PROPOSAL

Glenn County Multi-Jurisdiction Hazard Mitigation Plan

September 26, 2014

Prepared for:

Glenn County
Planning and Public Works Agency
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APPENDIX A – Resumes

A. Project Understanding

Tetra Tech's hazard mitigation planning skills include the ability to successfully manage complex, multi-task, and multidisciplinary projects, often under expedited schedules and tight budgets. We are thoroughly familiar with the mitigation planning and approval process required by Disaster Mitigation Act (DMA) of 2000, and we understand the evaluation criteria the Federal Emergency Management Agency (FEMA) will use to assess and approve the Glenn County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP). Tetra Tech already has templates, tools, and resources designed specifically for mitigation planning projects which will provide Glenn County and its planning partners a streamlined process and additional cost savings. This subject matter expertise, combined with the local experience and support offered by our California-based staff will enable us to assist with the development of the Glenn County MJHMP in strict accordance with the requirements and intent of DMA, and if the county's planning partners so choose, with the Community Rating System (CRS).

Based on our review of the Request for Proposals (RFP) and our understanding of hazard mitigation planning issues in northern California it is our understanding that the County's' objectives for this project are as follows:

- Develop an MJHMP for Glenn County that will meet the section 201.6 44 CFR plan update requirements for the county and its planning partners.
- Follow a scope of work that will meet the terms of the grant awarded to the county to fund this planning effort.
- Facilitate and coordinate an efficient planning process through a Steering Committee that includes county, city and special purpose district representatives, as well as other public or private stakeholders.
- Develop a public involvement strategy that strives to engage the public in each of the jurisdictions to be covered by the plan.
- Integrate the MJHMP with other planning efforts that have been or are currently being undertaken by participating jurisdictions and assess, identify and organize local capabilities and resources needed to develop the MJHMP.
- Facilitate the review and approval of the plan update by both State of California and FEMA Region IX.

Tetra Tech can do this for you! We feel confident, that our methodology and technical approach will not only meet, but will exceed these objectives. We strive to facilitate a planning process that will increase the capability of all those involved to implement the actions identified in the plan and to increase the resiliency of their community. Further, our proposed work plan is efficient and through. Our phased approach (see **Exhibit 1**) meets the process requirements of DMA, while actively pursuing project objectives on multiple fronts.

Our plan development process is built on a standardized approach that has been proven to meet project objectives on-time and on-budget, while also allowing flexibility to address the unique concerns of Glenn County and its planning partners. Based on our experience with similar planning projects, we expect a typical schedule of 9 to 12 months, depending on the number of planning partners involved. This timeframe is based on both our experience in writing plans with an anticipated 5 to 15 planning partners,

and as reviewers/approvers of plans that have attempted to expedite the process, missing critical steps that then do not meet FEMA approval. We understand that the County's desired schedule provides less than the optimal time to complete this process. We are confident that our technical approach discussed in **Section B** of this proposal can be accomplished within the desired time frame, as long as all of the planning partners meet their participation requirements.

Exhibit 1. Critical Path for Project Objectives

B. Scope of Work

Proposed Work Plan Methodology

The planning requirements specified under 44 CFR, section 201.6 are very prescriptive and "process" driven. The requirements are in place more to guide to the process of developing the plan rather than dictate plan results, which means that several "shalls" and "mays" are specified in the requirements. You must have a facilitator that has a thorough understanding of the difference between these two specifications to assure plan approval. The following are some key points Tetra Tech would like to point out before presenting our recommend approach to this project:

- For each planning partner to be granted compliance under the plan, the plan must clearly document how each planning partner participated in the plan's development. For multi-jurisdictional plans, it is very important to clearly define "participation." What will be required of each planning partner and how will that be documented in the plan?
- There are many overlaps between hazard mitigation planning requirements and other planning requirements in California, such as General Planning Law (AB-2140), Comprehensive Wildfire Preparedness Plans (CWPP), California Flood Safe initiative (AB-162), and the Community Rating System (CRS). Facilitating a process that generates a plan that will meet multiple program requirements would be a huge benefit to Glenn County and its partners.
- Once completed, this plan will act as the keyway to potential funding under FEMA hazard mitigation grant programs. For the plan to be viewed as a success, it should be successful in securing grant funding for the county and its planning partners. The key to achieving this is good project development.

The following technical approach is built upon a standardized approach that has been validated by dozens of planning processes across the country. This process works, attested by our ***100% first pass plan approval rate***. Our proposed work plan has seven distinct phases described as follows:

Phase 1: Organize and Review

Under this phase, Tetra Tech will work with the County and all planning partners to organize the key components for this planning process. This includes the planning partnership and a designated Steering Committee to oversee the plan scope of work. Under this phase, the Tetra Tech planning team will clearly identify a work plan and schedule that will become the script for the planning process. This work plan will be presented to the Steering Committee at its initial meeting. Based on our review of the RFP, it is our understanding that this combined planning effort will strive to provide DMA compliance to the unincorporated areas of Glenn County and water, reclamation, fire and cemetery districts. We understand that additional jurisdictions, including the County's two incorporated areas, may be added.

Based on our past experience with multi-jurisdictional planning, Tetra Tech understands the challenges of ensuring that all eligible planning partners participate in the process from start to finish and meet the participation requirements specified under the law. To make sure these requirements are met, a kick-off meeting will be held with all planning partners where attendees will be advised of participation requirements and asked to formally commit to the process in writing. To address those situations where a potential

partner chooses to not participate, or drops out during the process, Tetra Tech recommends clearly defined "linkage" procedures be included in the plan. These procedures will define the process necessary for a non-participating local government to follow in order to link to the plan in between cycle updates to the plan. This process would be very important to non-participating jurisdictions should a major disaster occur within the planning area. These procedures would script a fast-track process to link to the plan, which would afford eligibility for funding that would not be available for these jurisdictions because they were not covered by a plan.

A key element of **Phase 1** is the establishment of a Steering Committee to provide oversight on the plan's development up to adoption. Several options to this element can be pursued to best meet the needs and capabilities of the planning partnership. These options will be discussed with all planning partners at the project kick-off meeting and the best option will be selected. Tetra Tech will strive to create a Steering Committee with a diverse makeup that represents planning partners, citizens, academia, and other stakeholders within the planning area. Once established, this committee will meet periodically during the planning process to review and provide oversight on the plan's progress. One of the first actions of this committee will be to approve a public involvement strategy that will meet the capabilities of the partnership, while meeting the requirements of the law. Parameters for this strategy are discussed under **Phase 3.**

Coordination with other agencies (neighboring jurisdictions; resource agencies; businesses; academia; and local, regional, state, or federal agencies) to determine their probable impact and or support of the mitigation plan will occur under this phase. Also under **Phase 1**, a review of existing studies, reports, and technical information will be performed to assimilate sources of information into the decision-making process. This will include a comprehensive review of the current California State Hazard Mitigation Plan to assure consistency of this plan with the goals, objectives and actions of identified in the State plan. Tetra Tech will document and record the elements of this phase for incorporation into the plan document.

The measurable objectives of this phase are as follows:

- Project kick-off meeting
- Solidify planning partnership
- Formation of steering committee
- Agency coordination
- Steering committee meeting facilitation
- Review of existing documents

Phase 2: Identify Hazards/Perform a Risk Assessment

Under this phase, Tetra Tech will assist the partnership in identifying the characteristics and potential consequences of the hazards that may impact or have historically affected the planning area. Tetra Tech will perform a thorough assessment of each natural hazard, as well as the vulnerability of the planning area to each hazard identified, using tools such as Geographic Information System (GIS)/ Hazards U.S. Multi-Hazard (HAZUS-MH), benefit-cost analysis tools, and historical/local knowledge of past occurrences. At a minimum, a map delineating each hazard area, a description of each hazard (including potential depths, velocities, magnitudes, frequencies, etc.), and a discussion of past events will be prepared. The State Hazard Mitigation Plan will be the principal tool used to identify the hazards of concern for the planning area as well as our local knowledge based on other plans we have completed within the region, namely

Tehama, Humboldt and Siskiyou Counties. Also under each hazard, a vulnerability analysis will be performed that will include an inventory of the number and type of structures at risk; the impact on life, safety, and health, and the need and procedures for warning and evacuation; the identification of critical facilities and the impact of the hazard on those facilities; and a review of the development/redevelopment trends projected for the future in each identified hazard area. In addition, the flood hazard risk assessment will include a review of all FEMA-identified repetitive loss properties within the planning are as required under the CRS and Flood Mitigation Assistance (FMA) programs. Our approach utilizes the best available data in the planning area. If, during the course of the planning process, a need for additional studies or data is identified, it will be noted within the risk assessment.

Because this scope assumes a multi-jurisdictional application, **Phase 2** will assure that each participating planning partner's risk and vulnerability is addressed in the overall risk assessment. This will be accomplished by the use of established data capture tools that will walk each partner through the required steps of risk assessment. Existing data and personal interviews will be used to accomplish this phase. The primary tool utilized in the development of this risk assessment will be HAZUS-MH (version 2.0). Needs for additional data and/or special studies to better analyze the risk associated may be recommended under this phase, but will not be implemented. These recommendations will be incorporated into the latter stages of the project.

Tetra Tech will generate and analyze the output reports of HAZUS-MH based on the hazard scenarios run by the model and in some cases, using historical, anecdotal, and other information to evaluate how hazards may cause losses. We shall provide quantitative loss estimates, where feasible; in other cases, we will use FEMA, the California Emergency Management Agency (CalEMA), and other available guidance to estimate potential exposure, losses, and impacts in a qualitative manner, clearly specifying our sources, assumptions, and methodologies in all cases. We will use illustrative means including histograms, maps, and other diagrams to present and summarize information. These maps and illustrations also can be used to support public meetings and outreach regarding planning efforts. The constructed HAZUS-MH models will be turned over to the county upon project completion. Tetra tech staff will provide some baseline training to appropriate Glenn County personnel uses and applications of these models.

It is our understanding, based on the parameters identified in the RFP, that the County desires to have the risk assessment include non-natural hazards. It should be noted that DMA requirements indicate that non-natural hazards may be considered in the scope of local hazard mitigation plans, but are not required. Therefore, these type hazards are not considered to be reviewed components for plan approval. This provides Glenn County and its planning partners a lot of latitude in addressing the risk associated with these types of hazards. It would be our recommendation to structure the risk assessment such that the required components (natural hazards) are assessed separately from the non-required components (non-natural hazards). We typically include non-natural hazards as "other hazards of concern" in our risk assessments where they are profiled and assessed differently than the natural hazards. For an example of this approach, please refer to Part II of Volume 1 of the Humboldt Operational Area Hazard Mitigation Plan that has been provided with this proposal (under separate cover on disk).

