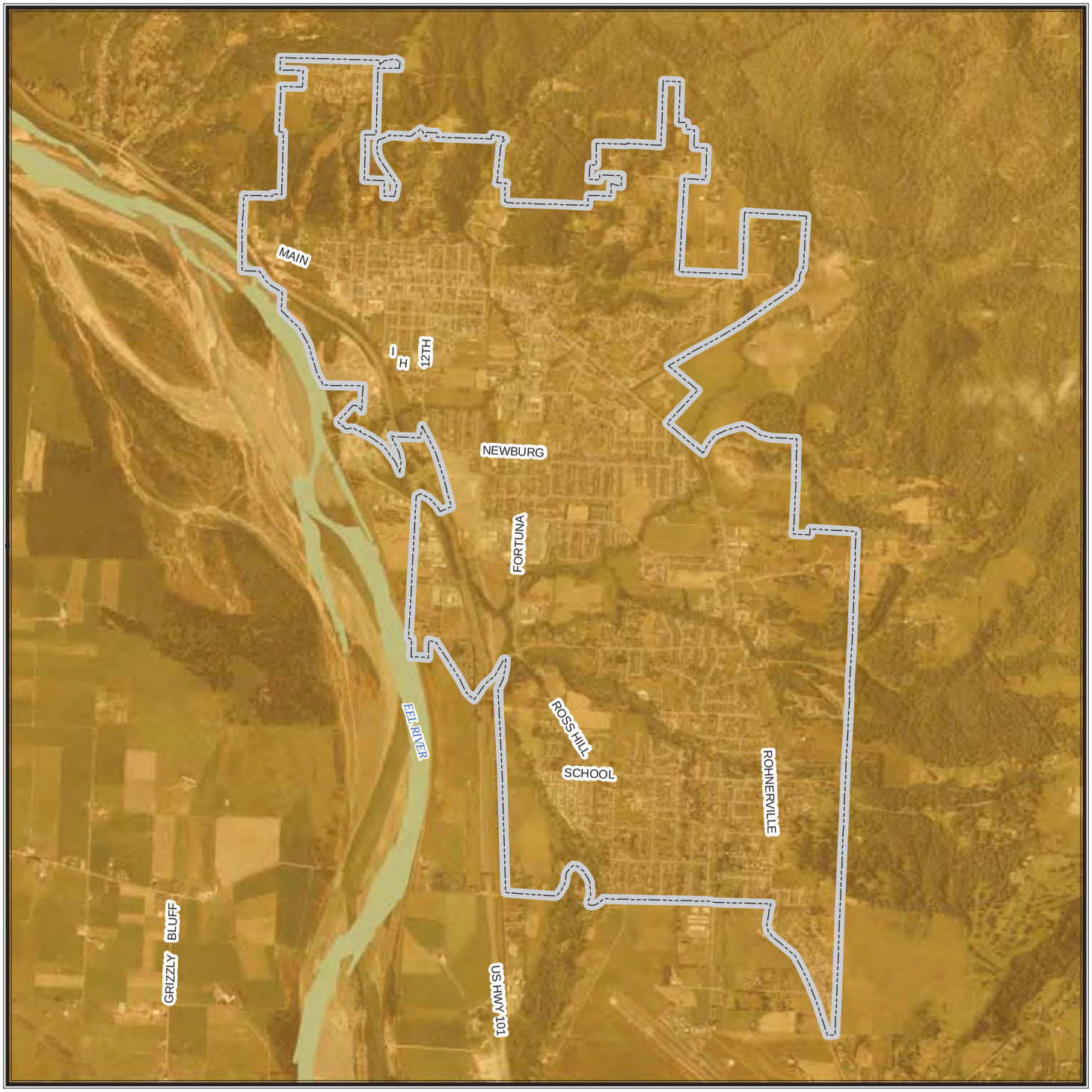
These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH

CITY OF FORUNTA

Quaternanry & Younger Earthquake Faults

Proximate Faults

Little Salmon Fault Zone

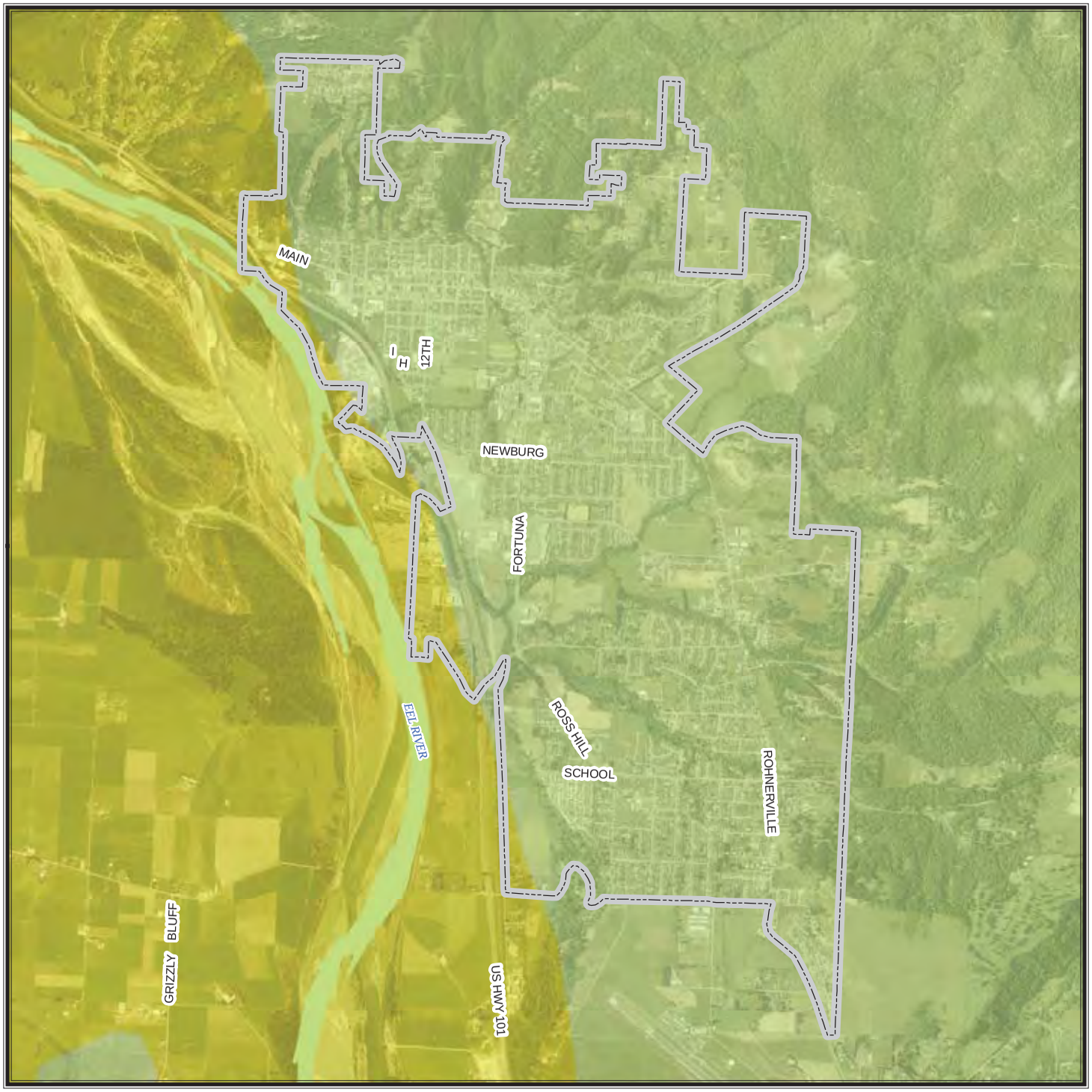
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

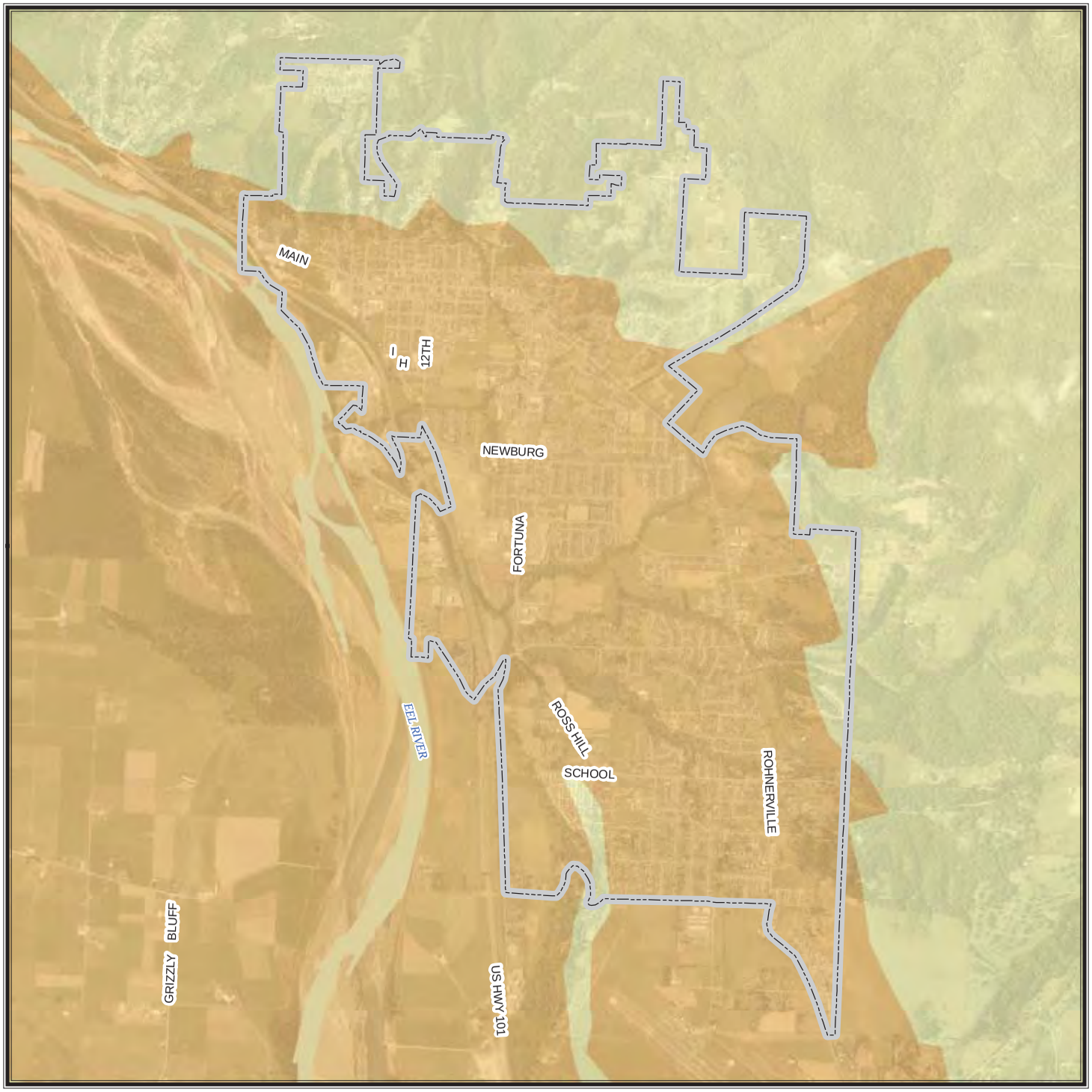
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

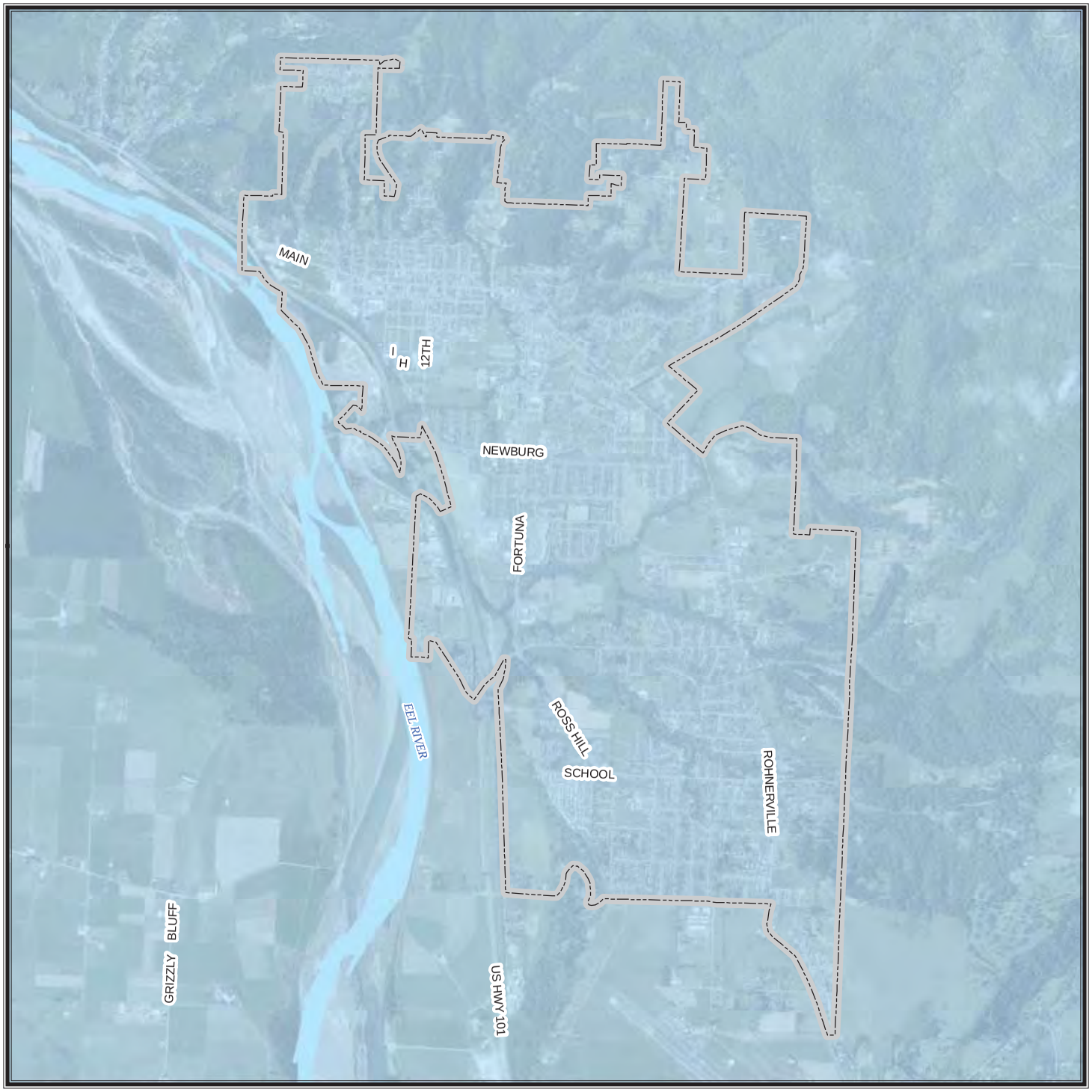
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

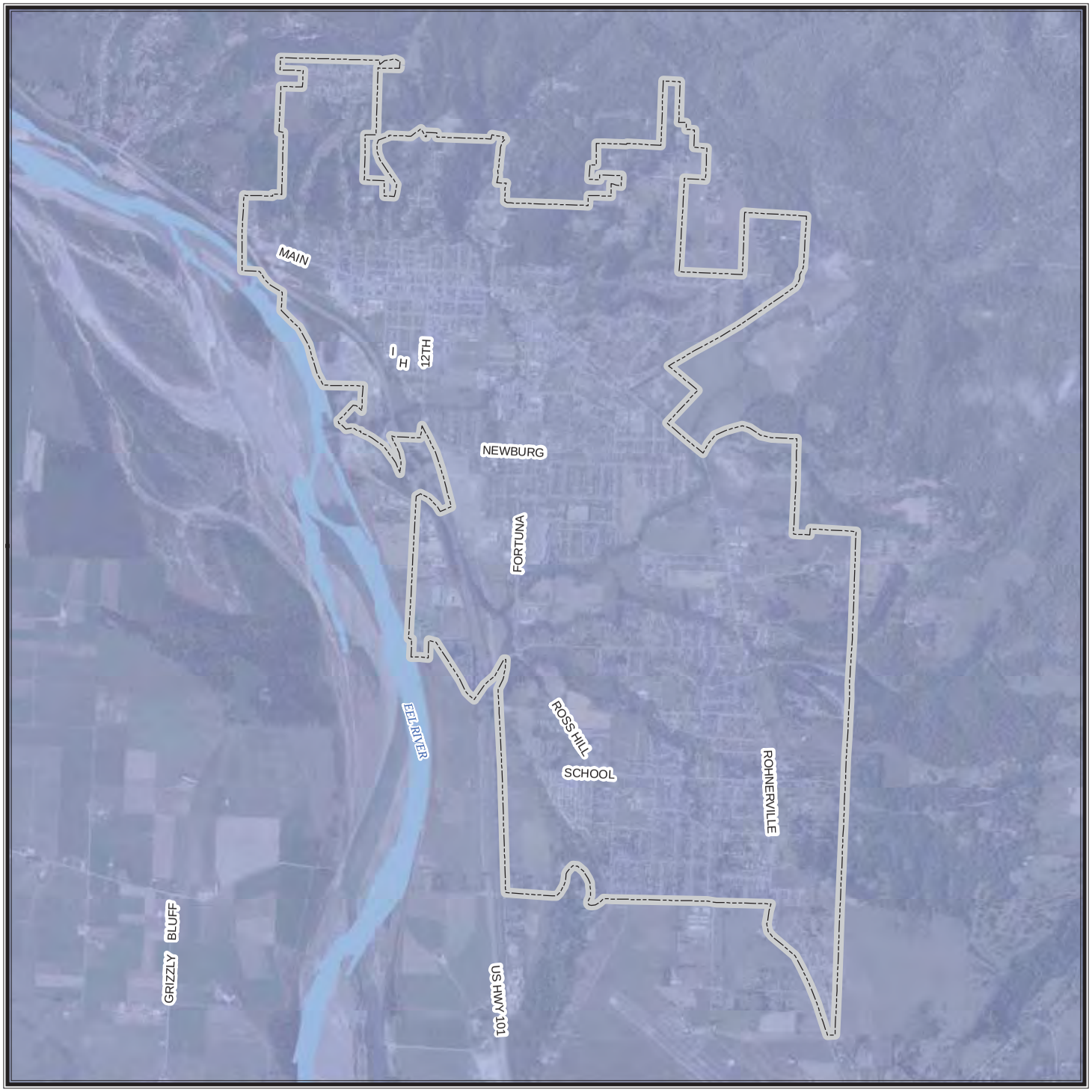
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

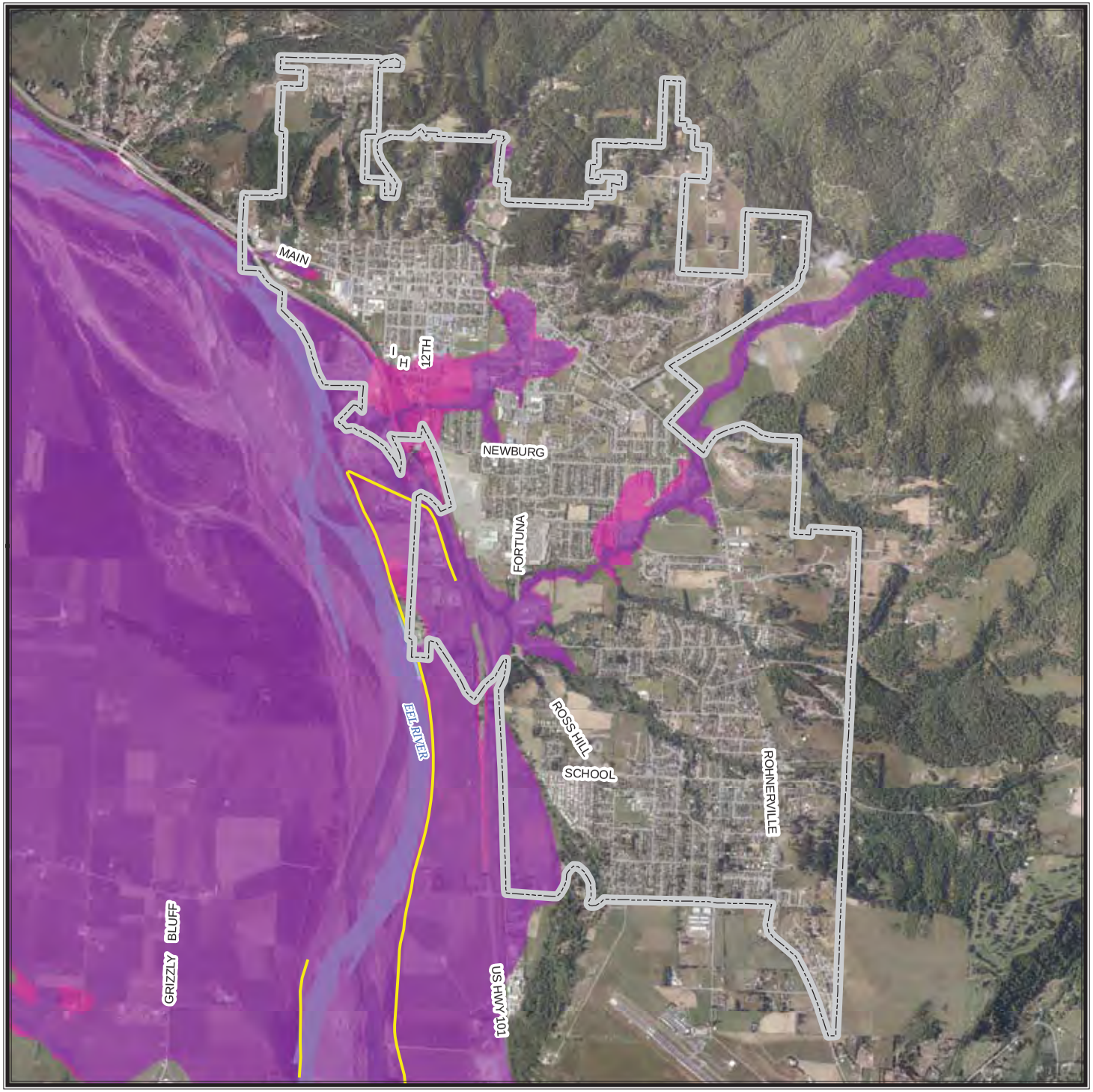
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

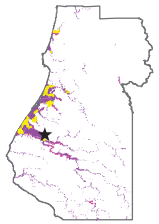
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

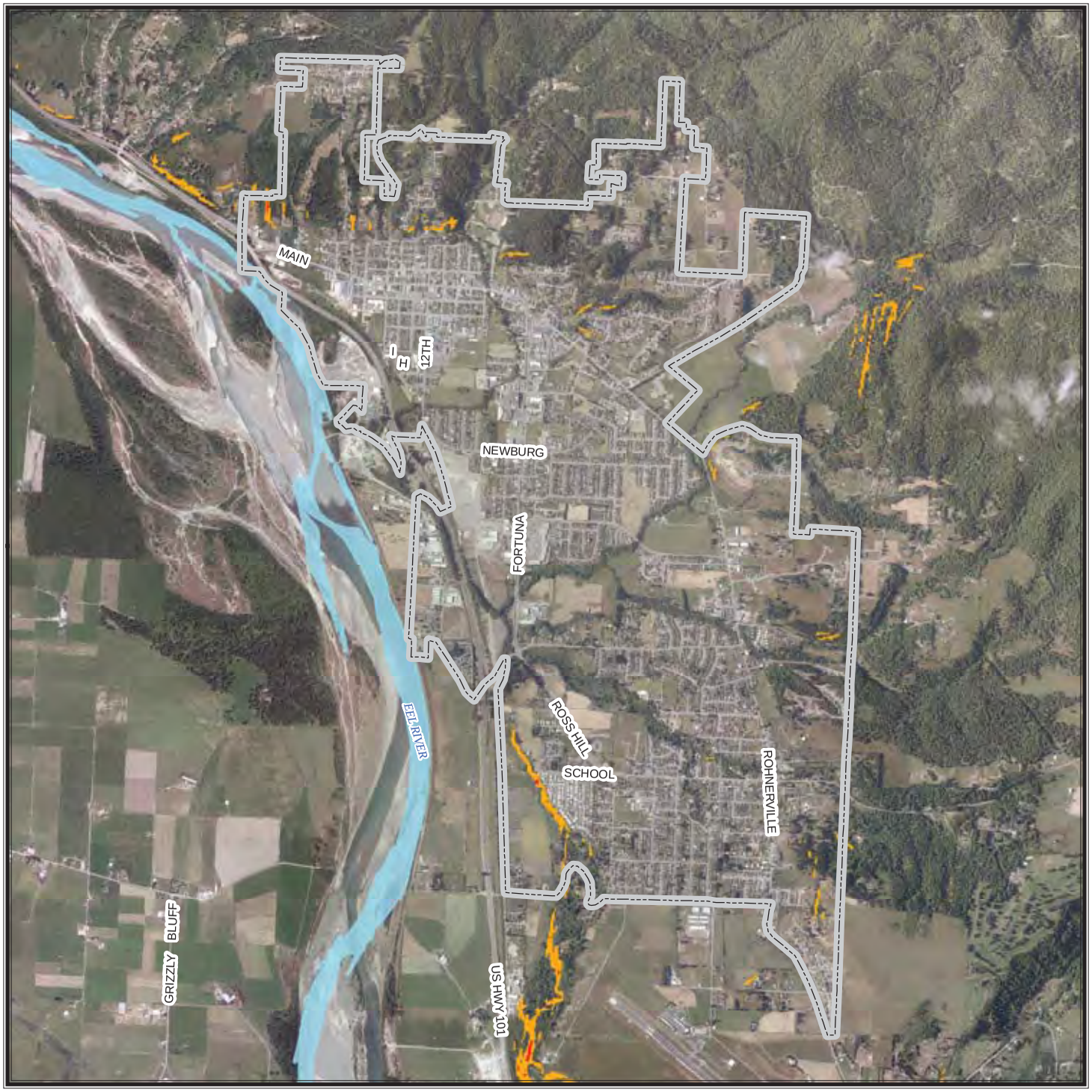
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH





CITY OF FORTUNA

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

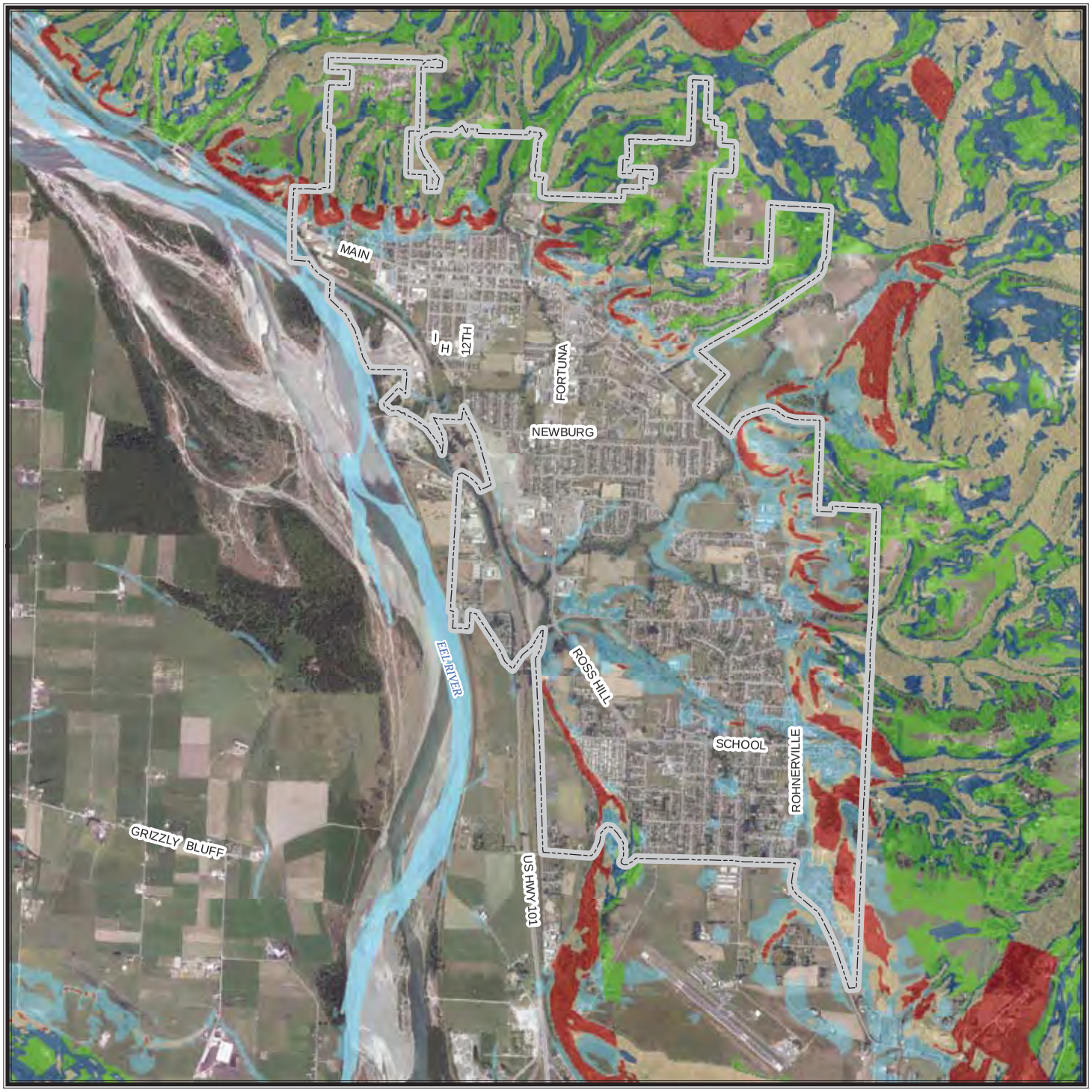
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH

CITY OF FORTUNA

Tsunami Inundation Areas

Tsunami inundation area

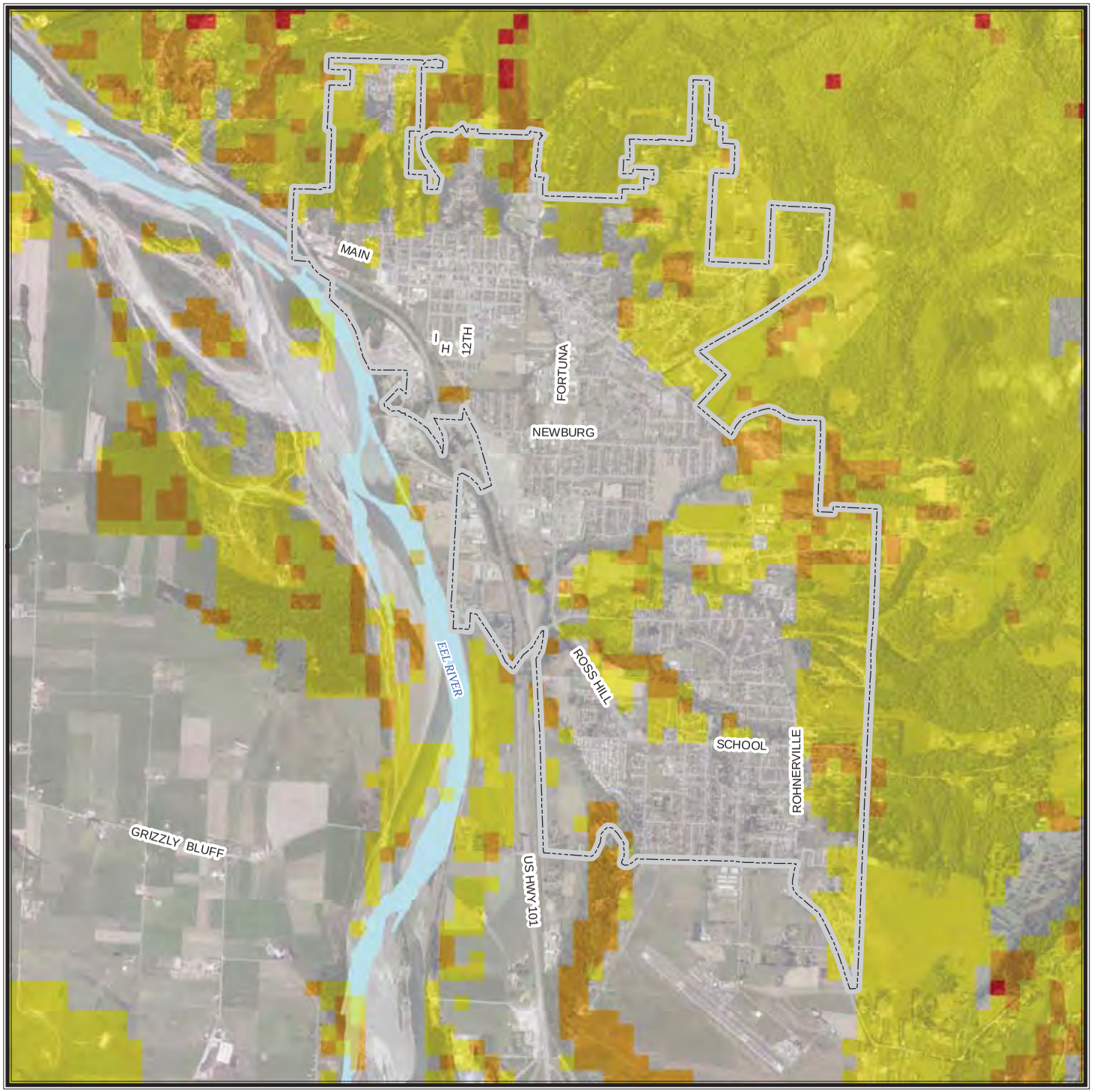
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

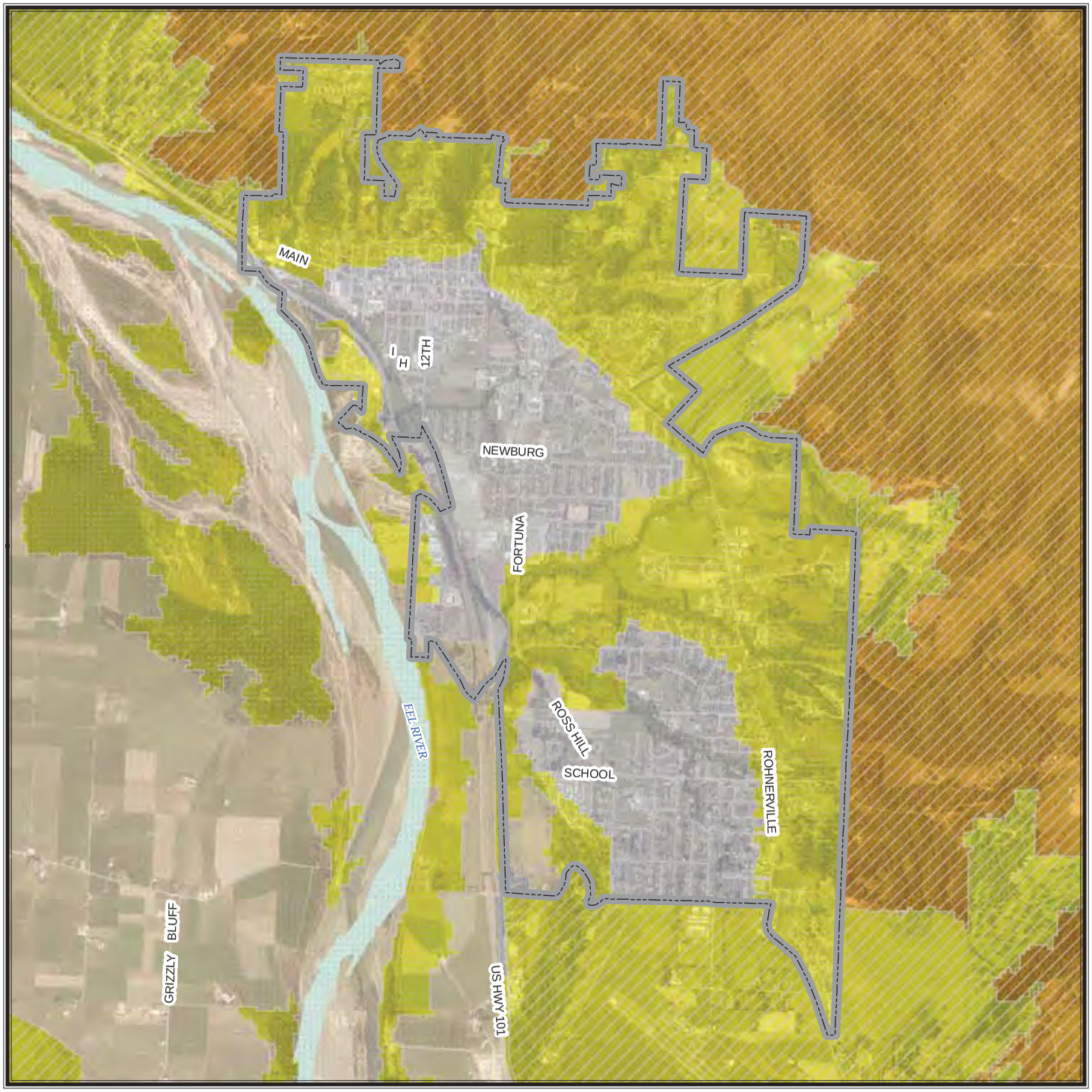
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF FORTUNA

Fire Hazard Severity Class

Hazard Class

- **Very High**
- **High**
- **Moderate**
- **Non-Wildland/Non-Urban**
- **Urban Unzoned**

Responsibility Areas

- **Federal (FRA)**
- **Local (LRA)**
- **State (SRA)**
- **None**

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH

CITY OF FORTUNA

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH

CITY OF FORTUNA

Fire Perimeters

Year of Fire

- **1908 - 1920**
- **1921 - 1940**
- **1941 - 1960**
- **1961 - 1980**
- **1981 - 2000**
- **2001 - 2012**

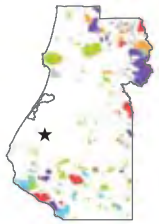
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

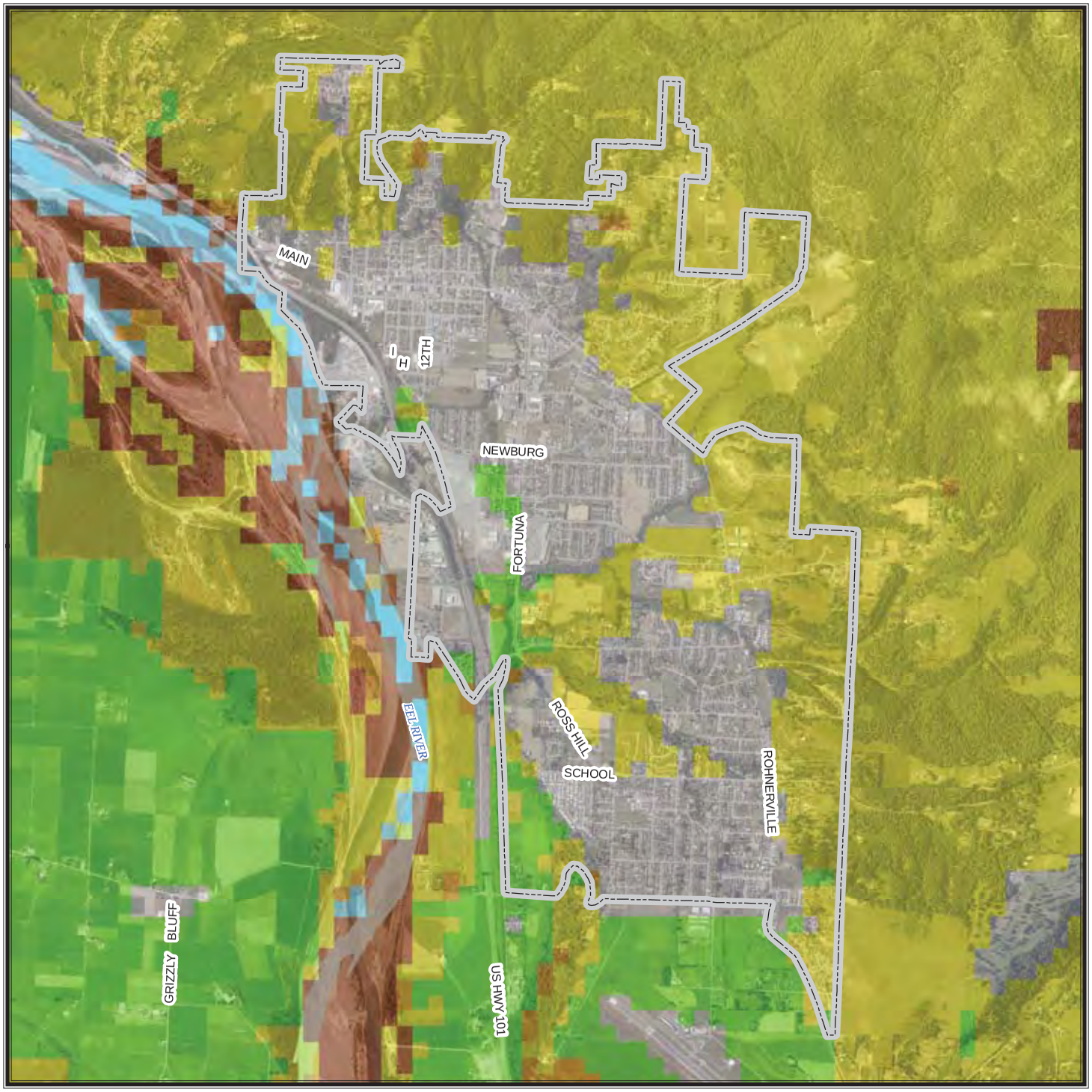
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH





CITY OF FORTUNA

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 Miles

N W E S

TETRA TECH

CHAPTER 9.
CITY OF RIO DELL UPDATE ANNEX

9.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

City Manager
City of Rio Dell
675 Wildwood Ave,
Rio Dell, CA 95562
Telephone: (707) 764-3532
e-mail Address: cm@riodellcity.com

Alternate Point of Contact

Community Development Director
City of Rio Dell
675 Wildwood Ave,
Rio Dell, CA 95562
Telephone: (707) 764-3532
e-mail Address: kcaldwell@riodellcity.com

9.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**February 1965. Rio Dell was incorporated as a General Law city. The City was not granted a separate charter, but operates under the general laws of the State of California.
- **Current Population—**3,363 as of January 1, 2013.
- **Population Growth—**Based on data available from the State of California Department of Finance, the population of Rio Dell grew by 5.9 percent between 2000 and 2013. Population growth was 0.4 percent from 2012 to 2013.
- **Location and Description—**The City of Rio Dell is located in Humboldt County, California, approximately 25 miles south of Eureka, along Highway 101 within the Eel River Valley. The city is approximately 2.4 square miles and is nestled within the redwood forests of Northern California.
- **Brief History—**In the 1870s Lorenzo Painter settled in what is now known as Rio Dell. He started a friendly farming community, which he named Eagle Prairie. Over the years three separate small community areas evolved that was popularly named Wildwood (which is now downtown Rio Dell, Belleview (now a major area and avenue northwest of the center of town) and Eagle Prairie (now the Pacific Avenue area west of the center of town). The City was incorporated in 1965 and the three areas combined into the single City of Rio Dell.

  The City, like most of the region, was intertwined with the timber industry. Tough economic times fell upon the area when in the 1970s a highway bypass was built around the City. In recent years the City has been pursuing strategies to revitalize the economy and the community. Rio Dell has also recently completed updates to several elements of the general plan.
- **Climate—**Rio Dell enjoys a mild climate with average summertime temperatures of 67 degrees. During winter months temperatures tend to be in the 40s. Annual average precipitation is about 48 inches. The wettest month of the year is typically January, with an average rainfall of 8.45 inches. Their tends to be less precipitation during the summer months.

- **Governing Body Format—**Rio Dell has a City Council/City Manager form of government. The City Council sets policy while the City Manager carries out the day-to-day business of the City. The Mayor is selected by the City Council and serves as the presiding officer at city council meetings and as the official head of the City for legislative and ceremonial purposes.
- **Development Trends—**In recent year the City of Rio Dell has invested in efforts toward revitalization. One such project involved substantial new development in the historic downtown area. Approximately 96 new, single-family construction permits were applied for between 2000 and 2011. Additionally, the City has taken on several infrastructure improvement projects including significant upgrades to the water and wastewater utilities and street re-paving and landscaping.

  Pursuant with California state law, the City of Rio Dell engages in long-range planning. Several updates to elements of the general plan have been made in recent years. The Conservation, Conservation and Circulation elements were updated in 2013, the Land Use element in 2008 and the Housing element in 2011. The Noise element was last updated in 2001 and the Safety Element was adopted in 1975.

9.3 ENERGY PROFILE

9.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Pacific Gas & Electric Company (PG&E)
- Propane—Propane for city operations is obtained from Sequoia Gas
- Liquid Fuel—Renner Petroleum (gas/diesel); Shell Oil (gas/diesel; Moore Fuel (gas/diesel)
- Natural Gas—Pacific Gas & Electric Company (PG&E)

9.3.2 Local Energy Demand

Government operations use five primary energy sources: electricity, natural gas, wood, propane, and solar. Each is described below (no energy demand information is provided for transportation fuels).

Electricity

Rio Dell consumed 16,165,021 kWh of electricity in 2012 as compared to 11,137,153 kWh in 2005. This amounts to a 45.1% increase over that time span. The year-over-year change was an increase of 0.1%.

Non-Residential Sector

Sixty-five percent of electrical consumption was derived from the non-residential sector in 2012. There were six segments that comprised about 80% of this consumption: retail, hospitality, water & wastewater treatment, schools, offices, and manufacturing & transportation.

Residential Sector

Thirty-eight percent of electrical consumption was from the residential sector. The average electrical use per single-family and multi-family residential customer was 644 and 296 kWh per month respectively. Electrical usage has gone up by 56.7% since 2005.

Natural Gas

Rio Dell consumed 663,892 therms of natural gas in 2012 as compared to 612,531 therms in 2005, an 8.4% increase. Between 2011 and 2012, there was a 3.2% decrease in consumption.

Non Residential Sector

Thirty-five percent of non-residential energy consumption was derived from natural gas during 2012. There were six segments that comprised almost 80% of non-residential consumption led by retail, hospitality, water & wastewater treatment, schools, offices, and manufacturing & transportation. Natural gas usage has decreased by 7.4% since 2005.

Residential Sector

Sixty-two percent of residential energy consumption was derived from natural gas during 2012. The average natural gas use per single-family and multi-family residential customer was 39 and 30 therms per month respectively. Natural gas usage has increased by 8.5% since 2005.

Wood

Rio Dell consumes wood in the residential sector, primarily for heating. On average, there are approximately 240 households using a total of approximately 600 cords of wood per year.

Propane

Rio Dell consumes propane in the residential sector, primarily for heating and cooking. About 120 households use propane gas for an average total of 109,000 gallons per year.

Solar

As of 2012, there were 2 kW of solar electricity being generated from 1 residential site that is connected to the PG&E grid. The City of Rio Dell is planning for a major remodel of the existing City Hall, which will likely include a PV solar system generating 40.0 kw for City Hall.

9.3.3 Agreements and Contracts

The City of Rio Dell is in the process of developing an agreement with the owner of the Shell Oil Service Station on Wildwood Ave, Rio Dell, Ca. for first priority use of fuel at the business in the event of a power outage or natural disaster. This priority extends to the Rio Dell City Police Department, Public Works Department for vehicles and diesel generators to power the City's water and wastewater facilities, and to the Rio Dell Volunteer Fire District.

9.3.4 Community Key Assets Energy Profile

The City of Rio Dell has identified 12 key assets for its energy profile:

- City Corporation Yard
- Water Infiltration Gallery
- Dinsmore Water Pumps
- City Police Department/City Hall
- Water Plant
- Wastewater Sludge Dryer
- Lift Station #2
- Lift Station #1
- Metropolitan Rd. S/O Hwy 101
- City Park, Davis Street
- Sewage treatment Plant, Hilltop Drive
- Water pumping station, Dinsmore

Table 9-1 summarizes the energy profile for each key asset.

TABLE 9-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: City Corporation Yard										
Public Works		Electricity					Diesel	500		
Key Asset #2: Water Infiltration Gallery										
—		Electricity					Diesel			
Key Asset #3: Dinsmore Water Pumps										
Drinking Water		Electricity								
Key Asset #4: City Police Department/City Hall										
Emergency Services/City Management		Electricity								
Key Asset #5: Water Plant										
Drinking Water		Electricity					Diesel			
Key Asset #6: Wastewater Sludge Dryer										
Wastewater Treatment		Natural Gas					Diesel			
Key Asset #7: Lift Station #2										
—		Electricity								
Key Asset #8: Lift Station #1										
—		Electricity								
Key Asset #9: Metropolitan Rd. S/O Hwy 101										
—		Electricity								
Key Asset #10: City Park, Davis Street										
—		Electricity								
Key Asset #11: Sewage treatment Plant, Hilltop Drive										
Wastewater Treatment		Electricity					Diesel			
Key Asset #12: Water pumping station, Dinsmore										
Drinking Water		Electricity								

9.3.5 Key Asset Energy Consumption and Backup Generator Analysis

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 9-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

TABLE 9-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: City Corporation Yard								
			508.8				Diesel	500
Generator Capacity Analysis: _____								
Key Asset #2: Water Infiltration Gallery								
8636	29							
Generator Capacity Analysis: _____								
Key Asset #3: Dinsmore Water Pumps								
1782	11							
Generator Capacity Analysis: _____								
Key Asset #4: City Police Department/City Hall								
3704	14							
Generator Capacity Analysis: _____								
Key Asset #5: Water Plant								
63441	172							
Generator Capacity Analysis: _____								
Key Asset #6: Wastewater Sludge Dryer								
32,000								
Generator Capacity Analysis: _____								
Key Asset #7: Lift Station #2								
598	7							
Generator Capacity Analysis: _____								
Key Asset #8: Lift Station #1								
1077	9							
Generator Capacity Analysis: _____								
Key Asset #9: Metropolitan Rd. S/O Hwy 101								
108								
Generator Capacity Analysis: _____								

TABLE 9-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #10: City Park, Davis Street								
303								
Generator Capacity Analysis: _____								
Key Asset #11: Sewage treatment Plant, Hilltop Drive								
35275	107							
Generator Capacity Analysis: _____								
Key Asset #12: Water pumping station, Dinsmore								
56								
Generator Capacity Analysis: _____								

9.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 9-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake	N/A	11/8/1980	Not Available
Severe Weather / Flood	N/A	1/18/1981	Not Available
Severe Weather / Flood	N/A	12/19/1981	Not Available
Severe Weather / Flood	N/A	3/31/1982	Not Available
Severe Weather / Flood	DR-677	01/25/1983	$3.82 million countywide
Severe Weather / Flood	N/A	12/25/1983	Not Available
Severe Weather / Flood	DR-758	02/21/1986	$5 million countywide
Earthquake	DR-943	04/04/1992	$10 million
Severe Weather / Flood	N/A	12/31/1992	Not Available
Severe Weather / Flood	N/A	1/20/1993	Not Available
Earthquake	N/A	12/26/1994	Not Available
Severe Weather / Flood	DR-1044	01/09/1995	$15 million countywide
Severe Weather / Flood	DR-1046	03/12/1995	$1.3 million countywide
Severe Weather / Flood	N/A	12/11/1995	Not Available
Severe Weather / Flood	N/A	12/29/1995	Not Available
Severe Weather / Flood	N/A	12/8/1996	Not Available
Severe Weather / Flood	DR-1155	01/04/1997	$35 million countywide
Severe Weather / Flood	DR-1203	02/09/1998	Over $6 million countywide
Severe Weather / Flood	N/A	11/21/1998	Not Available
Severe Weather / Flood	N/A	12/27/2002	Not Available
Severe Weather / Flood	DR-1628	12/31/2005	$413,000 $20,208,206 for County
Earthquake	N/A	1/9/2010	Not Available

Table 9-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 0
- Number of FEMA Identified Severe Repetitive Loss Properties: 0
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 0

9.5 HAZARD RISK RANKING

TABLE 9-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Storm	54
3	Flood	42
4	Drought	42
5	Landslide	21
6	Wildland Fire	18
7	Dam Failure	14
8	Volcano (Ash Fall)	5
9	Tsunami	0

Table 9-4 presents the ranking of the hazards of concern.

9.6 CAPABILITY ASSESSMENT

9.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 9-5.

TABLE 9-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** Ord. #202 Adopted Jan. 1990	Y	N	Y	Y
Zoning ***Comments:*** Ord. #252 Adopted Nov. 2004	Y	Y	Y	Y
Subdivisions ***Comments:*** Ord. #235 Adopted Feb. 1999	Y	Y	Y	Y
Stormwater Management	N	Y	Y	N
Post Disaster Recovery	N	N	N	N
Real Estate Disclosure ***Comments:*** CA State Civil Code 1102 requires full disclosure on Natural Hazard Exposure of the sale/re-sale of any and all real property.	N	N	Y	Y
Growth Management ***Comments:*** See General Plan	Y	N	N	N
Site Plan Review	Y	N	N	N
Public Health and Safety	Y	N	N	N
Environmental Protection	N	N	N	N
Energy Code	N	N	N	N
Planning Documents				
General or Comprehensive Plan ***Comments:*** Oct 2008	Y	Y	Y	Y
Floodplain or Basin Plan	N	N	Y	N
Stormwater Plan	N	Y	Y	N
Capital Improvement Plan ***Comments:*** Streets, water & wastewater facilities	Y	N	N	Y

TABLE 9-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Habitat Conservation Plan	N	N	N	N
Economic Development Plan ***Comments:*** Adopted 2008	N	N	N	Y
Shoreline Management Plan	N	Y	Y	N
Community Wildfire Protection Plan	N	N	N	N
General Plan Energy Conservation Element or Energy Specific Plan ***Comments:*** Adopted 2013	Y	N	N	Y
Climate Action Plan or Climate Adaptation Strategy	N	N	N	N
Response/Recovery Planning				
Comprehensive Emergency Management Plan	N	N	N	N
Threat and Hazard Identification and Risk Assessment	N	N	N	N
Terrorism Plan	N	N	N	N
Post-Disaster Recovery Plan	N	N	N	N
Continuity of Operations Plan	N	N	N	N
Public Health Plans	N	N	N	N

9.6.2 Administrative and Technical Capability

TABLE 9-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Y	K. Caldwell, Community Development Director
Engineers or professionals trained in building or infrastructure construction practices	Y	Professional Consultants
Planners or engineers with an understanding of natural hazards	Y	Professional Consultants
Planners or engineers with an understanding of energy resilience or alternative energy technology	Y	Professional Consultants
Staff with training in benefit/cost analysis	Y	Professional Consultants
Surveyors	Y	Professional Consultants
Personnel skilled or trained in GIS applications	Y	K. Caldwell, Community Development Director
Scientist familiar with natural hazards in local area	Y	Professional Consultants
Emergency manager	Y	Graham Hill, Police Chief
Grant writers	Y	Professional Consultants

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 9-6.

9.6.3 Fiscal Capability

TABLE 9-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Y
Capital Improvements Project Funding	Y
Authority to Levy Taxes for Specific Purposes	Y
User Fees for Water, Sewer, Gas or Electric Service	Y
Incur Debt through General Obligation Bonds	Y
Incur Debt through Special Tax Bonds	Y
Incur Debt through Private Activity Bonds	Y
Withhold Public Expenditures in Hazard-Prone Areas	Y
State Sponsored Grant Programs	Y
Development Impact Fees for Homebuyers or Developers	Y
Other	Y

The assessment of the jurisdiction's fiscal capabilities is presented in Table 9-7.

9.6.4 National Flood Insurance Program Compliance

TABLE 9-8.
NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

What department is responsible for floodplain management in your community?	Community Development Department
Who is your community's floodplain administrator (department/position)?	Karen Dunham, City Clerk
Do you have any certified floodplain managers on staff in your community?	No
What is the date of adoption of your flood damage prevention ordinance?	1999
When was the most recent community assistance visit or community assistance contact?	2009
To the best of your knowledge, does your community have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	No
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 9-8.

9.6.5 Energy Resilience Capability

TABLE 9-9. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	Jim Stretch, City Manager
Have you performed an energy assurance gap analysis for your community?	No
Have you completed a vulnerability assessment of power sources to each key asset?	No
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	No
Are emergency backup generators tested on a regular basis?	Yes
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Yes
Have you established a working relationship with your community's energy service providers?	Yes
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	Yes
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	Yes

Energy resiliency capabilities are presented in Table 9-9.

9.6.6 Community Mitigation Program Classifications

TABLE 9-10. COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule	No	99/99	--
Public Protection	Yes	7/9	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 9-10.

9.7 HAZARD MITIGATION ACTION PLAN

Table 9-11 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 9-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #RD-1—Improve Wastewater Collection System Mains, Laterals, and Manholes.							
New & Existing	Earthquake, Flood, Severe Storm	O-1, O-2	Public Works	High	General Fund, PDM Grants	Long Term	Y
Initiative #RD-2—Maintain and Upgrade Wastewater Lift Stations.							
New & Existing	Earthquake, Flood, Severe Storm	O-1, O-2	Public Works	Medium	General Fund, PDM Grants	Long Term	Y
Initiative #RD-3—Painter Street to Highway 101 Drainage Ditch Repair.							
New & Existing	Flood, Severe Storm	O-1, O-2, O-3	Public Works	Medium	General Fund, PDM Grants	Long Term	Y
Initiative #RD-4—Center Street to Painter Street Culvert Improvements.							
New & Existing	Flood, Severe Storm	O-1, O-2, O-3	Public Works	Medium	General Fund, PDM Grants	Long Term	Y
Initiative #RD-5—City Hall Seismic Retrofit.							
New & Existing	Earthquake	O-1, O-2, O-3, O-4, O-5	Public Works	High	General Fund, PDM & HMGP Grants	Long Term	Y
Initiative #RD-6—Fireman's Hall Seismic Retrofit.							
New & Existing	Earthquake	O-1, O-2, O-3, O-4, O-5	Public Works	High	General Fund, PDM & HMGP Grants	Long Term	Y
Initiative #RD-7—City Standby Power Generation Capabilities.							
New & Existing	All Hazards	O-1, O-2, O-4	Public Works	High	General Fund	Long Term	Y
Initiative #RD-8—Fire Sprinkler Installation at City Hall and Fireman's Hall.							
New & Existing	Earthquake, Wildland Fire	O-1, O-2, O-3, O-4, O-5	Public Works	Medium	General Fund, PDM & HMGP Grants	Long Term	Y
Initiative #RD-9—Construct Retaining Wall on Road to Dinsmore.							
New & Existing	Earthquake, Severe Storm, Landslide	O-1, O-2, O-3, O-4, O-5, O-9	Public Works	Medium	General Fund, Street Fund, PDM Grants	Long Term	Y

TABLE 9-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #RD-10—Designate, prepare and announce Emergency Assembly Points throughout the City.							
New & Existing	All Hazards	O-5, O-6, O-7	Public Works	Medium	General Fund	Short Term	Y
Initiative #RD-11—Adopt a long-term capital improvement plan, which provides the City the financial capability to fund capital projects that could include hazard mitigation projects.							
New & Existing	All Hazards	O-1, O-2, O-3, O-4, O-5, O-6, O-7, O-9	Public Works	Low	General Fund	Short Term	Y
Initiative #RD-12—Improve hillside stability in landslide-prone areas.							
New & Existing	Earthquake, Severe Storm, Landslide	O-1, O-2, O-3, O-4, O-5, O-9	Public Works	Medium	General Fund, PDM Grants	Long Term	Y
Initiative #RD-13—Prepare a Post Disaster Recovery Plan.							
New & Existing	All Hazards	O-1, O-4, O-5, O-6, O-12	Public Works	Low	General Fund	Short Term	Y
Initiative #RD-14—Install Emergency water interties with Scotia.							
New & Existing	Earthquake, Severe Storm, Drought	O-1, O-2, O-3, O-12	Public Works	High	General Fund, Water Fund, PDM Grants	Long Term	Y
Initiative #RD-15—Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.							
New & Existing	Tsunami, Severe Storm	O-3, O-4, O-5, O-6, O-7, O-8	Public Works	Medium	General Fund	Short Term	Y
Initiative #RD-16—Improve alternative communication capabilities throughout the City, including acquisition of and licensing for HAM radios, satellite telephones, mobile backup dispatch devices and other communication devices.							
New & Existing	All Hazards	O-1, O-4, O-5, O-12	Public Works	Medium	General Fund	Short Term	Y
Initiative #RD-17—Adopt an updated Emergency Response Plan.							
New & Existing	All Hazards	O-1, O-2, O-4, O-5	Public Works	Low	General Fund	Short Term	Y
Initiative #RD-18—Update City land use code for seismic setbacks/structural requirements and hillside development standards.							
New & Existing	Earthquake, Landslide	O-2, O-3, O-10, O-11	Public Works	Low	General Fund	Short Term	Y

TABLE 9-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #RD-19—Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Rio Dell.							
New & Existing	All Hazards	O-4, O-5, O-6, O-8	Public Works	Medium	General Fund	Short Term	Y
Initiative #RD-20—Update floodplain mapping throughout the City and continue to maintain compliance and good standing under the National Flood Insurance Program. This will be accomplished through the implementation of floodplain management programs that, at a minimum, will meet the minimum requirements of the NFIP, which include the following: • Enforcement of the adopted flood damage prevention ordinance, • Participating in floodplain identification and mapping updates, and • Providing public assistance/information on floodplain requirements and impacts							
New & Existing	Flood, Severe Storm	O-2, O-3, O-8, O-9	Public Works	Low	General Fund	Short term	Y
Initiative #RD-21—Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.							
New & Existing	All Hazards	O-4, O-5	Public Works	Low	General Fund	Short Term	Y
Initiative #RD-22—Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.							
New & Existing	All Hazards	O-6, O-7, O-8	Public Works	Low	General Fund	Short Term	Y
Initiative #RD-23—Develop Focused Storm Drainage Facility Plan.							
New & Existing	Severe Storm, Flood	O-2, O-3, O-6, O-9	Public Works	Medium	General Fund, CDBG	Short Term	Y
Initiative #RD-24—Increase fuel storage capacity and supply within the City, including at Wastewater Treatment and Water Facilities.							
New & Existing	All Hazards	O-1, O-2, O-4	Public Works	Medium	General Fund, Water Fund, Wastewater Fund	Short Term	N
Initiative #RD-25—Consider obtaining formal agreement with Shell to give the City and Fire District priority fueling. Coordinate with the Fire District to determine the station's operational capacity in event of an energy disruption.							
New & Existing	All Hazards	O-1, O-4	Public Works	Low	General Fund	Short Term	N
Initiative #RD-26—Determine whether any agreements exist with Scotia for the sharing of fuel and water in the event of an emergency.							
New & Existing	All Hazards	O-12	Public Works	Low	General Fund	Short Term	N

TABLE 9-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #RD-27—Maintain and update the City's Energy Assurance Plan and implement Energy Assurance Plan actions and projects, including requesting information (energy use, backup generator make/model/size, fuel storage) from key assets, determining energy assurance gaps, and evaluating Key Asset requirements to function in a longer-term (2 week) energy disruption.							
New & Existing	All Hazards	O-1, O-2, O-4	Public Works	Medium	General Fund	Long Term	N
Initiative #RD-28—Determine City water supply in event of long-term energy disruption. Set priority list for water distribution.							
New & Existing	All Hazards	O-1, O-2, O-3	Public Works	Medium	General Fund, Water Fund	Long Term	N
Initiative #RD-29—Determine refrigeration capacity of local markets and evaluate requirements to maintain functionality in event of energy disruption.							
New & Existing	All Hazards	O-3	Public Works	Medium	General Fund	Long Term	N
Initiative #RD-30—Determine fuel tank size and operational costs of new infiltration gallery backup generator.							
New & Existing	All Hazards	O-1, O-2	Public Works	Low	General Fund, Water Fund	Short Term	N
Initiative #RD-31—Coordinate with the Fire District to determine backup fuel supply adequacy and obtain increased storage if necessary.							
New & Existing	All Hazards	O-2, O-4, O-8	Public Works	Medium	General Fund	Short Term	N
Initiative #RD-32—Determine and obtain a properly sized backup power supply to power Police Department communications system.							
New & Existing	All Hazards	O-2, O-4	Public Works	Medium	General Fund	Short Term	N
Initiative #RD-33—Coordinate with the County and Ferndale to stabilize Blue Slide Road hillside and road surface from Ferndale to Rio Dell.							
New & Existing	Landslide	O-3, O-8, O-9, O-12	County, Ferndale, Public Works	High	General Fund, PDM Grants	Short term	N
Initiative #RD-34—Coordinate with County to stabilize landslide into Eel River upstream of City's fresh water infiltration gallery.							
New & Existing	Landslide	O-3, O-8, O-9, O-12	County, Ferndale, Public Works	High	General Fund, PDM Grants	Short term	N

TABLE 9-11.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #RD-35—Incorporate this Hazard Mitigation Plan as part of the General Plan Safety Element. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	All Objectives	City Council	Low	General Fund	Short Term	No

9.8 PRIORITY OF RECOMMENDED INITIATIVES

Table 9-12 identifies the priority for each initiative.

TABLE 9-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
RD-1	2	High	High	Yes	Yes	No	High
RD-2	2	Medium	Medium	Yes	Yes	No	High
RD-3	3	High	Medium	Yes	Yes	No	High
RD-4	3	High	Medium	Yes	Yes	No	High
RD-5	5	High	High	Yes	Yes	No	High
RD-6	5	High	High	Yes	Yes	No	High
RD-7	3	High	High	Yes	No	No	Low
RD-8	5	High	Medium	Yes	Yes	No	High
RD-9	6	High	Medium	Yes	Yes	No	High
RD-10	3	High	Medium	Yes	No	No	Medium
RD-11	8	Medium	Low	Yes	No	Yes	High
RD-12	6	High	Medium	Yes	Yes	No	High
RD-13	5	Medium	Low	Yes	No	Yes	High
RD-14	4	High	High	Yes	Yes	No	High
RD-15	6	Medium	Medium	Yes	No	No	Medium
RD-16	4	High	Medium	Yes	No	No	Medium
RD-17	4	Medium	Low	Yes	No	Yes	High
RD-18	5	Medium	Low	Yes	No	Yes	High
RD-19	4	Medium	Medium	Yes	No	No	Medium
RD-20	4	Medium	Low	Yes	No	No	High
RD-21	2	High	Low	Yes	No	Yes	High
RD-22	3	Medium	Low	Yes	No	Yes	High
RD-23	4	Medium	Medium	Yes	Yes	No	High
RD-24	3	High	Medium	Yes	No	No	Medium
RD-25	2	Medium	Low	Yes	No	Yes	High
RD-26	1	Low	Low	Yes	No	Yes	High
RD-27	3	Medium	Medium	Yes	No	No	Low
RD-28	3	Medium	Medium	Yes	No	No	Low
RD-29	1	Medium	Medium	Yes	No	No	Low
RD-30	2	Medium	Low	Yes	No	Yes	High

TABLE 9-12.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
RD-31	3	High	Medium	Yes	No	No	Medium
RD-32	2	High	Medium	Yes	No	No	Medium
RD-33	4	High	High	Yes	Yes	No	High
RD-34	4	High	High	Yes	Yes	No	High
RD-35	12	Medium	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

9.9 ANALYSIS OF RECOMMENDED INITIATIVES

Table 9-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

TABLE 9-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	RD-11, RD-13, RD-35		RD-10, RD-19	RD-28	RD-7, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-14
Drought	RD-10, RD-11, RD-13, RD-35		RD-10, RD-19	RD-28	RD-14	RD-14
Earthquake	RD-10, RD-11, RD-13, RD-18, RD-35	RD-1, RD-2, RD-3, RD-4, RD-5, RD-6, RD-8	RD-10, RD-19	RD-9, RD-12, RD-33, RD-34	RD-1, RD-2, RD-3, RD-4, RD-5, RD-6, RD-7, RD-8, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-9, RD-12, RD-14, RD-33, RD-34
Flood	RD-10, RD-11, RD-13, RD-20, RD-23, RD-35	RD-1, RD-2, RD-3, RD-4	RD-10, RD-19, RD-20	RD-9, RD-12, RD-33, RD-34	RD-1, RD-2, RD-3, RD-4, RD-5, RD-6, RD-7, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-9, RD-12, RD-14, RD-33, RD-34
Landslide	RD-10, RD-11, RD-13, RD-18, RD-35		RD-10, RD-19	RD-9, RD-12, RD-33, RD-34	RD-7, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-9, RD-12, RD-14, RD-33, RD-34

TABLE 9-13.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Severe Weather	RD-10, RD-11, RD-13, RD-15, RD-18, RD-23, RD-35	RD-1, RD-2, RD-3, RD-4	RD-10, RD-19	RD-9, RD-12, RD-33, RD-34	RD-1, RD-2, RD-3, RD-4, RD-5, RD-6, RD-7, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-9, RD-12, RD-14, RD-33, RD-34
Tsunami	RD-10, RD-11, RD-13, RD-15, RD-22, RD-35		RD-10, RD-19, RD-22		RD-7, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-14
Wildfire	RD-10, RD-11, RD-13, RD-35	RD-8	RD-10, RD-19		RD-7, RD-8, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-14
Other Hazards of Concern	RD-10, RD-11, RD-13, RD-35	RD-8	RD-10, RD-19		RD-7, RD-8, RD-16, RD-17, RD-19, RD-21, RD-24, RD-25, RD-26, RD-27, RD-28, RD-29, RD-30, RD-31, RD-32	RD-14

a. See Chapter 1 for description of mitigation types.

9.10 STATUS OF PREVIOUS PLAN INITIATIVES

Table 9-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

TABLE 9-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
RD-1	X			Chlorine Generation Equipment Replacement and Seismic Retrofit
RD-2	X			Upgrade Pumps at Headworks
RD-3		X		Improvements to Wastewater Collection System Mains, Laterals, and Manholes
RD-4		X		Wastewater Lift Stations Maintenance and Upgrades
RD-5	X			Install Stormproof Fuel Storage Tanks
RD-6	X			Belleview Creek Crossing Repair
RD-7		X		Painter Street to Highway 101 Drainage Ditch Repair
RD-8		X		Center Street to Painter Street Culvert Improvements
RD-9		X		City Hall Seismic Retrofit
RD-10		X		Fireman's Hall Seismic Retrofit
RD-11		X		City Standby Power Generation Capabilities
RD-12		X		Fire Sprinkler Installation at City Hall and Fireman's Hall
RD-13		X		Construct Retaining Wall on Road to Dinsmore
RD-14	X			Elevating Wastewater Plant
RD-15		X		Designate, prepare and announce Emergency Assembly Points throughout the City.
RD-16		X		Adopt a long-term capital improvement plan
RD-17		X		Improve hillside stability in landslide-prone areas
RD-18		X		Prepare a Post Disaster Recovery Plan
RD-19		X		Install Emergency water interties between neighboring jurisdictions
RD-20		X		Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.
RD-21	X			Adopt International Building Code on January 1st, 2008
RD-22		X		Improve alternative communication capabilities throughout the City, including acquisition of and licensing for HAM radios, satellite telephones, mobile backup dispatch devices and other communication devices.
RD-23		X		Adopt an updated Emergency Response Plan

TABLE 9-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
RD-24		X		Update City land use code for seismic setbacks/structural requirements and hillside development standards
RD-25		X		Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Rio Dell
RD-26		X		Update floodplain mapping throughout the City, including continued participation with the National Flood Insurance Program.
RD-27		X		Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.
RD-28		X		Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.
RD-29		X		Develop Focused Storm Drainage Facility Plan

CITY OF RIO DELL

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

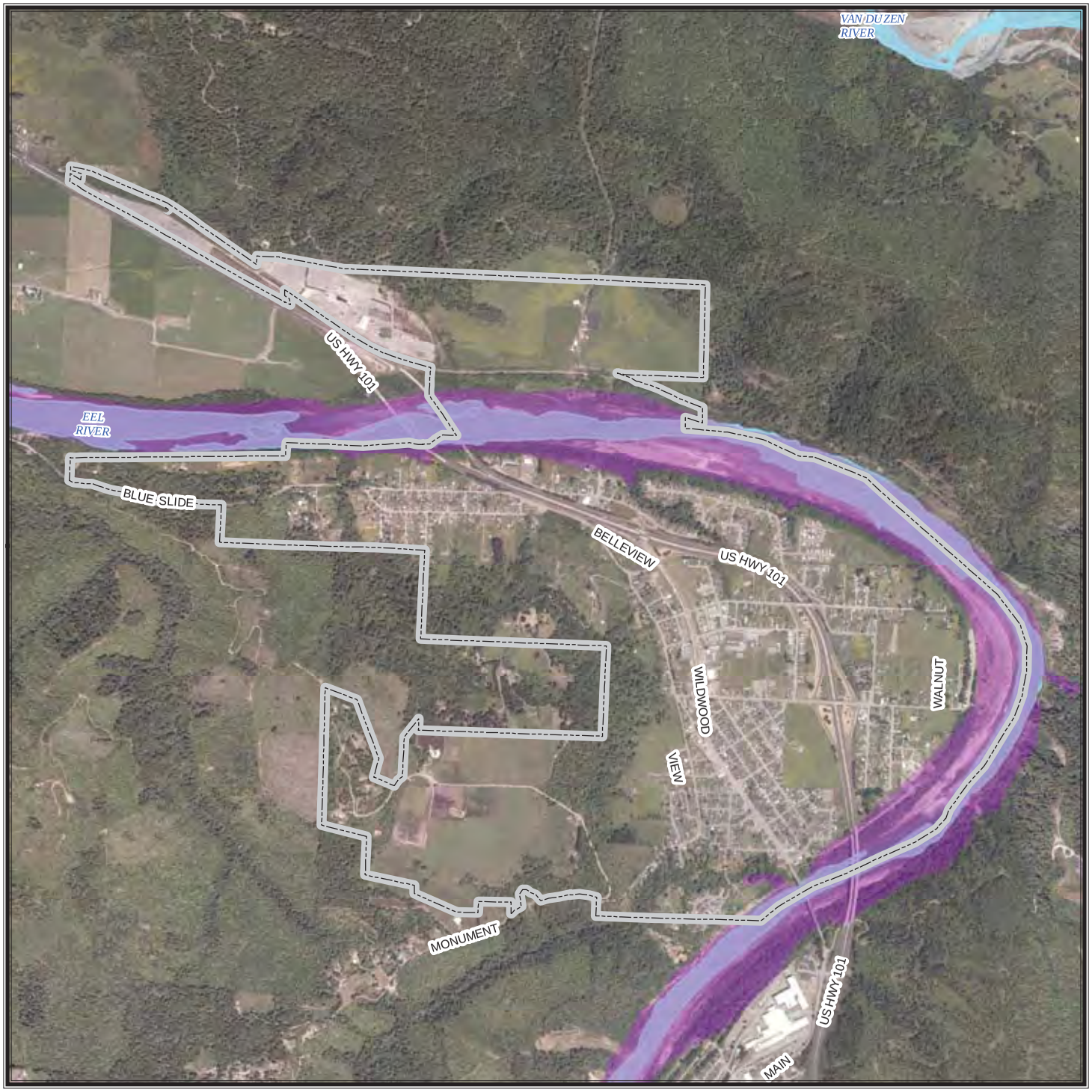
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.25 Miles

TETRA TECH



CITY OF RIO DELL

Dam Failure Inundation Areas

Scott Dam

Scott Dam inundation area

Dam failure inundation area data from 2007 provided by California Emergeny Management Agency Dam Safety Program.