The measurable objectives of this phase are as follows:

- Identify the hazards of concern for the planning area (both natural and non-natural)
- Map and identify extent and location of hazards
- Perform vulnerability analysis (natural hazards only)

- Format data for use in public involvement strategy
- Constructed HAZUS-MH models for the planning area

Phase 3: The Public Involvement Strategy

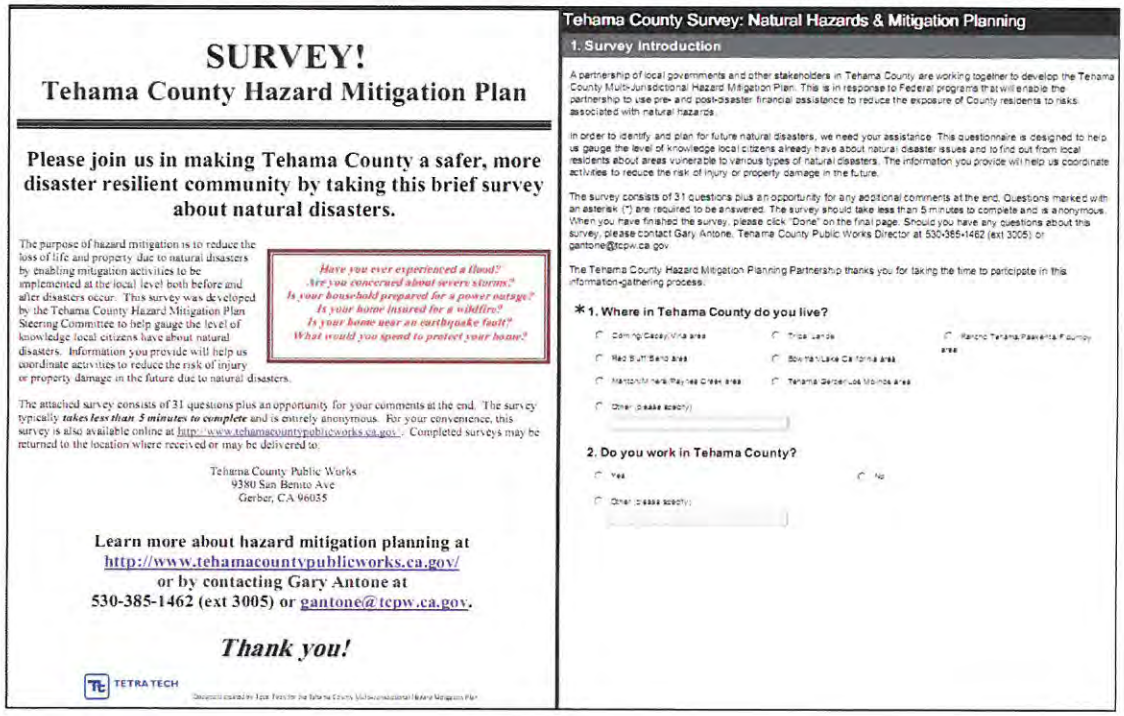
Section 201.6.b of 44 CFR states that "the planning process will include: an opportunity for the public to comment on the plan during the drafting stage and prior to adoption." It does not stipulate how this public involvement must occur. FEMA guidance documents suggest using multiple media outlets such as the Internet, brochures, fliers, questionnaires, and public meetings. Any or all of these approaches qualify as "public involvement" according to the DMA.

Based on our past planning experience, Tetra Tech has found it is often difficult to get the public actively involved in pre-disaster planning because there is limited perceived risk. As such, it can be difficult to get citizens involved in the process and to attend a traditional public meeting. Obviously, this point can be skewed by the occurrence or perception of an imminent disaster. Tetra Tech has had a great deal of success by proactively taking the issues to the citizens to seek their input, rather than relying on the public to bring their issues to us. This success is attributed to proactively taking the issues to the citizens to seek input and by explaining the risks and how citizens could be directly impacted. We have accomplished this by using the methods described below:

1. Using questionnaires that ask quantifiable questions on risk and vulnerability, and by utilizing Internet-based tools such as notifications, web-postings, and on-line surveys (see **Exhibit 2**)

2. Using HAZUS-MH workstations at public meetings that provide property specific information on risk (see **Exhibit 3**).

Exhibit 2. Example of survey used in Tehama county Mitigation Plan



SURVEY!

Tehama County Hazard Mitigation Plan

Please join us in making Tehama County a safer, more disaster resilient community by taking this brief survey about natural disasters.

The purpose of hazard mitigation is to reduce the loss of life and property due to natural disasters by enabling mitigation activities to be implemented at the local level both before and after disasters occur. This survey was developed by the Tehama County Hazard Mitigation Plan Steering Committee to help gauge the level of knowledge local citizens have about natural disasters. Information you provide will help us coordinate activities to reduce the risk of injury or property damage in the future due to natural disasters.

Have you ever experienced a flood?
Are you concerned about severe storms?
Is your household prepared for a power outage?
Is your home insured for a wildfire?
Is your home near an earthquake fault?
What would you spend to protect your home?

The attached survey consists of 31 questions plus an opportunity for your comments at the end. The survey typically ***takes less than 5 minutes to complete*** and is entirely anonymous. For your convenience, this survey is also available online at http://www.tehamacountypublicworks.ca.gov/. Completed surveys may be returned to the location where received or may be delivered to:

Tehama County Public Works
9380 San Benito Ave
Gerber, CA 96035

Learn more about hazard mitigation planning at http://www.tehamacountypublicworks.ca.gov/ or by contacting Gary Antone at 530-385-1462 (ext 3005) or gantone@tcpw.ca.gov.

Thank you!

TETRA TECH

Tehama County Survey: Natural Hazards & Mitigation Planning

1. Survey Introduction

A partnership of local governments and other stakeholders in Tehama County are working together to develop the Tehama County Multi-Jurisdictional Hazard Mitigation Plan. This is in response to Federal programs that will enable the partnership to use pre- and post-disaster financial assistance to reduce the exposure of County residents to risks associated with natural hazards.

In order to identify and plan for future natural disasters, we need your assistance. This questionnaire is designed to help us gauge the level of knowledge local citizens already have about natural disaster issues and to find out from local residents about areas vulnerable to various types of natural disasters. The information you provide will help us coordinate activities to reduce the risk of injury or property damage in the future.

The survey consists of 31 questions plus an opportunity for any additional comments at the end. Questions marked with an asterisk (*) are required to be answered. The survey should take less than 5 minutes to complete and is anonymous. When you have finished the survey, please click "Done" on the final page. Should you have any questions about this survey, please contact Gary Antone, Tehama County Public Works Director at 530-385-1462 (ext 3005) or gantone@tcpw.ca.gov.

The Tehama County Hazard Mitigation Planning Partnership thanks you for taking the time to participate in this information-gathering process.

*1. Where in Tehama County do you live?

Corning/Casey/Vina area
Red Bluff/Sand Area
Tehama Gerber/Los Molinos area
Other (please specify)

2. Do you work in Tehama County?

Yes
No
Other (please specify)

Our strategy uses a truly "multi-media" approach during the early stages of the plan's development focused on getting as many quantifiable responses from the public as possible. As stated in the introduction, this strategy would be a singular effort that covers the entire planning area, thus eliminating redundancy within the planning area, and saving financial resources for other key phases of the project. This multi-media approach would utilize:

1. Hazards mitigation questionnaire tailored to the needs and issues of the planning area. This questionnaire would be disseminated to target audiences determined appropriate by the steering committee.
2. Web-based sources to solicit input on draft elements of the plan such as the risk assessment, jurisdictional annexes, mitigation catalog, and the draft plan.
3. Articles that describe the plan, purposes for planning, and issues within the planning area prepared and disseminated via "press-releases to media outlets within the planning area.

Exhibit 3. Planning Lead Kristen Gelino answers a question from a property owner at a public meeting using HAZUS workstation.

Public Meetings – At a minimum, Tetra Tech anticipates that four public meetings will be held during this process. Two of the meetings will be conducted during the drafting stages of the plan to inform the public of the plan development process and to gauge the public's perception of risk-based information presented and developed under **Phase 2**. Additionally, a final round of public meetings will need to be held to present the draft plan to the public and allow them to comment. The format and number of these meetings and locations will be determined by the steering committee. These meetings should provide an interactive opportunity for the citizens to see and review key elements of the plan via use of HAZUS-MH workstations. Each attendee will be asked to provide comments on the plan to see if the plan meets the following criteria:

1. Is the plan user friendly?
2. Does the plan identify actions that can be supported by the constituency?
3. Does the plan meet the vision established by the planning partnership?
4. Are there any recommendations for changes and alterations?

These meetings will be advertised via media press release and the Internet.

The measurable objectives of this phase are as follows:

- Public Response (possibly in the form of replies to a questionnaire)
- Website Postings and Outreach
- Press Releases
- Public Meetings (minimum of 4)

Phase 4: Identify Goals, Objectives, and Actions

After the hazard identification and risk assessment documentation have been reviewed, Tetra Tech will work with the Steering Committee to identify linear goals and objectives for the planning area. Once these goals and objectives have been confirmed, a range of mitigation alternatives and actions on a hazard-by-hazard basis will be created. Actions that provide multi-objective risk reduction will be encouraged. Information obtained during the risk assessment and from the public involvement strategy will be used to create a mitigation catalog. The basis for this catalog will be a facilitated session(s) with the Partnership identifying strengths, weaknesses, obstacles, and opportunities within the planning area. This catalog can then be used by each planning partner to guide their decision-making with regard to mitigation initiatives and will represent the alternatives considered in the final plan. The mitigation actions will reduce the effects of hazards on both new development and existing inventory and infrastructure. As part of the mitigation alternative development step, Tetra Tech will develop a process for prioritizing, implementing, and administering action items based in part on a review of project benefits versus project costs as required by the law and for quantifying priority.

The measurable objectives of this phase are to develop the following:

- Goals and objectives
- Strengths, Weaknesses, Opportunities and Opportunities, (SWOO) analysis session
- Mitigation catalog
- Prioritization schedule

Phase 5: Develop Plan for Monitoring, Evaluating, and Updating the Plan

To ensure compliance with DMA requirements, Tetra Tech will develop and include a strategy for long-term mitigation plan maintenance describing the following:

- The method and schedule of monitoring, evaluating, and updating the mitigation plan on a 5-year cycle.
- A protocol for the development of a progress report to be completed annually reporting on the plan's accomplishments.
- The process for incorporating the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, zoning changes, or master plan development when appropriate.
- A description of how the community will continue public participation in the mitigation plan maintenance process.
- The inclusion of "Linkage procedures" that address potential changes in the planning partnership.

Phase 6: Assemble the Plan

Using the information gathered in the first five phases, Tetra Tech will prepare the mitigation plan. Tetra Tech will be listed as the author of the mitigation plan and the document will contain the following information:

- Brief introduction, including context for and description of the need for the mitigation plan. This will include a description of the planning process followed in the development of the mitigation plan and document all public involvement.
- Description of the community's mission, goals, programs, and policies, and an analysis of its capabilities to carry them out.
- Brief description of the history, physical setting, land use patterns, and development trends of the area to be covered by the mitigation plan.
- List and assessment of the hazards and risks to which each of the participating partners is vulnerable.
- Summary of current federal, state, and local programs and policies that address the identified risks. A prioritized list of recommended strategies, programs, policies, and actions to address identified hazards and risks. The review of mitigation activity alternatives will be conducted for each hazard. Additionally, Tetra Tech will identify those persons responsible for implementing recommendations, approximate cost of and potential funding sources for implementing recommendations, cost effectiveness of recommendations, and suggested timeline for implementing recommendations.
- Strategy for evaluating, adopting, and implementing the mitigation plan. The draft Action Plan will identify agencies and departments responsible for implementation, targeted time frame for implementation and possible funding mechanisms. Tetra Tech will include documentation that the participating partners have met the requirements of the DMA, as described in the Federal Register (Volume 67, Numbers 38 and 190, dated February 26, 2002 and October 1, 2002, respectively).
- Other descriptions, documentation, and mitigation plan elements as required, meeting state, and FEMA approval.
- Summary of how the community will monitor progress of the mitigation plan and activities and an established timeline for future updates, including an Annual Progress Report.
- Each of these elements will be applicable to each participating planning partner. Once again, this will be achieved by using templates that will generate annexes for each partner that will rank risk, quantify vulnerability by hazard, identify, and prioritize mitigation initiatives specific to each jurisdiction. Partners will be familiarized with how to complete their template via a "Template Workshop."

Because it will be a "multi-jurisdictional" plan, the final plan document will be laid out such that the plan will be segregated into two volumes. Volume 1 would contain all information that applies to the whole planning area (county) such as description of the planning process, risk assessment, goals and objectives and plan maintenance strategy. Volume 2 would contain those elements that are "jurisdiction specific" such as the jurisdictional capability assessment, risk ranking and mitigation strategy. Volume 2 would include a jurisdictional annex for each participating local government within the county. These annexes will meet DMA requirements for each jurisdiction. Volume 2 will also include the "linkage" procedures discussed under **Phase 1**. Examples of how this approach works can be viewed on the websites for Humboldt County, CA and Tehama County, CA at:

- http://www.humboldtgov.org/506/Local-Hazard-Mitigation
- http://www.tehamacountypublicworks.ca.gov/hazard_plan.htm

Templates will be provided to each participating planning partner to guide their completion of their jurisdictional annex. This jurisdictional annex process will represent the "participation requirement specified under FEMA regulations. All planning partners seeking compliance from a multi-jurisdictional plan must participate in the plan development process. This prescribed process will meet this requirement.

One of the primary benefits of developing a MJHMP is to enable each participating jurisdiction to become grant eligible. Grant eligibility starts with good projects, and Tetra Tech's expertise in this arena is unsurpassed. In the current economic situation, and with grant funds quickly dwindling, the ability to obtain grant dollars has become increasingly important. Tetra Tech team members assigned to this project have developed expertise in not only the development of sound strategies, but also in the area of hazard mitigation grant applications under all five FEMA Hazard Mitigation Grant programs. Those same project team members have also been utilized by FEMA as beta testers for the benefit-cost analysis re-engineering (BCAR) model prior to its deployment in 2009. Tetra Tech professionals have completed over 1,000 analyses using FEMA's current model that has resulted in securing in excess of $25 million in grant funding for our clients. Projects in which we have successfully completed grant applications include property acquisitions, structural elevations, stormwater drainage improvements, rock revetment/bank stabilization projects, and pumping stations. These types of projects are the building blocks to a resilient community, and Tetra Tech can help Glenn County and its planning partners develop fundable, implementable projects.

Once those strategies have been developed, as an added value, **Tetra Tech will provide a training session for all participating local jurisdictions for FEMA's Benefit Cost Analysis Tool**. Jurisdictions will be invited to attend this training, bringing with them their projects, and Tetra Tech team members will work with the jurisdictions to develop a completed BCA which can then be utilized to support future grant applications. While this assistance does not include any engineered studies or other studies necessary, for those projects already being processed, this training will not only help expedite the grant application process, but will provide the jurisdictions with the knowledge of how to complete a BCA.

The measurable objectives of this phase are as follows:

- Conduct partner template workshop
- Conduct BCA Workshop
- Format and finalize partner annexes
- Assemble draft plan (Volume 1/Volume 2)

Phase 7: Plan Review and Adoption

Under **Phase 7**, a first draft of the plan will be presented to the steering committee for review and approval. Changes desired will be incorporated into a second draft plan that will be forwarded to appropriate agencies identified under **Phase 1** for their review and comment. This will include FEMA Region IX and the CalEMA. Prior to submittal to these agencies, Tetra Tech will perform an "in-house" review of the draft plan using the Local Hazard Mitigation Plan (LHMP) Determination checklist used by FEMA and CalEMA reviewers to determine the mitigation plan's compliance with the DMA requirements. Key Tetra Tech team members have been trained by FEMA to perform these reviews and that training will be utilized under this phase. Once comments have been received from solicited agencies, the final draft plan will be prepared. The public will have an opportunity to comment on the final draft via the public involvement process described under **Phase 3** at least 2 weeks prior to adoption. Any additional revisions identified by the Planning Team based on the public involvement process will be incorporated into a revised final draft plan.

Once pre-adoption approval has been granted by the review agencies, the adoption phase of the plan's development process will begin. It should be noted that FEMA and CalEMA will not grant formal approval of the plan until it has been formally adopted by all participating planning partners. Therefore, the tracking of this adoption process will be imperative to the completion of this process. Once in the adoption phase, all planning partners will be given a timeframe (estimated to be 30 to 45 days at the most) to adopt the plan. Sample resolutions will be prepared for both the municipal and special-purpose district partners. Tetra Tech will track the adoption status of all partners, and prepare the adoption documentation package to be submitted to CalEMA and FEMA Region IX for final plan approval.

Additionally under **Phase 7**, Tetra Tech will provide guidance to Glenn County and its planning partners with assistance on gaining compliance with the requirements of California Assembly Bill 2140 (AB2140). This bill provides that the state may allow for more than 75 percent of public assistance funding under the California Disaster Assistance Act only if the local agency is in a jurisdiction that has adopted a local hazard mitigation plan as part of the safety element of its general plan. The local hazard mitigation plan needs to include elements specified in the legislation. In addition, this bill requires CalEMA to give federal mitigation funding preference to cities and counties that have adopted such plans. The intent of the bill is to encourage cities and counties to create and adopt hazard mitigation plans. Tetra Tech has developed sample resolutions that include the proper linkage language for AB2140 compliance.

The measurable objectives of this phase are as follows:

- Final approval of draft plan by steering committee
- Completion of LHMP checklist
- Submittal to CalEMA
- Adoption phase
- Submission of hard copy deliverables
- AB-2140 Compliance

Added Values of the Tetra Tech Approach

While our proposed technical approach will deliver on the primary objectives for the planning effort established by Glenn County—DMA compliance for the county and its partners—Tetra Tech will provide many other tangible benefits to the partnership. With the current state of declining resources, multi-

objective planning is very important for local governments. The other tangible benefits our technical approach provides are as follows:

- The planning process followed is that prescribed under FEMA's CRS program. The CRS is a voluntary program that rewards participants for exceeding the minimum requirements of the National Flood Insurance Program (NFIP). The reward is a reduction in the cost of flood insurance within a participating jurisdiction (up to 45%). Glenn County does not currently participate in the CRS program. Unfortunately, recent uncertainty concerning the NFIP has led to legislation such as the Biggert-Waters Act, and indicates that a sharp increase in NFIP rates will likely occur, in some cases by more than tenfold. Previous Tetra Tech LHMP plans have qualified our clients for significant flood insurance premium reductions under the CRS program, making this a fantastic opportunity for the City to demonstrate and publicize efforts that directly support the community.
- Our planning process is structured such that our plans easily meet the requirements specified under AB-162 and AB-2140. We are very familiar with these state-mandated programs and have developed tools and templates that support program compliance.
- We have structured our wildfire hazard profile section of our plans to meet CalFire's Comprehensive Wildfire Preparedness Plan requirements. This enables our plans to qualify as CWPP's for participating jurisdictions putting these two important planning documents on the same plan update cycle.
- We facilitate a process that tries to establish hazard mitigation at a programmatic level. Our plans to designed for practical use; therefore we focus our planning process on building capability to implement the hazard mitigation projects once the plan is complete. We spend a great deal of time on project screening, development, and training on the grant programs to enable the planning partners to pursue funding when it becomes available.
- The county-specific HAZUS-MH model constructed during this process will be handed off to the Glenn County planning partnership upon completion. HAZUS-MH is a tool with the unique capability to support all phases of emergency management.

Work Program Schedule

Tetra Tech has developed this proposal to describe the high-level phases and task activities that will evolve over the course of the project.

Upon award, Tetra Tech will work closely with Glenn County and its planning committee to establish a firm project schedule (dependent on month of award and level of effort already completed by county) that emphasizes efficiency and expediency while ensuring the goals and objectives of this planning process are fully met. Based on our experience with similar plan update projects, we expect a typical schedule of 9 to 12 months, depending on the number of planning partners involved. This timeframe is based on both our experience in writing plans with an anticipated 5 to 15 planning partners, and as reviewers/approvers of plans that have attempted to expedite the process, missing critical steps that then do not meet FEMA approval.

The timeline submitted below as **Exhibit 4**, which also includes deliverables and level of participation, has been developed based on the time line requirements specified in the RFP. We would like to note that this is

a very ambitious schedule, which is doable as long as each planning partner is diligent in meeting its participation requirements. This is a key plan review component stressed by both the California Office of Emergency Services (CalOES) and FEMA region IX. Since this will be the initial planning effort for Glenn County and its partnership, it will be very important for plan success that all partners have a thorough understanding of their expectations. It is our experience that plans that are facilitated without this understanding, do not succeed in their implementation. The Tetra Tech planning team is prepared to meet whatever best meets the needs and interests of the planning partnership.

Exhibit 4. Scheduled Timeline and Deliverables

Phase	Tetra Tech Team Members Involved with Task	Deliverables	Input & Review by Planning Partners and/or Steering Committee	Timeline
1	Rob Flaner Kristen Gelino Laura Johnston	▪ Project kick-off meeting ▪ Solidify planning partnership ▪ Formation of steering committee (SC) ▪ Agency coordination ▪ SC meeting facilitation ▪ Review of existing documents ▪ Critical facilities data gathering project discussed.	Attendance by all members at project kickoff meeting.	▪ Consultant under contract by September 2014 ▪ Kick-off to be completed within 1st month of project inception. ▪ SC to be formed in October 2014 ▪ SC to meet monthly on as-needed basis until plan's completion. These meetings will include information for all 7 phases of the plan's development.
2	Rob Flaner Carol Bauman Allison Miskiman Zach Baccala Kristen Gelino	▪ Critical facilities update ▪ Identification of the hazards of concern for the planning area ▪ Map and identify extent and location of hazards ▪ Construct HAZUS-MH model for earthquake, flood and dam failure ▪ Perform vulnerability analysis ▪ Format data for use in public Involvement strategy	▪ Critical facilities data input from all planning partners for CDMS update. ▪ Risk assessment results and any other relevant data as determined by SC members presented.	This will be an on-going effort beginning at the very onset of the project. Timeline for anticipated completion is somewhat dependent upon the integration of the GIS data from the County and the Assessor's data, as well as input from the local jurisdictions. The anticipated latest completion for this part of the project is January 2015.