These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH

CITY OF RIO DELL

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

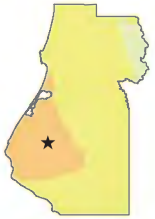
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Quaternanry & Younger Earthquake Faults

Proximate Faults

Little Salmon Fault Zone

Russ Fault Zone

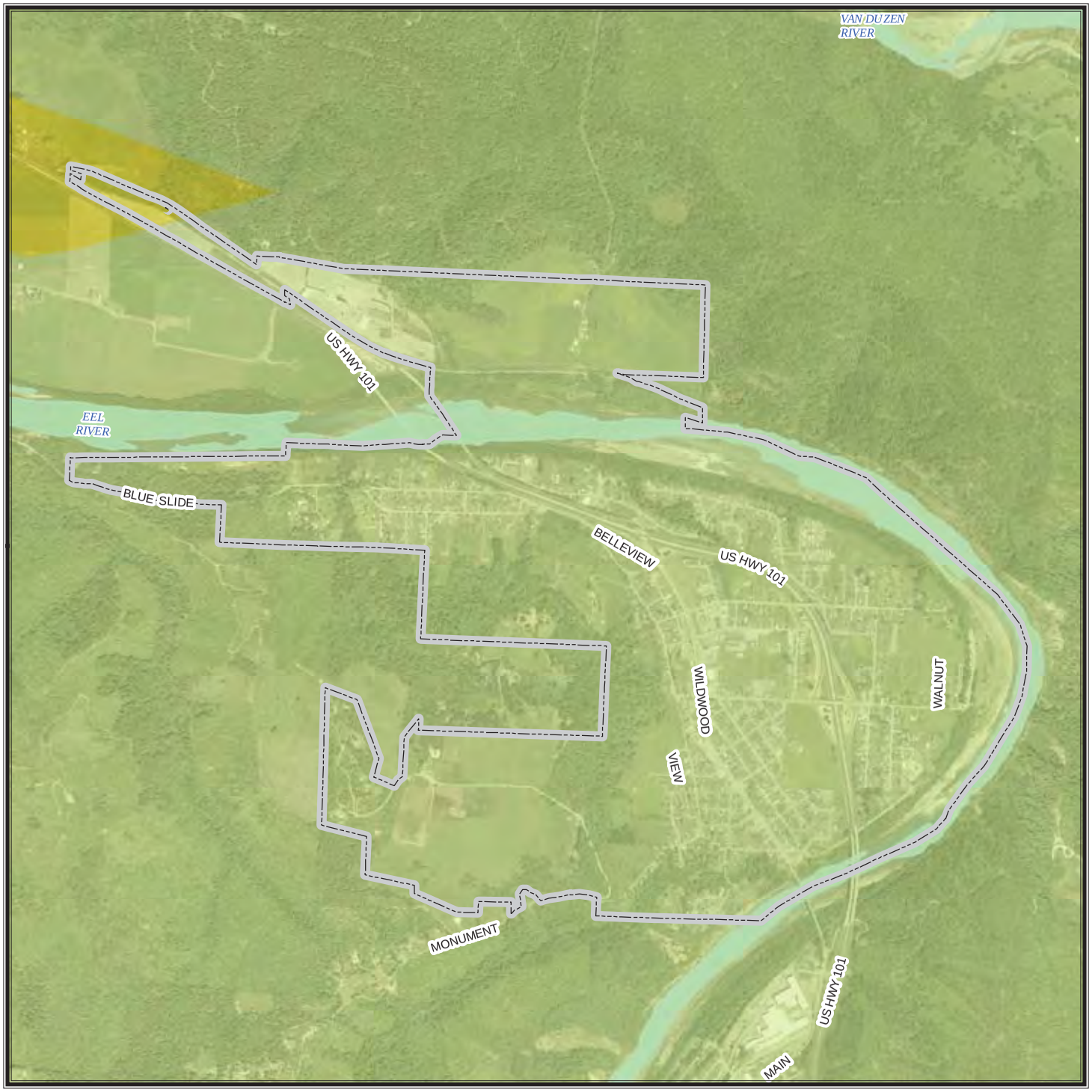
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.5 1 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

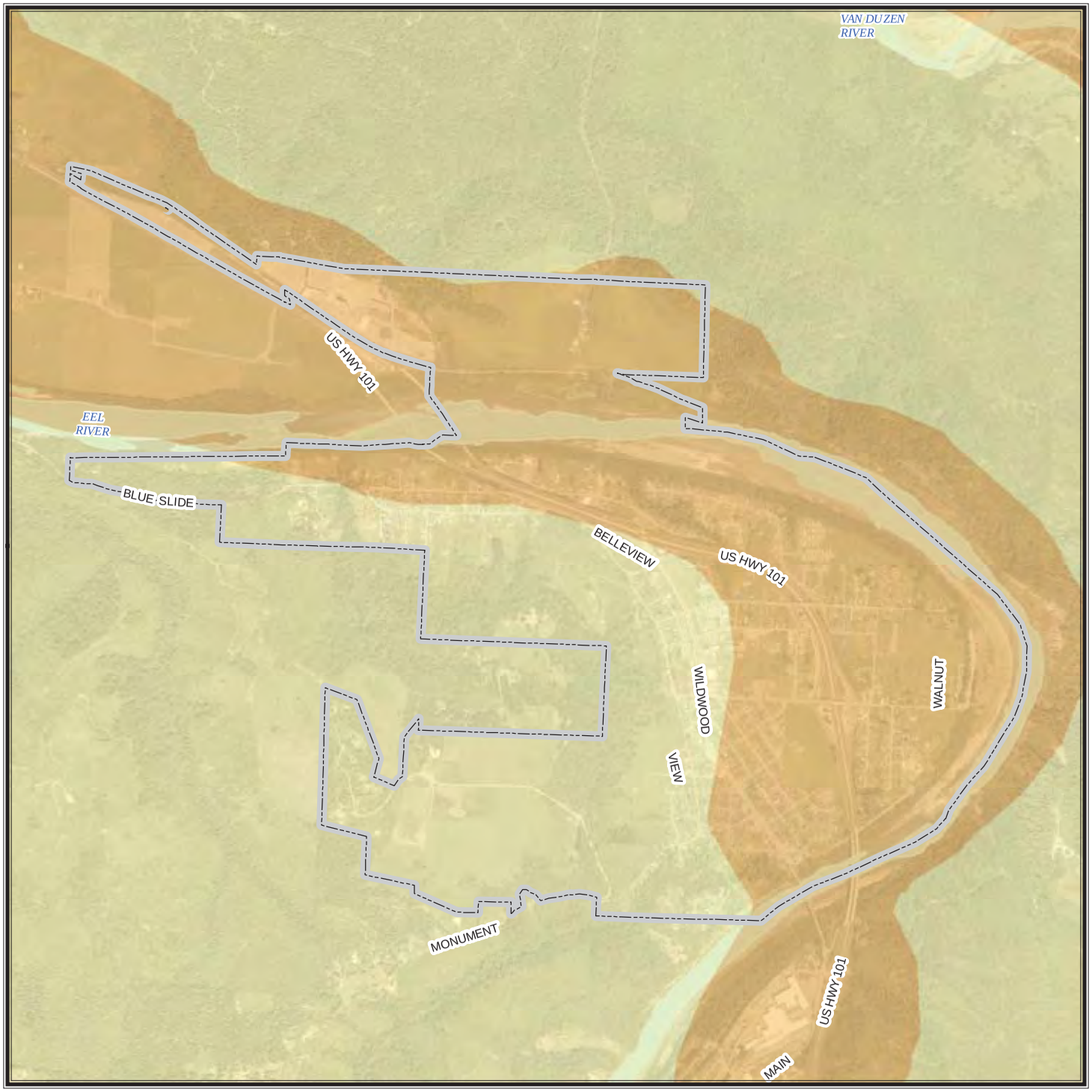
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH

CITY OF RIO DELL

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- I (Not Felt)
- II - III (Weak)
- IV (Light)
- V (Moderate)
- VI (Strong)
- VII (Very Strong)
- VIII (Severe)
- IX (Violent)
- X+ (Extreme)

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH

CITY OF RIO DELL

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

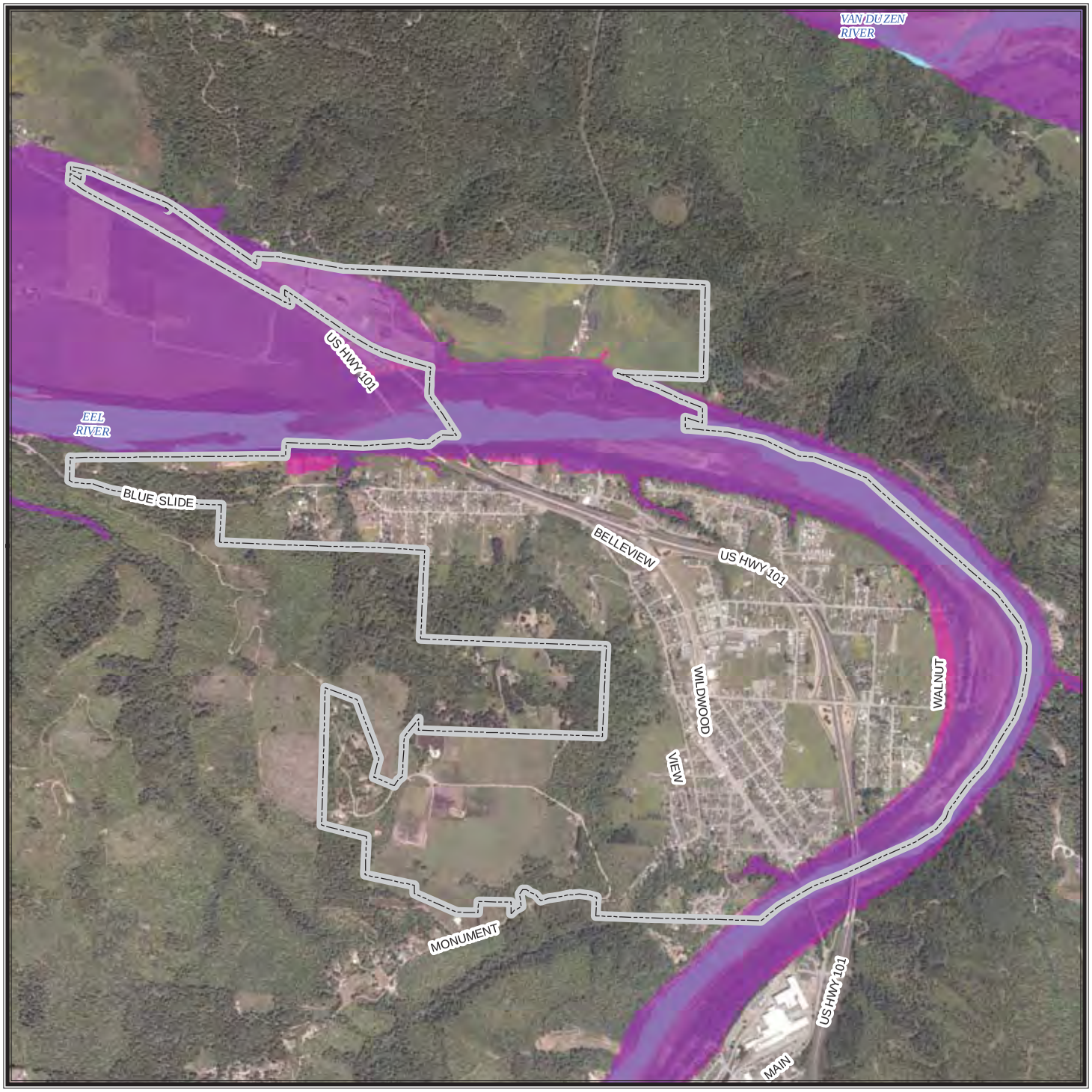
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

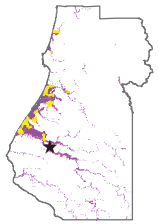
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

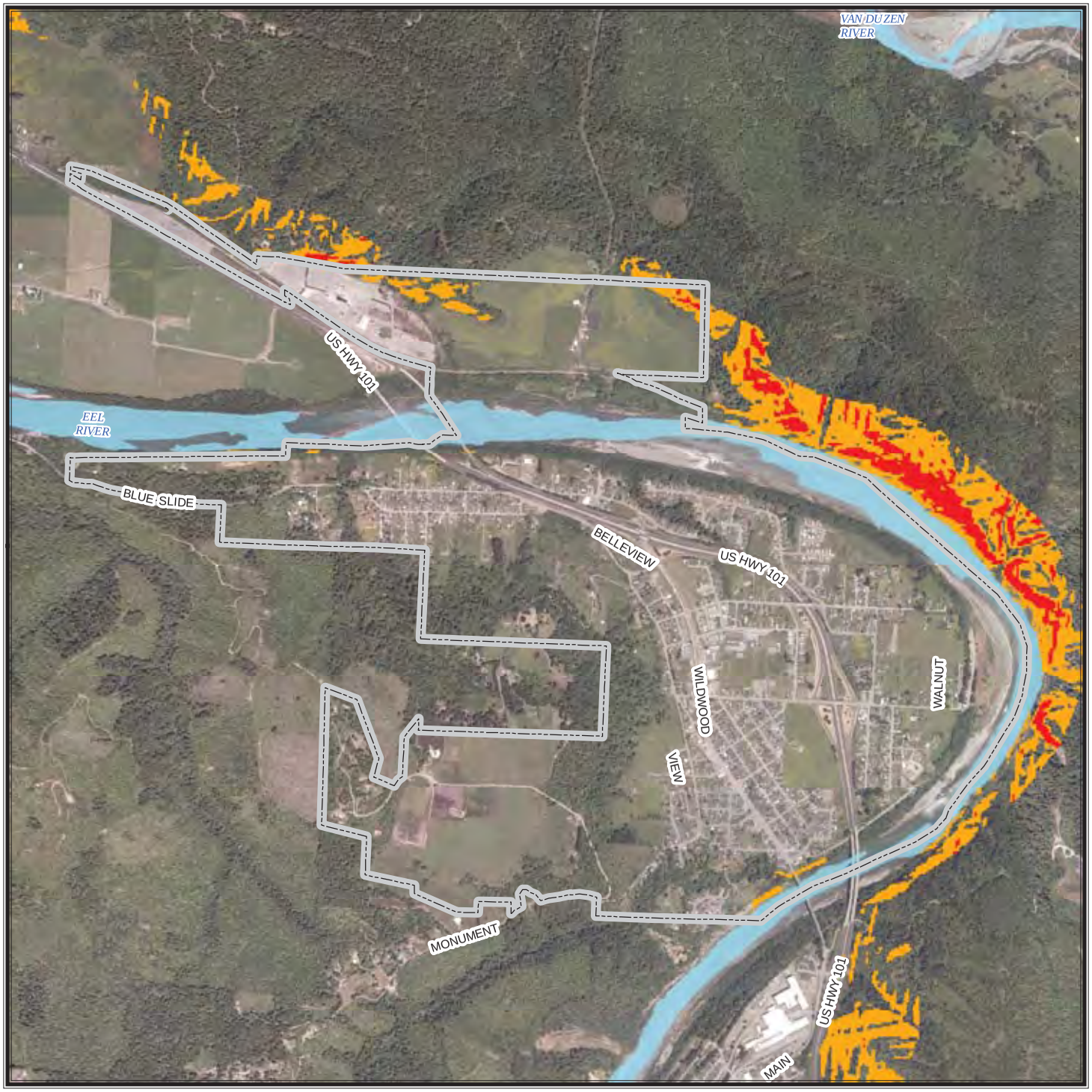
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH





CITY OF RIO DELL

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

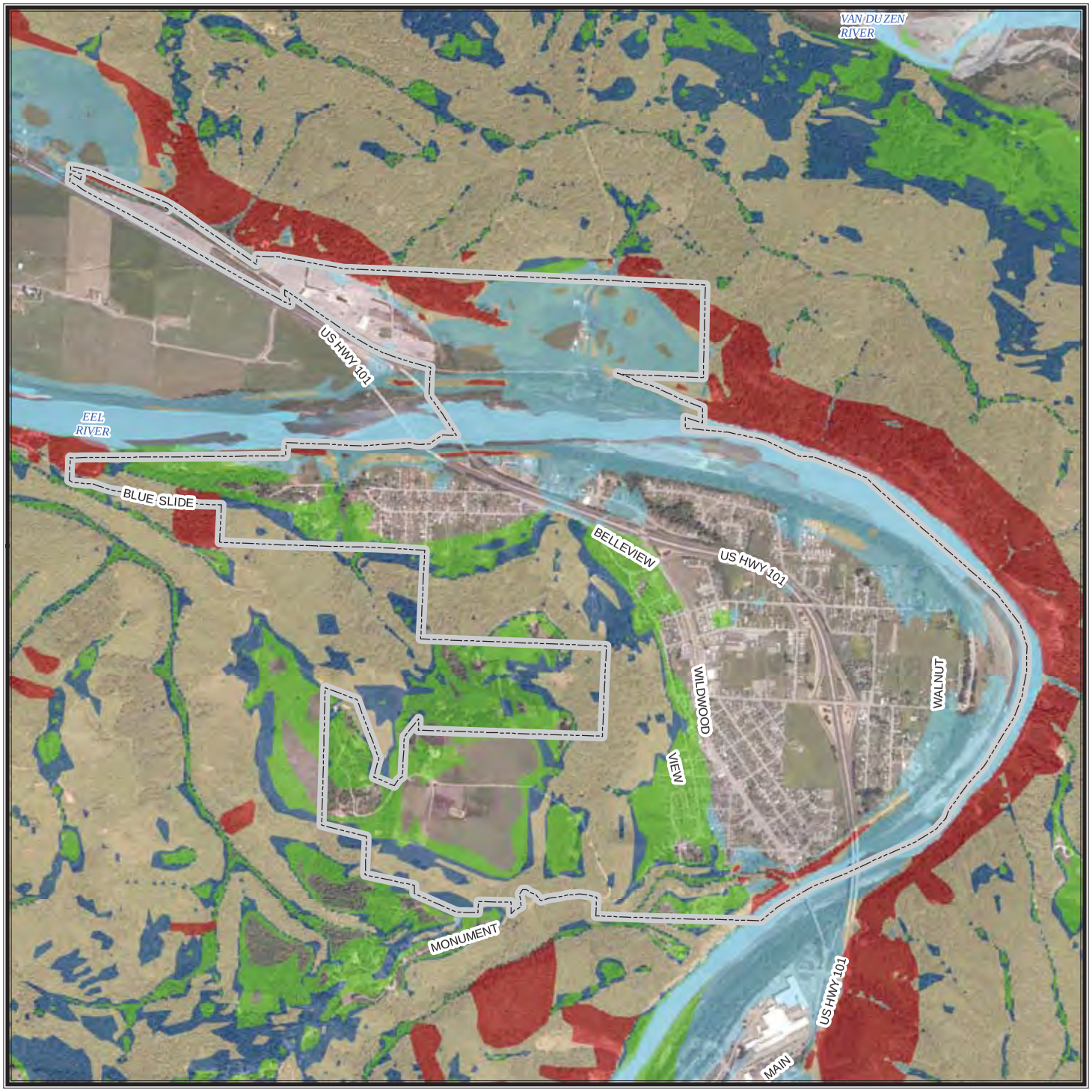
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH

CITY OF RIO DELL

Tsunami Inundation Areas

Tsunami inundation area

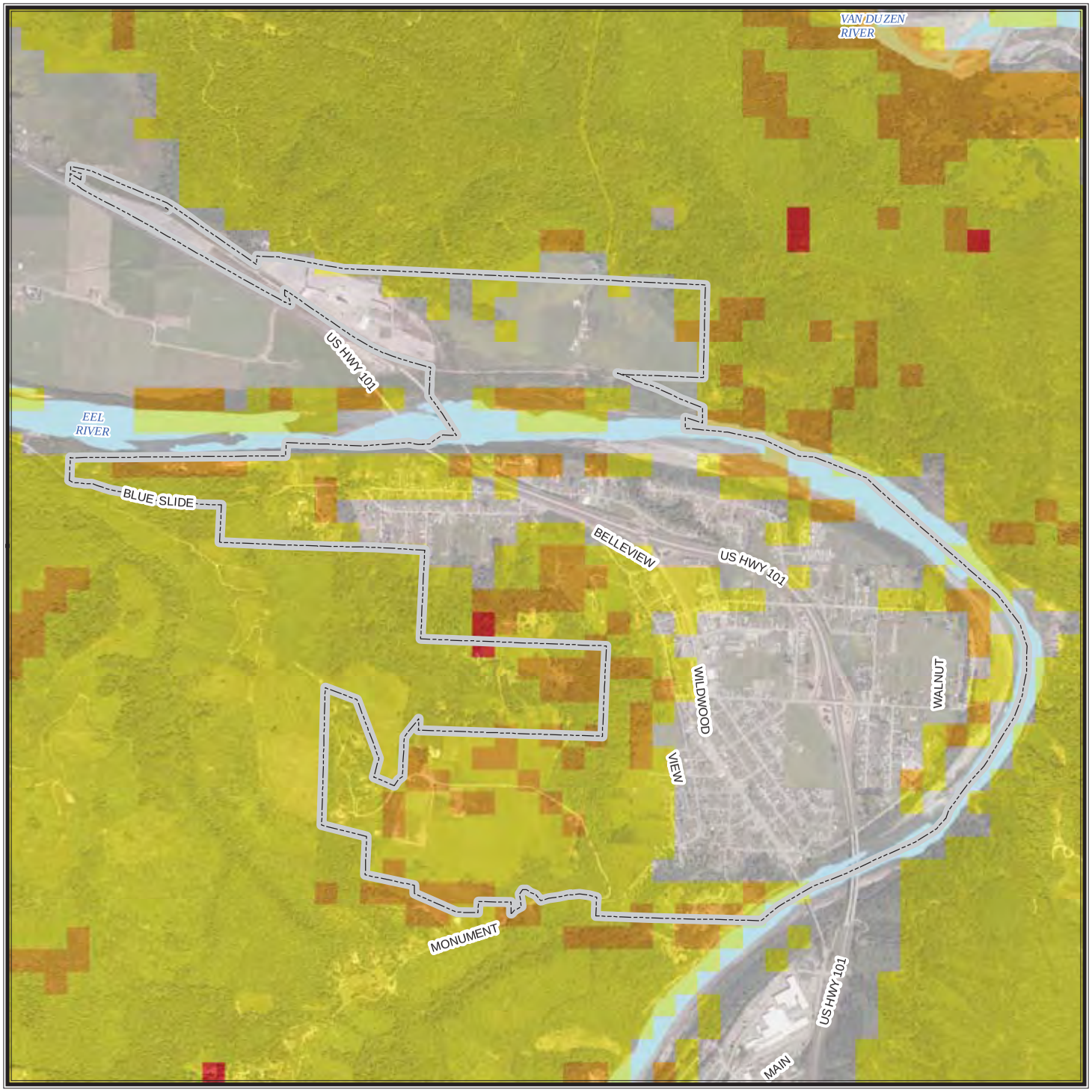
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

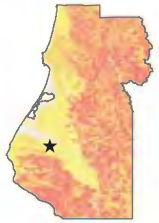
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Fire Hazard Severity Class

Hazard Class

- **Very High**
- **High**
- **Moderate**
- **Non-Wildland/Non-Urban**
- **Urban Unzoned**

Responsibility Areas

- **Federal (FRA)**
- **Local (LRA)**
- **State (SRA)**
- **None**

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH

CITY OF RIO DELL

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

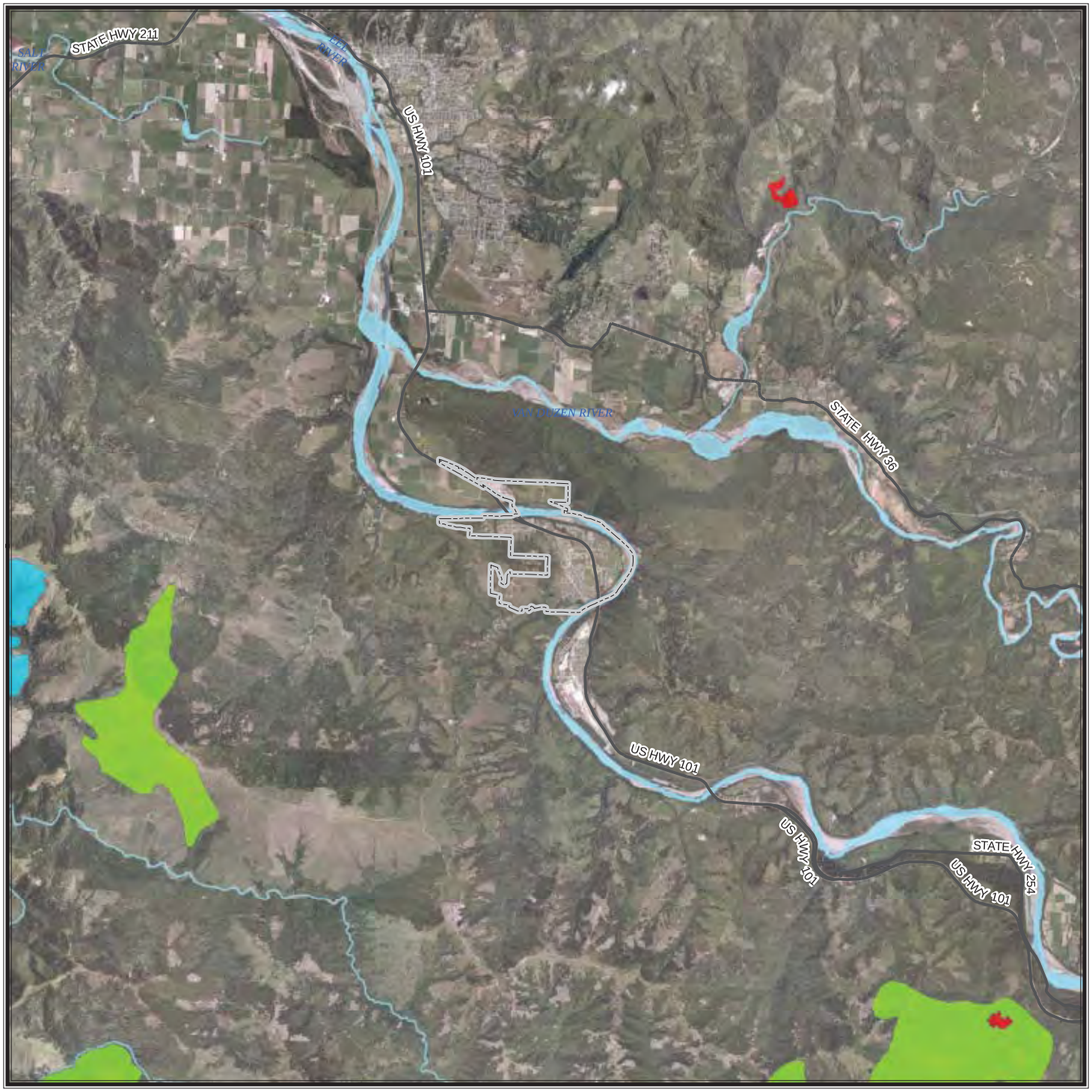
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH



CITY OF RIO DELL

Fire Perimeters

Year of Fire

- **1908 - 1920**
- **1921 - 1940**
- **1941 - 1960**
- **1961 - 1980**
- **1981 - 2000**
- **2001 - 2012**

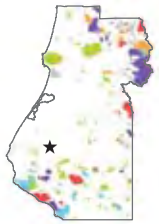
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

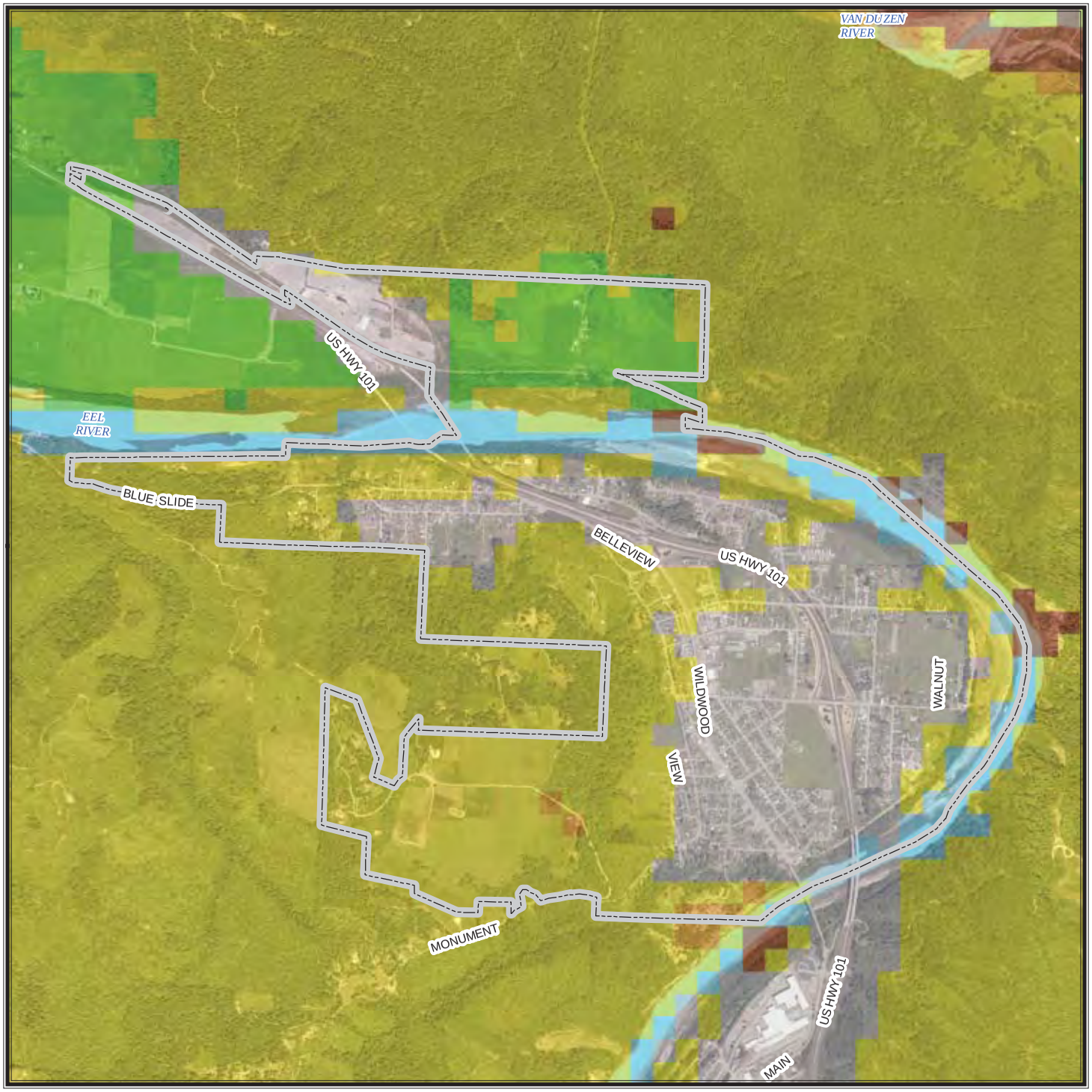
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

TETRA TECH





CITY OF RIO DELL

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 0.5 Miles

N W E S

TETRA TECH

CHAPTER 10.
CITY OF TRINIDAD UPDATE ANNEX

10.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
Bryan Buckman, Director of Public Works
City of Trinidad
409 Trinity Street
PO Box 390
Trinidad, CA 95570
Telephone: (707) 677-3862
e-mail: bbuckman@trinidad.ca.gov

Alternate Point of Contact
Karen Suiker, City Manager
City of Trinidad
409 Trinity Street
PO Box 390
Trinidad, CA 95570
Telephone: (707) 677-3876
e-mail: citymanager@trindad.ca.gov

10.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation—**November 1870. The City of Trinidad was incorporated as a General Law City. The City was not granted a separate charter, but operates under the general laws of the State of California.
- **Current Population—**365 as of January 1, 2013
- **Population Growth—**Based on data available from the State of California Department of Finance, the population of Trinidad grew by approximately 17 percent between 2000 and 2013. Due to the low population levels, this growth represents the addition of 54 people to the City. Population growth was 0.3 percent from 2012 to 2013.
- **Location and Description—**Trinidad, known as the smallest, oldest and most westerly city in California, is situated 17 miles north of Eureka, the Humboldt County seat. Adjacent to a major north-south freeway between San Francisco and Oregon (Highway 101), Trinidad, with its picturesque coastline and harbor, remains a well-known tourist attraction and ocean fishing port.

  Although its permanent core population is small, the City of Trinidad acts as the commerce hub for around 1,500 inhabitants in the surrounding unincorporated communities, including Westhaven, Patrick's Point and Big Lagoon, Additionally, Trinidad is bordered by the Trinidad Indian Rancheria, with its Cher-Ae Heights Casino, which attracts numerous visitors each day.
- **Brief History—**The Tsurai Indians settled the coastal area that is now Trinidad more than 350 years ago, establishing a village site along the bluff overlooking Trinidad harbor. On Trinity Sunday, June 9, 1775, it was "discovered" by Spanish sea captains Heceta and Bodega, who claimed the area for Spain and named its port La Santisima Trinidad.

  During the 1849 California gold rush, Josiah Gregg and seven companions found Trinidad after a month-long struggle over the mountains from the interior gold fields. From that time forward, Trinidad became a boomtown supplying gold-seekers heading for mines on the Klamath, Salman and Trinity Rivers. The City of Trinidad was officially incorporated in 1870. Trinidad harbor later became the only local seaport to ship lumber on Clipper ships from area sawmills. In the early 1900s, Trinidad Pier served as a whaling station and ship

repair facility. Trinidad today continues as home to a diverse community consisting of "million dollar" properties overlooking the Pacific Ocean—to RV parks and rental units near the freeway. It boasts a small fishing fleet, and it attracts thousands of visitors and tourists annually to its special events and picturesque beaches.

- **Climate—**The climate of Trinidad is dominated by the Pacific Ocean, with high humidity prevailing throughout the year. There are definite rainy and dry seasons. The rainy season lasts from October through April, accounting for about 90 percent of the annual precipitation, which averages about 40 inches. The dry season, lasting from May through September, is typically marked by low clouds and fog in the morning, usually clearing by late morning, then moving back in the evening.

  Temperatures in the Trinidad area are generally quite moderate, and the annual range of variation is one of the smallest in the lower 48 states. The annual mean temperature is about 51 degrees, with the colder lows rarely below the mid-30s and the warmer highs rarely above the mid-70s.

  When the winter storms hit the Trinidad coast, people will line the headlands to watch these magnificent events. The winter swells travel hundreds of miles from the Gulf of Alaska—often reaching 25 to 30 feet or more in height. A fact not known to many is this: The highest wave ever recorded struck Trinidad during a ferocious winter storm on December 31, 1913. According to one documented report, during that storm, the Trinidad Lighthouse keeper, who was performing his duties in the lantern room perched 196 feet above sea level, turned to see "a sea of unusual height." In his words, "The sea itself fell onto the top of the bluff and struck the tower on a level with the balcony, making a terrible jar."

- **Governing Body Format—**The City of Trinidad is governed by a five-member City Council and operates under the leadership of a mayor, with various department commissioner positions held by council members. Trinidad also has a City Manager who acts as the Chief Executive Officer of the City. The Manager is selected by the pleasure of the City Council. The Manager also acts as Trinidad's Finance Officer and is charged with coordinating the activities of contract consultants that handle other City functions.

- **Development Trends—**The City of Trinidad, pursuant to California state law, participates in long-range planning. Some elements of the City's general plan were updated in the 1980s and 1990s, but the Circulation, Open Space, Safety, and Noise elements have not been updated since the 1970s. Few applications for building permits for new, single-family construction have been received in the City since 2000—approximately 11. The City is 0.67 square miles, although only 0.485 square miles are on land.

10.3 ENERGY PROFILE

10.3.1 Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—Trinidad acquires its electricity from PG&E (Ivan Marruflo, 707-445-5631)
- Propane—Propane for city operations is acquired from Amerigas (Michael Sergeys, 707-822-2188) and Sequoia Gas Co. (Shane McWhorter, 707-599-5026).
- Liquid Fuel—Gasoline and Diesel is purchased from Trinidad Chevron (Rusty Wade, Manager, 707-267-0318, and Steve Celayeta, District Manager, 707-480-2526) and Renner Petroleum (Joe Rosa, Operations Manager, 707-725-2364).

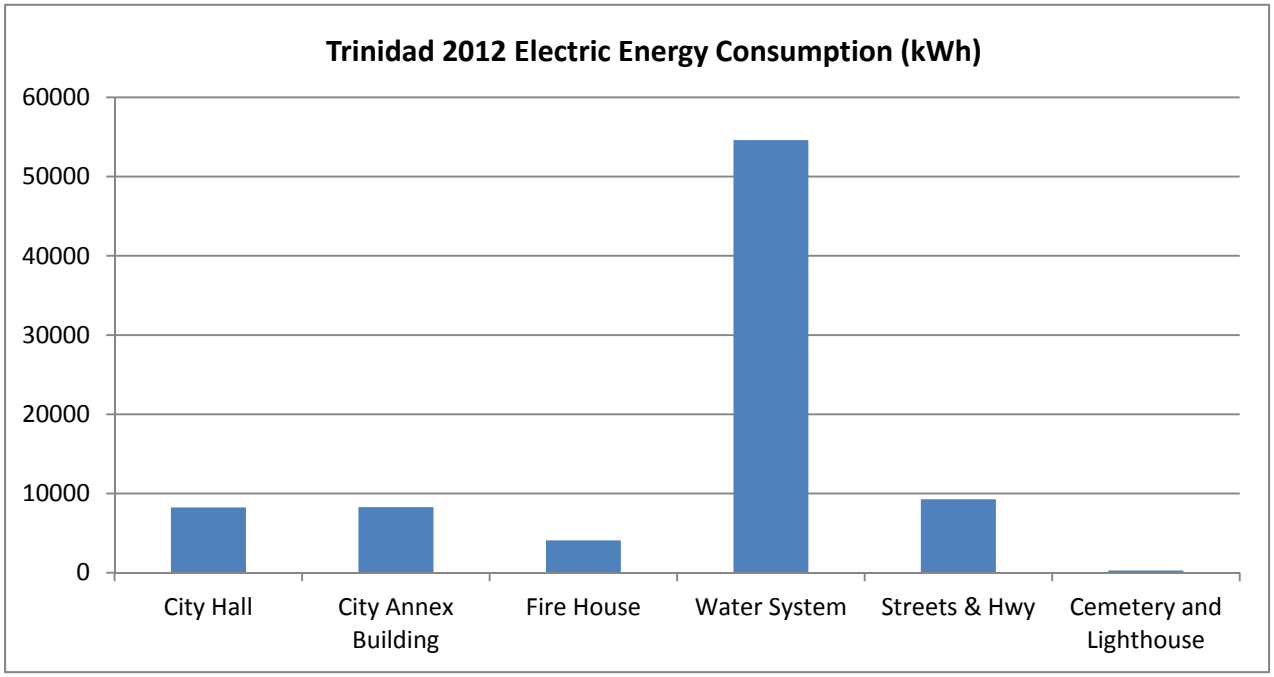
10.3.2 Local Energy Demand

Government operations use five primary energy sources: electricity, liquid fuels (gasoline, diesel, and kerosene), wood, solar, and propane. Each is described below (no energy demand information is provided for transportation fuels).

Electricity

The data presented have been provided by PG&E and are for the calendar year 2012 and typically compare consumption during that year to the prior year (2011) as a year-over-year change. A second comparison is to PG&E's base line year, 2005. In this way, one can see both a long term (2005-2008) trend and a short term (2011) change in consumption.

Overall consumption of electricity in 2012 was 21,020 MBtu. This figure represents an overall 65.6% increase in consumption since 2005 and a year-over-year increase from 2011 to 2012 of 1.7%. When measured in kWh of electricity, Trinidad consumed 6,160,532 kWh of electricity in 2012 as compared to 3,721,105 kWh in 2005.



Non-Residential Sector

Seventy percent of electrical consumption was derived from the non-residential sector in 2012. There were two segments that comprised about 80% of this consumption: hospitality and retail. Energy usage in this sector increased by 126.6% since 2005.

Residential Sector

Thirty percent of electrical consumption was from the residential sector. Energy usage in this sector has increased by 1.6% since 2005. Single family electrical use has increased by 10.5% since 2005 whereas multi-family residential has decreased by 18.8%.

Trinidad has eight facilities for which it paid energy bills. These facilities consumed a total of 67,588 kWh in 2012. The majority of the consumption came from the water system which consumed 54,610

kWh followed by streets and highways. The smallest consumers were the light house at 260 kWh and cemetery at a mere 21 kWh.

Liquid Fuels

The City is supplied with gasoline from one Chevron Station located on Main Street. Some households have private fuel tanks from Renner for home heating. During 2012, the City purchased 1430 gallons of liquid fuel: Chevron (1138); Renner (292).

Wood

Trinidad consumes wood in the residential sector, primarily for heating. On average, there are 20-25 households using a total of 50-60 cords of wood per year.

Solar

As of 2012, there were 85 kW of solar electricity being generated from 28 sites that are connected to the PG&E grid.

Propane

Trinidad consumes propane in the residential sector, primarily for heating and cooking. About 10 to 12 households use propane gas, for an average total of approximately 10,000 gallons per year. This approximation is based on a method used to allocate total County propane consumption using census data and is expected to be a significant underestimate. Amerigas supplied 594 gallons of propane to the City Hall and Sequoia sold 224 gallons to Trinidad for the City Annex Building. The demand for this fuel is due primarily for the exercising of the back-up generators except for City Hall which also uses propane for heating and cooking.