Phase	Tetra Tech Team Members Involved with Task	Deliverables	Input & Review by Planning Partners and/or Steering Committee	Timeline
3	Rob Flaner Kristen Gelino	▪ Questionnaires ▪ Website ▪ Press releases ▪ Public open houses	▪ Access to web template ▪ Participation in public meetings ▪ Meeting space/AV	▪ Continuously through all phases ▪ Questionnaire deployed by November 2014 ▪ Initial Public Outreach efforts at dates and times determined by SC and Contractor Target January 2015. ▪ 2 final public meetings on draft plan anticipated by May 2015
4	Rob Flaner Laura Johnston Kristen Gelino	▪ Goals and objectives ▪ SWOO analysis session ▪ Mitigation catalog ▪ Prioritization schedule	SC inputs on alternatives	November 2014
5	Rob Flaner Kristen Gelino	▪ Progress report procedures ▪ Update procedures ▪ Continuing public involvement ▪ "Linkage" procedures	All partners to review and approve procedures	February 2015
6	Rob Flaner Kristen Gelino Laura Johnston Dan Portman	▪ Partner template workshop ▪ BCA training ▪ Format and finalize partner annexes ▪ Assemble draft plan (on-going process throughout planning process) ▪ (Volume 1/Volume 2)	▪ Mandatory participation in template workshop by all planning partners. ▪ Review of draft sections as they become available.	March-April 2015
7	Rob Flaner Kristen Gelino	▪ Final approval of draft plan by SC ▪ Completion of LHMP checklist ▪ Submittal to CALOES ▪ Adoption phase ▪ Hard Copy deliverables	▪ All planning partners to adopt plan upon pre-adoption approval by FEMA.	▪ Plan submittal to CalOES by the end of May 2015 ▪ Plan adoption window dependent upon pre-adoption approval by CalOES and FEMA Region IX.

Planning Partner Roles

Tetra Tech's proposed technical approach has been proven effective for planning efforts similar to Glenn County's. With a deep resume of experience to build upon, our planning team is able to clearly define the roles for all parties involved in this process. For this section of the proposal, planning partners will be defined as:

- The Consultant
- Glenn County
- Regional Planning Partners

The roles played by each of these components are described as follows:

The Consultant

The Consultant will be the lead facilitator of the planning process (**Phases 1** through **7**) to assure that the end result is a FEMA and CalOES approved plan for the county and its planning partners. The Consultant will facilitate all steering committee meetings and will produce meeting agendas as well as record meeting minutes. Consultant will provide all tools and templates utilized under all 7 phases. Consultant will provide technical support to Glenn County for Phase 3 (Public Involvement Strategy). This technical support will include:

- Production of maps, PowerPoint presentations, and meeting documentation materials
- Example surveys, press releases, and literature
- Access to web-based tools such as Microsoft SharePoint and Survey Monkey
- Subject-matter expertise on hazards and risk assessments

Consultant will facilitate the selection of goals and objectives, and will review alternatives and actions. The Consultant will author the plan and submit the plan for review. Consultant will support the county and all planning partners with the adoption of the plan and submission of all documentation for final approval of the plan. Additionally, Consultant will support Glenn County in management of the grant funding by preparing quarterly progress reports required by CalEMA and tracking the "in-kind" contributions to be applied to the local match for the grant.

Glenn County

As the grant application agent, Glenn County will serve as the primary point of contact for CalEMA, FEMA Region IX, the Consultant, and the Planning Partners during this process and will be responsible for the management of the grant. The County will designate a lead project planner at the project inception. The lead project planner will participate in all 7 phases of the proposed scope of work and will participate in bi-weekly planning conference calls with the consultant. Glenn County will provide meeting venues for the steering committee and public meetings and will provide any and all audio/visual equipment needed to support these meetings. As a planning partner, Glenn County will commit to meeting the planning partner expectations discussed in the scope of work of this proposal.

Regional Planning Partners

First and foremost, each planning partner must commit to the process and agree to meet the planning partner expectations that will be provided to each prospective partner at the project's inception. A key component of the expectations document is a clear definition of "participation." Each planning partner will be asked to formally commit to the process by submitting a "letter of intent to participate" at the inception of the project. It is estimated that the total time commitment to meet these participation requirements for a planning partner not participating on the steering committee would be approximately 40 hours over a 6 to 8-month period. Approximately 60 percent of this time would be allocated to attending the mandatory jurisdictional annex workshop and completing the jurisdictional annex template. The Consultant will request that all planning partners make an attempt to participate in all 7 phases of the planning process to the best of their abilities. At a minimum, partners will be required to support the steering committee, complete their annex, and adopt the plan at its completion.

C. Project Team

Tetra Tech's team is comprised of key leaders and support personnel with the credentials needed to provide the technical support being sought by Glenn County. All team members are employees of Tetra Tech; we will not be using any subcontractors on this project. Our team experience working within the State of California will provide continuity and leadership assuring a smooth and efficient planning process and crosswalk review. Our experience working directly with FEMA Region IX at a programmatic level ensures familiarity with the technical and regulatory requirements to shepherd a planning effort. Our experience completing 8 multi- and single-jurisdiction plans in California provide us with a great deal of subject-matter expertise, and the fact that all of these plans were approved by FEMA on a "first-pass" review reflects our understanding of the DMA planning requirements. In addition, the proposed project manager for this assignment was the lead project planner for all of these California planning efforts, which gives us a head start on the management plan for this project. Tetra Tech's Disaster Management and Homeland Security Services – State and Local Programs Director, Mr. Andy Mazzeo, will ensure that all corporate resources are committed to the project team for the successful completion of the project. The backgrounds of key personnel identified to perform the proposed scope of work are summarized below and illustrated in the organizational chart in the qualifications section of this proposal (**Exhibit 5**). All of the personnel referenced below are available for this project and can be utilized at the percent indicated as needed. **Exhibit 6** shows the roles and responsibilities of our team members and **Exhibit 7** lists our Subject-Matter Expertise.

Exhibit 5. Organizational Chart

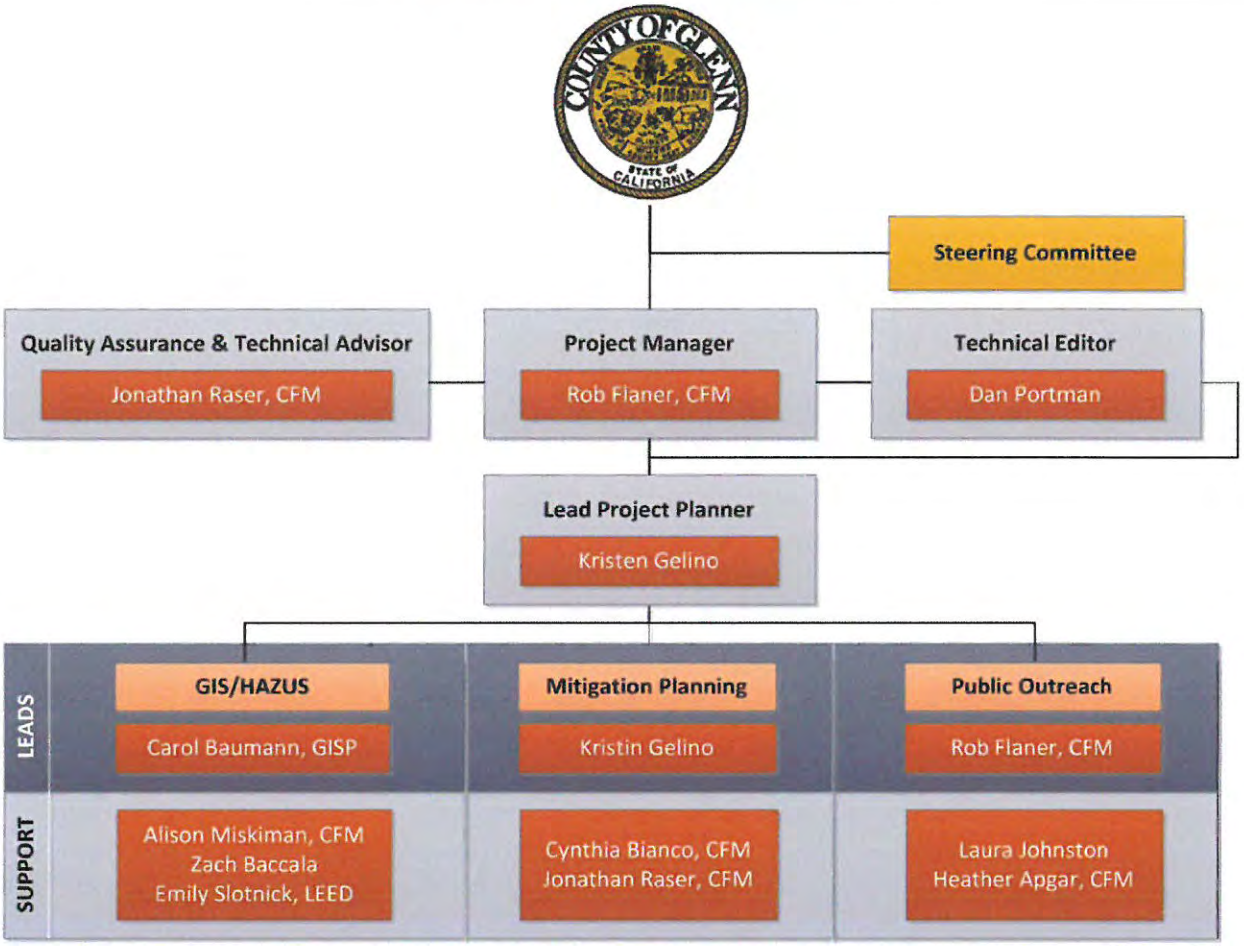


Exhibit 6. Proposed Team Roles and Responsibilities

Labor Classification/Staff	Role and Responsibility	Time Dedicated to Project
EMI Principal-In-Charge: ▪ Andy Mazzeo	▪ Responsible for maintaining communication with Glenn County and the assigned team members ▪ Responsible for coordination of quality assurance reviews for project deliverables	5%
Project Manager and : ▪ Rob Flaner, CFM	▪ Responsible for management and oversight of Glenn County's Hazard Mitigation Planning process ▪ Responsible for communication and coordination with the County and planning partners through the project period of performance ▪ Responsible for maintaining the Mitigation Plan Update project plan, schedule, and budget ▪ Responsible for development of plan elements ▪ Responsible for completion of FEMA crosswalk ▪ BCA training	50%
Lead Project Planner Kristen Gelino	▪ Responsible for facilitation of all phases of the scope of work. ▪ Coordination of Discipline leads ▪ Progress reporting to project manager	80%
Quality Assurance/Technical Advisor: ▪ Jonathon Raser	▪ Available SME on hazard mitigation planning. Will act as technical advisor to planning team.	10%
Quality Assurance/Lead Technical Editor: ▪ Dan Portman	▪ Responsible for initial template design ▪ Responsible for conducting final QC check on completed product and final formatting as appropriate	15%
GIS/HAZUS Modelers and Natural Hazard Risk Analysts: ▪ Carol Bauman ▪ Alison Miskiman ▪ Zach Baccala ▪ Bill Bohn	▪ Responsible for coordination with County GIS and Assessor personnel to integrate critical infrastructure/key resource (CI/KR) assets and critical facility information into CDMS format for use in HAZUS loss data ▪ Responsible for modeling the hazards of concern ▪ Responsible for presenting risk information in formats that can be used by analysts preparing the risk analysis ▪ Responsible for ensuring that the BCA modules with HAZUS runs as appropriate	80%
Hazard Mitigation Planners: ▪ Laura Johnston ▪ Cynthia Bianco ▪ Caitlin Kelly	▪ Responsible for supporting the hazard identification process and developing the hazard profiles for the natural/technological hazards ▪ Responsible for support of and facilitation of stakeholder outreach throughout the Hazard Mitigation Plan Update process ▪ Support alternatives analysis and project development	50%