10.3.3 Agreements and Contracts

The following agreements and contracts apply to energy use in the City of Trinidad:

- PGE; A Franchise Agreement between PG&E and the City of Trinidad has been in effect since 1961 under Ordinance 124; Franchise Act of 1937. The franchise has an indeterminate length and returns to the City 2% of the gross annual receipts from electricity sales within the City.
- Amerigas; informal agreement.
- Sequoia; informal agreement.
- Renner; as needed.
- Generator maintenance service agreement with Cummins West in Arcata, CA for City Hall.

10.3.4 Community Key Assets Energy Profile

TABLE 10-1.
COMMUNITY KEY ASSETS AND ENERGY PROFILE

	Primary Energy Supply			Backup Energy Supply						
Essential Service	Service Provider	Energy Type	Form of Agreement	Emergency Generator Brand Model	Peak Power (kW)	Continuous Power (kW, hp)	Fuel type	Gallons of storage	Storage on Site?	Portable
Key Asset #1: Water Treatment Facility, 1313 Westhaven Drive										
Drinking Water		Electricity		Generac Guardian Elite	25	25 kW	Propane	500	Y	
Key Asset #2: City Hall/EOC, 409 Trinity Street										
Emergency Operations Center for Administration		Electricity		Cummins Onan RS12000	12	12 kW	Propane	300	Y	
Key Asset #3: Civic Club Hall/EOC, 409 Trinity Street										
Emergency Operations Center for Administration		Electricity		N/A						
Key Asset #4: Civic Club Hall/EOC, 409 Trinity Street										
Fire Protection and EOC for Operations		Electricity		Kohler 14/20 RES	14	14 kW	Propane	300	Y	

City of Trinidad has identified four key assets for its energy profile:

- Water Treatment Facility
- City Hall/EOC
- Civic Club Hall/EOC
- Civic Club Hall/EOC

Table 10-1 summarizes the energy profile for each key asset.

10.3.5 Key Asset Energy Consumption and Backup Generator Analysis

TABLE 10-2.
KEY ASSET ENERGY CONSUMPTION AND BACKUP GENERATOR ANALYSIS

Electricity Use (kWh)		Highest Monthly Fuel Use (gallons)				Generator Information		
Highest Monthly	Peak	Gasoline	Diesel	Kerosene	Propane	Peak Output (kW)	Fuel Type	On-Site Storage (gallons)
Key Asset #1: Water Treatment Facility, 1313 Westhaven Drive								
5710	17					25	Propane	500
Generator Capacity Analysis: _____								
Key Asset #2: City Hall/EOC, 409 Trinity Street								
632	8					12	Propane	300
Generator Capacity Analysis: _____								
Key Asset #3: Civic Club Hall/EOC, 409 Trinity Street								
491	10							
Generator Capacity Analysis: _____								
Key Asset #4: Civic Club Hall/EOC, 409 Trinity Street								
340	2					14	Propane	300
Generator Capacity Analysis: _____								

Information on the energy requirements of the identified key assets is needed in order to ensure that any existing or new back-up generation is capable of meeting the required electrical load and that fuel storage for the backup generators is adequate to sustain operations of key assets for a minimum of 72 hours in the event of an energy disruption. Table 10-2 shows key asset energy consumption and results of a generator/fuel backup analysis.

10.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

Table 10-3 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: 0
- Number of FEMA Identified Severe Repetitive Loss Properties: 0
- Number of repetitive flood loss/severe repetitive loss properties that have been mitigated: 0

TABLE 10-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake	N/A	11/8/1980	Not Available
Severe Weather / Flood	N/A	1/18/1981	Not Available
Severe Weather / Flood	N/A	12/19/1981	Not Available
Severe Weather / Flood	N/A	3/31/1982	Not Available
Severe Weather / Flood	N/A	1/25/1983	Not Available
Landslide	N/A	1983	$63,000
Coastal Storms, Floods, Slides, Tornados	M#677	1/25/1983	$3.82 million
Flood	M#758	2/21/1986	$5.0 million countywide
Earthquake	M#943	04/04/1992	Not Available
Severe Weather / Flood	N/A	12/31/1992	Not Available
Severe Weather / Flood	N/A	1/20/1993	Not Available
Earthquake	N/A	12/26/1994	Not Available
Winter storms, flooding, landslides, mud flows	M#1044	1/9/1995	$15 million countywide
Severe winter storms, flooding	M#1046	3/12/1995	$1.3 million countywide
Landslide	N/A	1/27/1995	$68,000
Severe Weather / Flood	N/A	12/11/1995	Not Available
Severe Weather / Flood	N/A	12/29/1995	Not Available
Landslide	N/A	12/15/1995	$75,000
Severe Weather / Flood	N/A	12/8/1996	$186,000
Severe Weather / Flood	M#1203	2/9/1998	$5,000 $7.75 million countywide

TABLE 10-3.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe winter storms, flooding	M#1155	1/4/1997	$115,000 $35 million countywide
Severe Weather / Flood	N/A	1/27/1998	$5,000
Severe Weather / Flood	N/A	11/21/1998	$5,000
Severe Weather / Flood	N/A	12/27/2002	$35,000
Landslide	N/A	2003	$100,000
Landslide	N/A	6/14/2005	$75,000
Severe Weather / Flood	N/A	12/31/2005	$3.5 million
Severe Weather/ Wind	N/A	2006	Not Available

10.5 HAZARD RISK RANKING

TABLE 10-4.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Storm	45
3	Drought	42
4	Landslide	36
5	Flood	12
6	Tsunami	12
7	Wildland Fire	12
8	Dam Failure	0
9	Volcano (Ash Fall)	0

Table 10-4 presents the ranking of the hazards of concern.

10.6 CAPABILITY ASSESSMENT

10.6.1 Legal and Regulatory Capability

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 10-5.

TABLE 10-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Codes, Ordinances & Requirements				
Building Code ***Comments:*** #99-3 October 13, 1999	Yes	No	Yes	Yes
Zoning ***Comments:*** #17.04 "TMC" Ordinance #166 "1979"	Yes	Yes	Yes	Yes
Subdivisions ***Comments:*** 16.04 "TMC" Ordinance #163 "1981	Yes	Yes	Yes	Yes
Stormwater Management ***Comments:*** Draft General Plan Circulation Element, Energy and Public Services, July 2012	Yes	Yes	Yes	Yes
Post Disaster Recovery	No	No	No	No
Real Estate Disclosure ***Comments:*** CA. State Civil Code 1102 requires full disclosure on Natural hazard Exposure of the sale/re-sale of any and all real property.	Yes	No	Yes	Yes
Growth Management ***Comments:*** General Plan , May 2, 1978	Yes	No	No	No
Site Plan Review ***Comments:*** Zoning Ordinance #166 "1979"	Yes	No	No	No
Special Purpose Ordinances (floodplain management, critical or sensitive areas) ***Comments:*** No FEMA mapped SFHA. Not participating in National Flood Insurance Program.	No	Yes	Yes	Yes
Public Health and Safety ***Comments:*** Draft General Plan Circulation Element, Energy and Public Services, July 2012	Yes	No	Yes	Yes
Environmental Protection	No	No	Yes	No
Energy Code ***Comments:*** Draft General Plan Circulation Element, Energy and Public Services, July 2012	Yes	Yes	Yes	No
Planning Documents				
General or Comprehensive Plan ***Comments:*** Gen Plan May 2, 1978	Yes	Yes	Yes	Yes

TABLE 10-5.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated
Floodplain or Basin Plan	No	No	Yes	No
Stormwater Plan	Yes	Yes	Yes	No
Capital Improvement Plan	No	No	No	No
Habitat Conservation Plan	No	No	No	No
Economic Development Plan	No	No	No	No
Shoreline Management Plan	No	Yes	Yes	No
Community Wildfire Protection Plan	No	No	No	No
General Plan Energy Conservation Element or Energy Specific Plan ***Comments:*** Draft General Plan Circulation Element, Energy and Public Services, July 2012	Yes	No	Yes	No
Climate Action Plan or Climate Adaptation Strategy	No	No	No	No
Response/Recovery Planning				
Comprehensive Emergency Management Plan ***Comments:*** 2006 Trinidad Emergency Response Plan	Yes	No	No	No
Threat and Hazard Identification and Risk Assessment	No	No	No	No
Terrorism Plan	No	No	Yes	No
Post-Disaster Recovery Plan	No	No	No	No
Continuity of Operations Plan ***Comments:*** 2006 Trinidad Emergency Response Plan	Yes	No	Yes	No
Public Health Plans	No	No	Yes	No

10.6.2 Administrative and Technical Capability

TABLE 10-6.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Yes	Professional Consultants
Engineers or professionals trained in building or infrastructure construction practices	Yes	Professional Consultants
Planners or engineers with an understanding of natural hazards	Yes	Professional Consultants
Planners or engineers with an understanding of energy resilience or alternative energy technology	Yes	Bryan Buckman, Director of Public Works
Staff with training in benefit/cost analysis	Yes	Professional Consultants
Surveyors	Yes	Professional Consultants
Personnel skilled or trained in GIS applications	Yes	Professional Consultants
Scientist familiar with natural hazards in local area	Yes	Professional Consultants
Emergency manager	Yes	Karen Suiker, City Manager
Grant writers	Yes	Professional Consultants

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 10-6.

10.6.3 Fiscal Capability

TABLE 10-7.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No
Other	

The assessment of the jurisdiction's fiscal capabilities is presented in Table 10-7.

10.6.4 National Flood Insurance Program Compliance

The City of Trinidad does not participate in the NFIP.

10.6.5 Energy Resilience Capability

TABLE 10-8. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	Bryan Buckman, Director of Public Works
Have you performed an energy assurance gap analysis for your community?	Yes
Have you completed a vulnerability assessment of power sources to each key asset?	Yes
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	Yes
Are emergency backup generators tested on a regular basis?	Yes
Are multiple persons trained in the operation and maintenance of emergency backup generators?	Yes
Have you established a working relationship with your community's energy service providers?	Yes
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	No
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	Partial

Energy resiliency capabilities are presented in Table 10-8.

10.6.6 Community Mitigation Program Classifications

TABLE 10-9. COMMUNITY CLASSIFICATIONS			
	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule	Yes	9/9	--
Public Protection	Yes	6/9	--
Storm Ready	No	--	--
Firewise	Yes	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 10-9.

10.7 HAZARD MITIGATION ACTION PLAN

Table 10-10 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 10-10.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #T-1—Designate, prepare and announce Emergency Assembly Points throughout the City.							
N/A	All Hazards	1,4,5,8,12	City of Trinidad	Medium	General Fund	Short-term	Yes
Initiative #T-2—Adopt a long-term capital improvement plan, which provides the City the financial capability to fund capital projects that could include hazard mitigation projects							
New and Existing	All Hazards	1-6	City of Trinidad	Low	General Fund	Short-term	Yes
Initiative #T-3—Improve hillside stability in landslide-prone areas							
New and Existing	Landslide	2,3,7	City of Trinidad	Medium	General Fund	Long-term	Yes
Initiative #T-4—Prepare a Post Disaster Recovery Plan							
New and Existing	All Hazards	1,3,4,5,6, 8,10,12	City of Trinidad	Low	General Fund	Short-term	Yes
Initiative #T-5—Identify emergency water supplies and obtain emergency connection equipment							
New and Existing	Earthquake, Severe weather, Drought	1,2,5,12	City of Trinidad	High	Enterprise Fund	Long-term	Yes
Initiative #T-6—Perform seismic retrofits of critical facilities							
Existing	Earthquake	1,2,3	City of Trinidad	High	General Fund, Capital Improvement Fund, Enterprise Fund	Long-term	Yes
Initiative #T-7—Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.							
New and Existing	Tsunami, Severe Weather	1,3,4,5,6, 8,12	City of Trinidad	Medium	General Fund,	Short-term	Yes
Initiative #T-8—Improve alternative communication capabilities throughout the City, including acquisition of emergency transceivers, satellite telephones, and/or other communication devices.							
N/A	All Hazards	1,4,5,12	City of Trinidad	Medium	General Fund	Ongoing, Short-Term	Yes

TABLE 10-10.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline	Included in Previous Plan?
Initiative #T-9—Update City land use code for seismic setbacks/structural requirements and hillside development standards							
New and Existing	Earthquake, Landslide	10	City of Trinidad	Low	General Fund	Short-Term	Yes
Initiative #T-10—Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Trinidad							
New and Existing	All Hazards	3, 5, 8, 12	City of Trinidad	Low	General Fund	Short-Term	Yes
Initiative #T-11—Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.							
New and Existing	All Hazards	1, 4, 5, 7, 8, 12	City of Trinidad	Low	General Fund	Ongoing/ Short-Term	Yes
Initiative #T-12—Obtain and distribute current information about local natural hazard risks and emergency preparedness, including creating and maintaining a hazard mitigation informational web page on the City of Trinidad website.							
N/A	All Hazards	5, 6, 7, 12	City of Trinidad	Low	General Fund	Ongoing/ Short-Term	Yes
Initiative #T-13—Repair Van Wycke Trail Storm Damage							
N/A	Earthquake, Severe Weather, Landslide	3, 6, 9	City of Trinidad	High	General Fund	Short-Term	No
Initiative #T-14—Relocate Vulnerable Waterline along Van Wycke Trail							
Existing	Earthquake, Severe Weather, Landslide	1, 2, 3, 6, 9	City of Trinidad	High	General Fund/ Enterprise Fund	Short-Term	No
Initiative #T-15—Incorporate this Hazard Mitigation Plan as part of the General Plan Safety Element. The safety element of the general plan provides the city the capability to regulate future land uses in areas impacted by all hazards of concern identified by this plan.							
New & Existing	All Hazards	All Objectives	City of Trinidad	Low	General Fund	Short-Term	No

10.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 10-11.
MITIGATION STRATEGY PRIORITY SCHEDULE

Initiative #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
1	5	Medium	Medium	Yes	No	Yes	Medium
2	6	Low	Low	Yes	No	Yes	Medium
3	3	Low	Medium	Yes	Yes	Yes	Low
4	8	Low	Low	Yes	No	Yes	Medium
5	4	High	High	Yes	Yes	No	Medium
6	3	High	High	Yes	Yes	No	Medium
7	7	High	Medium	Yes	No	Yes	High
8	4	High	Low	Yes	No	Yes	High
9	10	Medium	Medium	Yes	No	Yes	Medium
10	4	High	Low	Yes	No	Yes	High
11	6	High	Low	Yes	No	Yes	High
12	4	High	Low	Yes	No	Yes	High
13	3	Medium	High	Yes	Yes	No	High
14	5	High	High	Yes	Yes	No	High
15	12	Medium	Low	Yes	No	Yes	High

a. See Chapter 1 for definitions of high, medium and low priorities.

Table 10-11 identifies the priority for each initiative.

10.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 10-12.
ANALYSIS OF MITIGATION INITIATIVES

	Initiative Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Earthquake	9, 15	2,9	10,11,12	9	1,4,5,8,11	6,13,14
Severe Storm	7, 15	2	10,11,12		1,4,5,8,11	13,14
Drought	15		10,11,12		1,4,5,8,11	
Landslide	9, 15	2,9	10,11,12	3,9	1,4,8,11	13,14
Flood	15	2	10,11,12		1,4,8,11	
Tsunami	7, 15	2	10,11,12		1,4,8,11	
Wildland Fire	15	2	10,11,12		1,4,8,11	
Dam Failure	15					

a. See Chapter 1 for description of mitigation types.

Table 10-12 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

10.10 STATUS OF PREVIOUS PLAN INITIATIVES

Table 10-13 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

TABLE 10-13.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
T-1		X		Designate, prepare and announce Emergency Assembly Points throughout the City.
T-2		X		Adopt a long-term capital improvement plan
T-3		X		Improve hillside stability in landslide-prone areas
T-4		X		Prepare a Post Disaster Recovery Plan
T-5		X		Obtain emergency water supplies
T-6		X		Perform seismic retrofits of critical facilities
T-7		X		Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready. A majority of the work has been completed to obtain the certification.
T-8	X			Adopt International Building Code on January 1st, 2008
T-9		X		Improve alternative communication capabilities throughout the City, including acquisition of emergency transceivers, satellite telephones, and/or other communication devices.
T-10	X			Adopt an updated Emergency Response Plan
T-11		X		Update City land use code for seismic setbacks/structural requirements and hillside development standards
T-12		X		Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Trinidad
T-13			X	Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.
T-14	X	X		Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.

TABLE 10-13.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
T-15		X		Obtain and distribute current information about local natural hazard risks and emergency preparedness, including creating and maintaining a hazard mitigation informational web page on the City of Trinidad website.
T-16			X	For emergency preparedness, implement offsite parking/storage for City equipment.

CITY OF TRINIDAD

Critical Facilities

- Airport
- Communication Facility
- Dam
- Emergency Operation Center
- Fire Facility
- Hazardous Material Facility
- Highway Bridge
- Medical Facility
- Police Facility
- Port Facility
- Potable Water Facility
- Power Facility
- School Facility
- Waste Water Facility

Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF TRINIDAD

Dam Failure Inundation Areas

Dam failure inundation area data from 2007 provided by California Emergeny Management Agency Dam Safety Program.

These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. However, later downstream changes, such as major land contour alterations, may affect the actual inundation pathway.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

N
W E
S

0 0.25 Miles

TETRA TECH

CITY OF TRINIDAD

Cascadia Fault
9.0 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 9.0
Epicenter: Approximately 60 miles W/NW of Tillamook, OR

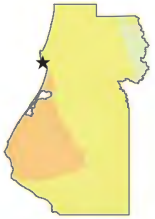
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, scenario generated in 2011.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH



CITY OF TRINIDAD

Quaternanry & Younger Earthquake Faults

Proximate Faults

Mad River Fault Zone

Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF TRINIDAD

Ferndale Fault
6.5 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 6.5
Epicenter: 23.1 miles WNW of Ferndale, CA

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.25 Miles

TETRA TECH

CITY OF TRINIDAD

Soil Classification

National Hazards Earthquake Reduction Program (NEHRP)

Soil Types by Site Class

- **Class B - Rock**
- **Class C - Very Dense Soil, Soft Rock**
- **Class D - Stiff Soil**

Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for site conditions.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF TRINIDAD

Offshore Punta Gorda/ Point Mendochino 5.6 Magnitude Scenario

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 5.6
Epicenter: offshore of Punta Gorda/Cape Mendocino at N40.39, W125.28

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in March 2000.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.25 Miles

TETRA TECH

CITY OF TRINDAD

Trinidad Fault
7.2 Magnitude Event

Peak Ground Acceleration

Mercalli Scale, Potential Shaking

- **I (Not Felt)**
- **II - III (Weak)**
- **IV (Light)**
- **V (Moderate)**
- **VI (Strong)**
- **VII (Very Strong)**
- **VIII (Severe)**
- **IX (Violent)**
- **X+ (Extreme)**

Magnitude: 7.2
Epicenter: 96.9 miles W of Trinidad, CA

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in June 2005.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.25 Miles

TETRA TECH

CITY OF TRINIDAD

FEMA DFIRM
Flood Hazard Areas

Levees and Annual Flood Hazard

- **Levee**
- **1 Percent Annual Flood Hazard**
- **0.2 Percent Annual Flood Hazard**
- **X Protected By Levee**

Flood hazard areas commonly referred to as the 100 year floodplain are those areas that have an annual flood risk of 1 percent. Areas commonly referred to as the 500 year floodplain have a 0.2 percent annual flood hazard risk.

Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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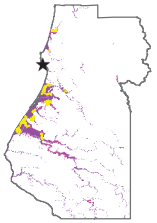

CITY OF TRINIDAD

Landslide Hazard Areas

Steep Slopes and NEHRP Soft Soils

- **15-30 percent slope**
- **Greater than 30 percent slope**

Slopes are only mapped in NEHRP class D soils.

This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 0.25 Miles

N W E S

TETRA TECH

CITY OF TRINIDAD

Landslide Susceptibility

Susceptibility to Landsliding (0 to X, low to high)

0	VII
III	VIII
V	IX
VI	X

Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CITY OF TRINIDAD

Tsunami Inundation Areas

Tsunami inundation area

Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Although an attempt was made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event. This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region. For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event. Data published in September 2009.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.25 Miles

TETRA TECH

CITY OF TRINIDAD

Fire Condition Class

Condition Class

- **1 - low**
- **2 - moderate**
- **3 - high**
- **9 - non assigned**

Condition classes refer to risk of key ecosystem component loss.

Fire condition class data provided by CAL FIRE. Condition class refers to the general deviation of ecosystems from their presettlement natural fire regime, although it includes numerous other data classifications and can be viewed as a measure of sensitivity to fire damage to key elements and processes typical of those ecosystems, or fire-related risk to ecosytem health. Dataset last updated November 2003.

Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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TETRA TECH

CITY OF TRINIDAD

Fire Hazard Severity Class

Hazard Class

- **Very High**
- **High**
- **Moderate**
- **Non-Wildland/Non-Urban**
- **Urban Unzoned**

Responsibility Areas

- **Federal (FRA)**
- **Local (LRA)**
- **State (SRA)**
- **None**

Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildland fires. The data displayed on this map are a combination of two FHSZ datasets - FHSZs in State Responsibility Areas (SRA) adopted in November 2007 and draft FHSZs for all other areas from January 2007.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.25 Miles

TETRA TECH

CITY OF TRINIDAD

Fire Perimeters

Cause of Fire

- **Arson**
- **Campfire**
- **Debris**
- **Equipment Use**
- **Escaped Prescribed Burn**
- **Lightning**
- **Misc**
- **Playing with Fire**
- **Powerline**
- **Smoking**
- **Unknown/Unidentified**
- **Vehicle**

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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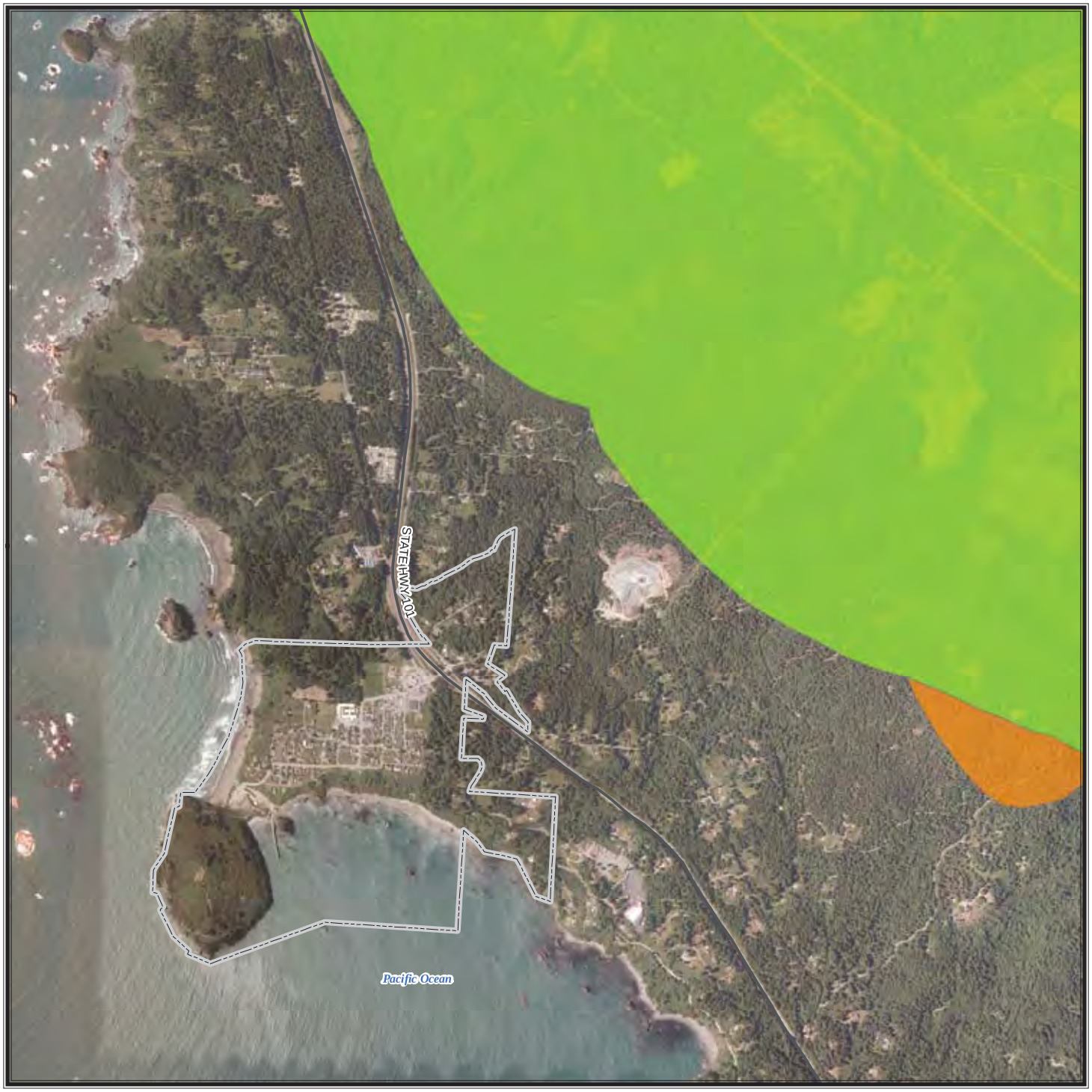

CITY OF TRINIDAD

Fire Perimeters

Year of Fire

- 1908 - 1920
- 1921 - 1940
- 1941 - 1960
- 1961 - 1980
- 1981 - 2000
- 2001 - 2012

Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Dataset updated March 2013.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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0 0.25 0.5 Miles

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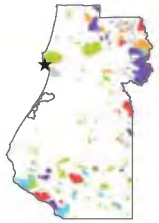

CITY OF TRINIDAD

Natural Fire Regime

Regime

- **Barren/Rock**
- **Water, including wetlands**
- **Agriculture**
- **Urbanized land cover**
- **0-35 year fire frequency, low severity**
- **35-100+ year fire frequency, mixed severity**
- **35-100+ year fire frequency, high severity**
- **200+ year frequency, high severity**

Natural fire regime data provided by CAL FIRE. A natural fire regime is a general classification of the role fire would play across a landscape without modern human mechanical intervention. (References: Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Wash. DC; Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. Pages 171-178 In Proceedings of Society of American Foresters National Convention, Sept. 18-22, 1994, Anchorage, AK. Society of American Foresters, Wash. DC.) The natural fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation
(amount of vegetation replacement). Dataset last updated November 2003.

Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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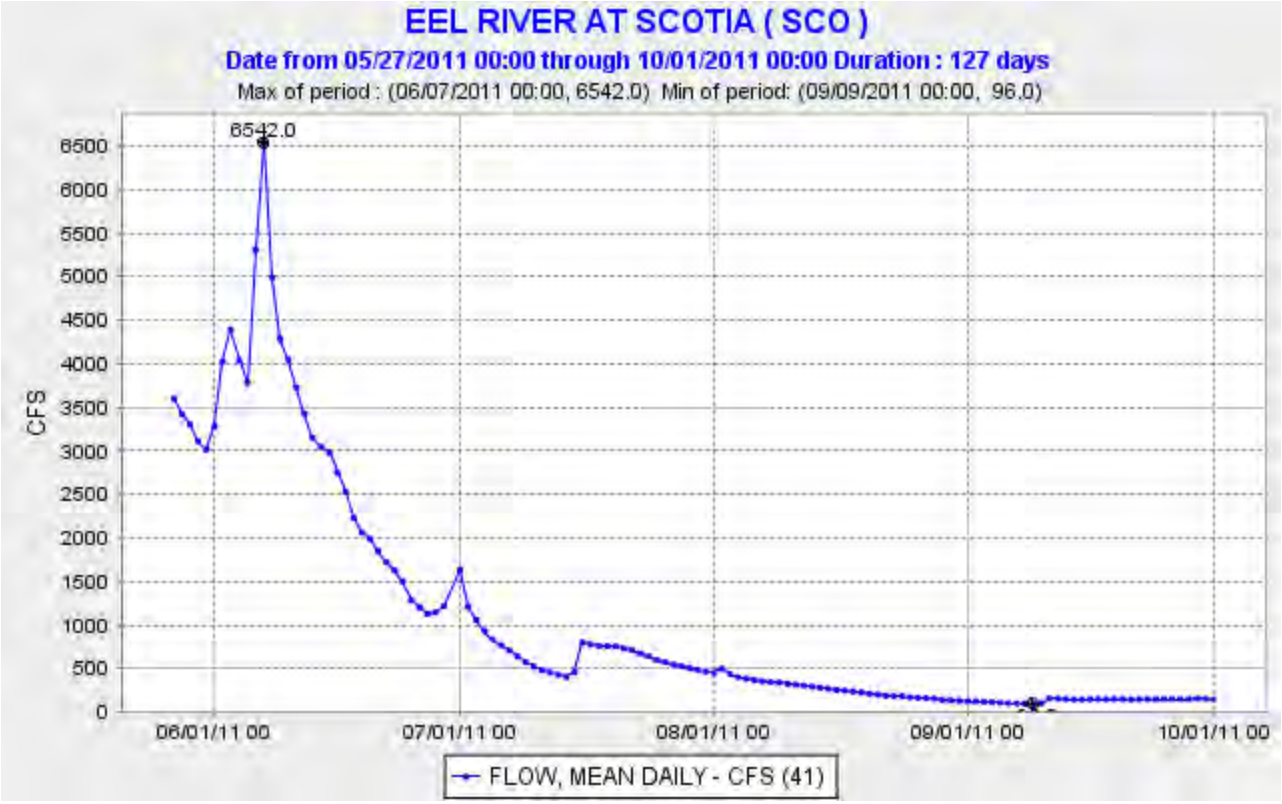
0 0.25 Miles

TETRA TECH


EEL RIVER AT SCOTIA (SCO)
Date from 05/27/2011 00:00 through 10/01/2011 00:00 Duration : 127 days
Max of period : (06/07/2011 00:00, 6542.0) Min of period: (09/09/2011 00:00, 96.0)
6542.0
CFS
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
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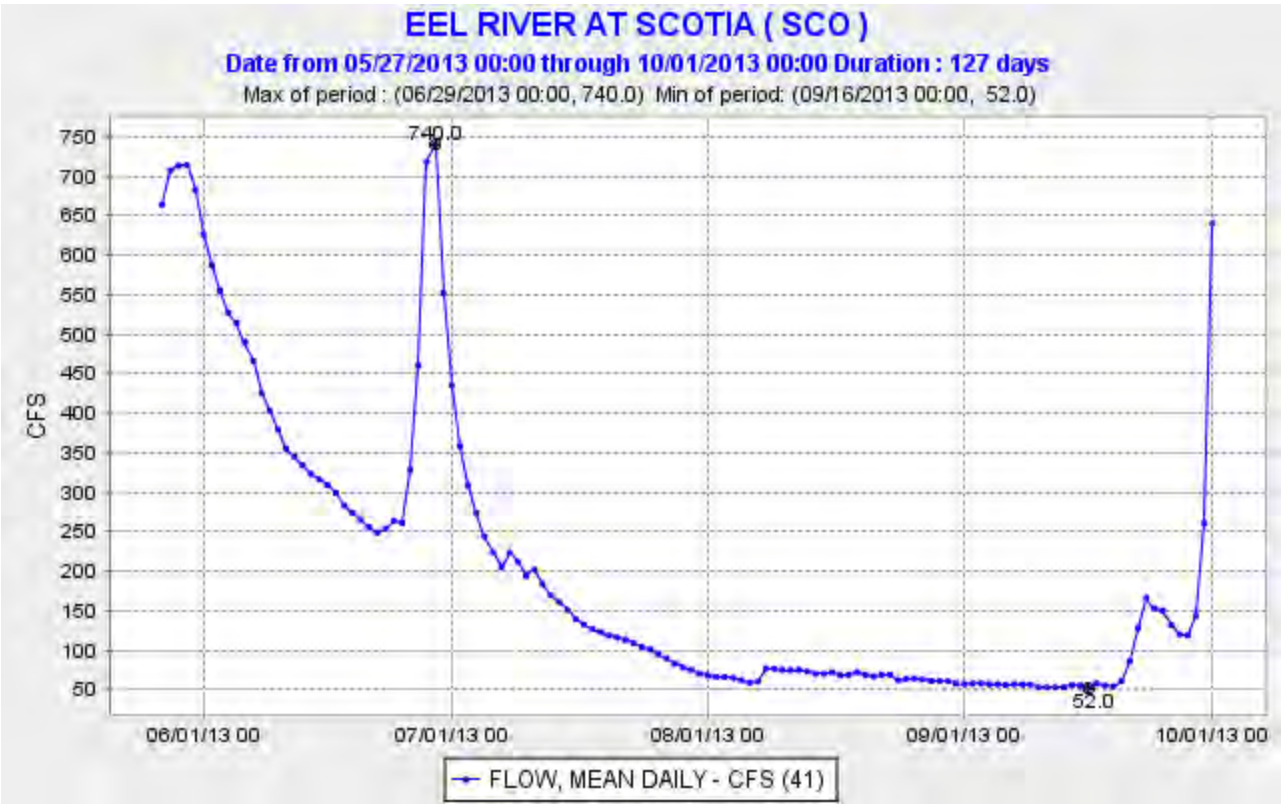
06/01/11 00
07/01/11 00
08/01/11 00
09/01/11 00
10/01/11 00
FLOW, MEAN DAILY - CFS (41)


EEL RIVER AT SCOTIA (SCO)
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CFS
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
740.0
52.0
06/01/13 00
07/01/13 00
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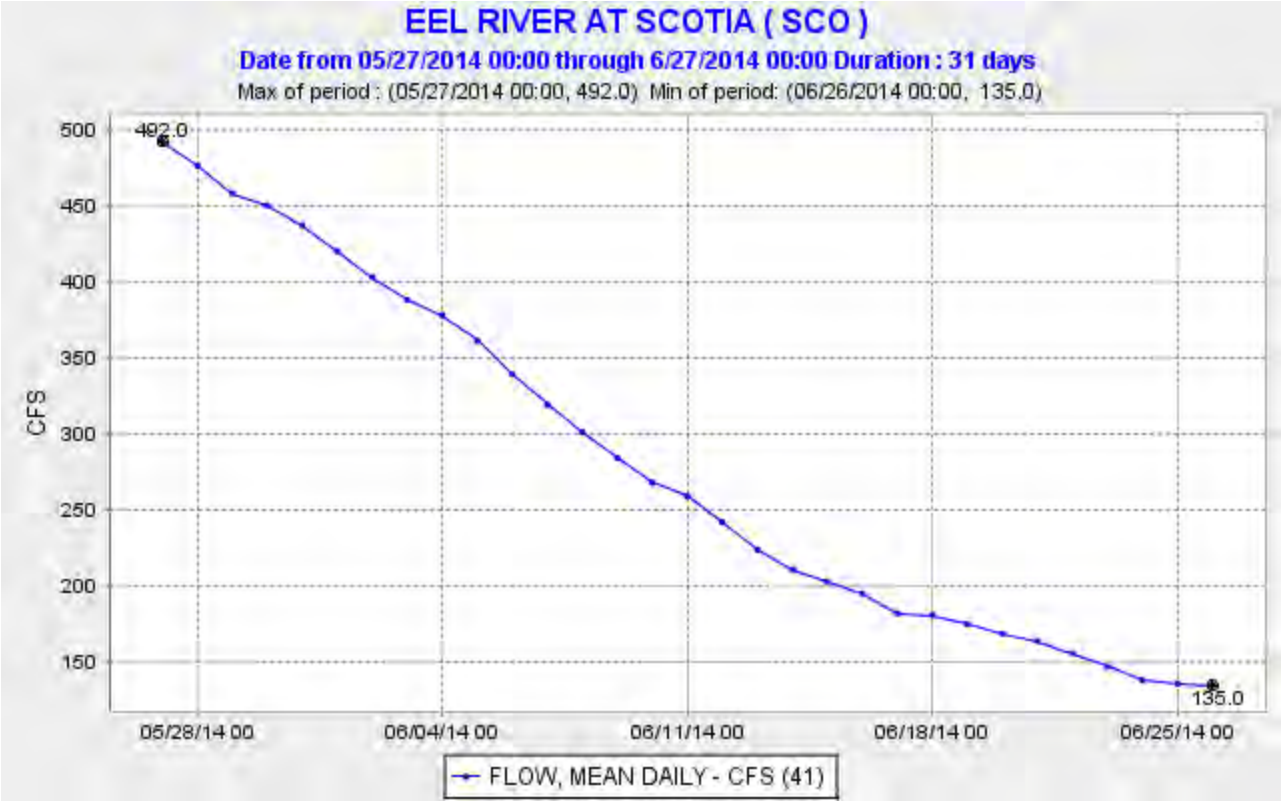
09/01/13 00
10/01/13 00
FLOW, MEAN DAILY - CFS (41)


EEL RIVER AT SCOTIA (SCO)
Date from 05/27/2014 00:00 through 6/27/2014 00:00 Duration : 31 days
Max of period : (05/27/2014 00:00, 492.0) Min of period: (06/26/2014 00:00, 135.0)
CFS
500
450
400
350
300
250
200
150
492.0
135.0
05/28/14 00
06/04/14 00
06/11/14 00
06/18/14 00
06/25/14 00
FLOW, MEAN DAILY - CFS (41)

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City of Rio Dell

Water System Asset Management Plan and Preliminary Capital Improvement Plan

May 2014

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1. Introduction and CIP Overview

This Capital Improvement Plan (CIP) consists of documents that identify current and future needs for the replacement of water system components for the City of Rio Dell. The included Asset Management Plan (AMP) identifies the remaining useful life of the individual system components and the estimated replacement costs at the end of their useful lives. The AMP is the supporting documentation needed for the City to start more accurately budgeting for systematic capital replacements. Together, these documents will assist the City in planning for necessary future component replacements and to determine the amount of revenue needed. Proactive maintenance of a public water system is vital to providing a community with safe and reliable access to drinking water and protecting public health.

This document is comprised of seven main sections:

- Background: An overview of the CIP development and purpose
- Existing Water Facilities: Presents a background on the City's water system.
- Need for Improvements: Presents on-going maintenance issues that need to be addressed to keep the system in good working order.
- AMP: Presents a summary of the AMP developed for the City's water treatment plant, distribution system, and storage assets with estimated replacement schedules and costs.
- Preliminary Capital Improvement Plan: Presents the analysis of the AMP, which indicates the amount of funds the City should be setting aside for Capital Replacement and presents recommendations by City staff for high priority components to be replaced.
- Funding Options: Discussion of possible funding scenarios with information on necessary water rate increases to fund improvements and impacts to rate payers.
- Summary: Presents the final budget information.

2. Background

In an effort to continue documenting the value of the City of Rio Dell's existing infrastructure and begin planning for future replacements, the City has requested that GHD develop an updated CIP and AMP for the City's water system, similar to the CIP completed by the City and GHD in 2010. In recent years, the City has invested considerably in its water system, most recently completing a Water Infrastructure Improvement Project in 2006. Following the format laid out by the EPA, an AMP was completed to document existing water system infrastructure and includes recent upgrades. The AMP and CIP cover an inventory of the water system components including treatment, storage, and distribution system assets. GHD worked closely with City staff to identify date of installation, condition, service history, useful life, remaining useful life, importance, redundancy, priority, and estimated replacement costs (in 2014 dollars) for all water system assets.