Exhibit 7. Subject Matter Expertise

Planning Team Member	Local Hazard Mitigation Planning	Special Purpose District Experience	State Hazard Mitigation Planning	DMA Compliance	Risk Assessment/HAZUS	GIS/Cartography	FEMA-Accredited Plan Reviewer	FEMA Hazard Mitigation Grant Programs	Benefit-Costs Analysis	Public Facilitation	Public Outreach	FEMA Regulations/Requirements	Other FEMA programs (IA, PA, CRS, NFIP)	Other Grant programs that can support mitigation	Experience in Emergency Management	Training on FEMA Programs
Key Personnel																
Rob Flaner, CFM	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Kristen Gelino	✓	✓		✓		✓				✓	✓					
Carol Bauman, GISP	✓	✓			✓	✓					✓					✓
Allison Miskiman, CFM	✓	✓	✓	✓	✓	✓			✓	✓	✓		✓	✓	✓	✓
Laura Johnston	✓	✓	✓	✓	✓		✓	✓		✓	✓		✓	✓		
Dan Portman	✓	✓	✓									✓				
Andy Mazzeo, CHMM	✓		✓		✓					✓	✓	✓		✓	✓	✓
Additional Personnel Available as Needed																
Jonathon Raser, CFM	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
Cynthia Bianco, CFM	✓	✓		✓	✓			✓		✓	✓	✓	✓	✓	✓	✓
Kaitlin Kelly	✓	✓		✓	✓			✓		✓	✓	✓	✓	✓	✓	✓
Heather Apgar	✓	✓	✓	✓	✓		✓	✓		✓	✓		✓	✓		
Emily Slotnick	✓	✓	✓	✓	✓		✓	✓		✓	✓		✓	✓		
Zach Baccala					✓	✓			✓	✓	✓		✓	✓	✓	✓
Bill Bohn, CFM					✓	✓			✓	✓	✓		✓	✓	✓	✓

Key Personnel

Andy Mazzeo, Principal-in-Charge, has a total of 17 years of professional experience, 15 of which are with Tetra Tech. As program manager, he has directed contracts with state and local governments, as well as private industry partners. Mr. Mazzeo has successfully managed project teams consisting of more than 20 people, and contracts with as many as 50 concurrent projects and values of more than $2 million per year. Mr. Mazzeo is program manager for the Los Angeles Urban Area Security Initiative Strategic Planning Project and serves as program manager for Tetra Tech's involvement on the FEMA's Response Directorate's New Madrid Seismic Zone Catastrophic Planning Project. In this capacity, Mr. Mazzeo is responsible for managing a $1.1 million task order to provide staffing support in the offices of FEMA Regions IV and Region VII and in six state emergency management agency offices. Mr. Mazzeo also serves as the program manager for a task order under the New York Regional

Catastrophic Planning Program. Under this task order, he is responsible for overseeing the development of an all-hazards catastrophic incident playbook for local, county, and state executives.

Project Manager

Rob Flaner, CFM, is the Project Manager for Tetra Tech, and will be responsible for planning and executing all tasks through to the project's completion. Mr. Flaner will manage the multidisciplinary project team and will serve as the Public Outreach Lead for this project to ensure plan compliance with FEMA requirements. Mr. Flaner has over 25 years experience in floodplain management as well as hazard mitigation through FEMA programs. He developed a comprehensive background in all aspects of floodplain management administering the Community Rating System (CRS) under contract with FEMA. Mr. Flaner was responsible for implementing the CRS program in nine western states covering three FEMA Regional offices, including FEMA Region IX. He was able to take this vast experience and apply this knowledge to planning for the impacts of natural hazards in response to federal mandates under the DMA. Mr. Flaner is very familiar with the federal requirements of the DMA, and has been trained and certified by FEMA as a Disaster Assistance Employee (DAE) to review hazard mitigations plans for DMA compliance. He has an extensive resume of hazard mitigation projects that he has managed that include over 30 planning efforts providing DMA compliance to over 500 local governments. He has also developed expertise in the development of hazard mitigation grant applications under the five FEMA Hazard Mitigation Grant programs. Mr. Flaner has been utilized by FEMA as a beta tester for the benefit-cost analysis re-engineering (BCAR) model prior to its deployment in 2009. He has personally completed over 30 hazard mitigation grant applications as well as over 500 benefit-cost analyses that have resulted in Tetra Tech clients receiving in excess of $10 million in grant funding. As the proposed project manager for this project, Mr. Flaner will be responsible for and involved in the completion of 100 percent of the scope of work and his duties will include:

- Lead project planner
- Negotiating the scope of work and contract
- Formulating the work plan
- Facilitating work process
- Assigning tasks
- Monitoring timeline and deliverables
- Completing progress reports
- Providing BCA training
- Coordinating with County designated staff
- Drafting the plan
- Ensuring QA/QC compliance of final plan
- Performing crosswalk of draft plan prior to submittal to CalEMA and FEMA

Supporting Professional Staff

Lead Project Planner, Kristen Gelino will support all phases of the proposed scope of work for this project and will lead the planning process to ensure plan compliance with FEMA requirements. Having recently completed coursework at the University of Washington in the Master of Urban Planning Program and Institute for Hazard Mitigation and Planning, Ms. Gelino brings a fresh perspective to our planning team. She has a familiarity and interest in planning and environmental law and experience with a diverse array of team-oriented and independent projects. Ms. Gelino has played integral roles in recent Tetra Tech planning efforts for King and Spokane Counties in Washington, and Cook County in Illinois. Ms. Gelino will support the project manager in facilitation of the planning process.

Risk Assessment/GIS/HAZUS Team Leader, Carol Bauman, GISP, is our team's senior geographic information systems (GIS) Analyst and will be the lead for the Risk Assessment, including compiling relevant GIS layers and profiling hazards in HAZUS-MH. Ms. Bauman is an advanced user of HAZUS for risk assessments, estimating losses for earthquake and flood events and is certified as a GIS Professional (GISP) by ESRI. She has been involved in multiple aspects of GIS projects including technical project management, data acquisition and integration, data conversion, database design, metadata documentation, application development, software customization, and map design and production. Ms. Bauman will regularly interact with County GIS (as well as other) staff.

Mr. Dan Portman, Lead Technical Editor, has more than 15 years of experience as a technical editor and illustrator at Tetra Tech. His strong report editing and production skills for hazard mitigation plans pursuant to the DMA have been used to refine and develop over 12 plans over the past 5 years. Mr. Portman's role on this project will be to technically edit and format the plan document, as well as implement QA/QC protocol on all deliverables generated under Phase 6 of the proposed scope of work.

Resumes of key personnel proposed for this project can be found in **Appendix A** of this proposal.

D. Qualifications

Company Profile

Tetra Tech, Inc. (Tetra Tech) is a leading provider of specialized management consulting and technical services in three principal business areas: resource management, infrastructure, and communications. Clients include a diverse base of public and private-sector organizations located throughout the United States and internationally. The company was founded in 1966 and became a publicly traded company (NASDAQ-TTEK) in 1991 Tetra Tech, Inc., is incorporated in the State of Delaware and its Federal Employer Identification Number (FEIN) is 62-1080561. Tetra Tech EM Inc. (Tetra Tech) is a wholly owned subsidiary of Tetra Tech, Inc., a family of more than 45 companies working in areas including resource management and infrastructure development. Tetra Tech has 33 offices in California. The proposed scope of work for this project will be managed from Tetra Tech's office located in Rancho Cordova, California. Contact information is provided below:

Project Management Office
2969 Prospect Park Drive, Suite 100 | Rancho Cordova, CA 95670
Point of Contact: Rob Flaner | **Tel:** 208-939-4391 | **Email:** Rob.Flaner@tetratech.com

Tetra Tech prides itself on its responsiveness to client needs. Our management approach is simple: We work as partners with our customers to provide creative, cost-effective, and sound solutions to problems. Our offices work cooperatively to ensure that our clients receive the best expertise to tackle their problems. Our project managers are the decision-makers for their own projects and can tailor the company's services to meet the unique needs of each client. Our commitment to client service is demonstrated by our track record: more than two thirds of Tetra Tech's work is repeat business for clients we have worked with for 10 years or more. We take pride in our clients' successes and our contribution to those successes.

Since its founding, Tetra Tech has substantially increased the size and scope of its business. Today, Tetra Tech boasts annual revenues of nearly $2.7 billion and employs 14,000 personnel in 330 offices worldwide.

The 2014 Engineering News-Record magazine's ranking of the Top 500 engineering firms in the country placed Tetra Tech as the 8th largest provider of engineering and technical services (July 2014). Tetra Tech is one of the leading firms in the nation in the field of disaster management and homeland security, with millions of dollars in revenue coming from contracts in such diverse areas as infrastructure hardening and protection; emergency response; emergency management, planning, and preparedness; exercise design and training delivery; and grant management.

Project Experience

As a firm with nearly 50 years of natural resource planning and environmental experience, Tetra Tech offers the local knowledge and high quality services required for this project. Tetra Tech has been on the cutting edge of risk analysis, capability assessment, and hazard mitigation planning (HMP) efforts pursuant to the Disaster Mitigation Act of 2000 (Public Law 106-109) since its inception. Tetra Tech is recognized nationally for its subject matter expertise in the field of HMP pursuant to the Federal legislation. Collectively, the experience our team has gained from our many engagements has allowed us to stay on the forefront of developing and delivering innovative approaches and solutions to our client's challenges in the scope of work areas. Our plans are not only well received by our clients; they are well received by the agencies that review them. This is substantiated by ***Tetra Tech's 100%, first-pass approval rate of our plans***.

Tetra Tech has completed single- and multi-jurisdictional HMP projects for a broad range of clients and environments, from highly urbanized to predominantly rural, from coastal plains to mountainous watersheds, from cities with vast staffs and resources to villages having few, shared resources. We have prepared or updated local hazard mitigation plans (LHMP) covering more than 1,000 participating jurisdictions nationwide. Many of these projects have direct relevance to this Glenn County scope of work. They are relevant to this effort because they involve developing mitigation strategies via a facilitated process in response to a federal mandate. Further, they illustrate working with local governments, big and small, with varying degrees of capability. Each one of these projects has refined tools and templates that work in any environment. **Exhibit 8** identifies HMP efforts performed by the proposed Tetra Tech team members that will be engaged for the Glenn County project. The proposed organizational chart can be found in the previous section of this proposal and resumes for each individual assigned to this project can be found in **Appendix A**.

Exhibit 8. Relevant Recent TEAM Hazard Mitigation Planning Experience

FEMA Region	State	Jurisdiction(s)
II	New Jersey	Counties of Hudson, Somerset, Cape May Township of Little Falls (Passaic County)
	New York	Counties of Broome, Chenango, Cortland, Delaware, Fulton, Greene, Montgomery, Onondaga, Saratoga, Suffolk, Tioga, Tompkins Cities of New Rochelle and Port Jervis Towns of Cortlandt, Clay, East Fishkill, (Unincorporated) Greenburgh, New Castle Villages of Ardsley, Briarcliff Manor, Dobbs Ferry, Elmsford, Hastings-on-Hudson, Irvington, Tarrytown, Scarsdale
	Puerto Rico	Rincón, Utuado
III	Pennsylvania	Counties of Lehigh and Northampton
V	Illinois	Cook County
VI	Oklahoma	Oklahoma County
VIII	Colorado	Adams, Lake, Park, Teller, Fremont and El Paso Counties. Recently selected by Montezuma County.
	Montana	Montana State Montana University System HMPs (8 campus plans) Counties of Blaine, Butte-Silver Bow, Daniels, Golden Valley, Hill, Judith Basin, Musselshell, Philips, Roosevelt, Sheridan, Valley, Wheatland Fort Belknap, Fort Peck, Rocky Boy, and Blackfeet Reservations (Tribal Plans)
IX	California	Counties of Contra Costa, Del Norte, Humboldt, Tehama, and Siskiyou City of Roseville Tribal Plan for Yurok Tribe (State-Level Standard Plan)
X	Alaska	City of Quinhagak
	Idaho	Counties of Ada, Bonner, and Gem
	Oregon	City of Portland
	Washington	Counties of Grant, King, Kittitas, Pierce, Snohomish, Spokane, and Whitman Cities of Covington, Goldbar, North Bend, Sultan, and Snoqualmie Tribal Plans for Hoh Tribe and Makah Nation

Tetra Tech offers complete hazard mitigation planning support services to our clients. Not only do we specialize in developing mitigation plans and updates compliant with the Disaster Mitigation Act (DMA) of 2000, but we also provide additional services directly associated with hazard mitigation. For example, Tetra Tech has completed benefit-cost analyses (BCA) and provided FEMA Hazard Mitigation Assistance (HMA) grant support for municipalities throughout the country wishing to secure funding to implement mitigation actions identified within their LHMPs. Tetra Tech also provides technical guidance and assistance to communities entering or seeking to achieve higher ratings within the NFIP CRS program. For more than 8 years, we have served as a mission support contractor for FEMA's advancement of HAZUS the preferred software solution used

to conduct risk assessments as part of HMP projects.

Project Profiles

Project Title:	**The Humboldt County Operational Area Hazard Mitigation Plan**
Technical Representative:	Cybelle Immitt (707) 268-3736 (direct) E-mail address: cimmitt@co.humboldt.ca.us

Project Description: As a sub-consultant to Humboldt County's contractor, Tetra Tech's services were retained to facilitate the development of the Multi-jurisdictional, Natural Hazards Mitigation Plan for Humboldt County, CA and 21 planning partners, including the cities of Eureka (population 42,233), Arcata (population 16,651) and Fortuna (population 11,250). This was the initial hazard mitigation plan for the Humboldt County operational area. This plan addressed dam failure, drought, and earthquake, fishing losses, flood, landslide, severe weather, tsunami, and wildfire. A unique aspect to this plan was the involvement of the eight tribes within the county. While not actual planning partners, these tribes were vital stakeholders in the planning process. This effort also involved project development where FEMA grant eligible projects were identified, scoped, and targeted for specific FEMA hazard mitigation grants. This plan was well received by the planning partnership as well as the citizens of Humboldt County and received first pass approval by both the state and FEMA on January 12, 2008.

"I am happy to say that FEMA has reviewed our local hazard mitigation plan and will be sending out an approval letter today. I spoke to the FEMA reviewer this morning and she told me that it was one of the best plans she has had "the pleasure of reviewing". They are not asking for any changes to the plan and they made a special phone call to congratulate us for a job well done. So, I am passing the kudos on to the entire team"

Note- Tetra Tech was awarded the contract to perform the 5-year update to this plan in October 2012.

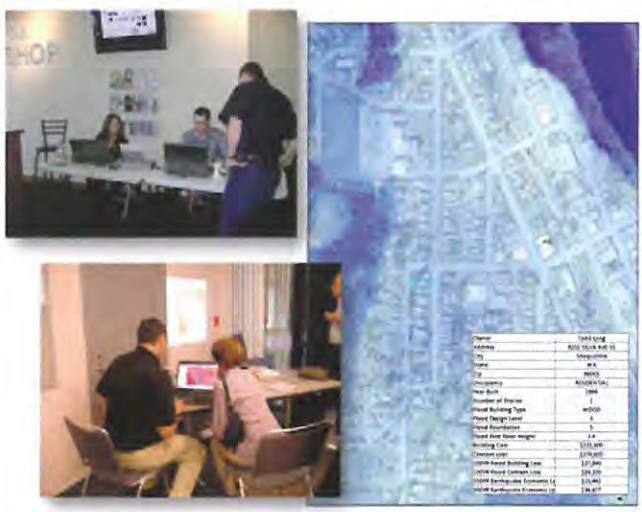
Project Web Link:	http://co.humboldt.ca.us/planning/HazardMitigation/default.asp
Period of Performance: March 2014	Initial Plan, June 2006 to December 2007, Plan Update November 2012 to
Project Status:	Initial Plan approved by FEMA Region IX January 12, 2008, Plan update approved March 20, 2014

Project Title: **Contra Costa County Hazard Mitigation Plan-Update**

Organization Name/Address: Contra Costa County, CA
Department of Public Works
255 Glacier Dr.
Martinez, CA 94553-4825

Technical Representative: Marcel Indelactao, Contra Costa County Office of Emergency services
(925) 646-4461
minde@so.cccounty.us

Project Description: Tetra Tech facilitated a comprehensive update to the hazard mitigation plan of record for Contra Costa County, California, and 38 local governments within the county. The county and numerous local governments within the county were covered under a regional plan created by the Association of Bay Area Governments (ABAG). Recognizing the numerous shortcomings of a large regional planning effort, Contra Costa County sought to create a countywide plan through the update process that would better suit the needs and capabilities of the county and its planning partners.



Tetra Tech was selected to facilitate this process because of our extensive experience with complex multi-jurisdictional planning efforts. Of upmost importance was the need to address a gap in the ABAG plan, which was inclusive of special-purpose districts within the planning area. This planning effort includes over 30 special-purpose district planning partners that are the owners, operators, or proprietors of identified critical facilities within the planning area.

This plan update process has totally repackaged the hazard mitigation plan for the county and has been built upon a comprehensive risk assessment of seven identified hazards of concern using the best available data and technology.

Project Web Link: http://www.co.contra-costa.ca.us/index.aspx?NID=2302

Period of Performance: December 2008 to December 2010

Project Status: Plan approved by FEMA region IX on February 27, 2012

Project Title:	**The Tehama County Hazard Mitigation Plan**
Technical Representative:	Gary Antone, Tehama County Department of Public Works (530) 385-1462 (ext. 3005) gantone@tcpw.ca.gov

Project Description: Tetra Tech was selected by Tehama County department of Public Works to prepare the initial hazard mitigation plan for Tehama County and six local government planning partners. The plan assessed eight natural hazards of concern (avalanche, dam failure, drought, earthquake, flood, landslide, severe weather, and wildfire) using HAZUS-MH as the primary risk assessment tool. This plan also includes integration of the County's Comprehensive Wildfire preparedness Plan (CWPP) following the approach and methodology used in the Siskiyou County plan. This planning process also included integration of the County General plan pursuant to CA Assembly Bill 2140. This planning process resulted in the identification and prioritization of 75 mitigation actions to be targeted for implementation by individual planning partners. This plan was approved by FEMA Region IX on September 18, 2012.

Project Web Link:	http://www.tehamacountypublicworks.ca.gov/hazard_plan.htm
Period of Performance:	December 2010 to May 2012
Project Status:	Initial Plan approved by FEMA Region IX January 12, 2008, Plan update approved March 20, 2014

E. Works Samples

Included in this proposal package is a CD that includes the approved and adopted Humboldt Operational Area Hazard Mitigation Plan. The work for this plan began in November 2012 and was completed in March 2014.

APPENDIX A

Resumes

TETRA TECH

Robert Flaner, CFM

Project Manager

EDUCATION

B.S., Biological Sciences, University of California at Davis, 1984

AREAS OF EXPERTISE

Hazard Mitigation Planning

Floodplain Management

Community Rating System

FEMA Benefit/Costs Analysis

REGISTRATIONS/ AFFILIATIONS

Certified Floodplain Manager, 2000

ASFPM US-00-00143

EXPERIENCE SUMMARY

Rob Flaner developed a comprehensive background in all aspects of floodplain management while administering the Community Rating System (CRS) under contract with the Federal Emergency Management Agency (FEMA). The CRS is a FEMA program that provides incentive to communities to exceed the minimum requirements of the National Flood Insurance Program. The CRS program recognizes a comprehensive range of non-structural flood hazard mitigation activities that include: public information, mapping and regulations, flood damage reduction, planning and flood warning. Rob was responsible for coordinating all CRS objectives between State, Local, and Federal entities in a 9-state territory that spanned three FEMA Regions. During his tenure with the CRS program, Rob was able to develop strong working relationships with his Federal, State, and Local partners. The CRS since its inception has developed into a template for sustainable floodplain management that can be used at the local level to support multiple facets of community programs. Rob's detailed understanding of the CRS program and floodplain management helped him to develop a diverse floodplain management background that has been utilized by FEMA as a Disaster Assistance Employee.

Rob has taken this diverse experience in floodplain management and expanded it into planning and preparing for the impacts of all natural hazards through coordinated planning efforts pursuant to the Disaster Mitigation Act of 2000. Utilizing planning tools such as HAZUS-MH, FEMA's Benefit Cost Analysis Re-engineering (BCAR) and the CRS 10-step planning template, Rob has supported local governments across the country in all phases of emergency management. Rob currently serves as Tetra Tech's Hazard Mitigation program Manager for the western U.S. This position involves managing multi-disciplined projects as well as providing subject matter expertise in all phases of emergency management.

RELEVANT EXPERIENCE

Hazrd Mitigation Planning

Humboldt Operational Area Hazard Mitigation Plan-Update, Humboldt County, CA, December 2012 to January 2014

Tetra Tech was selected by Humboldt County Department of Public works to perfore the 5-year update to the Humboldt Operational Area Hazard Mitigation Plan. Tetra Tech facilitated the development of the initial plan as a sub-consultant to Winzler-Kelly, Inc. This update effort included 34 local governemt planning partners. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. The plan assessed eight natural hazards of concern (dam failure, drought, earthquake, flood, landslide, severe weather, tsunami and wildfire) using Hazus-MH as the primary risk assessment tool. This plan also includes integration of the County's Comprehensive Wildfire preparedness Plan (CWPP) following the approach and methodology used in the Siskiyou County plan. This planning process also included integration of the County General plan pursuant to CA Assembly Bill 2140. This planning process resulted in the identification and prioritization of 75 mitigation actions to be targeted for implementation by individual planning partners. This plan was approved by FEMA Region IX on March 20, 2014.

Tehama County Hazard Mitigation Plan, Tehama County, CA, July 2010 to September 2012

Tetra Tech was selected by Tehama County department of Public Works to prepare the initial hazard mitigation plan for Tehama County and six local government planning partners. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. The plan assessed eight natural hazards of concern (avalanche, dam failure, drought, earthquake, flood, landslide, severe weather, and wildfire)

using Hazus-MH as the primary risk assessment tool. This plan also includes integration of the County's Comprehensive Wildfire preparedness Plan (CWPP) following the approach and methodology used in the Siskiyou County plan. This planning process also included integration of the County General plan pursuant to CA Assembly Bill 2140. This planning process resulted in the identification and prioritization of 75 mitigation actions to be targeted for implementation by individual planning partners. This plan was approved by FEMA Region IX on September 18, 2012.