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3. Existing Water Facilities

The City of Rio Dell's water system infrastructure including valves, fire hydrants, storage tanks, water treatment plant, distribution system piping, and water service area boundary is shown in Figure 1, in Appendix A. Figure 2 in Appendix A shows the 2006 water pipeline project in more detail.

The City's water supply needs were originally met by individual wells and springs serving clusters of homes and a private water company that served the broader area. Much of the current water system was developed around World War II and later. Eventually, the City developed a well system which was supplied from three wells located north of the City across the Eel River. The production from the City's well system began declining significantly in the fall of 2000, and no increase in water level in the wells was observed even after winter rains came. Attempts to rehabilitate one of the three wells resulted in its complete collapse and failure. An additional well was drilled, and it produced only a minimal amount of water.

It appeared that a water shortage emergency was at hand, and the City of Rio Dell declared a local disaster that was followed by a disaster declaration by the Governor. The Office of Emergency Services, the Department of Health Services and the City of Rio Dell then undertook the funding of the Rio Dell Emergency Interim Water Supply System that was constructed over the summer of 2001. The Emergency Interim Water Supply System provided a capacity of 500,000 gallons per day which was enough to meet then current needs based on implementing moderate conservation measures.

In 2006, the City completed an upgrade to the interim water system which included a permanent water intake on the Eel River consisting of an infiltration gallery; wet well; intake pump; force main; improvements to the chlorination system; additional filtration units; miscellaneous pipes, valves and appurtances; and site paving. The current system with improvements has a filtration capacity of 1,000,000 gallons per day.

Much of the early water distribution system was constructed out of available pipe and was installed without regard to an appropriate long-term design standard. Approximately 28,000 feet of new 6", 8" and 10" water mains were installed in 2006, funded through a grant from the California Department of Water Resources (DWR). There have been several other minor projects in recent years to continue the process of replacing sections of the distribution system. There are still small pipes, 2" to 6", that are 50 years or older and should be replaced.

The City of Rio Dell maintains four water storage tanks. The Painter Street Tank is a 250,000-gallon welded steel water tank that supplies the main pressure zone. The Douglas Tank site has a new 500,000 gallon bolted steel tank and an existing 250,000 gallon redwood tank also supplying the main pressure zone. The Dinsmore Tank, a 100,000-gallon bolted steel water tank installed in 2007, supplies a smaller pressure zone and is filled from the Douglas Tank.

4. Need for Improvements

Proposed improvement projects are presented and described in this section under the heading that best describes the need for the project element including health and safety, system operation and maintenance, and capacity for growth. The project elements discussed under each heading are presented in their preliminary priority order.

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The water treatment plant improvements are generally intended to enhance the reliability of the water treatment plant or meet upcoming regulations and are not intended to increase plant capacity. The City currently produces approximately 90 million gallons of drinking water per year. Average daily use is estimated at 0.267 million gallons per day (MGD), while peak daily use is estimated at approximately 0.474 MGD.

4.1 Replacement of Transmission and Distribution Pipelines and Appurtenances

The City of Rio Dell's water transmission and distribution system originated from the consolidation of private systems and construction of new sections over time. The resulting system serves incremental new developments rather than serving the City as a whole. There remains considerable steel piping in deteriorating condition within the system that is smaller than 4" in diameter and is inadequate to provide fire protection if needed. The distribution system in Dinsmore on Monument Road and Old Ranch Road is in particularly poor condition and needs replacement. All old steel pipe smaller than 4" in diameter should be replaced to comply with current California Waterworks Standards. Additionally, cleanout and blow off assemblies need to be added to keep the piping network clean. Valves and hydrants that do not operate properly need to be replaced. Older pipes also tend to have higher water leak rates; therefore, replacing these pipes would provide the benefit of improving water conservation.

4.2 Clarifier/Flocculator

The existing flocculator unit does not adequately treat the high wintertime turbidity levels and needs replacement. During winter storm events, turbidity levels rise to a level that the existing flocculator cannot treat, and the water intake system has to be turned off until turbidity level decrease and treatment can resume. The City needs a new 1000 gpm pre-treatment unit to handle winter turbidity levels.

4.3 Booster Pump Station to Dinsmore

The City of Rio Dell operates a booster pump station at the Douglas Tank site which boosts pressure from the City's primary pressure zone to a second pressure zone on the Dinsmore Plateau. The booster pump station plumbing is in need of replacement. The suction piping necks down from 8" to 2", while the discharge piping is also 2". The piping was done by a previous developer and needs to be modified to provide adequate flows. Moreover, the pumps appear to have diminished in capacity and are in need of replacement. This booster pump station will be replaced when the Dinsmore Plateau is developed and paid for by the development. Until development occurs and the pump station is replaced, the City will maintain the existing station.

4.4 Dinsmore Tank Solar Powered Telemetry System

The existing wiring for the Dinsmore Tank is buried directly in ground and is corroded, causing malfunction. The City needs to replace the system with a solar powered telemetry system to maintain continuous operation of the Dinsmore Tank.

4.5 Painter Street Tank Rehabilitation

The City of Rio Dell's existing Painter Street Tank is in need of repair or replacement. The existing paint job on the tank has deteriorated, and both the interior and exterior of the tank need to be repainted. There are also rusty areas that need spot repair. The top of the tank has several holes

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remaining from previous plumbing that need to be patched. It appears that replacement of the tank may be more economical and provide the City with a better long-term solution than rehabilitating the existing Painter Street Tank. Valving at the tank also needs to be replaced.

4.6 Auxiliary Power Generator

Currently, there is no auxiliary power source dedicated to the source supply feed pumps at the City's infiltration gallery (source water supply) on the Eel River. The City needs a generator and automatic transfer switch for these pumps in order to be able to continue to provide a safe source of drinking water to City residents in the event of an extended power outage.

4.7 Douglas Tank Replacement

The City's Douglas Tank #1, a 250,000 gallon redwood tank, has several leaks that are getting worse with time. The cost of lining the tank to provide additional useful life is an option; however, the expense would be high, and replacement would be a better long term solution.

4.8 Additional Plant Operations Building

There are currently only two enclosed buildings serving the City of Rio Dell's water treatment plant, which are used to capacity. The City needs a new building to serve as an administrative work space and equipment storage area. The building would provide staff with a functional office space to prepare and store plant documents, while remaining on the treatment plant site to perform any necessary operations activities. The storage area would be a separate section of the building and would free up space in the laboratory to be able to more safely use the laboratory for its intended purpose. Equipment and file storage is especially important on the North Coast where prolonged rainfall can damage equipment and ruin treatment plant records.

4.9 Re-Coating of Existing Water Treatment Filters

The existing water treatment plant has many pieces of process equipment that are corroding due to exposure to the environment and routine operation. If left unchecked, the rust and corrosion could lead to decay of the underlying steel and eventual need for extensive repairs or replacement.

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5. Asset Management Plan

A separate Asset Management Plan was developed for each of the three main areas of the City's water system; water treatment, water storage and distribution system. The AMP includes a description of each asset, the year it was installed, expected useful life and remaining useful life, condition, service history, importance to the treatment system, redundancy, priority for addressing, and total cost for replacement in 2014 dollars. This information is useful to the City in understanding the value of the infrastructure the City has invested in and puts in perspective the importance of regular maintenance to protect the City's assets. The remaining useful life of the water system components ranges from 1 to 97 years with an average remaining useful life of 24 years. A summary of each system and the value of investment is discussed below.

5.1 Water Treatment

The Rio Dell Water Treatment AMP is included as Table B.1 in Appendix B. The water treatment plant includes the raw water intake, coagulation/flocculation system, filtration, backwash system,

SCADA system, and miscellaneous site improvements. The total replacement capital cost for the water treatment system in 2014 dollars is $3,012,958 excluding any permitting, environmental, design, or outside labor costs.

5.2 Water Storage

The Rio Dell Water Storage Tank AMP is included as Table B.2 in Appendix B. The Water Storage AMP covers the four City storage tanks, the Booster pump station serving the Dinsmore Tank, flow meters, and miscellaneous site improvements. The total replacement capital cost for the City's water storage system is $1,369,314, excluding any permitting, environmental, design, or outside labor costs.

5.3 Distribution System

The Rio Dell Water Distribution System AMP is included as Table B.3 in Appendix B. The distribution system includes almost 20 miles of pipes running beneath the City streets, in addition to valves, fire hydrants and water meters. The total replacement capital cost for the City's water distribution system is $9,068,610, excluding any permitting, environmental, design, or outside labor costs.

Table 1 – Summary of Water System Replacement Value

Summary of Water System Replacement Value	
Water Treatment	$3,012,958
Water Storage	$1,369,314
Distribution System	$9,068,610
TOTAL	$13,450,882

6. Capital Improvement Plan

Several of the system components have exceeded their expected service lives, and planning for the replacement of these components should have already started. It is also clear that the cost of replacing or saving for the replacement of everything that currently should be addressed would be a severe hardship on the City's water customers if borne all at once. Proactive asset management practice suggests implementing a comprehensive, multi-year capital improvement plan as part of the City's annual water budget process.

A preliminary Capital Improvement Plan was developed from each of the AMPs. The CIP was developed assuming that the useful life of components could be extended with good maintenance, and the collection of funds for assets with remaining useful lives greater than 30 years was delayed by 10 years to better disburse the bulk of the repayment costs. Table B.4 in Appendix B shows the CIP with the useful life of system components and the delay in collection of funds for items that have long remaining useful life. This table assumes the City completes the projects in Table 3 below in the next five years and begins addressing other components after two years.

The analysis assumes an interest rate of 2.12% (an average over the past 10 years) in the City's LAIF account and an inflation rate on capital goods of 1.51% (May 2014 Rate).

City staff worked closely with GHD to identify the City's top priority projects. The components that are agreed to be most urgently in need of repair or replacement at the present time (May 2014) are listed in Table 2.

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Table 2 – Summary of Priority Water System Projects

Priority Project	Capital Replacement Cost (2014 dollars)
Infiltration Gallery Extension	$1,000,000
Replacement of Distribution Piping	$420,000
Replacement Clarifier	$350,000
Painter Street Tank Replacement	$300,000
Backup Generator for Infiltration Gallery	$40,000
Dinsmore Tank Solar Powered Telemetry	$29,000
SCADA System	$6,000
TOTAL	$2,145,000

The above costs represent our opinion of probable construction costs in 2014 dollars.

7. Funding Options

The City needs to consider how it will pay to replace its aging water infrastructure and save for future replacement of newly installed components before increased wear and tear and deferred maintenance create a situation where the City is unable to satisfactorily fulfill its dedication to providing clean, safe, and reliable drinking water supply to its citizenry. The recommended approach is to create a plan for systematic component replacement based on the needs outlined in the three AMPs, working closely with City staff and City Engineer recommendations.

Development of a specific plan was outside the scope of this preliminary CIP effort. However, a simplified 5-year CIP was developed to provide the City a starting place for collecting additional funds for capital replacement. The 5-year CIP includes completion of the majority of the projects listed in Table 2.

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Table 3 – Five Year Capital Expenditures to Complete Priority Projects

Priority Project	2014 Capital Cost	Year 1	Year 2	Year 3	Year 4	Year 5
Infiltration Gallery Extension	$1,000,000		$ 180,000	$ 180,000	$ 330,000	$ 310,000
2" or smaller water line (Old) (25%)	$ 420,000		$ 100,000	$ 100,000	$ 100,000	$ 120,000
Replacement Clarifier	$ 350,000	$ 350,000				
Painter Street Welded Steel Tank Replacement	$ 300,000		$ 150,000	$ 150,000		
Backup Generator for Infiltration Gallery	$ 40,000	$ 40,000				
Dinsmore Tank Solar Powered Telemetry	$ 29,000	$ 29,000				
SCADA System		$ 6,000				
Total	$ 2,145,000	$ 425,000	$ 430,000	$ 430,000	$ 430,000	$ 430,000
Average Monthly Cost per water connection (1,430 connections)		$ 24.77	$ 25.06	$ 25.06	$ 25.06	$ 25.06

If the City were to collect an additional $430,000 a year for the Capital Improvement Program, starting in Year 2017, that amount would be approximately half of the needed funds to fully replace the system components as they wear our under the assumption of useful life.

8. Summary

The City of Rio Dell has invested over $12 million in the water intake, treatment, storage, and distribution systems serving the City. The Asset Management Plan and Preliminary Capital Improvement Plan provide the City a framework for planning for the eventual replacement of water system infrastructure. The City should be collecting between $400,000 and $1,400,000 a year for replacement of water system components at the end of their useful life. The variation in amount reflects the potential to extend the useful life of some components and the potential for obtaining grants to offset City funds.

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Appendices

Appendix A – Figures

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Raw Water Intake
Water Tank
Fire Hydrant
Valve

Pre-2006 Pipeline
<= 2" Diameter Pipeline
4" Diameter Pipeline
6" Diameter Pipeline
8" Diameter Pipeline

2006 Installed Water Mains
2006 Direct Fill Line
Water Service Area Boundary

0 450 900 1,800 ft
1 inch = 900 feet printed at 11x17

N

Sources: USDA: Aerial NAIP 2009 1 meter resolution; Humboldt County GIS: Parcels, Blueline Streams.

Cartography	Date	Project #
GG	10/29/2010	01061-01010

Figure 1
Existing Facilities and Service Area

Rio Dell
Water System CIP

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Raw Water Intake
Water Tank
Fire Hydrant
Valve

2006 Installed Pipeline
6" Diameter Pipeline
8" Diameter Pipeline
10" Diameter Pipeline

2006 Direct Fill Line
Water Service Area Boundary

0 300 600 1,200 ft
1 inch = 667 feet printed at 11x17

N

Sources: USDA: Aerial NAIP 2009 1 meter resolution; Humboldt County GIS: Parcels, Blueline Streams.

Cartography	Date	Project #
GG	12/8/2010	01061-01010

Figure 2
Existing Facilities, Service Area, and 2006 Pipeline

Rio Dell
Water System CIP

WINZLER & KELLY
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Appendix B – Asset Management and Capital Improvement Plan Tables

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Table B.1: Rio Dell Water Treatment Plant CIP Inventory - 2014

Teatment Plant

Asset - Treatment Plant	Description	Installation Date	Expected Useful Life	Remaining Useful Life	Condition	Service History	Adjusted Useful Life	Importance (Low, Medium, High, Critical)	Redundancy	Priority (1=highest) (5=lowest)	TOTAL 2014 COST
Raw Water Intake											
Infiltration Gallery Intake Piping	596 ft of piping	2006	60	52	new	annual		c	yes	1	$ 1,000,000
Raw Water Intake Pumps	(2) 15 HP + (1) 30 HP + (1) Myers	2006	15	7	new	annual		c	yes	1	$ 107,926
Wet Well	appx. 225 SF building	2006	50	42	new	none		c	none	1	$ 103,308
Raw Water Forcemain	10-inch (appx. 2251')	2006	50	42	new	none		c	none	1	$ 232,547
Backwash System	10-inch gravity fed from Douglas Tank (appx. 200')	2006	50	42	new	annual		h	none	2	$ 20,662
Auma Actuators	allows for bypass of flocculator; controlled from panel based on NTUs	2006	15	7	new	inspections quarterly		m	none	4	$ 7,461
Coagulation/Flocculation											
Temperature/pH Meter	Hach pHD differential pH	2006	15	7	new	quarterly		m	none	4	$ 264
Raw Water Turbidity Meter	Hach Surface Scatter 6 (Raw)	2001	15	2	good	quarterly		m	none	2	$ 5,432
Streaming Current Monitor	Chemtrac SCM2500XRD	2006	15	7	excellent	quarterly		m	none	2	$ 12,334
Chlorine Solution Tank	500 gal Tank	2006	50	42	excellent	quarterly		h	none	1	$ 2,296
Sodium Hypochlorite Injection	Solenoid Metering Pump (Premia 75 - 0.5gph)	2006	15	7	new	quarterly		h	none (only 1 unit)	1	$ 1,211
Chlorine Analyzer	Hach CL17	2006	15	7	excellent	quarterly		c	none (only 1 unit)	1	$ 3,420
Coagulant Solution Tank	350 gal Tanks (1 for summer; 1 for winter)	2001	60	47	excellent	quarterly		h	none (only 1 unit per season)	1	$ 2,009
ProPac 932 Polymer Injection	Liquid alum-polymer coagulatn blend from NTU Technologies, Inc.; solenoid metering pump (.5 gph max); Premia	2009	15	10	excellent	quarterly		h	none (only 1 unit per season)	1	$ 2,009
ProPac 9700 Polymer Injection	Liquid alum-polymer coagulatn blend from NTU Technologies, Inc.; solenoid metering pump (1 gph max); Premia	2006	15	7	excellent	quarterly		h	none (only 1 unit)	1	$ 2,870
Flash Mixer	Hayward Gordon Model HIM-20-10 (2hp)	2006	20	12	new, bad seal	biannual		c	None	1	$ 17,218
Flocculator/Clarifier	Roberts Filter RELIANT™ Floc/Settler Pretreatment Unit (designed for Q_{max} of 360 gpm; floc and SOR of 3.0 gpm/ft^2	2001	40	1	good, but severly undersized	annual		l	None	5	$ 350,000
Flocculator Vertical Paddle Wheel Motors	slow turn wood paddle wheels	2001	20	7	good	regular for motors		l	None	5	$ 517
Flocculator Elecric Actuating Sludge Wasting Valve	6-in Bray Series 70 (Open/Close)	2001	15	2		biannual		l		5	$ 1,722
Clarified Water Tanks	(2) 2,500 gal Tanks; came with RELIANT	2001	60	47	good	annual		l	2 units	5	$ 8,035
											$ -

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Asset - Treatment Plant	Description	Installation Date	Expected Useful Life	Remaining Useful Life	Condition	Service History	Adjusted Useful Life	Importance (Low, Medium, High, Critical)	Redundancy	Priority (1=highest) (5=lowest)	TOTAL 2014 COST
Filtration											**$ -**
Transfer Pumps	pump to filters/throttles back w/filter influent valves; (2) split case horiz. Centrifugal pumps (Baldor Model 182JM motors & Goulds Model 3656 pump w/6.75" impeller) - 1725 RPM, 3HP	2001	20	7	good	2x/year		l	**yes; 1 duty/1standby? Both on at same time**	5	$ 9,183
Clarified Water Turbidity Meter	continuously measured at each filter outlet (HACH 1720D)	**2001**	15	2	good	quarterly		l	none (six total)	4	$ 2,984
Clarified Water Turbidity Meter	continuously measured at each filter outlet (HACH 1720E)	**2006**	15	7	good	quarterly		l	none (six total)	4	$ 2,984
Clarified Water Flowmeters	**McCrometer MC-03 Propeller (4-inch) on Filters 3 and 4**	2006	15	7	good	1x/year		c	none	1	$ 3,214
Clarified Water Flowmeters	**McCrometer MC-03 Propeller (4-inch) on Filters 1 and 2**	2009	15	10	excellent	1x/year		c	none	1	$ 3,214
Clarifier/Polishing Filters	Roberts Filter PACER II™ Dual Treatment Filters (2 units total installed in 2001); recoated in 2006	**2001**	50	37	good	1x/year		c	**none; filter loading rates would be exceeded w/1 down**	1	**$ 803,509**
Clarifier/Polishing Filters	Roberts Filter PACER II™ Dual Treatment Filters (2 units total in 2006)	**2006**	50	42	good	1x/year		c	**none; filter loading rates would be exceeded w/1 down**	1	**$ 803,509**
Filter Media	Cobble, white sand, red sand, anthracite	2006	10	2	good	every 10 years		c	none	1	$ 27,549
Chlorine Injection	Post Premia 75 Pumps (1 gph)	2006	15	7	good	quarterly		c	none	1	$ 1,748
Chlorine Analyzer	Hach CL17	2006	15	7	good	quarterly		h	none	1	$ 3,420
Clear Well	16,700 gal concrete clearwell	2006	100	92	good	1x/5 years		c	none	1	$ 28,697
Finish Water Pump #1	Vertical turbine pumps with VFD (Goulds 350 gpm pumps w/ 640 gpm combined capacity)	2014	15	15	good	2x/year		c	**none; demand exceeds single pump capacity**	1	$ 57,393
Finish Water Pump#2	Vertical turbine pumps with VFD (Goulds 350 gpm pumps w/ 640 gpm combined capacity)	2006	15	7	good	2x/year		c	**none; demand exceeds single pump capacity**	1	$ 57,393
Effluent Flow Meters	Siemens Sitrans 10" flowmeter	2006	15	7	good	1x/year		h	none	1	$ 7,461
Bray Valves	4" (4 four-inchers), replaced 2014 from Item Below	**2014**	10	10	good	excellent		h		1	$ 7,723
Bray Valves	4", 6", & 8" (8 per filter; 1 8-inch per filter; 1 6-inch filter; 2 four-inchers)	**2001**	10	2	good	excellent		h	2 new ones + parts on shelf	1	$ 9,624
Bray Valves	4", 6", & 8" (8 per filter; 1 8-inch per filter; 1 6-inch filter; 6 four-inchers)	**2006**	10	2	good	continuous		h	2 new ones + parts on shelf	1	$ 17,347
Level Controllers	LC-115 for Fitlers 3&4	**2006**	15	7	good	1x/year		h		1	$ 1,377
Level Controllers	LC-115 for Filters 1&2	**2009**	10	5	excellent	1x/year		h		1	$ 1,377
											$ -

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Asset - Treatment Plant	Description	Installation Date	Expected Useful Life	Remaining Useful Life	Condition	Service History	Adjusted Useful Life	Importance (Low, Medium, High, Critical)	Redundancy	Priority (1=highest) (5=lowest)	TOTAL 2014 COST
Backwash System											**$ -**
Backwash Pumps	Goulds Model 3656 (350 gpm, 3500 RPM, 7-7/8 inch impeller)	2009	15	10	good	2x/year		m	yes	3	$ 5,739
Backwash Tank	11,300 gal	2001	60	47	good	every 2 years		l	none	3	$ 17,218
Bray Valve	1-4"	2014	10	10	good	every 2 years		m	none	1	$ 1,200
Air Scour Blowers	1 for each filter (Filters 1&2)	**2001**	15	2	good	1x/year		m	4 units; yes	2	$ 17,218
Air Scour Blowers	1 for each filter (Filters 3&4)	**2006**	15	7	good	1x/year		m	4 units; yes	2	$ 17,218
											$ -
SCADA System											**$ -**
Red Lion HMI/PLC	Roberts Filter Group	**2009**	20	20	Excellent	as needed		c	none	1	$ 22,957
Filter Controllers	for each filter	**2006**	20	12	good	as needed		c	none	1	$ 2,971
Aqua Sierra SCADA	server hardrives, power supplies, radio controls	2006	10	1	poor	as needed		m	none	2	$ 6,000
											$ -
Miscellaneous											**$ -**
Fencing & security gates	Security fencing around plant; needs replacement	2006	40	32	good	as needed		m		3	$ 34,436
Yard lighting (overhead)	Working on lights for years, only a few work, need to replace fixtures	2013	40	39	excellent	as needed		m		3	$ 11,479
Asphalt pavement	New asphalt	2013	40	39	excellent	as needed		l		4	$ 86,090
Grating, stairs, railings	Raling and stairs at plant in good condition; Filters 1 and 2 installed in 2001; Filters 3 and 4 installed in 2006	2006	50	42	good	as needed		l		3	$ 91,830
Standby Generator	Currently Don's Rental, have quoted from Rogers Machinery in the past but never purchased; don't have one yet	2015	15	16				m		3	$ 40,175
TOTAL											**$ 3,012,958**

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Table B.2: Rio Dell Water Storage Tank CIP Inventory - 2014

Storage Tanks

Asset - Storage	Description	Installation Date	Expected Useful Life	Remaining Useful Life	Condition	Service History	Adjusted Useful Life	Importance (Low, Medium, High, Critical)	Redundancy	Priority (1=highest) (5=lowest)	TOTAL 2014 COST
Douglas Storage Tanks											
.25 MG Redwood Tank	48' Diameter/19.5' to overflow pipe	1978	40	4	Good	1x/5 years; serviced in		low	none	5	$ 300,000
0.5 MG Bolted Steel Tank	Epoxy coated bolted steel; 47.5' Diameter/37' to Overflow Weir Cone	2006	75	67	Excellent	1x/5 years; serviced in		critical	none	1	$ 286,967
Recirculation Pump Station	(2) 5 HP pumps (Not currently used)	2006	30	22	Excellent	1x/year		low	1 duty; 1 standby	5	$ 97,569
Wood Building	Houses chlorine, booster pumps, and recirculation pumps	2006	50	42	Excellent	as needed		medium	none	3	$ 13,774
Booster Pump Station to Dinsmore	(2) 15 HP pumps (appx. 62 gpm each existing); controlled by level at Dinsmore & suction/discharge piping	2006	20	12	Excellent	quarterly		critical	yes; 1 duty/1 standby	1	$ 74,612
Security Fencing	perimeter fencing	2006	60	52	Excellent	as needed		low	none	4	$ 13,774
Telemetry	combination for Douglas and Dinsmore	2001	20	7	Good	as needed		critical	none	1	$ 5,981
Flowmeter	Magmeter for 0.5 MG tank	2006	20	12	Excellent	1x/year		low	none	4	$ 4,591
Flowmeter	EMCO for (2) booster pumps	2006	20	12	Excellent	1x/year		critical	none	1	$ 4,591
Flowmeter	for recirculation pump station	2006	20	12	Excellent	1x/year		low	none	5	$ 4,591
Dinsmore Tank											
0.1 MG Bolted Steel Tank	fed by booster pump station at Douglas;	2006	75	67	New	1x/5 years; serviced in		critical	none	1	$ 200,877
Flowmeter	not hooked up; no power	2006	20	12	New	1x/year		low	none	5	$ 4,591
Solar Powered Telemetry	NOT INSTALLED YET	2015	15	16	Good	as needed		critical	none	1	$ 28,697
Painter Tank											
0.25 MG Welded Steel Tank	level transducer for indication only; floats with 0.5 MG Douglas Tank	1956	60	2	Fair	1x/5 years; serviced in		critical	none	1	$ 300,000
Solar Powered Telemetry	works when sunny (1 solar panel; converter; RTU)	2005	15	6	Good	as needed		critical	none	1	$ 28,697
TOTAL											**$ 1,369,314**

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Table B.3: Rio Dell Water Treatment Plant CIP Inventory - 2014

Water Distribution System

Asset - Collection System	Expected Useful Life	Condition	Service History	Adjusted Life	Age	Remaining Useful Life	Importance	Redundancy	Priority (1=highest) (5=lowest)	TOTAL 2014 COST
2" or smaller water line										
Lineal Feet (LF) - 22533	60	Poor to Fair	LF needing replacement – 22,370'	50	1950	0	High	none	1	$ 1,677,750
4" water line										
Lineal Feet (LF) - 10313	60	Poor to Fair	LF needing replacement – 10,304'	50	1950	0	High	none	1	$ 772,800
6" water line										
Lineal Feet (LF) - 34947	60	Poor to Fair	LF needing replacement – 34,947'	50	1975	11	High	none	2	$ 2,795,760
Lineal Feet (LF) - 1389	100	New	New line installed in 2006	50	2006	42	High			$ 111,120
8" water line										
Lineal Feet (LF) - 9330	60	Poor to Fair	LF needing replacement – 9,330'	50	1980	16	High	none	3	$ 793,050
Lineal Feet (LF) - 5718	100	New		50	2006	42	High			$ 486,030
10" water line										
Lineal Feet (LF) - 20790	100	New	LF needing replacement – 0'	50	2006	42	High	none	4	$ 1,871,100
Fire Hydrant Assemblies										
Quantity - 23	40	Fair	Units needing replacement – 23	30	1980	0	High	none	3	$ 103,500
Quantity - 28	100	New	28 replaced in 2006	30	2006	22	High			$ 126,000
Gate Valves										
Quantity - 64	40	Fair	Units needing replacement – 64	30	1980	0	High	none	3	$ 96,000
Quantity - 157	100	New	93 replaced in 2006	30	2006	22	High			$ 235,500
TOTAL										**$ 9,068,610**

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Table B.4: Capital Improvement Plan Budget for Useful Life Estimates, with 5-Year CIP Items Removed

COMPONENT	TOTAL REPLACEMENT COST ($)	ADJUSTED REMAINING USEFUL LIFE	YEAR TO BEGIN SAVING	YEAR OF REPLACEMENT	COMPOUND AMOUNT ($)	ANNUAL SINKING FUND ($)	2015	2016	2017	2018	2019	2020	2021	2022	$2,023	2024	2025
TREATMENT																	
Raw Water Intake																	
Infiltration Gallery Intake Piping	$275,000	52	2025	2067	$ 516,064	$7,740	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,740
Raw Water Intake Pumps	$94,023	7	2017	2022	$ 101,339	$19,427	$ -	$ -	$ 19,427	$ 19,427	$ 19,427	$ 19,427	$ 19,427	$ 19,427	$ -	$ -	$ -
Wet Well	$90,000	42	2025	2057	$ 145,387	$3,221	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,221
Raw Water Forcemain	$202,590	42	2025	2057	$ 327,266	$7,251	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,251
Backwash System	$18,000	42	2025	2057	$ 29,077	$644	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 644
Auma Actuators	$6,500	7	2017	2022	$ 7,006	$1,343	$ -	$ -	$ 1,343	$ 1,343	$ 1,343	$ 1,343	$ 1,343	$ 1,343	$ -	$ -	$ -
Coagulation/Flocculation																	
Temperature/pH Meter	$230	7	2017	2022	$ 248	$48	$ -	$ -	$ 48	$ 48	$ 48	$ 48	$ 48	$ 48	$ -	$ -	$ -
Raw Water Turbidity Meter	$4,732	2	2017	2020	$ 4,950	$1,615	$ -	$ -	$ 1,615	$ 1,615	$ 1,615	$ 1,615	$ -	$ -	$ -	$ -	$ -
Streaming Current Monitor	$10,745	7	2017	2022	$ 11,581	$2,220	$ -	$ -	$ 2,220	$ 2,220	$ 2,220	$ 2,220	$ 2,220	$ 2,220	$ -	$ -	$ -
Chlorine Solution Tank	$2,000	42	2025	2057	$ 3,231	$72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 72
Sodium Hypochlorite Injection	$1,055	7	2017	2022	$ 1,137	$218	$ -	$ -	$ 218	$ 218	$ 218	$ 218	$ 218	$ 218	$ -	$ -	$ -
Chlorine Analyzer	$2,979	7	2017	2022	$ 3,211	$616	$ -	$ -	$ 616	$ 616	$ 616	$ 616	$ 616	$ 616	$ -	$ -	$ -
Coagulant Solution Tank	$1,750	47	2025	2062	$ 3,047	$55	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 55
ProPac 932 Polymer Injection	$1,750	10	2017	2025	$ 1,973	$229	$ -	$ -	$ 229	$ 229	$ 229	$ 229	$ 229	$ 229	$ 229	$ 229	$ 229
ProPac 9700 Polymer Injection	$2,500	7	2017	2022	$ 2,695	$517	$ -	$ -	$ 517	$ 517	$ 517	$ 517	$ 517	$ 517	$ -	$ -	$ -
Flash Mixer	$15,000	12	2025	2027	$ 15,456	$7,647	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,647
Flocculator Vertical Paddle Wheel Motors	$450	7	2017	2022	$ 485	$93	$ -	$ -	$ 93	$ 93	$ 93	$ 93	$ 93	$ 93	$ -	$ -	$ -
Flocculator Pneumatic Sludge Wasting Valve	$1,500	2	2017	2020	$ 1,569	$512	$ -	$ -	$ 512	$ 512	$ 512	$ 512	$ -	$ -	$ -	$ -	$ -
Clarified Water Tanks	$7,000	47	2025	2062	$ 12,188	$220	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 220
Filtration																	
Transfer Pumps	$8,000	7	2017	2022	$ 8,623	$1,653	$ -	$ -	$ 1,653	$ 1,653	$ 1,653	$ 1,653	$ 1,653	$ 1,653	$ -	$ -	$ -
Clarified Water Turbidity Meter	$2,600	2	2017	2020	$ 2,720	$888	$ -	$ -	$ 888	$ 888	$ 888	$ 888	$ -	$ -	$ -	$ -	$ -
Clarified Water Flowmeters	$2,800	7	2017	2022	$ 3,018	$579	$ -	$ -	$ 579	$ 579	$ 579	$ 579	$ 579	$ 579	$ -	$ -	$ -
Clarified Water Flowmeters	$2,800	10	2017	2025	$ 3,157	$366	$ -	$ -	$ 366	$ 366	$ 366	$ 366	$ 366	$ 366	$ 366	$ 366	$ 366
Clarifier/Polishing Filters	$700,000	37	2025	2052	$ 1,049,147	$29,191	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 29,191
Filter Media	$24,000	2	2017	2020	$ 25,104	$8,193	$ -	$ -	$ 8,193	$ 8,193	$ 8,193	$ 8,193	$ -	$ -	$ -	$ -	$ -
Chlorine Injection	$1,523	7	2017	2022	$ 1,642	$315	$ -	$ -	$ 315	$ 315	$ 315	$ 315	$ 315	$ 315	$ -	$ -	$ -
Chlorine Analyzer	$2,979	7	2017	2022	$ 3,211	$616	$ -	$ -	$ 616	$ 616	$ 616	$ 616	$ 616	$ 616	$ -	$ -	$ -
Clear Well	$25,000	92	2025	2107	$ 85,441	$395	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 395
Finish Water Pump #1	$50,000	15	2017	2030	$ 60,755	$4,108	$ -	$ -	$ 4,108	$ 4,108	$ 4,108	$ 4,108	$ 4,108	$ 4,108	$ 4,108	$ 4,108	$ 4,108
Finish Water Pumps #2	$50,000	7	2017	2022	$ 53,891	$10,331	$ -	$ -	$ 10,331	$ 10,331	$ 10,331	$ 10,331	$ 10,331	$ 10,331	$ -	$ -	$ -
Effluent Flow Meters	$6,500	7	2017	2022	$ 7,006	$1,343	$ -	$ -	$ 1,343	$ 1,343	$ 1,343	$ 1,343	$ 1,343	$ 1,343	$ -	$ -	$ -
Bray Valves	$8,384	2	2017	2020	$ 8,770	$2,862	$ -	$ -	$ 2,862	$ 2,862	$ 2,862	$ 2,862	$ -	$ -	$ -	$ -	$ -
Level Controllers	$1,200	7	2017	2022	$ 1,293	$248	$ -	$ -	$ 248	$ 248	$ 248	$ 248	$ 248	$ 248	$ -	$ -	$ -
Backwash System																	
Backwash Pumps	$5,000	10	2017	2025	$ 5,637	$654	$ -	$ -	$ 654	$ 654	$ 654	$ 654	$ 654	$ 654	$ 654	$ 654	$ 654
Backwash Tank	$15,000	47	2025	2062	$ 26,117	$472	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 472
Pneumatic Valves	$1,000	10	2017	2025	$ 1,127	$131	$ -	$ -	$ 131	$ 131	$ 131	$ 131	$ 131	$ 131	$ 131	$ 131	$ 131
Air Scour Blowers	$15,000	2	2017	2020	$ 15,690	$5,121	$ -	$ -	$ 5,121	$ 5,121	$ 5,121	$ 5,121	$ -	$ -	$ -	$ -	$ -
SCADA System																	
Red Lion HMI/PLC	$20,000	20	2025	2035	$ 23,234	$2,110	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,110
Filter Controllers	$2,588	12	2017	2027	$ 3,006	$273	$ -	$ -	$ 273	$ 273	$ 273	$ 273	$ 273	$ 273	$ 273	$ 273	$ 273
Aqua Sierra SCADA	$10,140	1	2017	2020	$ 10,606	$3,462	$ -	$ -	$ 3,462	$ 3,462	$ 3,462	$ 3,462	$ -	$ -	$ -	$ -	$ -
Miscellaneous																	
Fencing & security gates	$30,000	32	2017	2047	$ 47,031	$1,138	$ -	$ -	$ 1,138	$ 1,138	$ 1,138	$ 1,138	$ 1,138	$ 1,138	$ 1,138	$ 1,138	$ 1,138
Yard lighting (overhead)	$10,000	39	2017	2054	$ 17,411	$315	$ -	$ -	$ 315	$ 315	$ 315	$ 315	$ 315	$ 315	$ 315	$ 315	$ 315
Asphalt pavement	$75,000	39	2025	2054	$ 115,829	$2,932	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,932
Grating, stairs, railings	$80,000	42	2025	2057	$ 129,233	$2,863	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,863

STORAGE																	
Douglas Storage Tanks																	
.25 MG Redwood Tank	$300,000	4	2017	2020	$ 313,796	$102,412	$ -	$ -	$ 102,412	$ 102,412	$ 102,412	$ 102,412	$ -	$ -	$ -	$ -	$ -
0.5 MG Bolted Steel Tank	$286,967	67	2025	2082	$ 674,273	$6,199	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,199
Recirculation Pump Station	$97,569	22	2017	2037	$ 131,670	$5,355	$ -	$ -	$ 5,355	$ 5,355	$ 5,355	$ 5,355	$ 5,355	$ 5,355	$ 5,355	$ 5,355	$ 5,355
Wood Building	$13,774	42	2025	2057	$ 22,251	$493	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 493
Security Fencing	$13,774	52	2025	2067	$ 25,849	$388	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 388
Telemetry	$5,981	7	2017	2022	$ 6,446	$1,236	$ -	$ -	$ 1,236	$ 1,236	$ 1,236	$ 1,236	$ 1,236	$ 1,236	$ -	$ -	$ -
Flowmeter	$4,591	12	2017	2027	$ 5,334	$484	$ -	$ -	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484
Flowmeter	$4,591	12	2017	2027	$ 5,334	$484	$ -	$ -	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484
Flowmeter	$4,591	12	2017	2027	$ 5,334	$484	$ -	$ -	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484
Dinsmore Tank																	
0.1 MG Bolted Steel Tank	$200,877	67	2025	2082	$ 471,991	$4,339	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,339
Flowmeter	$4,591	12	2017	2027	$ 5,334	$484	$ -	$ -	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484	$ 484
Painter Tank																	
Solar Powered Telemetry	$28,697	6	2017	2021	$ 30,470	$7,379	$ -	$ -	$ 7,379	$ 7,379	$ 7,379	$ 7,379	$ 7,379	$ -	$ -	$ -	$ -
DISTRIBUTION																	
Piping																	
2" or smaller water line (Old) (75%)	$1,258,313	0	2017	2020	$ 1,316,179	$429,555	$ -	$ -	$ 429,555	$ 429,555	$ 429,555	$ 429,555	$ -	$ -	$ -	$ -	$ -
4" water line (Old) (75%)	$579,600	0	2017	2020	$ 606,254	$197,860	$ -	$ -	$ 197,860	$ 197,860	$ 197,860	$ 197,860	$ -	$ -	$ -	$ -	$ -
6" water line (Old)	$2,795,760	11	2017	2026	$ 3,199,480	$326,405	$ -	$ -	$ 326,405	$ 326,405	$ 326,405	$ 326,405	$ 326,405	$ 326,405	$ 326,405	$ 326,405	$ 326,405
6" water line (New)	$111,120	42	2025	2057	$ 179,504	$3,977	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,977
8" water line (Old)	$793,050	16	2017	2031	$ 978,192	$60,747	$ -	$ -	$ 60,747	$ 60,747	$ 60,747	$ 60,747	$ 60,747	$ 60,747	$ 60,747	$ 60,747	$ 60,747
8" water line (New)	$486,030	42	2025	2057	$ 785,137	$17,396	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,396
10" water line (New)	$1,871,100	42	2025	2057	$ 3,022,592	$66,972	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 66,972
Other																	
Fire Hydrant Assemblies (Fair)	$103,500	0	2017	2020	$ 108,260	$35,332	$ -	$ -	$ 35,332	$ 35,332	$ 35,332	$ 35,332	$ -	$ -	$ -	$ -	$ -
Fire Hydrant Assemblies (New)	$126,000	22	2025	2037	$ 150,826	$11,170	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,170
Gate Valves (Fair)	$96,000	0	2017	2020	$ 100,415	$32,772	$ -	$ -	$ 32,772	$ 32,772	$ 32,772	$ 32,772	$ -	$ -	$ -	$ -	$ -
Gate Valves (New)	$235,500	22	2025	2037	$ 281,901	$20,877	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,877
					TOTAL		$ -	$ -	$ 1,270,421	$ 1,270,421	$1,270,421	$ 1,270,421	$449,836	$442,457	$401,658	$401,658	$598,284
INFLATION	1.51%				connections	$1,150	$ -	$ -	$ 92	$ 92	$ 92	$ 92	$ 33	$ 32	$ 29	$ 29	$ 43
LAIF INTEREST RATE	2.12%				percent of collection	$1	$ -	$ -	$ 46	$ 46	$ 46	$ 46	$ 16	$ 16	$ 15	$ 15	$ 22