Siskiyou County Hazard Mitigation Plan, Siskiyou County, CA, July 2010 to May 2012

Tetra Tech was selected by Siskiyou County Office of Emergency Services to prepare the initial hazard mitigation plan for Siskiyou County and ten local government planning partners. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. The plan assessed eight natural hazards of concern (dam failure, drought, earthquake, flood, landslide, severe weather, volcano and wildfire) using Hazus-MH as the primary risk assessment tool. This plan also includes integration of the County's Comprehensive Wildfire preparedness Plan (CWPP) which was one of the first plans in the state to do so. This planning process also included integration of the County General plan pursuant to CA Assembly Bill 2140. This planning process resulted in the identification and prioritization of 153 mitigation actions to be targeted for implementation by individual planning partners. This plan was approved by FEMA Region IX on June 15,, 2012.

Kittitas County Hazard Mitigation Plan, Kittitas County, WA, June 2010 to July 2012

Tetra Tech was selected by Kittitas County Department of Public Works to prepare the initial hazard mitigation plan for Kittitas County and twelve local government planning partners. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. The plan assessed nine natural hazards of concern (avalanche, dam failure, drought, earthquake, flood, landslide, severe weather, volcano and wildfire) using Hazus-MH as the primary risk assessment tool. This planning process resulted in the identification and prioritization of 157 mitigation actions to be targeted for implementation by individual planning partners. This plan was approved by FEMA Region X on July 27, 2012.

Multi-Jurisdictional Hazard Mitigation Plan Update, Ada County, ID, CA, August 2008 to August 2011

Tetra Tech was selected by Ada City-County Emergency Management (ACCEM) to perform a comprehensive update to the Ada County All Hazards Mitigation Plan. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. This planning effort culminated in a total restructuring of the initial plan that involved expanding the coverage of the plan from 6 to 21 eligible local governments within the Ada County planning area. A key element in this planning effort was a comprehensive risk assessment of 8 identified hazards of concern. Hazus-MH was utilized to assess the risk to dam failure, earthquake and flood hazards. This was a level 2 analysis of over 37,000 user defined facilities. A highly accurate DEM of the planning area was prepared by Tetra Tech using available Green LIDAR provided by the County. The plan identified and prioritized over 200 risk reduction actions to be implemented by the 21 planning partners. This plan was approved by FEMA Region X on December 1, 2011.

Multi-Jurisdictional Hazard Mitigation Plan Update, Contra Costa County, CA, August 2008 to August 2011

Tetra Tech was retained to complete a comprehensive update to the Contra Costa County Hazard Mitigation Plan. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. This was a unique planning effort in that it involved converting a single jurisdictional plan to a multijurisdictional plan covering 37 local governments within the 9th largest county in the State of California. Many of these planning partners had never participated in a mitigation planning effort, while many others were covered under a large scale, regional plan. This added the challenge of making sure this planning effort met the planning requirements of 2 FEMA crosswalks. This plan followed the CRS planning script adding the additional benefit of CRS credits for the 6 CRS participating communities within the planning area. The cornerstone of this plan update was a comprehensive risk assessment of the planning area using HAZUS-MH at a level 2 including a comprehensive update of over 3000 critical facilities using the CDMS tool within Hazus. This plan was approved by FEMA region IX on February 27, 2012.

The City of Roseville, Multi-Hazard Mitigation Plan-Update, City of Roseville, California, October 2009 to March 2011

Tetra Tech was selected by the City of Roseville to perform the 5-year update to the City's Multi-Hazard Mitigation Plan. Tetra Tech was fortunate to be the firm selected to prepare the City's initial hazard mitigation plan in 2005 that paved the way for the City to become the nation's first and only CRS Class 1 community. This plan acted as the conduit for this accomplishment. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. During the plan update process, key elements of the plan were strengthened or enhanced, including: the addition and analysis of the dam failure hazard, update and enhancement of the initial Hazus model to include a level 2/user defined analysis of the dam failure hazard, and enhancement of the public outreach strategy using new technology and tools. Key to this planning effort was maintaining the City's CRS Class 1 by making sure the process met all of the CRS planning prerequisites for plan updates. Once completed, the plan update was scored as 1 of the top 5 scoring plans under CRS activity 510 in the nation. This plan was approved by FEMA on March 28, 2011 on a first pass review by both the State and FEMA.

Multi-Jurisdictional Natural Hazards Mitigation Plan, Crescent City-Del Norte County, California, 200-2010

Tetra Tech was selected by Crescent City to develop a multi-jurisdictional hazard mitigation plan covering the Del Norte County Operational Area. This multi-jurisdictional plan covered the City, Del Norte County and 5 special purpose districts with a stake in hazard mitigation within the operational area. Rob was the project manager for this project as well as the lead project planner. Rob managed the multi-disciplined team that completed the scope of work for this project. This planning effort offered many unique challenges due to the remote, rural nature of the planning area. These challenges enabled the Tetra Tech Planning team to develop specialized tools and templates specific to the issues and capabilities of small, rural planning areas. This plan identified and prioritized over 50 risk reduction measures to be implemented by the 7 planning partners. This plan was approved by FEMA on February 15, 2011 on a first pass review by both the State and FEMA.

TETRA TECH

Jonathan Raser, CFM

Qualiy Assurance & Technical Advisor

EXPERIENCE SUMMARY

Jonathan Raser, CFM has over 20 years of experience in environmental and risk assessment/hazard mitigation project management. Current work includes managing State and Local Hazard Mitigation Plan (HMP) projects regulated under the Disaster Mitigation Act of 2000 (DMA 2000), and the regional development of this business sector.

Mr. Raser and his staff supports numerous counties and jurisdictions with plan implementation from annual plan review, grant application support, continued public and stakeholder outreach, to plan updating. He has FEMA training on Benefit-Cost Analysis (BCA) for mitigation projects, and has prepared and submitted BCAs and grant applications under the Unified Hazard Mitigation Assistance programs (PDM, RFC, SRL, HMA) and state HMGP.

Mr. Raser has supported coastal community resiliency efforts under contract with NOAA's Coastal Resource Center, performing pilot projects and developing guidance for coastal communities in the evaluation of natural hazard risk and long-term sustainability.Mr. Raser chairs the Community Rating System (CRS) subcommittee of the New Jersey chapter of the Association of State Floodplain Managers (ASFPM).

RELEVANT EXPERIENCE

Hazard Mitigation Planning and Implementation

Hazard Risk Assessment and Mitigation Planning (DMA 2000) (2003 to Present). Mr. Raser currently manages local All-Hazard Mitigation Plan projects for counties and single jurisdictions in New Jersey and New York State, including Cape May, Hudson, Suffolk and Westchester counties. These plans have included working with the New Jersey Office of Emergency Management (NJOEM) and New York State Emergency Management Office (NYSEMO), and various federal, county and local agencies and organizations to identify hazards, collect relevant data, prepare loss estimates/risk assessments, and develop appropriate mitigation strategies.

Mr. Raser has formal training and extensive experience working with FEMA's Hazards U.S. – Multi-Hazard (HAZUS-MH) GIS extension for conducting hazard analysis/risk assessment, as has received formal FEMA training in its use and application. Further, Mr. Raser has performed HAZUS-MH analysis for FEMA sponsored risk assessment pilot projects in several major U.S. cities, and supports counties and municipalities in the preparation of grant applications to prepare DMA 2000 plans.

DMA 2000 Mitigation Planning – Program Management, (2003 to Present). Mr. Raser manages all aspects of the Tetra Tech EM's mitigation program, which includes completed, approved single and multi-jurisdictional local plans in New Jersey (4 counties) and New York (9 counties). Further Mr. Raser supports mitigation planning efforts nationwide, working with Tetra Tech divisions throughout the county to expand this business area and develop local and regional planning capabilities. Having exposure to projects and planners working in other FEMA regions, Mr. Raser has been able to develop consistent planning approaches, tools and deliverables that have met the needs and approval of a wide range of clients and FEMA plan reviewers.

EDUCATION

B.S. Chemical Engineering, Syracuse University, 1983

Professional Certificate in Geomatics, Rutgers University, 2001

AREAS OF EXPERTISE

Hazard Mitigation

Training

Grant Application, Tracking and Budgeting

Risk Assessment

Benefit Cost Analysis

Strategic Planning

REGISTRATIONS/ AFFILIATIONS

Member, Association of State Floodplain Managers (ASFPM)

Member, New Jersey Association of Floodplain Managers (NJAFM)

Chair, Community Rating Subcommittee of the NJAFM

Member, New York State Floodplain and Stormwater Managers Association (NYSFSMA)

KEY TRAINING/ CERTIFICATIONS

Certified Floodplain Manager, Association of State Floodplain Managers

YEARS OF EXPERIENCE

25

State Hazard Mitigation Planning, (2012 to Present). Mr. Raser is currently managing the project to perform the 2014 Update the New Jersey State HMP. In addition to meeting the obligations of the three-year State Plan update cycle, the update process is intended to meet EMAP Standards 4.3 and 4.4. Further, compliance with recent THIRA directives and deadlines are being considering in light of the ongoing State update process. Mr. Raser is working with along with other Tetra Tech staff who have developed the Montana and Washington State Plans and their updates.

Local All-Hazards Mitigation Planning (DMA 2000), (2003 to Present). Mr. Raser currently manages local All-Hazard Mitigation Planning projects for counties and single jurisdictions in New York State (Broome, Chenango, Cortland, Delaware, Montgomery, Orange, Onondaga, Suffolk, Tompkins and Westchester counties) and New Jersey (Cape May, Hudson, Passaic). These plans have included working with the New York State Office of Emergency Management (NYSOEM), New Jersey State Police – Office of Emergency Management, and various federal, county and local agencies and organizations to identify hazards, collect relevant data, prepare loss estimates/risk assessments, and develop appropriate mitigation strategies. In these projects Mr. Raser has been directly responsible for organizing and managing mitigation Steering and Planning committees, establishing participation requirements and documenting participation, developing and implementing data and information collection programs, planning and conducting public outreach through a wide variety of methods (questionnaires/surveys, websites, public meetings and forums, brochures and mailings, press releases, emails and social media), and working directly with the planning partners to identify and prioritize a program of appropriate and cost-effective mitigation actions.

Environmental Site Assessment:

Mr. Raser has conducted NJDEP Preliminary Assessment (ECRA/ISRA), Phase I and II Environmental Site Assessment, wetlands and environmentally sensitive area identification, and lead and asbestos surveys.

Mr. Raser has performed environmental due-diligence and risk-assessment investigations for over fifteen (15) years for clients including Prudential Real Estate Investors Group, Met-Life Bank, PNC Bank, Fleet Bank, Industrial Bank of Japan (IBJ Schroeder), as well as various industrial and private clients, and the management of large due-diligence portfolios (up to 160 sites). These investigations have been performed on properties throughout the eastern United States, and have ranged from small, undeveloped properties to active industrial facilities with operational histories from the 1700's. In addition to identifying and characterizing risks on real property, Mr. Raser has worked with major insurers using a variety of environmental liability insurance mechanisms to facilitate the transfer of contaminated properties including Brownfield redevelopment projects.

Site Investigation/Remediation:

Mr. Raser has extensive experience conducting site Investigation and remediation performed under New Jersey, New York, Pennsylvania and Rhode Island regulation, RI/FS, innovative site characterization/screening (soil vapor, XRF, immuno-assay), treatability studies (bioremediation, groundwater pump-and-treat), remedial design, design and construction of soil and groundwater treatment systems, groundwater investigation, hazardous waste management and reporting, underground storage tank closure and remediation, aboveground storage tank cleaning and decommissioning, asbestos and lead abatement.