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date

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COST ITEM LIST - Scotia Intertie

GHD INC

Estimator: JJW
Checked By: PK
Date: 07-10-2014

Project: City of Rio Dell & Scotia CSD Emergency Intertie

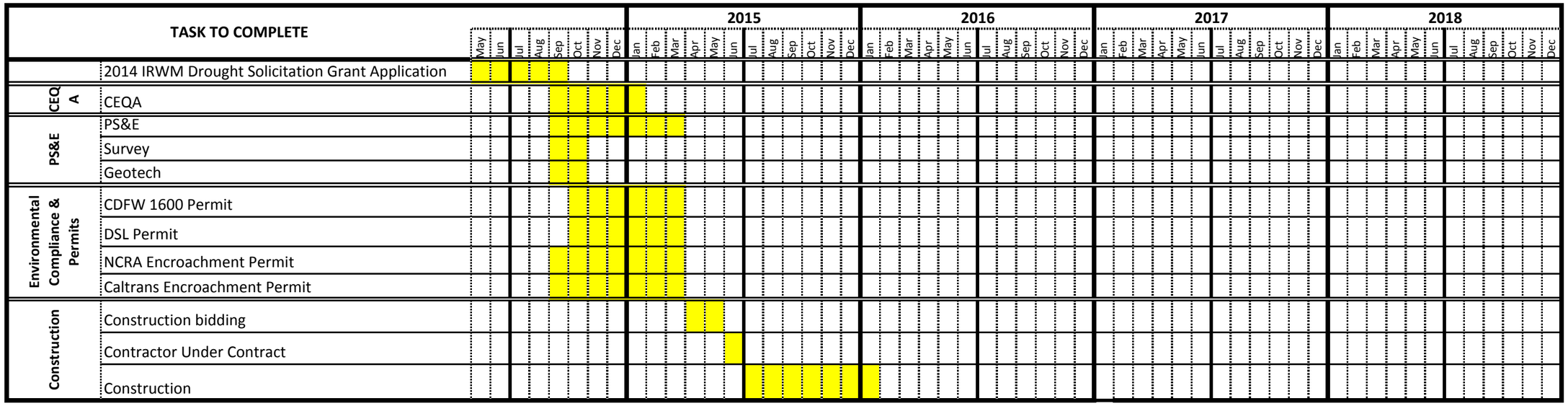
Construction Cost	UNIT	QTY	UNIT PRICE	TOTAL
Mobilization	LS	1	7.0%	$66,010
Construction Area Signs	LS	1	0.5%	$4,715
Construction Staking	LS	1	2.0%	$18,860
Traffic Control	LS	1	0.5%	$4,715
Control of Water	LS	1	3.0%	$28,290
Erosion control - SWPPP	LS	1	2.0%	$18,860
Demolition	LS	1	0.3%	$2,358
Temporary Shoring and Trench Safety	LS	1	1.0%	$9,430
Clearing and Grubbing	LS	1	$ 1,000.00	$1,000
10" PVC Pipe and Fittings	LF	1,940	$ 100.00	$194,000
Miscellaneous Valves	LS	1	$ 40,000.00	$40,000
Directional Drill (under River) includes 12-in OD HDPE Pipe and Drill Pits	LF	1,500	$ 472.00	$708,000
			Total	**$1,096,238**

Engineering Cost

CONTINGENCIES	**0%**		**$0**
DESIGN & SURVEYING			**$209,000**
Geotech		$50,000	
Survey		$39,000	
50% PS&E		$76,000	
Final PS&E		$44,000	
Environmental Permitting			**$95,000**
CEQA		$35,000	
Encroachment Permitting		$40,000	
Section 1600/ State Lands		$20,000	
Administration			**$35,000**
Administration		$8,000	
Labor Compliance		$9,500	
Reporting		$11,000	
Monitoring Plan		$6,500	
Pre-Bid Services			**$5,000**
CONSTRUCTION ENGINEERING			**$109,624**
		Total:	**$1,549,861**

City of Rio Dell Scotia CSD Emergency Water Intertie Timeline Analysis

May 2014



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FILED
DEC 12 2013
SUPERIOR COURT OF CALIFORNIA
COUNTY OF HUMBOLDT

SUPERIOR COURT OF CALIFORNIA

COUNTY OF HUMBOLDT

CITY OF RIO DELL, Plaintiff, vs. SHN CONSULTING ENGINEERS & GEOLOGISTS, INC., a California corporation, and DOES 1-20, inclusive, Defendants.	CASE NO.: DR130745 **COMPLAINT FOR NEGLIGENT DESIGN; BREACH OF CONTRACT and NEGLIGENT SUPERVISION**

The Parties

Plaintiff the CITY OF RIO DELL (hereinafter "City" or "plaintiff"), alleges as follows:

1. Defendant SHN CONSULTING ENGINEERS & GEOLOGISTS, INC. ("SHN"), is, and at all times mentioned herein was, a corporation organized under the laws of the State of California, doing business in the County of Humboldt, California.

2. Plaintiff CITY OF RIO DELL is, and at all times mentioned herein was, a municipal entity located in the County of Humboldt, State of California.

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3. Plaintiff does not presently know the true names and capacities of the defendants sued herein as Does 1 through 20, inclusive. Plaintiff will seek leave of court to amend this complaint to allege said defendants' true names and capacities as soon as plaintiffs ascertain them.

4. At all times mentioned herein, each defendant was the agent and employee of each and all of the other defendants and was acting in the course of such agency and employment.

Jurisdiction and Venue

5. Plaintiff, in its capacity as a municipal entity, provides water and waste water services to the citizens of the City of Rio Dell. In connection with providing said services, the City owns and operates the water treatment plant and facility at/near the Eel River, located at 475 Hilltop Drive, Rio Dell, California (the "Water Treatment Plant"). The City also owns and operates all infrastructure connected to the Water Treatment Plant, expressly including, without limitation, the water infiltration gallery located at/near the bed of the Eel River, south of the City of Rio Dell (the "Infiltration Gallery").

6. On or about calendar year 2004 and continuing thereafter, SHN was engaged in its capacity as a licensed California engineer to design and supervise all aspects related to the design, permitting and construction of the Infiltration Gallery and works of improvement and structures associated with the Infiltration Gallery, including, without limitation, appurtenant structures commonly referred to as the "aerator system" and the "wet well" designed by SHN to clean, maintain and flush sediment from the Infiltration Gallery. SHN and the City entered and executed that certain written Service Agreement dated May 19, 2004, a true and correct copy of which is attached hereto as "**Exhibit 1**" (the "Services Agreement"). Appended as "Exhibit A" to the Services Agreement is a recital of the scope of work SHN contracted to provide to the City relative to the design and construction of the Infiltration Gallery.

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7. Between calendar years 2004 and 2006, SHN issued charges to the City for engineering design and related services pertaining to the Infiltration Gallery and project in excess of $202,000. The total costs and expenses for the design, permitting and construction of the gallery and project exceeded $3,720,000.

8. All work performed by defendant SHN was both commissioned and performed in Humboldt County, California, related to the Infiltration Gallery at/near Rio Dell, California. Additionally, Section 4.K. of the Services Agreement states that all litigation shall be venued in the County of Humboldt, State of California.

9. Defendant SHN made all substantive decisions related to the Infiltration Gallery, including ascertaining, planning and supervising all aspects of design and placement of the improvements in the bed of the Eel River. Plaintiff is informed and believes, and based thereon alleges, that SHN was instrumental in designing, directing, identifying and planning all work to be performed relative to the design and construction of the Infiltration Gallery, and all attendant defects in the Infiltration Gallery, as herein alleged, derive from the design.

Summary of Defective Design and Negligence

10. Commencing on or about May of 2004 and continuing through calendar years 2005 and 2006, SHN planned, designed and performed numerous tasks related to the Infiltration Gallery. Among them, and without limitation, SHN performed the following tasks and services: (a) prepared preliminary Infiltration Gallery designs; (b) controlled and prepared topographical surveys of the Eel River and surrounding areas to ascertain riverbed conditions and river channel flows to site the system; (c) performed geotechnical and fieldwork investigations to evaluate subsurface conditions in the vicinity of the wet well and river channel characteristics; (d) prepared design memoranda for the Infiltration Gallery and associated structures; (e); performed design calculations and layouts of the Infiltration Gallery for incorporation into the bid documents; (f)

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prepared hydraulic calculations to identify suitable sediment flushing discharge equipment and components; (g) performed CAD drafting for the Infiltration Gallery system; (h) supervised and provided requisite documentation for Infiltration Gallery permitting, including preparation of the mitigation and monitoring plan for system operation; (i) financing and grant funding assistance; and (j) internal quality assurance during the Design phase of the Infiltration Gallery.

11. As designed and constructed, the Infiltration Gallery includes the placement of four perforated intake pipes, each approximately 80 feet in length, laid in trenches running parallel to the Eel River, backfilled with rock and a "filter pack" developed pursuant to SHN specifications. The intake gallery was designed to provide 1,200 gallons of water per minute (gpm) to accommodate future water demands within the City. Water from the river is supposed to enter the gallery and flow by gravity to the wet well (designed by SHN) where it is lifted by turbine pumps to the City's water treatment plant. The pumps attendant to the system were sized to provide up to 600 gpm to the treatment plant. SHN made all substantive decisions regarding the placement of the Infiltration Gallery, its design and specifications.

12. Plaintiff is informed and believes, and based thereon alleges, that SHN performed (or attempted to perform) the services recited in Paragraph 10 of this Complaint, and the Infiltration Gallery was constructed and placed into service on or about September 2006.

13. On or about July 29, 2012, the City began to notice that the Infiltration Gallery was straining to recruit and intake water from the Eel River. At this time, the City also noticed that the pumps in the wet well could not be used without pump cavitation when the water plant was functioning and the pumps were in service and drawing water. These declines in water supply returned in June and July of 2013. Additionally, during the winter of 2012 the turbidity in the Eel River was higher than in

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prior years since the gallery was constructed, and at that time and again in the winter of 2013, the system has not been able to meet the water demands of the community because the back flushing system does not remove the sediment build-up in the gallery, thereby resulting in a substantially diminished capacity to produce water.

14. In response to the water supply shortage and inability of the Infiltration Gallery to sufficiently intake water of sufficient quantity, City of Rio Dell commissioned an engineering review and inspection of the Infiltration Gallery to determine the cause of the failures.

15. Following the engineering assessment and inspection, numerous defects in the Infiltration Gallery design and wet well and aerator systems were identified, all of which were previously latent and not subject to detection by the City until the system failures commenced in the summer of 2012 and 2013, and the nature of the defects were identified by a licensed engineer. The latent defects in the engineering design and structure of the Infiltration Gallery and wet well and aerator systems include, without limitation, the following defects, generally described:

(a) The Infiltration Gallery can not be effectively backwashed with water as designed and constructed because the backfilled trench above the collector pipes is outside of the river flow channel, there is no sweeping velocity to carry away sediment, and much of the sediment falls back into the trench when the backwash cycle ends;

(b) When the river covers the infiltration gallery during the high river flows and provides sweeping velocity, the high river level reduces the available head between the wetwell and the collector trenches, resulting in inadequate cleaning flows and direction;

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(c) The Infiltration Gallery configuration, having collector pipes parallel to the river with the top of the back filled trenches at an elevation above typical summer river levels renders backwashing ineffective;

(d) The Infiltration Gallery is not properly placed with the collector pipes isolated from the river flow during low summer river levels;

(e) The Infiltration Gallery was placed in riverbed substrate with low permeability based on the design and direction provide by SHN;

(f) The wet well backwashing system lacks the capability and capacity, as designed, to backwash the system;

(g) The air scouring system, as designed, is completely ineffective in that the air scour slots are too large compared to the 375 cubic feet per minute air flow rate (as recommended by the SHN Operations and Maintenance Manual);

(h) The maintenance protocol and system design prepared by SHN are incapable of effectively maintaining with Water Infiltration Gallery system; and

(i) The permitting protocol and maintenance procedures established by SHN and included in the permits obtained for the City by SHN during the permitting process interfere with Infiltration Gallery maintenance.

16. As a result of these design failures inherent in the Infiltration Gallery and associated wet well and aerator maintenance systems, the City has had to take emergency measures to render the system functional, as the City's cost and expense, commencing in September of 2013. These measures include obtaining emergency permits to excavate and reconfigure portions of the riverbed to draw water flows to the Infiltration Gallery. The City is informed and believes, and based thereon alleges, that these emergency

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measures would not be necessary if SHN had properly designed the system prior to construction.

FIRST CAUSE OF ACTION:

Negligent Design

(Against Defendant SHN and Does 1 through 20)

17. Plaintiff hereby incorporates by reference the allegations appearing in paragraphs 1 through 16, above.

18. Defendant SHN entered into the engineering Services Agreement with the City for the purpose of designing the Infiltration Gallery and associated maintenance structures. In its capacity as a professional engineer, SHN was obligated to perform these services in a manner compliant with professional engineering principals, practices and standards. Further, SHN was obligated to competently inspect and assess key aspects of Eel River geology and hydrology, including but not limited to subgrade soil and bedrock conditions prior to placing the Infiltration Gallery and associated structures.

19. In performing engineering services for the City, SHN negligently designed the Infiltration Gallery and the wet well and aerator maintenance structures, and breached their obligation to provide competent and adequate design services in multiple respects, including all of the design defects and failures recited in Paragraph 15 of this Complaint, above.

20. The defects inherent in SHN's design remained latent and unknown to plaintiff until the July, 2012, partial failure and recurrent failure of the Infiltration Gallery in July and August of 2013. Thereafter, upon retention of an engineer and review of the design and associated documents (including the Operations Manual and maintenance system), the cause of the damage became known to plaintiff as well as the scope and extent of SHN's defective construction designs.

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21. As a direct result of the failures recited herein, the Infiltration Gallery and associated maintenance structures constructed pursuant to SHN's design are structurally inadequate and ultimately failed on or about September of 2013, resulting in damages to the City in the form or emergency permitting, excavation and repair costs for the system.

22. Additionally, as a result of the design defects alleged herein, the City is informed and believes, and based thereon alleges, that the Infiltration Gallery has been damaged by excess sediment accumulation and blockage, which can not be effectively backflushed and removed from the system, causing failures to occur and limiting the capacity of the system to intake water. Future permitting and repair costs and expenses will be incurred to repair the system and render it functional.

SECOND CAUSE OF ACTION:

Breach of Contract

(Against SHN and Does 1 through 20)

23. Plaintiff hereby incorporates by reference the allegations appearing in paragraphs 1 through 22, above.

24. Defendant SHN entered into the engineering Services Agreement with the City for the purpose of designing the Infiltration Gallery and associated maintenance structures. Pursuant to Section 4.F. of the Services Agreement, SHN was obligated to perform these services in a manner compliant with professional engineering principals, practices and standards. Further, SHN was obligated to competently inspect and assess key aspects of Eel River geology and hydrology, including but not limited to subgrade soil and bedrock conditions prior to placing the Infiltration Gallery and associated structures.

25. In performing engineering services for the City, SHN failed to adequately design the Infiltration Gallery and the wet well and aerator maintenance structures, and breached their contractual obligation to provide adequate design services in multiple

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respects, including all of the design defects and failures recited in Paragraph 15 of this Complaint, above.

26. The defects inherent in SHN's design remained latent and unknown to plaintiff until the July, 2012, partial failure and recurrent failure of the Infiltration Gallery in July and August of 2013. Thereafter, upon retention of an engineer and review of the design and associated documents (including the Operations Manual and maintenance system), the cause of the damage became known to plaintiff as well as the scope and extent of SHN's defective construction designs.

27. As a direct result of the failures recited herein, the Infiltration Gallery and associated maintenance structures constructed pursuant to SHN's design are structurally inadequate and ultimately failed on or about September of 2013, resulting in damages to the City in the form or emergency permitting, excavation and repair costs for the system.

28. Additionally, as a result of the design defects alleged herein, the City is informed and believes, and based thereon alleges, that the Infiltration Gallery has been damaged by excess sediment accumulation and blockage, which can not be effectively backflushed and removed from the system, causing failures to occur and limiting the capacity of the system to intake water. Future permitting and repair costs and expenses will be incurred to repair the system and render it functional.

29. Section 4.F. of the Services Agreement allows the prevailing party in any litigation involving the Agreement recover reasonable attorneys fees, costs and expenses associate with the litigation.

THIRD CAUSE OF ACTION:

Negligent Supervision

(Against Defendants SHN and Does 1 through 20)

30. Plaintiff hereby incorporates by reference the allegations appearing in paragraphs 1 through 28 above.

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31. Pursuant to the Services Agreement, defendant SHN was obligated to, among other items, supervise and prepare appropriate permit applications for the construction and operation of the Infiltration Gallery and associated maintenance structures (i.e., the wet well and aerator) and prepare mitigation and monitoring programs relative to maintenance and operation of the system for inclusion in the permits.

32. Additionally, SHN had the obligation (and during the course of construction did) supervise and monitor construction of the Infiltration Gallery to insure it was constructed in accordance with SHN's design specifications.

33. During the course of providing these services, SHN was negligent in numerous material respects involving the supervision and construction of the Infiltration Gallery and associated structures, including: (a) negligently supervising permit preparation resulting in the issuance of permits with operating constraints rendering Infiltration Gallery maintenance operations ineffective; (b) inclusion of permitting criteria in conflict with proper Infiltration Gallery maintenance; (c) construction of the Infiltration Gallery in a location on/in the riverbed where water recruitment is ineffective and compromised by sediment accumulation.

34. SHN's negligent supervision and the resultant design defects in the Infiltration Gallery system remained latent and unknown to plaintiff until the July, 2012, partial failure and recurrent failure of the Infiltration Gallery in July and August of 2013. Thereafter, upon retention of an engineer and review of the design and associated documents (including the Operations Manual and maintenance system), the cause of the damage became known to plaintiff as well as the scope and extent of SHN's defective construction designs and negligence and negligent supervision during the design, permitting and construction process.

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Eureka, CA 95502

PRAYER

WHEREFORE, Plaintiffs pray for judgment as follows:

First Cause of Action:

1. For the damages, together with interest on that amount as provided by law;
2. For reasonable attorney's fees;
3. For costs of suit; and
4. For such other and further relief that the court considers proper.

Second Cause of Action:

1. For the damages, together with interest on that amount as provided by law;
2. For reasonable attorney's fees;
3. For costs of suit; and
4. For such other and further relief that the court considers proper.

Third Cause of Action:

1. For the damages, together with interest on that amount as provided by law;
2. For reasonable attorney's fees;
3. For costs of suit; and
4. For such other and further relief that the court considers proper.

Dated: December 11, 2013

MITCHELL, BRISSO, DELANEY & VRIEZE, LLP

By: _____
Russell S. Gans
Attorneys for Plaintiff

MITCHELL, BRISSO,
DELANEY & VRIEZE, LLP
814 Seventh Street
P.O. Drawer 1008
Eureka, CA 95502

NORTH COAST RESOURCE PARTNERSHIP

2014 IRWM Drought Project Grant Application

ATTACHMENT 3:

Project Justification Appendix

Integrated Regional Water Management Program
Applicant: Humboldt County

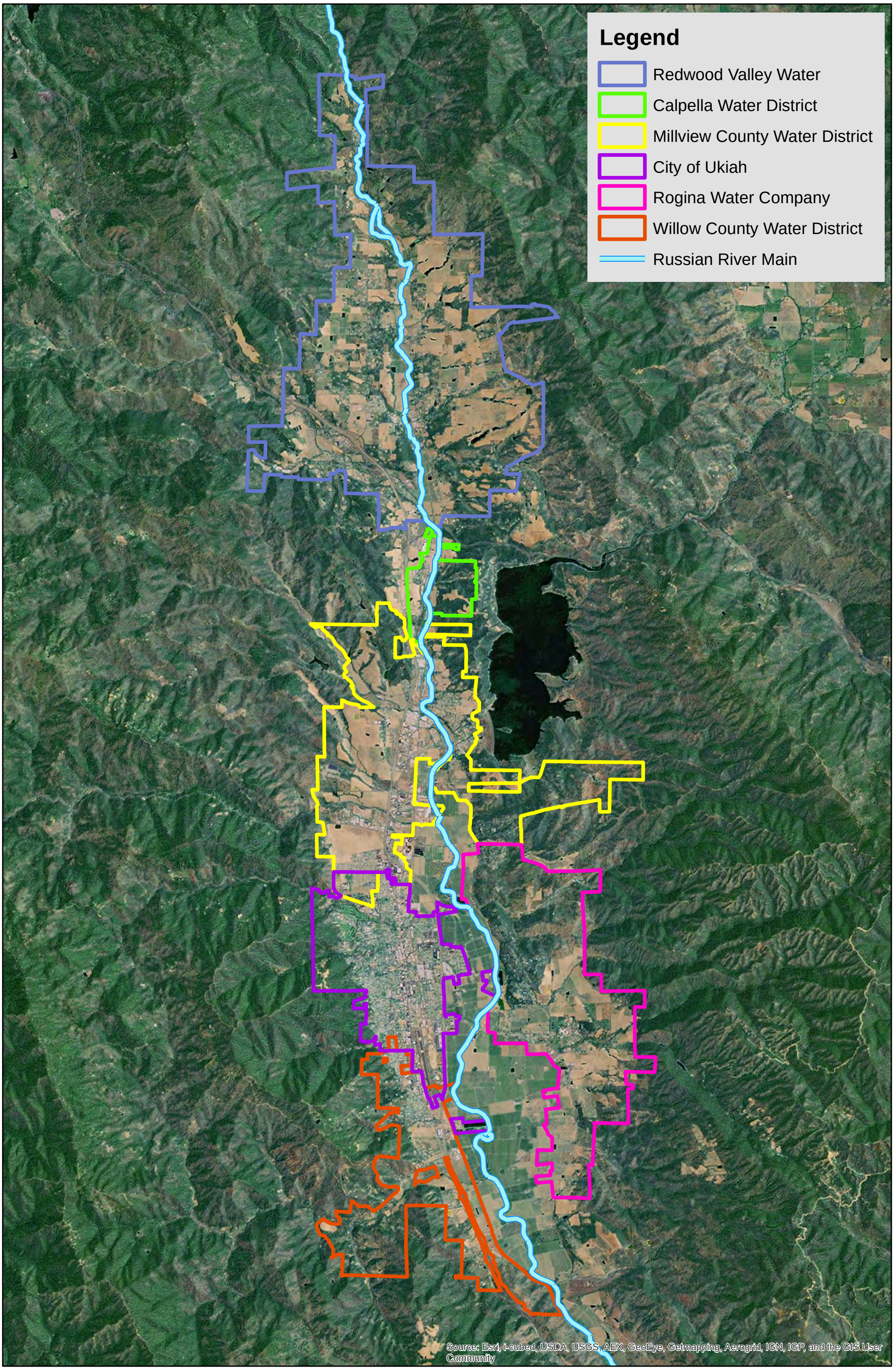
North Coast Resource Partnership 2014 IRWM Drought Project Grant

Attachment 3. Project Justification Appendix

Supporting Documentation

1. Project Area Map
2. Ukiah Valley System Data provides demand data for the six water suppliers
3. Source Capacity Data shows capacity for the six water suppliers
4. Source Capacity with Curtailment and Reductions provides drought response measures for each of the six water suppliers
5. Drought Conservation Status provides conservation status through 2015 for each of the six water suppliers
6. Intertie model provides specific information for connecting the six systems
7. Water supplier drought action letters and resolutions
8. Redwood Valley Cost Estimate
9. Preliminary Well Design
10. Scope and costs for New Water Supply Well and Pump Station for Millview County WD
11. CEQA exemption for Well 9

Attachment 1



Attachment 2

Table 1: Ukiah Valley System Data

1	2	3	4	5	6	7	8	9	10	11
Water System Name	**Source Type**	**Population**	**Connections**	**2012 Average Demand (MGD)**	**2012 Average Demand (gpm)**	**2012 Average Demand (gpdc)**	**Demand *@50 gpcd* (MGD)**	**Demand *@50 gpcd* (gpm)**	**Total Storage Capacity (MG)**	**Disadvantaged Community**
Redwood Valley County Water District	SW	5,000	1,339	0.46	319	92	0.25	174	1.85 (+ 64 ac/ft raw pond)	PARTIALLY
Calpella County Water District	GW	548	176	0.09	63	161	0.03	21	0.31	PARTIALLY
Millview County Water District	SW	5,500	1,489	1.20	833	218	0.28	194	2.6	PARTIALLY
Rogina Water Company	GW	3,700	1,003	0.50	347	135	0.19	128	1.16	PARTIALLY
City of Ukiah	SW-GW	15,955	5,524	1.30	903	81	0.80	556	5.9	YES
Willow County Water District	GW	3,797	1,069	0.74	514	195	0.19	132	2.3	PARTIALLY
Combined Totals		34,500	10,600	4	2,979	882	1.73	1,205	13	

SW: surface water
GW: ground water

gpcd: gallons per capita per day
MGD: million gallons per day
gpm: gallons per minute

Table 2a. Source Capacity

1	2	3	4	5	6	7	8
Water System Name	**GW Sources (gpm)**	**SW + GWUDI Sources (gpm)**	**SWTP Design Capacity (gpm)**	**Combined Capacity[1] (gpm)**	**Combined Capacity[1] (gpcd)**	**Sum of Reduced/ Curtailed Source Capacity[2] (gpcd)**	**Worse Case Drought Source Capacity[3] (gpcd)**
Redwood Valley County Water District	currently none	64 AF raw storage = 8 days at 1,800	1,800	1,800	518	63	0
Calpella County Water District	25	100 (Millview SW)	N/A	25	263	262	40
Millview County Water District	currently none	1,500 SW 2,300 GWUDI	800 - 2,400 typical: 1,600	2,300	602	353	71*
Rogina Water Company	1,552	0	N/A	1,552	604	72	43
City of Ukiah	1,027	3,400	3,250	4,277	386	232	71
Willow County Water District	2,000	450	N/A	2,450	929	159	95
Combined Totals	3,052	7,650 + 64 AF	7,567	10,502	2,356	1,141	477

1. Combined Capacity based on limiting factor either source or treatment

2 Values from Table 2b, Column 10

3. Worse case drought based on no surface water availability and 40% reduction in all GW and GWUDI sources with applicable curtailment and reductions

* Millview well field is supplied by percoloation ponds fed by river water pumped via permits & contracts. Without SW to the ponds, it is unknown how long the well field will produce. This figure is based on assumptions stated in Note 3.

Table 2b: Source Capacity with Curtailment and Reductions

1	2	3	4	5	6	7	8	9	10
System Name	**Source Name**	**Source Capacity (gpm)**	**Percolated GW?**		**If not, is source subject to SWRCB curtailments?**		**Source capacity w/ SWRCB Curtailment (gpm)**	**RRFCD Reduced Source Capacity (gpm)**	**Sum of Reduced/Curtailed Source Capacity (gpcd)**
			YES	**NO**	**YES**	**NO**			
Redwood Valley County Water District	Pump Station Caisson, WTP Raw	1,800 [1]		X	X		0	220 [2]	63
	Well *(PROPOSED PROJECT WELL)*	*500?*	*X*			*X*	*N/A*	*N/A*	
Calpella County Water District	Well-01	25	X			X	N/A	N/A	262
	Millview CWD Purchased-Treated	100		X	N/A			75	
Millview County Water District	Russian River Intake	1,500		X	X[3]	X[3]	897 [3]	450 [4]	353
	Well-08, surface influenced	2,300		X	X				
	Well *(PROPOSED PROJECT WELL)*	*700?*	*X*			*X*	*N/A*	*N/A*	
Rogina Water Company	Well -02	892	N/A[5]		X		0	186 [5]	72
	Well -04	380			X				
	Well -05	200			X				
	Well -06	80			X				
City of Ukiah	Ranney Collector (Treatment capacity)	3,250		X	X[6]	X[6]	1,257	0 [7]	232
	Well -03	380		X	X		0	285	
	Well -04 (offline b/c water quality)	400	X			X	N/A	0	
	Well -07	600	X			X	N/A	600	
	Well -08	427	X			X	N/A	427	
	Well -09 *(PROPOSED PROJECT WELL)*	*700?*	*X*			*X*	*N/A*	*N/A*	
Willow County Water District	Well -03	GWUDI-450		X	X		0 [8]	418 [8]	159
	Well -05			X	X				
	Well -06			X	X				
	Well -07	1,000		X	X				
	Well -08	1,000		X	X				

1 Limiting factor for drinking water was determined to be the water treatment plant production capacity

2 RVCWD is being provided with 355 AF in 2014 from RRFCD; this is a 60% reduction. 355 AFY = 220 gpm

3 MCWD Post-1914 water rights (1,440 AFY) subject to curtailment MCWD pre-1914 water rights (1,447 AFY = 897 gpm) not currently but may be curtailed in future

4 MCWD contract with RRFCD 970 AFY @ 25% reduction = 727 AFY = 450 gpm

5 Rogina Water Company well status has not yet been determined; being provided with 400 AFY from RRFCD. 400 AFY @ 25% reduction = 300 AFY = 186 gpm

6 COU Post-1949 water rights subject to curtailment (14,490 AFY) COU pre-1914 water rights (2.8 cfs= 2,028 AFY = 1,257 gpm) not currently but may be curtailed in future

7 COU returned its 800 AFY allotment to the RRFCD to be used for RVCWD and others

8 WCWD post-1949 water right = 728 AFY = 451 gpm; RRFCD contract 900 AFY @ 25% reduction = 675 AFY = 418 gpm

Table 3: Drought Conservation Status

Water System Name	Conservation January 2014 to present	Current Conservation	Planned or Anticipated Actions for 2015
Redwood Valley County Water District	January dire warning and voluntary conservation. Mid February 50% reduction of Ag. Effective mid-March Ag turned off	Effective April 1 domestic Mandatory conservation of $\leq$ 50 gpcd with significant financial penalties for overuse	If no rain: rely on intertie and hopefully a new well. Possible reduction to 27 gpcd
Millview County Water District	In January, Mandatory limits on water use for outdoor use (lawns, etc.) [Stage 2]	Effective March 1, Mandatory conservation of 43.3 gpcd with tiered financial penalties for overuse [Stage 3]	Mandatory 43.3 gpcd, rely on intertie and hopefully new well
Calpella County Water District	In April, Mandatory conservation with 25% reduction	Mandatory 25% reduction	Mandatory 25% reduction, rely on intertie
Rogina Water Company	In March, Mandatory conservation with 25% reduction	Mandatory 25% reduction	Mandatory 25% reduction, rely on intertie
City of Ukiah	Voluntary Conservation since 2009	Voluntary Conservation since 2009	If no rain: Mandatory Conservation expected to be a minimum of 20%
Willow County Water District	In April, Mandatory conservation with 25% reduction	Mandatory 25% reduction	Mandatory 25% reduction, rely on intertie

Copies of Conservation Resolutions and communications in Attachment 3

Table 4 Intertie Model

Intertie Entities (listed North to South)	Existing Intertie Diameter (inch)	Existing N - S Flow (gpm)	Existing S - N Flow (gpm)	Proposed Intertie Diameter (inch)	Proposed N - S Flow (gpm)	Proposed S - N Flow (gpm)	Install Pump Station	Pipe required (linear feet)
Redwood Valley - Calpella (East Road, near A Road)	4	40 - 100 (gravity)	100 (pump)	4	40 - 100 (gravity)	100 (pump)	N/A	N/A
Redwood Valley - Calpella (Central Avenue)	N/A	N/A	N/A	6	200 (gravity)	200 (pump)	YES	1,450
A new intertie is being constructed between RWCWD-CCWD. Distribution hydraulics do not support an upgrade to the exisiting interite								
Calpella - Millview	6	100 (pump)	100 (pump)	6	300 (pump)	300 (pump)	YES	12
Millview routinely supplies 100 gpm to Calpella. Upgrades to the CCWD-MCWD intertie will support additional water being wheeled from WCWD to RWCD through CCWD.								
Millview - Ukiah	8	400 (gravity)	400 (gravity)	8	1,500 (gravity)	1,500 (pump)	YES	700
Millview tanks must be lowered by 10-feet in order to receive water from Ukiah. Upgrades to the MCWD-COU intertie will allow water to be pumped northward through this intertie.								
Millview - Rogina	N/A	N/A	N/A	6	500 (gravity)	500 (pump)	YES	300
Ukiah - Willow	6	500 (fire truck)	150 (gravity)	6	500 (pump)	500 (pump)	YES	10

Attachment # 4

Redwood Valley Cost Estimate

Deliverables:

- *Response to submittals and RFIs.*
- *Inspection reports.*
- *Summary report on construction and commissioning of well station including as-built station drawings.*
- *Final DWSAP.*

Estimated Project Costs

Our estimate of costs for engineering and field services for the proposed well and pump station project is encompassed in the following table. Cost estimates are presented by task and are considered suitable for planning and budgeting purposes.

Task	Description	Outside Services	Engr. Services	Total
1	Review Existing Data and Project Objectives	*n/a*	$10,000	$10,000
2	Exploratory Test Hole Drilling, Oversight/Evaluation, and Water Quality Testing	$77,000	$18,500	$95,500
3	Scope Development (CEQA Compliance) Compliance)Environmental Documentation Scoping	$5,000	$1,500	$6,500
4	Regulatory Submittal and Preliminary DWSAP	*n/a*	$15,000	$15,000
5	Well Design and Plans/Specifications	*n/a*	$3,000	$3,000
6	Technical Assistance During Well Construction	*n/a*	$28,000	$28,000
7	Pump Station Design and Plans/Specifications	$15,000	$35,000	$50,000
8	Technical Assistance During Station Construction	$12,000	$15,000	$27,000
Totals		$109,000	$126,000	$235,000

261,500

Notes:

(1) Test hole drilling and monitoring well construction will be subcontracted to Roadrunner Drilling.

(2) As the final size and capacity of the production well is not known at this time, estimated costs above are provided for budgetary purposes only and based on a pumping well and pumping station designed to produce upwards of 500 gallons per minute.

(3) Environmental work will be performed by LSCE's subconsultant Inland Ecosystems. Structural and electrical plans and technical assistance during construction is included and will be performed by LSCE subcontractors (Merkel & Associates, and Electrical Power Systems (EPS) respectively.)

(4) **For budget purposes, the estimated cost for a 500 foot deep, 12 inch diameter production well is estimated at $350,000 with the estimated cost of a pumping station, with electrical, concrete, station piping, and well pump, is estimated at $175,000.**

The proposed project sum presented above includes LSCE's labor under each task and outside engineering services, all as delineated in this proposal. LSCE will bill monthly for labor and materials, only as incurred, in accordance with LSCE's Schedule of Fees for Engineering and Field services

800K

REDWOOD VALLEY COUNTY WATER DISTRICT

Connection to Calpella Water System

Preliminary Estimate of Probable Costs

Prepared by Brelje & Race Consulting Engineers

February 2014

	Item	Unit	Unit Cost	Quantities	Total Cost
1.	Mobilization	LS	$ 2,100	1	$ 2,000
2.	6-inch HDPE water main	FT	$ 85	1,450	$ 123,000
3.	Tie-in to Redwood Valley water system	LS	$ 5,000	1	$ 5,000
4.	Tie-in to Calpella water system	LS	$ 4,000	1	$ 4,000
5.	Tie-in to pump station	LS	$ 6,000	1	$ 6,000
6.	Pump station site piping	LS	$ 9,000	1	$ 9,000
7.	Pump station building	SF	$ 200	140	$ 28,000
8.	Pump station mechanical	LS	$ 27,000	1	$ 27,000
9.	Pump station electrical	LS	$ 20,000	1	$ 20,000
10.	Temporary pump and power	LS	$ 18,000	1	$ 18,000
11.	Permanent power supply	LS	$ 8,000	1	$ 8,000
12.	Modifications to Millview-Calpella PS	LS	$ 20,000	1	$ 20,000
13.	Demobilization	LS	$ 3,000	1	$ 3,000
	Subtotal Construction Cost				$ 273,000
	10% Contingency				$ 27,000
	Engineer's Estimate of Total Construction Cost				**$ 300,000**

Encroachment Permit Fee	$ 1,900
Engineering Planning and Analysis, Assistance with CDPH Processing	$ 10,000
Engineering Design (12% of construction)	$ 36,000
Stormwater & Encroachment Permit Applications	$ 5,000
Construction Management/Inspection (12% of construction)	$ 36,000
District Administration and Legal	$ 10,000

Engineer's Estimate of Probable Project Costs	**$ 399,000**

Client:	Millview Co. Water District	Lat/Long:	.
Project Name:	Preliminary Well 35 Design	GSE (ft-msl)	
LSCE #:	14-5-009	Design Date:	3/22/14
Location:	Ukiah, CA	Drilling Method:	.
Geologist:	C. Jenkins	Driller:	.

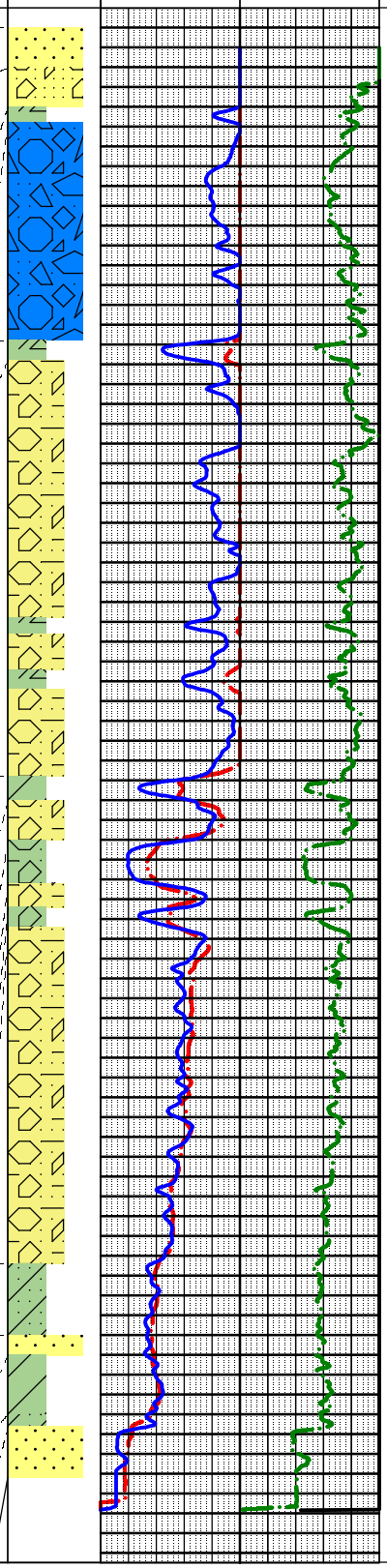
LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Attachment 4

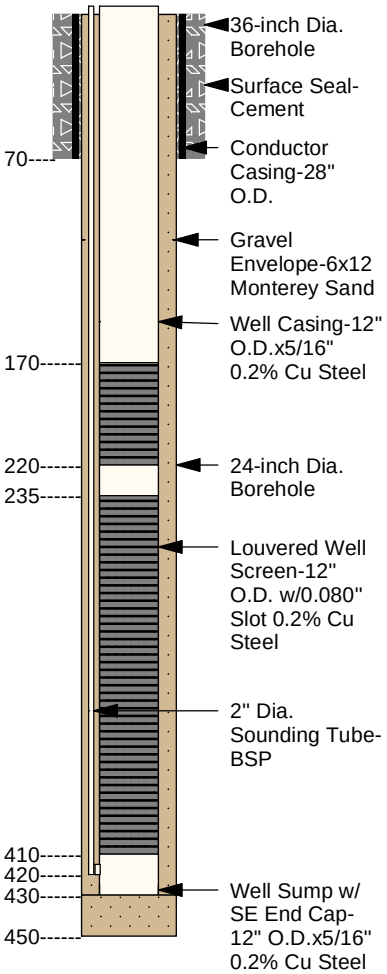
Lithologic Description

- 0–50: Sand- fine to coarse, sub-round to sub-angular
- 50–100: Gravelly Sand- fine to coarse, sub-round to sub-angular, gravel up to 1", lithics
- 100–150: Gravelly Clay- light brown mottled gray, low plasticity, gravel up to 1"
- 150–200: Sand and Gravel- fine to coarse, sub-round to sub-angular, gravel up to 1", lithics
- 200–250: Gravelly Clay- light brown, low plasticity, gravel up to 1/2"
- 250–350: Sand and Gravel with Clay- fine to coarse, gravel up to 1/2", clay is reddish brown, low to medium plasticity, clayey lenses from 298 to 306' and 324 to 334'
- 350–400: Clay- greensih gray, sticky, soft, low plasticity, trace sand and gravel
- 400–450: Sand and Gravel with Clay- fine to coarse, gravel up to 1/4", clay is brown mottled greenish gray, soft, low plasticity
- 450–500: Clay with Sand and Gravel- greenish gray, moderately sticky, low plasticity, gravel up to 1/4"
- 500–550: Sand and Gravel with Clay- fine to coarse, gravel up to 1/4"
- 550–600: Clay with Sand and Gravel- brown, soft, low plasticity, fine to coarse sand, gravel up to 1/4"
- 600–650: Sand and Gravel with Clay- Fine to coarse sand, gravel up to 1/4", angular sand and gravel, increasing clay content with depth, hard and slow drilling
- 650–700: Sandy Clay- brown, soft, low plasticity, color change at 640' to light gray
- 700–750: Sand- fine to medium, well sorted, with light gray clay
- Clay- gray, low plasticity, with fine to medium sand
- Sandy Clay- gray, low plasticity, fine to medium sand
- Sand- Fine to coarse, possibly sandstone, very hard and slow drilling

Strat-Column



Well Construction Diagram



LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

GROUND-WATER RESOURCES
HYDROLOGY - DEVELOPMENT - MANAGEMENT

Attachment 4

January 14, 2014
File No. 12-3-065

Mr. Tim Bradley
General Manager
Millview County Water District
151 Laws Avenue
Ukiah, CA 95482

SUBJECT: SCOPE AND COSTS FOR NEW WATER SUPPLY WELL AND PUMP STATION (WELL NO 35)
MILLVIEW COUNTY WATER DISTRICT, UKIAH, CALIFORNIA

Dear Mr. Bradley:

In response to your request, this letter outlines a scope for engineering and field services associated with the design and construction of a new deep water supply well facility (Well 35) located on land currently owned by the Millview County Water District (MCWD) near Carter Lane (APN 169-130-10). The proposed scope of engineering services for this project encompasses a suitability assessment of the candidate well site, assistance with environmental review and regulatory approvals, exploratory drilling and testing, design and preparation of plans and specifications for well and pump station, and technical assistance during the project construction phases.

Project Understanding and Approach

Currently, Millview derives all of its source capacity from the Russian River, where the water is pumped either directly from the river, or from wells extracting the river underflow. The water is then treated and placed in storage at Millview's water treatment plant site, prior to being pumped into the distribution system. The Russian River has historically been a reliable source of water however is impacted by changes in seasonal climate conditions. Recently, with little precipitation during the recent winter months, the prospect of a continuing drought will mean water shortages with resulting rationing.

It is our understanding that MCWD, in response to possible water shortages that may be experienced during the drought, seek to construct a new municipal well and pumping station to

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supplement source capacity for the immediate and future drought years.

In the past, Millview extracted groundwater from two wells (Wells 1 and 2, drilled in the early 1960s) which were completed below confining clay layers that appear to hydraulically separate the river from a deep groundwater source. Deeper completions in the region indicate the presence of other clay units that may be even more regionally extensive. Given available well control, candidate sites include Millview's water treatment plant site and the original Well 1/2 site, located near Carter Avenue.

To develop a groundwater source, a deep test hole is recommended to the depth of 800 feet with the purpose of delineating target aquifers that are hydraulically separate from the river. The test hole would be converted to a monitoring well for sampling and water quality testing within prospective aquifer completion targets. Based on aquifer properties determined from samples and geophysical logging, water quality, and correlations with other regional wells, this exploration and testing program would be used to design a deep groundwater supply well. For budgeting purposes, the cost for the test hole, monitoring well, water quality testing, and well design recommendations, is estimated at $104,000, which includes all engineering and field oversight costs.

From the test hole/monitoring well data, a production well will be designed and constructed. Test pumping will follow well construction and development and will define the well hydraulic conditions for the design of a well pump. The cost for construction and testing of a groundwater well is estimated at $525,000, which includes all engineering and field oversight costs. This estimate is based on the construction of a 16-inch diameter well, which will permit MCWD to pump in excess of 1,000 gallons per minute. If, from the exploratory test hole it is determined that a lower capacity is likely, the well can be reduced in size to 12-inch diameter, resulting in construction savings.

From the well test pumping, a well pump will be sized to efficiently maximize the amount of production from the well. The design of the well pump will be accompanied by the design and construction/testing of a pumping station, which will include the station piping, building and slab, electrical switchgear and instrumentation, and all site work. The cost for construction of a pump station is estimated at $ 450,000, which includes all engineering and field oversight costs.

As the time frame for the design, bidding and awarding, construction, development, and testing of a municipal water supply well and pumping station is normally many months, it is likely the new well source cannot be constructed in time to provide supplemental capacity for the MCWD customers during the coming summer. However there are procedures that can be initiated by MCWD that will permit LSCE to attempt to minimize the construction period and possibly complete the well and pumping station during the summer months. The fact that MCWD already owns the property simplifies and expedites the process.

The procedure is, but not limited to, the following:

1. Declaration – The MCWD Board formally declare a w
2. ater emergency.
3. Water Conservation - MCWD immediately implement water conservation measures.
4. CEQA – By declaring an emergency and stating the need to immediately develop an alternate sources of supply (a groundwater well), MCWD can declare the project Categorically Exempt. If assistance is needed with this portion, Inland Ecosystems MCWD's environmental consultant on past projects, will be available to assist with the process.
5. Design – The District direct LSCE to immediate proceed with the design process for both the water well and the pumping station. LSCE would develop plans and specifications to solicit proposals from qualified contractors.
6. Long Delivery Items – Pre purchase long term delivery items such as the well pump and electrical switchgear. This will ensure the project can be completed without long delays normally associated with waiting for the delivery of specialized equipment.
7. Power to the Site – Immediately file a request for electrical service with the local power utility.
8. Bidding – Permit LSCE to informally solicit at least three proposals from well drilling and pumping station contractors.
9. Award – If required, call a special meeting of the Board to award the contract(s).
10. Construction – Call for expedited turn-around times for all submittal review and testing of well and station components. The well pump station can be designed/constructed in two phases, with the first phase consisting of the pumping equipment, station pipeline and electrical, with the second phase consisting of the building, etc. In this manner the well can be put into operation in an expedited manner while the balance of the facilities are constructed.
11. Completion Bonus – Discuss the possibility of awarding the contractor a bonus payment for early completion of the project.

During the course of the of the design and construction process, LSCE would work closely with the California Department of Public Health (CDPH) to expedite the Amendment to the Water Supply Permit process so as to seamlessly integrate the new source into the system.

Our initial assessment of the MCWD Carter Lane site (based upon a recent site visit, previous work on the site by LSCE, and a cursory review of base-maps), suggests that space is limited but should accommodate a new well and pumping station and meet minimum setback requirements specified by the CDPH.

As part of the suitability assessment, LSCE will develop a conceptual site plan showing the station layout with site access, CDPH setbacks, and connections to MCWD's distribution system. The site plan will serve to delineate the production well point for initial regulatory submittals and for the selection of a suitable location for exploratory test hole drilling and

monitoring well construction. LSCE will submit the conceptual layout and supporting information needed to obtain regulatory concurrence from the CDPH. LSCE will also address the current pipeline hydraulics that connect the proposed well to the MCWD distribution system.

Next, with regulatory concurrence on the conceptual site plan, we propose to coordinate and oversee exploratory test hole drilling using a licensed and qualified well subcontractor. The test hole-drilling program will be designed to delineate target aquifer units for the proposed production well. A geophysical log and formation samples obtained during this phase will serve as primary input to well design including sanitary and intermediate annular seal depths, screen intake locations, gravel envelope gradation for sand control, etc. For the project setting, we recommend converting the test hole to a monitoring well to assess aquifer conditions, collect ground-water samples for water quality screening, and to measure pumping interference from other local wells. From these activities, we will produce a preliminary well design suitable for the regulatory review and approval for the new production well.

Concurrent with the exploratory phase of work, we propose to prepare an initial study in compliance with CEQA. CEQA compliance is required under the CDPH permit amendment process for adding a new source of supply to an existing water supply permit. It has been our experience that compliance with the California Environmental Quality Act (CEQA) can require a varying level of assistance from the design engineers, depending upon the specific project, the location, and the extent of potential impacts. However, for purposes of this proposal LSCE is assuming that the subject project will be Categorically Exempt as the work will be performed under a declared water shortage emergency. LSCE proposes to work with Dr. Glenn Merron of Inland Ecosystems, who has performed other work for MCWD in the area is familiar with the various regulatory agencies and personnel.

After the preliminary design phase and CEQA analysis, LSCE will submit CDPH checklist items for a permit amendment to add a new well to MCWD's system. The purpose of this submittal is to obtain concurrence on the project prior to the final design and construction phases. As part of this submittal, we will prepare a preliminary Drinking Water Source Assessment and Protection Program (DWSAP) report. The DWSAP report delineates Ground-Water Protection Zones, calculates Physical Barrier Effectiveness, and assesses and ranks Possible Contaminating Activities within the Ground-Water Protection Zones. This process is required for all new public drinking water sources prior to issuance of a permit to use that well in a water system. The preliminary report prepared at this stage will be finalized upon completion and startup of the well pump station and then submitted with MCWD's application to amend its water supply permit for the new well source.

After obtaining concurrence on site and preliminary well design and station layout, we will finalize design and prepare plans and specifications for well construction. At the same time, we will initiate design work for the pump station. Besides the preliminary well design and conceptual station plan, the design phase will consist of 75- and 100-percent levels of completion. Separate plans and specifications for the pump station construction contract will be finalized after testing of the new well.

LSCE will provide assistance with obtaining competitive bids on the well and pump station contracts, to be issued separately, and technical assistance during construction phases. For the latter, we will provide milestone inspection services to insure that construction satisfies the design requirements. We will also review and recommend acceptance of submittals, provide regular progress updates, and provide the MCWD with as-built documents for the new well and pump station facilities.

Scope for Engineering and Field Services

LSCE's proposed project approach is integrated into the following tasks. Each task description includes a summary of deliverables and key activities on which the cost estimating is based. Budgets for each task are compiled in the subsequent section on Cost Estimating and Contract Administration.

Task 1: Suitability Assessment, Conceptual Station Layout, and Initial CDPH Submittal

Under Task 1 LSCE will assess the Well 35 site for its suitability to accommodate construction activities, future O&M, and how the well might optimally be situated to comply with regulatory offset requirements. As part of this effort, LSCE will prepare a conceptual station layout that delineates the facility components and the prospective production well location.

Based upon a boundary and topographical base map provided by MCWD, LSCE will delineate site improvements on the conceptual site plan including site access, piping location (including metering and valving to the main line), building/enclosure, fencing, paving, and tie-ins to utilities.

As discussed above, LSCE is concerned with meeting CDPH setback requirements. Therefore, LSCE proposes to prepare brief letter report that includes the conceptual layout along with the setback distances. LSCE will submit the letter report to the DPH and obtain tentative approval on setback distance before proceeding either the subsequent tasks discussed below. The conceptual site plan will be submitted to the County environmental health department and CDPH. This step insures that no unnecessary costs are incurred constructing test holes and monitoring wells for a site that may not meet the CDPH setback requirements. If any regulatory offset cannot be met, the submittal will provide a basis for a variance request.

Task 1 Overview
Meetings and Key Activities:

- *One field inspection of the Well 35 site.*

Deliverables:

- *Pre-design memo on site suitability and conceptual well station plan.*
- *Submit conceptual site plan to County and CDPH.*

Task 2: Exploratory Test Hole Drilling Oversight and Evaluation

Under Task 2, LSCE will coordinate and oversee exploratory test hole drilling at the Well 35 site for well design purposes. Based on previous hydrogeologic assessments by LSCE, we have budgeted this phase of work using an exploratory target depth of 800 feet. At this depth, we anticipate being able to assess site conditions to the extent necessary to meet project objectives.

The drilling work will be performed by a licensed and qualified well driller under subcontract to LSCE. A geophysical survey conducted in the exploratory test hole will be used to delineate completion intervals for the prospective water supply well. Formation samples from the test hole will be used as a basis for design of a gravel filter pack to satisfy the appropriate sand control requirements for a municipal well station. The test hole will be converted to a monitoring well that will be used to measure water levels and collect water samples. In addition, the monitoring well can serve as an observation well, to assess production well efficiency and final acceptance of the constructed well.

The monitoring well design will be prepared by LSCE's geology and engineering staff and will comply with state and local well standards. Upon completion of the monitoring well construction and development, LSCE will provide a sampling rig to obtain water samples from each monitoring well piezometer. LSCE will submit the samples to a State certified laboratory for preliminary water quality screening. The screening will encompass CDPH initial source water quality monitoring requirements for primary and secondary constituents, volatile organic chemicals, selected synthetic organic chemicals, and selected unregulated chemicals.

At the completion of exploratory drilling, monitoring well construction, and water quality testing, LSCE will prepare a status memorandum summarizing results and recommendations for final well design. The report will delineate recommended completion intervals that appear most favorable in meeting project objectives.

Task 2 Overview

Meetings and Key Activities:

- *Multiple trips to project site for exploratory drilling activities, monitoring well construction, and ground-water sampling.*

Deliverables:

- *Summary report on test hole exploratory activities including recommendations for well design, estimates of yield, and water quality for production well.*
- *Lithologic log, as-built profiles, and electric log for test hole/monitoring well.*

Task 3: CEQA Compliance

Under Task 3, if MCWD requires assistance with the filing of a Categorical Exemption, LSCE will work with Inland Ecosystems to prepare the required environmental documentation for the proposed new well project. For budgeting purposes we have assumed that the effort will only require the Board declaration of an emergency followed by the filing of a Categorical Exemption. Task 3 includes the completion of the following subtasks:

1) Project Initiation and Review of Information
2) Assist MCWD with the preparation of the appropriate Categorical Exemption wording for Board action.

Task 3 Overview

Meetings and Key Activities:

- *Attend Board meeting to act on CEQA action, if required.*

Deliverables:

- *Draft Categorical Exemption*

Task 4: Regulatory Submittal

Under Task 4, LSCE will submit CDPH checklist items to add well and amend MCWD's existing water supply permit. LSCE will also prepare a draft DWSAP for inclusion with submittals to DHS and the local well construction permitting agency. The DWSAPP will be finalized upon commissioning of the well pump station, and submitted in final form to DHS under Task 8. The CDPH checklist items are as follows:

Item	Description
Permit Amendment Application	Submittal will indicate that the actual amendment application will be sent after well station is constructed and tested.
CEQA Documentation	Submittal will provide a copy of the Cat X subsequent to Board action by MCWD.
Well Drilling Specifications	Submittal will include preliminary well profile. Final construction specifications will be sent with permit application.
Well Plot Plan	Submittal will include plot plan for proposed well.
DWR Well Completion	To be submitted after test well is constructed.
Well Data Sheet and Chlorination Data Sheet	To be submitted after station is constructed and tested.
DWSAP Document	Submittal will include draft DWSAP. Finalized upon commissioning of the well pump station
State Well No. and Lat./Long.	Submittal will include coordinates for proposed well location (actual coordinates of constructed well to be sent with final application).

Item	Description
Water Quality Reports	Submittal will include analytical results for representative samples from monitoring well and other CSD wells. Some testing may be deferred until station is completed.

CDPH will be requested to review and comment so that final design and construction activities may proceed. LSCE will contact CDPH to ensure that concurrence is obtained and all questions or comments are addressed to the satisfaction of the department.

Task 4 Overview

Meetings and Key Activities:

- *Preparation of a preliminary DWSAP and submittals for regulatory review.*

Deliverables:

- *Letters and associated submittals to CDPH and County Environmental Health requesting concurrence on siting and design.*

Task 5: Well Design and Plans/Specifications

Under Task 5, LSCE will prepare construction documents for the proposed new production well based on results from the preceding tasks. The principal design parameters shall include well depth, casing and screen materials and dimensions, locations and types of seals, type and locations of intake screen(s), gravel envelope size and gradation for sand control, and size of screen openings to properly retain the gravel pack. These parameters will be selected to achieve a well that is hydraulically efficient and produces sand-free water. The well design will also consider water quality concerns such as corrosivity and the need to isolate or exclude individual zones to meet state drinking water standards.

The plans and specifications will follow a previously utilized MCWD format for construction contract documents. We will prepare a 75-percent and 100-percent design level packages. Sets of the final design package will be prepared for use by the MCWD to solicit bids and award a contract for the work.

Task 5 Overview

Meetings and Key Activities:

- *N/A*

Deliverables:

- *Plans and specifications for production well at two levels: 75- and 100-percent.*

Task 6: Technical Assistance During Well Construction and Testing

Under Task 6, LSCE will provide technical assistance during the well construction phase as shown below. During the course of the construction work, LSCE will provide daily telephonic reports to MCWD's designated representative.

Competitive Bidding and Bid Evaluation: Assist with solicitation of competitive bids from qualified, licensed California water well drilling contractors, evaluate bids, and recommend award.

Drilling Operations: Check mobilization and drilling fluid control provisions.

Conductor/Surface Casing: Witness conductor/surface casing installation and grouting operations to insure compliance with design and well permit requirements.

Production Borehole Construction: Monitor drilling operations and drilling fluid control when drilling through the target aquifer units to minimize formation damage.

Casing Installation: Witness caliper logging, borehole conditioning and casing assembly installation including casing welds, alignment, casing guide placement, and intake screen locations.

Gravel and Annular Seal Placement: Inspect gravel and seal installation and record final quantities installed.

Well Development: Witness initial well development with the drilling rig, final development of the well by pumping, and compliance with discharge requirements.

Well Testing: Witness acceptance testing for sand production and well efficiency, obtain water quality samples and monitor well pump tests, and evaluate aquifer characteristics for present and projected well performance in order to develop pump design criteria.

Payment and Acceptance: Review contractor's progress billings and recommend final acceptance.

At the completion of the construction and testing of the new well, LSCE will provide a summary report on the construction and testing activities, including an as-built well profile.

Task 6 Overview
Meetings and Key Activities:
- *Multiple trips to project site for construction and testing activities.*

Deliverables:
- *Inspection reports.*
- *Summary report on construction and testing of production well including as-built well profile.*

Task 7: Pump Station Design and Plans/Specifications

Under Task 7, LSCE will design the pumping plant, including deep well line shaft or submersible pump and motor, motor control center, discharge piping, and the piping that connects the well the pumping station to the distribution system and storm drain system (it is assumed that the well will be housed in a building or an enclosed structure). Other

modifications and improvements will include grading, drainage, paving, fencing, and painting. The electrical control logic will be designed to permit future communication between the new well and the MCWD office to be located at the water treatment plant.

The parameters incorporated in the design and selection of the pumping equipment will include an analysis of the relationship between the system flow requirements, their effect on pumping levels in the well, and the variable hydraulic losses in the well head piping and the distribution system. The development of the resulting system-head relationship will provide the criteria for selecting the most efficient pump to meet desired flow rates.

Based on an evaluation of pumping test data, LSCE will prepare plans and technical specifications for the station at the 75- and 100-percent levels, (note that a conceptual plan is to be prepared under Task 1).

Design elements addressed in the plans are:

Site Improvements: Drainage, replacement paving, above-ground and below-ground piping for the connection to the distribution system and site access for maintenance.

Structural Plans for Enclosures and Other Structures: Enclosures (as required) to house the pump station components, the station piping, and electrical switchgear.

Electrical Plan: Electrical service, metering, main disconnect and transfer switches, motor starter, controls, instrumentation, electrical conduits and conductors; all according to the MCWD's standards.

Site Plan: Delineation of site and mechanical facilities.

Mechanical Plan: Well pump, station and main piping, and mechanical conduits.

Standard Construction Details: Plans will include pipe supports, pump pedestal construction and other standard details.

Information to be provided by others shall include a topographic base map in AutoCAD format that includes the location of all current surface features, subsurface utilities and applicable easements and property boundaries, and existing or planned roadways with curb, gutter, and sidewalks. The base map will be provided by MCWD should be provided at the start of the overall project so that it can be used in developing the conceptual layout under Task 1.

It is assumed that the MCWD will provide a geotechnical engineering report that defines site soil conditions and foundation design recommendations.

Task 7 Overview

Meetings and Key Activities:

- *One design meeting.*

- *One site visit w/EPS.*

Deliverables:

- *Plans and specifications for the well pump station at two levels: 75 percent, and 100 percent, or final. For each design submittal, LSCE will send two copies of the plans and specifications for comment and review to each designated reviewer. The final versions of the plans and specifications will be provided in electronic format for incorporation into the MCWD's contract documents.*

Task 8: Technical Assistance During Station Construction

Under Task 8, LSCE will provide the following engineering support services during the station construction phase. Note that it is assumed that, as with earlier projects, MCWD will perform resident inspection (day to day inspection), as needed, and that LSCE will provide submittal and RFI review, key milestone inspections, and assistance during station start-up.

Competitive Bidding and Bid Evaluation: Assist with solicitation of competitive bids from qualified, licensed California contractors, evaluate bids, and recommend award.

Conferences: Prior to commencement of construction, a conference with the contractor will be held to confirm the contractor's understanding of the intent of the contract documents. Final site visitation with the contractor will be made as part of the conference to review site access and to address questions of the contractor prior to equipment arrival.

Submittals and RFIs: Review all submittals and requests for information to ensure all products used during construction are consistent with the plans and specifications.

Pump Components: Match field performance characteristics with design parameters for the pumps and their prime movers, and verify that installation meets manufacturer and industry standards.

Structural Plans for Enclosures and Other Structures: Inspect enclosure foundation, CMU/steel construction, building/enclosure structures and paving.

Electrical and Control System: Verify the adequacy of the motor control center components and the operating control and safety features for starting and stopping the pump station.

Discharge and Mainline Piping: Inspect materials of construction of the station piping and connection to the mainline.

Pumping Plant Testing: Verify field performance of the pumping plant against the manufacturer's quoted performance and the specified performance, including capacity, discharge head, and pumping plant efficiency.

Payment and Acceptance: Review, approve, and recommend payment on the contractor's

progress billings. Conduct final inspection and recommended acceptance of the work.

At the completion of station construction, LSCE will finalize the preliminary DWSAP according to the selected design capacity and water quality test results at that design rate, for inclusion with the MCWD's CDPH permit amendment application. Here, it is assumed that the MCWD will conduct the final water quality sampling ands testing.

Task 8 Overview

Meetings and Key Activities:

- *Multiple trips to project site for construction, testing, and start-up activities.*

Deliverables:

- *Response to submittals and RFIs.*
- *Inspection reports.*
- *Summary report on construction and commissioning of well station including as-built station drawings.*
- *Final DWSAP.*

Cost Estimate and Contract Administration

Our estimate of costs for engineering and field services for the proposed well and pump station project is encompassed in the following table. Cost estimates are presented by task and are considered suitable for planning and budgeting purposes.

Task	Description	Outside Services	Engr. Services	Total
1	Suitability Assessment, Conceptual Design, and CDPH Memo	*n/a*		
2	Exploratory Test Hole Drilling, Oversight/Evaluation, and Water Quality Testing	90,000	14,000	104,000
3	Scope Development (CEQA Compliance) Compliance)Environmental Documentation Scoping	2,000	0	2,000
4	Regulatory Submittal and Preliminary DWSAP	*n/a*	15,000	15,000
5	Well Design and Plans/Specifications	*n/a*	10,000	10,000
6	Technical Assistance During Well Construction	*n/a*	16,000	16,000
7	Pump Station Design and Plans/Specifications	15,000	35,000	50,000
8	Technical Assistance During Station Construction	12,000	15,000	27,000
	Totals	119,000	105,000	**224,000**

Notes:

(1) Outside services provided by subcontract driller for 800-ft test hole, triple completion monitoring well is estimated to cost $104,000. Water quality testing performed by certified testing laboratory: est. $5,000. Total estimate for Task 2 "outside service" is $90,000.

(2) Task 6, well construction - estimate for an 800 foot, 16-inch diameter well is $525,000, which includes all engineering and field inspection services.

(3) *Structural and Electrical plans and technical assistance during construction is included and will be performed by LSCE subcontractors (Merkel & Associates, and Electrical Power Systems (EPS) respectively.)*

The proposed project sum presented above includes LSCE's labor under each task and outside engineering services, all as delineated in this proposal. LSCE will bill monthly for labor and materials, only as incurred, in accordance with LSCE's Schedule of Fees for Engineering and Field services (attached).

In the event that LSCE is directed to deviate from the proposed scope, or as dictated by unforeseen field conditions, LSCE will provide notification of any potential changes in the estimated cost and time to complete the work. LSCE will not proceed with any work that deviates from the approved scope and budget until approval to proceed is granted.

We appreciate the opportunity to provide you with this scope and budget.

Sincerely,

LUHDORFF AND SCALMANINI,
CONSULTING ENGINEERS

William Gustavson

Thomas Elson

Attachments: Schedule of Fees for Engineering and Field Services (January 2014)

LUHDORFF AND SCALMANINI
CONSULTING ENGINEERS
500 FIRST STREET
WOODLAND, CALIFORNIA 95695

SCHEDULE OF FEES - ENGINEERING AND FIELD SERVICES
January, 2014

Professional:*	
Principal Professional	*$ 195/hr.*
Project Manager	*$ 180/hr.*
Senior Professional	*$ 170/hr.*
Project Professional	*$ 145 to 165/hr.*
Staff Professional	*$ 110 to 125/hr.*
Technical:	
Engineering Inspector	*$ 110 to 125/hr.*
Engineering Assistant	*$ 95/hr.*
Technician	*$ 95/hr.*
ACAD Drafting	*$ 105/hr.*
Clerical Support:	
Word Processing, Clerical	*$ 65/hr.*
**********	
Vehicle Use	*$ 0.55/mi.*
Subsistence	*Cost Plus 15%*
Groundwater Sampling Equipment (Includes Operator)	*$ 170.00/hr.*
Copies	*.20 ea.*
**********	
Professional or Technical Testimony	*200% of Regular Rates*
Requested Technical Overtime	*150% of Regular Rates*
Outside Services/Rentals	*Cost Plus 15%*
Services by Associate Firms	*Cost Plus 15%*

* *Engineer, Geologist, Hydrogeologist, and Hydrologist*

Client:	Millview Co. Water District	Lat/Long:	39.19177/123.20031
Project Name:	Carter Ln. Monitoring Well	GSE (ft-msl)	635
LSCE #:	14-5-009	Drill Date:	2/18/2014
Location:	Ukiah, CA	Drilling Method:	Direct Rotary
Geologist:	C. Jenkins	Driller:	Roadrunner Drilling & Pump

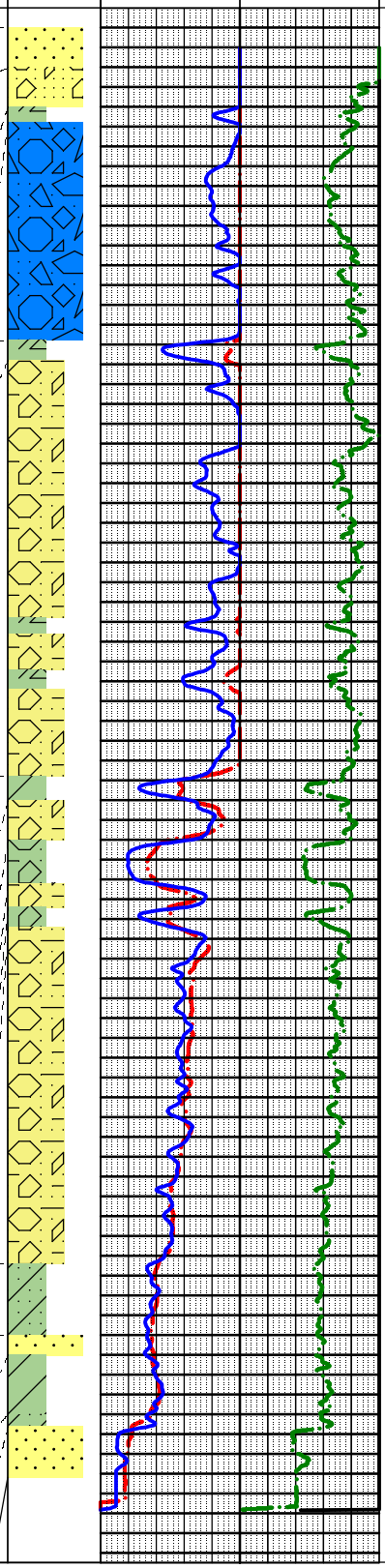
LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Attachment 4

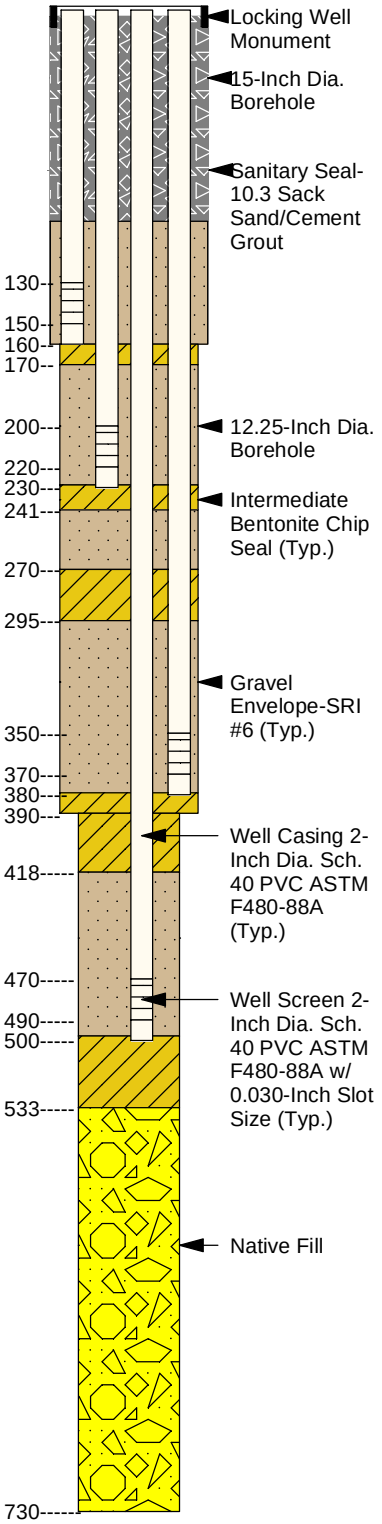
Lithologic Description

- 0–50: Sand- fine to coarse, sub-round to sub-angular
- 50–100: Gravelly Sand- fine to coarse, sub-round to sub-angular, gravel up to 1", lithics
- 100–150: Gravelly Clay- light brown mottled gray, low plasticity, gravel up to 1"
- 150–200: Sand and Gravel- fine to coarse, sub-round to sub-angular, gravel up to 1", lithics
- 200–250: Gravelly Clay- light brown, low plasticity, gravel up to 1/2"
- 250–400: Sand and Gravel with Clay- fine to coarse, gravel up to 1/2", clay is reddish brown, low to medium plasticity, clayey lenses from 298 to 306' and 324 to 334'
- 400–450: Clay- greensih gray, sticky, soft, low plasticity, trace sand and gravel
- 450–500: Sand and Gravel with Clay- fine to coarse, gravel up to 1/4", clay is brown mottled greenish gray, soft, low plasticity
- 500–550: Clay with Sand and Gravel- greenish gray, moderately sticky, low plasticity, gravel up to 1/4"
- 550–600: Sand and Gravel with Clay- fine to coarse, gravel up to 1/4"
- 600–650: Clay with Sand and Gravel- brown, soft, low plasticity, fine to coarse sand, gravel up to 1/4"
- 650–700: Sand and Gravel with Clay- Fine to coarse sand, gravel up to 1/4", angular sand and gravel, increasing clay content with depth, hard and slow drilling
- 700–750: Sandy Clay- brown, soft, low plasticity, color change at 640' to light gray
- 750: Sand- fine to medium, well sorted, with light gray clay
- Clay- gray, low plasticity, with fine to medium sand
- Sandy Clay- gray, low plasticity, fine to medium sand
- Sand- Fine to coarse, possibly sandstone, very hard and slow drilling

Strat-Column



Well Construction Diagram



NOTICE OF CEQA EXEMPTION

City of Ukiah

CONFORMED COPY

Copy of Document Recorded on
06/05/2014 02:44:16 PM
as 2014-E0038
Mendocino County Clerk-Recorder

TO:

☑ County Clerk
County of Mendocino
Courthouse
Ukiah, CA 95482

FROM:

City of Ukiah
300 Seminary Avenue
Ukiah, CA 95482

PROJECT TITLE: City of Ukiah water well number nine (9)

DESCRIPTION OF PROJECT: The project involves the drilling, testing and installation of a new (emergency) water well to provide water to the City of Ukiah.

LOCATION: The project site is located in the southwest portion of that area known as the Brush Street Triangle - south of Brush Street situated between Highway 101 and the NWP railroad Tracks on a parcel owned by the Rural Communities Housing Development Corporation – North Ukiah area, Mendocino County

PUBLIC AGENCY APPROVING PROJECT: City of Ukiah – City Council - June 4, 2014

NAME OF PROJECT APPLICANT: City of Ukiah Public Works Department

CEQA EXEMPTION STATUS:

☑ **Statutory Exemption Section** 15269 (c) – Emergency Projects

REASONS WHY PROJECT IS EXEMPT: 1) After a number of years of below normal rainfall, the City has received less than 50% of normal rainfall prior to the beginning of the 2014 dry summer season; 2) Due to the most severe drought in the last 100 years, effective May 27, 2014, the SWRCB has curtailed the right of most permit holders to appropriate water from the Russian River and has warned the City that if it fails to substantially reduce its diversions from the Russian River and conserve water, the Board will curtail the City's right to divert water from the river under its pre-1914 and senior post-1914 water rights; 3) If those rights are curtailed, the City will have no water available for any irrigation which will cause severe property damage to residential, commercial and municipal landscaping and food production; and 4) As a result of this sudden and unexpected occurrence, the City must drill, test and install an additional well to supply additional water from groundwater sources as soon as possible this summer and fall to avoid or mitigate serious damage to property and the public health, and for this reason the City does not have time to comply with the California Environmental Quality Act ("CEQA") before procuring a contractor to drill, test and install said well.

LEAD AGENCY CONTACT PERSON: Charley Stump – cstump@cityofukiah.com / (707) 463-6200

SIGNATURE: _____
Charley Stump, Director
Planning & Community Development

DATE: June 5, 2014

NORTH COAST RESOURCE PARTNERSHIP

2014 IRWM Drought Project Grant Application

ATTACHMENT 3:

Project Justification Appendix

Integrated Regional Water Management Program
Applicant: Humboldt County

North Coast Resource Partnership 2014 IRWM Drought Project Grant

Attachment 3. Project Justification Appendix

Supporting Documentation

1. High Efficiency Fixture Direct Install Water Savings Analysis (2011)
2. Specifications for High-Efficiency Fixtures for Installation
3. Detailed project map

Attachment B

High-Efficiency Plumbing Fixture Direct Install Water Savings Analysis

for

Sonoma County Water Agency

404 Aviation Boulevard,
Santa Rosa, California

Revised November 2011

By

John Koeller
Koeller and Company
Yorba Linda, California

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INTRODUCTION

The purpose of this study was to evaluate the results of a multi-faceted water conservation 'direct installation' program developed and managed by the Sonoma County Water Agency (Water Agency)[1], a water wholesaler in northern California that is also responsible for flood protection services, distribution of recycled water, recreational opportunities and wastewater treatment.

The program encompassed the replacement of older water-using fixtures and fixture fittings in both domestic (residential) and non-residential applications with new high-efficiency products. Qualified, licensed plumbers were used to install all such items, which included toilet fixtures, urinals, showerhead, and faucet aerators. It should be noted that the analysis and this report focus almost entirely upon the water use reductions resulting from toilet fixture replacements and does not assess savings associated with showerhead and faucet aerators.

The program was implemented in several service areas:

Airport/Larkfield/Wikiup Sanitation Zone
Geyserville Sanitation Zone
Occidental County Sanitation District
Penngrove Sanitation Zone
Russian River County Sanitation District
Sea Ranch Sanitation Zone
Sonoma Valley County Sanitation District

Only two of the above service areas were included in this study as inclusion depended upon the availability of customer water use data. The areas and program time frame where data was available were as follows:

Sonoma Valley County Sanitation District[2] (City of Sonoma[3])
Installations from June 2009 through April 2010

Sonoma Valley County Sanitation District (Valley of the Moon Water District[4])
Installations from June 2009 through February 2010

Airport/Larkfield/Wikiup Sanitation Zone[5] (Town of Windsor[6])
Installations from November 2009 through April 2010

In this report, service areas are further broken out by retail water provider as note above in parenthesis.

[1] http://www.scwa.ca.gov/quick-facts/
[2] http://www.scwa.ca.gov/lower.php?url=svcsd
[3] http://www.sonomacity.org/
[4] http://www.vomwd.com/index.html
[5] http://www.scwa.ca.gov/lower.php?url=airport-larkfield-wikiup-sanitation-zone
[6] http://www.ci.windsor.ca.us/

PROGRAM BACKGROUND

Schedule

The subject program was executed over a period of about 11 months, beginning with a pilot program in June 2009 expanding to full fledged program from September 2009 through April 2010. During the eight months of the full program, more than 5,000 fixtures were installed.

Fixtures and Fixture Fittings

This study focused on the replacement of approximately 1,776 aging toilet fixtures[7] with high-efficiency models[8], divided as follows:

Table 1. Toilet fixture replacements

Service Area	Residential	Commercial	Total
City of Sonoma	266	451	717
Valley of the Moon Water Dist	874	18	892
Town of Windsor	0	164	164
Total	1140	633	1773

The program installed 1.28 gpf HETs through December 2009. Beginning in January 2010, the program requirements were modified to require 1.1 gpf or less HETs for tank-type toilets; it also allowed the replacement of 1.6 gpf ULFTs if at least one non-efficient (greater than 2.0 gpf) toilet was to be replaced at the same participating property.

Urinals, showerheads and faucet aerators were also replaced through the program as well:

Table 2. Urinal fixture replacements

Service Area	Properties	Urinals
City of Sonoma	3	23
Valley of the Moon Water Dist	0	0
Town of Windsor	19	59
Total	22	82

Table 3. Showerhead replacements

Service Area	Residential	Commercial	Total
City of Sonoma	44	51	95
Valley of the Moon Water Dist	52	1	53
Town of Windsor	0	1	1
Total	96	53	149

[7] A total of 1,954 toilet fixture installations were evaluated for this study, however, 178 fixtures could not be included as part of the analysis due to a lack of or inconsistent water use data. Other toilets (3) were excluded for other reasons. In addition, 82 urinal fixtures were replaced as well.

[8] High-efficiency toilet (HET) fixtures are defined as those with an effective flush volume 20 percent less that the Federal maximum of 1.6 gallons per flush (gpf). As such, all HETs flush (on average) at 1.28 gallons or less. The first HET fixtures were introduced to the North American marketplace in 1999. Since that date, over 1,000 different HET models from dozens of manufacturers exist in the U.S. marketplace. The U.S. EPA's WaterSense program endorses HETs and labels those models that perform to a high set of standards.

Table 4. Faucet aerator replacements

Service Area	Residential	Commercial	Total
City of Sonoma	191	163	354
Valley of the Moon Water Dist	113	5	118
Town of Windsor	0	118	118
Total	304	286	590

Participating Properties

A total of 1,740 sanitation customer properties participated and are benefitting from the program. Included in this study are 364 properties, divided by retail water service providers as follows:

Table 5. Properties participating in the program

Service Area	Residential	Commercial	Total
City of Sonoma	79	44	123
Valley of the Moon Water Dist	215	5	220
Town of Windsor	0	21	21
Total	294	70	364

Plumber Participation

Any licensed plumber could participate in the program provided they agreed to Water Agency's terms and conditions and met certain insurance requirements. Participating plumbers were paid through a set rate schedule for materials and labor. A total of thirteen (13) plumbers participated in the program. Seven (7) of those plumbers participated in the toilet installations analyzed for this report.

The participating plumbers verified eligibility, performed a water audit of the property[9], provided and installed the fixtures, invoiced the customer for any upgrades, and invoiced SCWA for the base price of materials, recycling, and labor.

Data Collection

For the purpose of assessing water use reductions achieved through the program, the Water Agency collaborated with its retail water service providers to secure water meter readings for the 364 properties for a minimum of one year following fixture installation. These meter readings were then compared to meter reads from periods prior to installation of from 24 to 36 months.

In addition to metered water consumption and property location, each data set for an individual participant (property) contained information on type of property occupancy, the number and type of fixtures and fixture fittings within the property, listing of which of those items were replaced, the flush volume and technology[10] of the replaced toilets, the date of replacement, and the licensed plumber name.

[9] The on-site audit included: an inventory of all toilets, urinals, showerheads, faucets, and clothes washers at the property; a recording of flush volumes and design of the toilets, flow rates of the faucets, and the efficiency of the clothes washers – standard or Energy Star rated; a 5-minute "whole-house" leak check at the water meter; and a post-installation inventory of the replacement fixtures and fixture fittings.

[10] Toilet fixtures were identified either as gravity-fed, pressure-assist, or flushometer valve/bowl combinations.

STUDY RESULTS

Methodology

Metered water consumption data furnished by the retail water service providers was used to assess demand reductions, if any, due to fixture and fitting replacements. Sub-metering or other fixture-specific monitoring of uses within homes and businesses was not performed. All results relied entirely upon data from utility meters and reports from the installing plumbers.

To reduce the effect of seasonal variations in climate (and, hence, water demand variances) from year to year, only demand over the six fall and winter months was considered. Because all of the participating water utilities are programmed for bimonthly billing, and therefore all water consumption was measured in two-month increments, it was impractical to use a period any shorter than six months for the 'winter analysis'. Moreover, the installations of the high-efficiency products occurred largely during the 2009-2010 winter period. As such, the analyses of the 'before' and 'after' cases compared the 2008-09 winter period with that of the identical 2010-11 period.

Where possible, properties where only toilets were being replaced were isolated from those with mixed installations. For example, many of the installations involved replacement of an array of different products at the same property, e.g., toilets and urinals; toilets, showerhead and aerators; or toilets, urinals, showerheads, and aerators.

In some cases, the information provided by the installation plumbers or the water consumption data from meter readings was such that certain properties (and the associated fixture replacements) had to be removed from our analyses. The remainder of the installations (1,776) were each evaluated individually and some further removals occurred because of extraordinary changes in post-installation water consumption when compared to pre-installation[11].

Findings

Water savings achieved through toilet fixture replacement were assessed for several different categories of end-user, type of toilet, and the flush volume of the old and new toilets. A further analysis was made for replacement activities where the plumber replaced a variety of plumbing items in a single site visit. Finally, a similar analysis was made for urinal replacements.

Overall water savings

The replacement of toilet fixtures and all other devices[12] resulted in the following:

Table 6. Savings from all toilet fixture and fixture fitting replacements[13]

	Residential	Commercial	Total
No. of Properties	294	70	364
No. of Toilets	1140	633	1773
Daily Water Savings per Toilet (gallons)	**54.7**	**58.9**	**56.2**

[11] These were cases where a substantial increase or decrease in water use was not warranted solely by the reported fixture and fixture fitting replacements.
[12] Includes instances where other plumbing items (urinals, showerheads, aerators) were replaced at the property at the same time as toilet replacement.
[13] Represents a mixture of aging toilets replaced: 1.6 gpf, 3.5 gpf, and higher. Replacement toilets all qualified as HETs. Some properties and toilet installations are left out of this summary, due to lack of water use data or data inconsistencies.

Water savings by end use category – Residential

(Single-family housing vs. Multi-family housing)

In total, 1,140 new HETs were installed in 294 residential applications, replacing an equal number of non-efficient 1.6 gpf and 3.5 gpf rated fixtures. Refer to Table 7.

Table 7. Residential installs

Service Area	Residential Installations		
	Single Family	Multi-Family	Total
City of Sonoma	89	177	266
Valley of the Moon Water Dist	337	537	874
Total	426	714	1140

Water savings associated with toilet installs in the single and multi-family categories were divided into two further categories, those installs where only toilets were replaced and those installs involving toilets and other fixtures or fixture fittings. Of the total of 1,140 toilets replaced in residential, 813 were installs involving no other such items. Table 8 displays the water savings per toilet achieved for both single and multi-family for both scenarios.

Table 8. Water savings – residential installations[14]

	No. of Toilets	Water Savings (gal/day)	
		Single Family	Multi-Family
Toilets 'alone'	813	27.6	59.4
Toilets combined with other devices	327	36.0	70.8

Water savings per residential household

A secondary analysis was performed to determine water savings by participating household. In the case of multi-family installs, the participating plumber reported on the number of apartment units within the property being retrofitted.[15] Table 9 displays household water use reductions reported as per installed toilet basis.

Table 9. Water savings per household

Service Area	Dwelling Units	Toilets Replaced	Avg Water Savings per Dwelling Unit (gal/day)
Single-Family Dwellings			
City of Sonoma	49	89	109.5
Valley of the Moon Water Dist	190	337	53.5
Combined	239	426	65.0
Multi-Family Dwelling Units			
City of Sonoma		177	
Valley of the Moon Water Dist	412	537	86.1
Combined	412	714	
All Dwelling Units	651	1140	

[14] Toilets 'alone' category excludes those instances where toilets were installed along with urinals, showerheads, or aerators. However, the category includes instances where 3.5 gpf and 1.6 gpf toilets were installed together in the same property.

[15] Dwelling unit counts are for actual living units, regardless of the number of dwelling units in a given multi-unit apartment building. For example, 537 toilets were replaced in 412 apartments in the Valley of the Moon Water District. It should be noted that the unit information was not available for the multi-family properties located in the City of Sonoma.

Water savings by end use category – Non-residential

(Commercial and institutional applications)

Commercial and institutional replacements of toilets were similarly broken into two categories, i.e., installs where the toilet alone was replaced without any additional plumbing replacements on the same property and installs where the toilet was accompanied by installs of one or more of the following: urinal fixture, showerhead, or faucet aerator. Savings as disclosed by the billing data is summarized in Table 10.

Table 10. Water savings – non-residential installations[16]

	Proper-ties	Toilets Replaced	Average Water Savings per Toilet (gal/day)
Toilets 'alone'	32	164	132.0
All non-residential toilet installations	64	633	64.6

Non-residential installations fell into seven categories, most participating properties being in the office and retail/services classifications as noted in Table 11.

Table 11. Water savings by commercial-institutional category

Non-Residential Category	Properties	Toilets Replaced	Average Water Savings per Toilet (gal/day)
Office (incl medical offices)	21	96	34.6
Retail & Services	20	57	194.3
Hospitality: Lodging & Restaurants	7	366	45.0
Warehouse	4	29	35.9
Light Manufacturing	4	52	7.6
Religious Institutions	4	19	150.8
Mobile Home Park	3	2	197.3
Health Club - Spa	1	12	443.8
Combined	64	633	64.6

It is important to note that all of the office building toilet replacements were accompanied by aerator installations as well. As a result, there was no reliable method to isolate the savings resulting from toilet replacement from that derived from aerators.

Conversely, retail and service installations were isolated because installations were not accompanied by other fixtures or fittings. Half of the hospitality (lodging and restaurants) installations and half of the religious installations were accompanied by aerator installs. Interestingly, however, only one of the five lodging institutions that received replacement toilets were also provided with new showerheads. This would indicate that those remaining four hotels were already equipped with efficient showers in the guest rooms or that hotel management declined the offer of replacement showerheads.

The health club-spa installation of 12 toilets was accompanied by the installation of three high-efficiency urinals (HEUs) as well. Eight of the 12 toilets replaced were reported as likely 3.5 gpf

[16] The majority of the 164 toilet installations made 'alone' replaced 3.5 gpf fixtures in high-volume locations, resulting in large per-toilet water savings.

or greater. The sample size for health club-spa and for the mobile home park are such that the savings data may not be representative of such facilities and cannot be applied with confidence to other similar end uses.

Water savings by replaced toilet

(1.6 gallons per flush vs. 3.5 gallons per flush)

Plumbers were required to record and report the flush volume of the toilets they replaced at each participating property. That report indicated whether the replaced fixtures were functioning at 2.0 gallons or less[17]; all others were reported to be flushing at 2.1 gallons or more (assumed to be 3.5 gpf fixtures). However, plumbers were not required to physically measure toilet flush volumes, relying instead upon their observation and experience. As a result, it cannot necessarily be assumed that all of the recorded information is fully accurate; but it is sufficient to provide a general picture of what was removed and replaced within the participating properties.

In many properties, installing plumbers replaced both types of older fixtures, i.e., 2.0 gpf or less *and* 3.5 gpf. However, it was those installations where only one or the other was replaced that could be used for developing the savings data shown in Table 12.

Table 12. Water savings by replaced toilet

Category	Properties	Toilets Replaced	Average Water Savings per Toilet (gal/day)
Residential			
Replace 1.6 gpf	17	19	27.1
Replace 3.5 gpf	165	504	41.8
Commercial			
Replace 1.6 gpf	8	335	25.8
Replace 3.5 gpf	45	235	102.8
Combined			
Replace 1.6 gpf	25	354	25.9
Replace 3.5 gpf	210	739	61.2
TOTAL	235	1093	49.8

Water savings by replacement toilet design/technology

(Gravity-fed vs. pressure-assist vs. flushometer valve combination)

Another area in which building managers and water efficiency practitioners are interested is that related to the design of replacement product. For example, will a standard gravity-fed HET (at 1.28 gpf) yield a savings similar to that of the pressure-assist HET (at 1.1 gpf)?

In this Water Agency program, installed HETs were fairly evenly divided between the two designs. However, most commercial installs of one or the other technology were accompanied by installs of showerheads, aerators, or urinals, therefore excluding them from a 'toilet only'

[17] It is likely the fixtures recorded as 2.0 gpf or less were designed and originally rated at 1.6 gpf, complying with the EPAct 92 Federal maximum. Based upon other studies, we know that many of these aging fixtures were likely to be flushing at something other than 1.6 gallons. This includes those adjusted to higher flush volumes as well as those with lower flush volumes. In the latter case, reduced flush volumes on these aging fixtures frequently degrades flush performance and, thus, results in double flushing by the customer .

water savings analysis. Analyzing only 'discrete' installations[18], Table 13 displays the water savings yield from 911 such toilet replacements[19].

Table 13. Water savings by type of replacement toilet

	Residential	Commercial	Combined
Pressure-assist toilets	269	43	312
Daily water savings/toilet (gal)	94.9	153.4	120.6
Gravity-fed toilets	478	121	599
Daily water savings/toilet (gal)	39.7	124.3	56.8
Combined savings (gal/toilet/day)	**59.5**	**132.0**	**72.6**

Water savings by installation plumber

For the toilet replacements evaluated in this study, seven (7) different licensed plumbers performed the installations. Documentation provided by the Water Agency showed those plumbers as installing a total of 1,954 toilet fixtures[20], 82 urinal fixtures, 149 showerheads, and 590 faucet aerators (refer to Tables 1 through 4) as replacements for existing fixtures and fixture fittings.

Table 14 displays the total water savings[21] attributed to each of the seven plumbers shown on a per toilet basis:

Table 14. Water savings by installation plumber

Plumber	Properties Serviced	Toilets Replaced	Average Daily Water Savings
A	217	1269	52.9
B	53	167	13.6
C	59	183	54.3
D	20	111	36.6
E	1	8	89.7
F	3	44	11.7
G	2	7	115.1
Combined	**355**	**1789**	**47.8**

Differences in average daily water savings among the seven (7) plumbers are largely attributable to the types of properties and replacements made, since, in some cases, replacements of showerheads, faucet aerators, or urinals were made at the same time as the

[18] 'Discrete' installations are defined as a pressure-assist or gravity-fed toilet install that is not accompanied by an installation (replacement) of a urinal, showerhead, nor aerator. For example, a gravity-fed toilet is not accompanied by the concurrent installation of pressure-assist toilets, urinals, showerheads or aerators. It should also be noted that the pressure-assist toilets installed in this program were rated at 1.0 gpf, whereas the gravity-fed toilets used as replacements were rated at 1.28 gpf. This difference resulted in the savings from pressure assist fixtures to be significantly greater than those resulting from gravity-fed toilet replacements.

[19] The 911 'discrete' installs represents two-thirds of the 1,371 toilet replacements that took place without urinal, showerhead or aerator replacements at the same property. The difference of 455 installs occurred at properties where both pressure-assist and gravity-fed toilets were installed at the same time.

[20] A total of 1,773 toilet installs were evaluated in this study; refer to footnote 7.

[21] Savings derived from all sources: toilets, urinals, showerheads, and aerators.

toilet replacements. The reader should not infer that one plumber is necessarily ‘better’ than another plumber based upon the water savings data in this table.

Water savings – urinal replacements

A total of 82 urinals in 22 properties were replaced with HEUs as part of this Water Agency program (Table 2). Of the 82, only 12 urinals (in two properties) were installations unaccompanied by the replacement of other fixtures or fixture fittings. The water use data from this small sample and those two properties was inconclusive; it could not be used for developing any general water savings metrics.

Stealth® Bottom Outlet Toilet

N7714, N7716, N7717, 77000WHAI1, 77001RWHAI1

FEATURES AND BENEFITS

The Revolutionary Toilet that Saves More Water than any Other on the Market

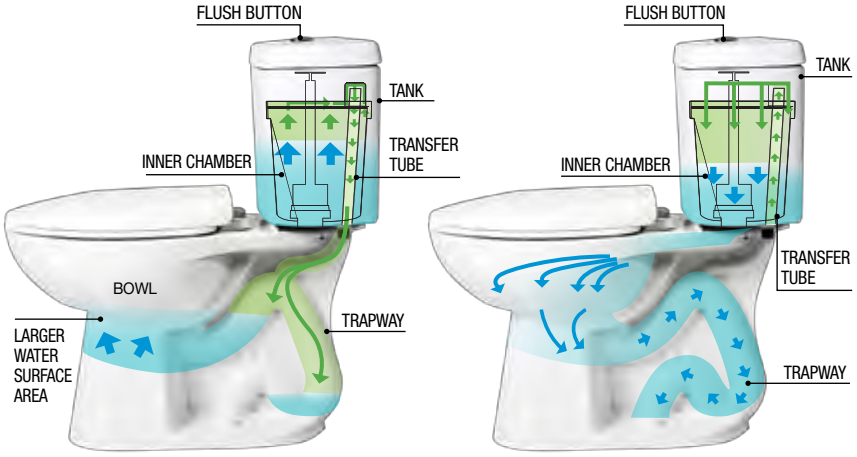
Stealth Vacuum-Assist Power Chamber Inside

Stealth Toilet

Quietest Flushing Toilet on the Market

- Powerful flush delivered with a patented Stealth flush chamber and air transfer system
- Uses just 0.8 gallons per flush (0.8 GPF)
- Fluidmaster 400A fill valve standard
- One flush thoroughly evacuates the bowl every time
- Two piece toilet
- Bowl cleared every time due to smooth, low friction ceramic surface
- Stylish, inconspicuous and durable flush button
- Meets EPA criteria for WaterSense label
- Elongated bowl meets ADA height requirements
- Fully glazed 2" trapway for enhanced flush performance
- Limited Lifetime Warranty*

STEALTH FLUSH TECHNOLOGY



FILLING

1. Water fills the tank and inner chamber, forcing air to the top of the chamber and down the transfer tube.
2. Air is forced through the transfer tube into the trapway exerting positive pressure on the water in the bowl. This pressurizes the trapway and creates a larger water surface area in the bowl.

AIR
WATER

FLUSHING

1. Flush button is depressed.
2. Inside the inner chamber, the vacating flush water creates a vacuum that depressurizes the trapway.
3. This depressurization creates the suction force that pulls the wastewater into the trapway initiating the siphonic flush action.
4. Water empties from the tank cleansing the bowl and flushing waste down the trapway.
5. The trapway is completely filled producing an ultra highly efficient flush.

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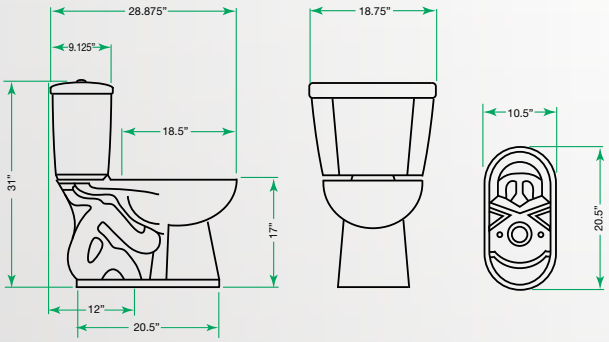
Stealth® Bottom Outlet Toilet

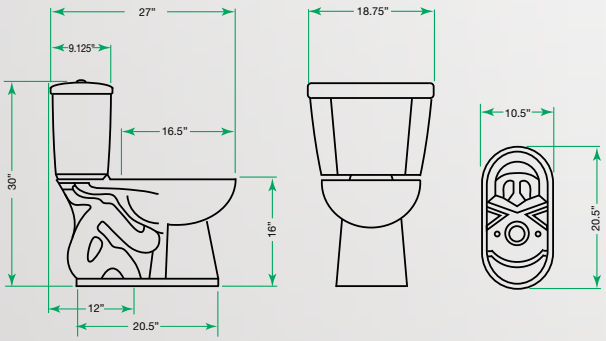
SPECIFICATIONS

N7714, N7716, N7717, 77000WHAI1, 77001RWHAI1

N7717/N7714 Elongated Bowl Specs



N7716/N7714 Round Bowl Specs

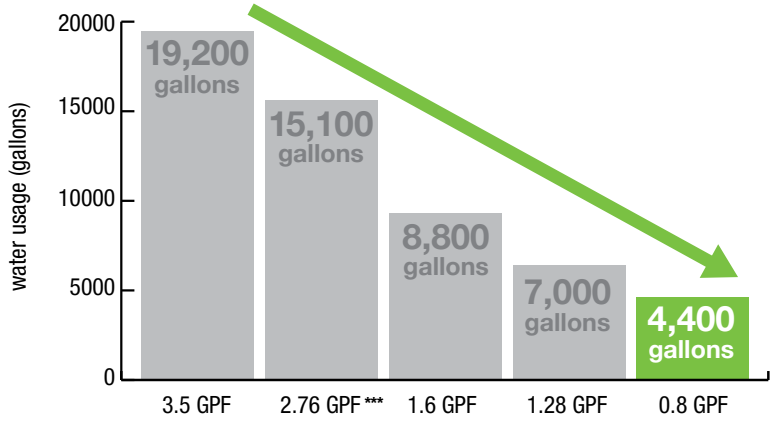


*Dimensions are subject to change

Overall Dimensions	Elongated: 17" high bowl Round: 16" high bowl
Footprint	20.5" x 10.25", Water Area 8" x 6"
Assembled Dimensions	Elongated: Width 18.75" Height 31" Depth 28.875" Round: Width 18.75" Height 30" Depth 27"
Rough In	12"
Materials	Vitreous China – White Finish Polished chrome top-mount flush actuator
Certifications	Meets or exceeds the following: ASME A112.19.2 /CSA B45.1, WaterSense labeled

WaterSense Meets EPA Criteria

Saves Over 70% More Water Than Less Efficient Toilets**



**Annual water savings for Stealth based on a comparison to a 3.5 GPF toilet, 3-person household, 5 flushes per person/per day.
*** 2.76 GPF represents the average flush volume of a toilet in the United States

*LIMITED LIFETIME WARRANTY on vitreous china products. Toilet tank trim: fill valve and flush valve assembly and plumbing fittings are warrantied for a period of ten years to the purchaser from the date of purchase. For complete warranty details, call Niagara Conservation at 1-800-831-8383.

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Stealth® Bottom Outlet Toilet

N7714, N7716, N7717, 77000WHAI1, 77001RWHAI1

PACKAGING

77000WHAI1 Single Flush Elongated (All in One)

RETAIL PACKAGING

Item No	77000WHAI1
UPC Code	732291770002
Type of Packaging	High Quality White Corrugate with Litho Label
Dimensions	Width 16.0" Height 28.5" Depth 31.0"
Weight (Pkg.)	103 lbs
I2of5 Master	00732291770002

77001RWHAI1 Single Flush Round (All in One)

RETAIL PACKAGING

Item No	77001RWHAI1
UPC Code	732291000420
Type of Packaging	High Quality White Corrugate with Litho Label
Dimensions	Width 16.0" Height 28.5" Depth 31.0"
Weight (Pkg.)	100 lbs
I2of5 Master	00732291000420

N7716 Bowl (Round)

BULK PACKAGING

Item No	N7716
UPC Code	732291771641
Type of Packaging	Kraft Corrugated
Dimensions	Width 16.75" Height 18.75" Depth 30"
Weight (Pkg.)	40 lbs

N7717 Bowl (Elongated)

BULK PACKAGING

Item No	N7717
UPC Code	7322917717332
Type of Packaging	Kraft Corrugated
Dimensions	Width 16.75" Height 18.75" Depth 30"
Weight (Pkg.)	40 lbs

N7714 Tank (fits N7716 Round and N7717 Elongated)

BULK PACKAGING

Item No	N7714
UPC Code	732291771429
Type of Packaging	Kraft Corrugated
Dimensions	Width 9.5" Height 16" Depth 19"
Weight (Pkg.)	37 lbs

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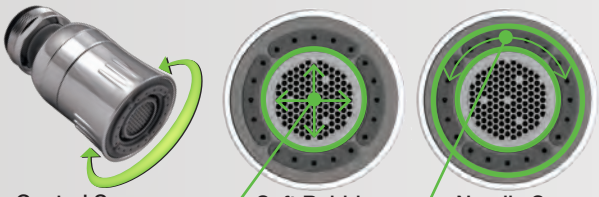
Lead Free Kitchen Aerator

N3126P-C, N3126P-BN, N3126VP-C

FEATURES AND BENEFITS

N3126P-C (Chrome)

- Control from soft bubble spray to forceful needle spray with slight twist
- Aerated, splash-free stream adds force to cleaning



N3126VP-C

- Tip-touch pause action reduces flow to a trickle while keeping temperature consistent
- Soft bubble spray provides full stream of water

Constant Output Regardless of Pressure

Finishes & Flow Rates

	1.5 GPM with Pause Action	1.5 GPM without Pause Action
Chrome	N3126VP-C	N3126P-C
Brushed Nickel	N3126P-BN	

Lead Free Kitchen Aerator

Water Savings Without Sacrificing Performance

- 1.5 GPM saves 32% over standard faucets*
- Dual-thread brass connection
- 360° swivel action, virtually lead-free aerator
- Housing constructed of durable ABS plastic with high-polish chrome finish, does not contain any unplated brass parts
- Soft rubber nozzles for easy cleaning and decalcification
- Conical shape compensator helps to filter debris and mineral build-up
- Installs easily without tools
- Niagara's patented pressure compensating technology guarantees a consistent flow rate across wide range of pressure
- Limited lifetime warranty**

POTENTIAL SAVINGS*

	Water (Gallons)	Electric (kWh)	Gas (therms)	Dollars
Water Savings	1,916			$15
Energy Savings with Electric Water Heater		281		$37
Energy Savings with Gas Water Heater			10	$9

*Factors in calculating savings potential:

- 3-person household each using a faucet 2.5 minutes per day, 365 days per year
- Comparing water use with this 1.5 GPM aerator vs. a standard 2.2 GPM unit
- Water and sewer cost of $8 per 1,000 gallons
- 8.34 BTUs to raise the temperature of 1 gallon 1°
- 500.4 BTUs to raise the temperature of 1 gallon 60° (i.e. 50° to 110° F)
- 1 million BTUs = 293 kWh
- Average cost of electricity $0.133 per kWh (Bureau of Labor Statistics Sept 2012)
- Average cost of gas $0.953 per therm (Bureau of Labor Statistics Sept 2012)

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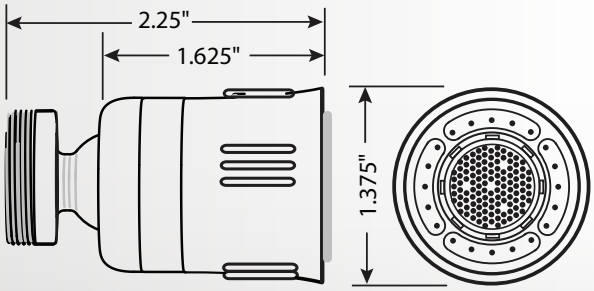
Lead Free Kitchen Aerator

N3126P-C, N3126P-BN, N3126VP-C

SPECIFICATIONS

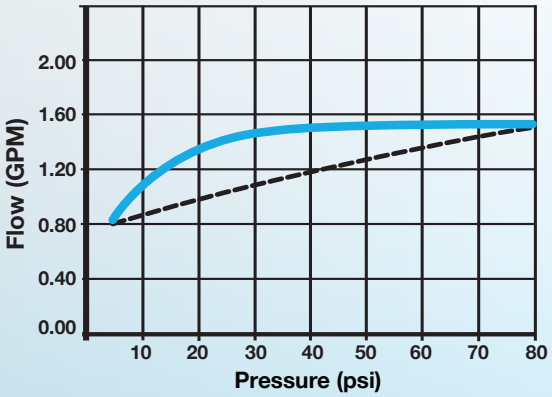


*Dimensions are subject to change

Overall Dimensions	Diameter 1.375" Length 2.25"
Materials	Body: Chrome-plated durable ABS plastic; Threaded connection: Chrome–plated Brass
Threads	Dual-thread system accommodating both male and female applications, with 55/64-27 internal threads and 15/16-27 external threads
Certifications	Meets or exceeds: ASME A112.18.1 / CSA B125.1; ANSI/NSF 61 Chrome plated parts meet ASTM B368 for corrosion testing

Consistent Flow Rate Across Wide Range of Pressure

1.5 GPM Flow Rate



1.5 Pressure Compensated Spray — *Non-Pressure Compensated Spray*

**WARRANTY FOR AERATORS PURCHASED AT RETAIL:
Limited Lifetime Warranty for aerators purchased at retail for as long as the original purchaser owns the product. Niagara will replace any part that, in our opinion has proved defective, provided it has not been abused, misused, altered or damaged after its purchase.
For complete product warranty details, call Niagara Conservation at 1-800-831-0800.

WARRANTY FOR AERATORS OBTAINED THROUGH WHOLESALE, MUNICIPALITIES, UTILITIES OR OTHER COMMERCIAL CHANNELS:
10-year Limited Warranty to the purchaser from the date of purchase. Niagara will replace any part that, in our opinion has proved defective, provided it has not been abused, misused, altered or damaged after its purchase.
For complete product warranty details, call Niagara Conservation at 1-800-831-8383.

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Lead Free Kitchen Aerator

N3126P-C, N3126P-BN, N3126VP-C

PACKAGING

Retail Packaging:
Blistercard Display Packaging

Inner Pack

RETAIL PACKAGING

Item No	RN3126P-C, RN3126P-BN
UPC Code	**RN3126P-C** 732291000666 Chrome w/o Valve **RN3126P-BN:** 732291000673 Brushed Nickel w/o Valve
Type of Packaging	Blistercard Display Packaging
Pack Quantities	6 Per Inner Pack, 24 Per Master Carton
Dimensions Ea. Pkg.	Width 4.75" Height 6.75" Depth 1.5"
Dimensions Inner Pack	Width 5.25" Height 5.0" Depth 8.5"
Weight of Inner Pack	0.95 lbs
I2O5	**RN3126P-C** 20732291000660 Chrome w/o Valve **RN3126P-BN:** 20732291000677 Brushed Nickel w/o Valve
Dimensions of Master	Width 5.0" Height 6.875" Depth 12.5"
Weight of Master	2.0 lbs

Bulk Packaging:
Plastic Bag

BULK PACKAGING

Item No	N3126VP-C, N3126P-C, N3126P-BN
UPC Code	**RN3126VP-C** 732291001069 Chrome w/ Valve **RN3126P-C** 732291001076 Chrome w/o Valve **RN3126P-BN:** TBD Brushed Nickel w/o Valve
Type of Packaging	Kraft Corrugated
Pack Quantities	200 Per Carton
Dimensions of Master	Width 15" Height 7" Depth 15"
Weight of Master	21.5 lbs

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leoperl 1.5 gpm Cascade Aerated Stream Bathroom Faucet Aeratc Serious Flow Control

Price: $2.50
SKU: TS-350
Brand: Neoperl
Weight: 0.07 LBS
Shipping: Calculated at checkout
Quantity: 1 ADD TO CART
Buy in bulk and save

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·oduct Description

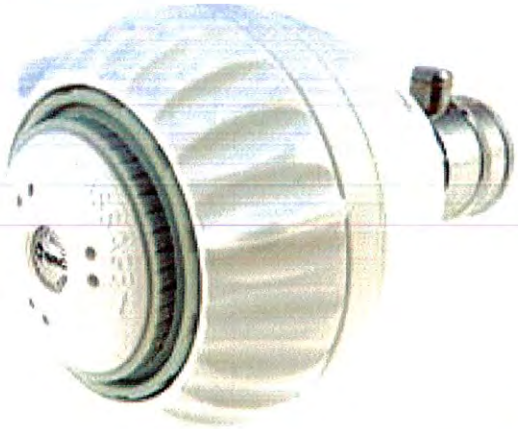
aterSense Listed. Neoperl 1.5 gpm, dual thread kitchen or bathroom faucet aerator. Best quality and ·rformance at a lower cost. NSF 61 approved.

ficient Water, Energy & Money Saving item!

·rated stream produces a larger and whiter stream that is soft to the touch and non-splashing.
›n Pressure compensating
·rated stream
·rators introduce air into the water stream to produce a larger and whiter stream soft to the touch and non-lashing. Aerators are the usual choice for residential faucet applications.

·rators are found in nearly all kitchen and lavatory faucets. An aerator is a key component in the overall ·rformance of the faucet. Here is how you should expect your aerator to perform:
ovide optimum performance at the prevailing line pressure in your country
ıntrol the stream straightness and diameter reduce splash by aerating the stream and eliminating side spray
ve water and reduce energy costs meet local plumbing codes and standards.

1.5 GPM White Shower Pro Massage Deluxe Water Saver, With On/Off Button, Efficient Low Flow, Quality Shower Head



Price: $12.25
SKU: ES-740w-1.5
Brand: NRG
Weight: 0.60 LBS
Shipping: Calculated at checkout
Quantity: 1 ADD TO CART

Buy in bulk and save

Recommend Sign Up to see what your friends recommend.

Product Description

1.5 gpm Super Saving Shower Pro Massage with on/off featured. Select from gentle rain, combination and massage settings.

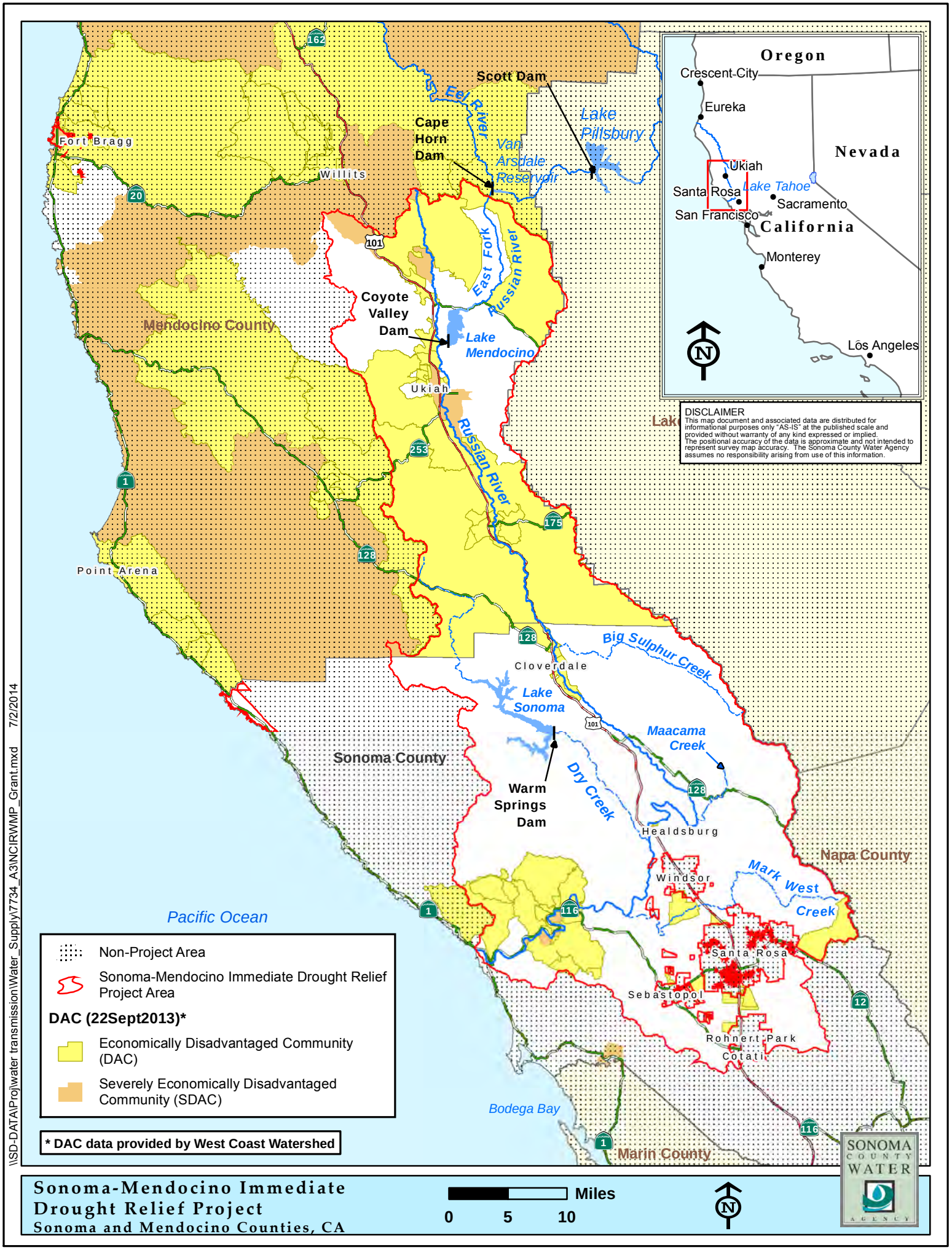
Efficient Water, Energy & Money Saving item!

Shower Pro Massage with on/off switch. Select from gentle rain, combination and massage settings.

Durable and resilient white plastic body means no corrosion. Energy efficient. Save money and conserve water. Non-removable Neoperl pressure compensating flow controller produces steady low flow rate no matter what the water pressure. On/Off button features a Navy Style shower.
Easy installation shower head , no tools required. Manufactured to high standards and highest energy savings. Chrome plated brass nut couplings and screen washers for serious flow control.

*Note the on/off button on the shower head reduces the spray into a trickle to prevent scalding.

*Did you know that a 10 minutes shower with a non-low flow shower head can use upwards of 80 gallons of water and generate up to 4 pounds of CO2, not to mention the cost of the energy to heat the water.By installing a low flow shower head and cutting your shower time to 5 minutes you can reduce your water usages



Sonoma-Mendocino Immediate Drought Relief Project

Sonoma and Mendocino Counties, CA