Major site investigation and remediation projects Mr. Raser has led include the investigation and in-situ bioremediation of a major fuel oil transfer facility near sensitive wetlands; design, construction and operation of a 70,000 gallon per day treatment system for copper and chromium contaminated groundwater, and investigations at complex industrial and manufacturing facilities with contamination of soil, groundwater, surface water, sediments and structures.

Mr. Raser has developed and managed Geographic Information Systems (GIS) and environmental databases for large-scale environmental investigation and remediation projects, including two- and three-dimensional mapping and modeling.

Environmental Impact Assessment:

Mr. Raser has prepared, reviewed and provided expert testimony to Environmental Impact Statements (EIS) for proposed projects including telecommunications facilities, major subdivisions and transportation projects. For numerous wireless projects, Mr. Raser has provided GIS mapping and analysis of environmental conditions and viewshed modeling in support of

environmental site assessment (ESA) and environmental impact statement (EIS) projects. Mr. Raser has developed specialized viewshed analysis maps for state historic planning and Section 106 consultation, and has provided 3-D modeling for cell tower demonstrations.

In addition to identifying environmentally sensitive areas and characterizing associated risks and threats, Mr. Raser has prepared ESA protection plans and maps under New Jersey DEP Spill Control Act regulation.

Geographic Information Systems (GIS):

Mr. Raser has extensive experience working with ArcGIS and related extensions (including FEMA's HAZUS-MH), relational database development and management, spatial database management, scanning and digitizing, aerial photo-interpretation and satellite image analysis (remote sensing), network analysis, transformation and analysis of raster and vector data, modeling, three-dimensional mapping and analysis, Natural Resource Inventories, environmentally sensitive areas mapping, urban forestry studies, watershed management, demographics and marketing analysis, development of web-enabled and web-based applications with GIS functionality

Environmental Modeling:

Mr. Raser has conducted air dispersion modeling of VOCs, heavy metals and particulates (ISCST, ISCLT, Disperse); surface water dilution modeling (COREMIX), groundwater plume modeling, topographical modeling (Surfer), TR-55, HEC-HMS and HEC-RAS Hydrological modeling, USEPA BASINS modeling for TMDL.

Permitting and Environmental Compliance:

Mr. Raser has experience with permitting and environmental compliance in the areas of NJDEP DPCC/DCR and combined SPCC planning, RCRA and HSWA compliance and permitting, ECRA/ISRA compliance, NPDES permitting, Level I-IV Air Quality permitting, Land Use permitting (freshwater wetlands and stream encroachment).

Mr. Raser has managed and been involved with DPCC/DCR plan preparation projects for various industrial clients in New Jersey including Ortho-McNeil Pharmaceuticals, Schering-Plough, Ford Motor Company, Tosco Petroleum, Conoco-Phillips, and Proctor & Gamble, including the preparation of maps and Environmentally Sensitive Area Protection Plans.

SCIENTIFIC/TECHNICAL PUBLICATIONS

Raser, J., Bianco, C., April-May 2009, "Disaster Mitigation Planning", The Military Engineer

Werner, J., Raser, J., Chandler, T., O'Gorman, M., 2000, "Trees Mean Business – A Study of the Economic Impacts of Trees and Forests in the Commericial Districts of New York City and New Jersey"

ADDITIONAL TRAINING/CERTIFICATIONS

FEMA HAZUS-MH Training (Basic and Advanced)

Benefit-Cost Analysis Reengineered (BCAR) Training

Engineer-In-Training (EIT)

Project Management Traning (Levels 100, 200)

TETRA TECH

Kristen C. Gelino

Lead Project Planner and Mitigation Planning Lead

EXPERIENCE SUMMARY

Ms. Gelino specializes in hazard analysis and mitigation planning. She has a familiarity with environmental law and experience with a diverse array of team-oriented and independent projects. Ms. Gelino is currently completing her master's thesis, which analyzes the extent to which ecosystem services are addressed in local climate action plans. In addition she is currently assisting in the development of a technical paper in support of the World Bank's Low Carbon, Livable Cities Initiative. Ms. Gelino provides support through report preparation and development, client engagement, geospatial analysis and assessment, and administrative tasks.

EDUCATION

MUP, Urban Planning, University of Washington, Degree expected 2014

B.A., Program in the Environment and Political Science, University of Michigan, 2007

AREAS OF EXPERTISE

Hazard Mitigation Planning

Environmental Planning

Sustainability

REGISTRATIONS/ AFFILIATIONS

American Planning Association, Student Member, 2011

Association of State Flood Plain Managers, Student Member, 2013

National Hazard Mitigation Association, Student Member, 2013

RELEVANT EXPERIENCE

Hazard Analysis and Mitigation Planning

Planner, King County, 2013 – 2014. Ms. Gelino provided project support by providing technical assistance to a 56 member planning partnership, assisting with public meetings, providing GIS support and contributing to document development. Ms. Gelino also provided outreach to County stakeholders through the presentation of risk assessment results at the Resilient King County workshops.

Planner, City of Covington, 2013 – 2014. Ms. Gelino provided project support by assisting and facilitating with Steering Committee meetings, public meetings, and GIS support and document development.

Planner, Fremont County, CO, 2014. Ms. Gelino provided project support through hazard profiling and GIS support.

Planner, El Paso County, CO, 2014. Ms. Gelino provided project support through hazard profiling and GIS support.

Geospatial Analysis

Planner, Humboldt County, CA, 2013. Ms. Gelino provided support through assistance with jurisdictional annexes and GIS mapping for final document.

Intern, FEMA Region X-Mitigation Division, 2013. Ms. Gelino provided support in updating CDMS data for Region X counties, running HAZUS-MH earthquake and flood scenarios, preparing data for hazard mapping and geoplatform deployment, and resolving database issues for user defined facility analysis. Ms. Gelino also assisted in the instruction of a HAZUS workshop at the University of Washington.

Sustainability

Team member, UW-Solar, 2012-2014. Ms. Gelino provided project support to an interdisciplinary University of Washington Campus Sustainability Fund solar installation project. She assisted in the Infrastructure and Planning and Education and Outreach teams as well as during the RFP process. Additionally, she assisted in the grant writing and submittal process, developed location decision criteria for the solar arrays and data control systems, and completed a site-specific feasibility assessment. The system was installed on a University of Washington Housing and Food Service dorm in March of 2014. Ms. Gelino is currently working on finalizing the educational components of the project.

Research/Writing Assistant, Jan Whittington, PhD., 2013-2014. Ms. Gelino is currently providing research and writing assistance to Professor Whittington in support of the development of a Climate Smart Capital Investment Plan Methodology commissioned by the World Bank's Low Carbon, Livable Cities initiative.

TETRA TECH

Carol Baumann, GISP

GIS/HAZUS Lead

EXPERIENCE SUMMARY

Carol Baumann is a Senior Geographic Information Systems (GIS) Analyst with twenty years of experience working for public and private sector clients. She has been involved in multiple aspects of GIS projects including technical project management, data acquisition and integration, data conversion, database design, metadata documentation, application development, software customization, and map design and production. She has provided technical leadership in a wide variety of projects including natural hazard mapping and analysis, surface water management, utilities, health and epidemiology, environmental conservation, and planning. Ms. Baumann has collaborated with federal, state and local government agencies, private companies and the general public.

EDUCATION

M.S., Geography, University of South Carolina

B.S.E., Electrical Engineering, Duke University

AREAS OF EXPERTISE

GIS Data Modeling & Analysis

Data Conversion

Map Design & Production

REGISTRATIONS/ AFFILIATIONS

Urban & Regional Information Systems Association (URISA), 2009 -2013

KEY TRAINING/ CERTIFICATIONS

Certified GIS Professional (GISP)

Esri Certified Desktop Professional

RELEVANT EXPERIENCE

Natural Hazard Mapping and Analysis

Hazard Mitigation Plans for Multiple Jurisdictions, Multiple Clients, 2013 – Present. Ms. Baumann, as the risk assessment lead, is facilitating a detailed analysis of the impact of multiple hazards (including flood, earthquake, dam failure, wild land fire, and tsunami) in the following jurisdictions: King County (WA), Spokane County (WA), City of Covington (WA), Humboldt County (CA), Park County (CO), Fremont County (CO), and Cook County (IL). She is using tools such as Hazus-MH and ArcGIS to analyze current hazards data, general building stock, and critical facilities, to determine structure exposure and loss estimates. Where feasible, she is updating the Hazus-MH default general building stock data with current tax assessor information and critical facilities identified by the jurisdictions.

Hazard Building Inventory Update for King County, King County Flood Control District WA, 2012. Ms. Baumann was responsible for acquiring and analyzing the county's spatial and tabular parcel and assessor data to create a building specific inventory database (User Defined Facilities). This database, a significant enhancement to the "straight from the box" data provided with Hazus, was incorporated into a Level 2 Hazus analysis of 100 and 500 year flood scenarios for the King County Flood Control District.

Federal Emergency Management Agency (FEMA) Mapping Projects, FEMA, 2003 – 2011. As the Technical Manager, Ms. Baumann managed the creation of Digital Flood Insurance Rate Maps (DFIRMs) for 24 counties and communities in Washington, Idaho, Oregon and Alaska. She coordinated with government agencies and engineering companies to acquire and process base map and flood hazard data that met FEMA DFIRM specifications. She developed procedures and checklists that adhered to an internal International Organization for Standardization (ISO) quality management system for processing the base map and flood hazard data into the standard DFIRM geodatabase format. Ms. Baumann trained technical staff on all aspects of creating DFIRMs, provided technical support and quality control. She proactively addressed and provided solutions for technical issues by regularly communicating with FEMA regional office, FEMA quality control contractors, project prime contractors, and communities. Ms. Baumann analyzed request for proposal requirements and created project time and cost estimates for business development staff.

TETRA TECH

Cynthia Addonizio-Bianco, CFM, LEED BD+C

Mitigation Planning

EXPERIENCE SUMMARY

Cynthia Addonizio-Bianco, CFM, LEED AP is involved in the management and performance of Local Hazard Mitigation Planning (HMP) projects regulated under the Disaster Mitigation Act of 2000 (DMA 2000) and has over twenty years experience in engineering and planning including experience in hazard mitigation planning and in the petrochemical field as a mechanical engineer, packaged equipment engineer and manager. Her mitigation planning experience includes work on single and multi-jurisdictional mitigation plans. In addition she has worked as an engineer on various projects including the design of two North Sea oil production platforms as well as shale oil recovery and pipeline demonstration plants. Her experience includes the oversight of hazard mitigation planning and engineering groups to ensure quality standards and performance of work within project schedules.

Ms. Addonizio-Bianco has managed both countywide (multi-jurisdictional) and single jurisdiction HMP projects in New York and New Jersey (FEMA Region II), working along with the New York State Emergency Management Office (SEMO) and New Jersey Office of Emergency Management (NJOEM). In addition she has performed FEMA BCA analysis and e-grant support for a flood mitigation project in New Jersey.

In addition to mitigation planning, Ms. Addonizio-Bianco is knowledgeable in the support of county and local governments throughout New York and New Jersey with plan implementation, including grant application and BCA support.

EDUCATION

BS Sibley School of Mechanical Engineering, Cornell University

AREAS OF EXPERTISE

Mitigation Planning

Community Reconstruction Planning

Grant Support

REGISTRATIONS/ AFFILIATIONS

ASFM Certified Floodplain Manager, Certificate No.: US-07-02614, issued 4/12/07

LEED BD+C (Leadership in Environmental and Engineering Design Accredited Professional), 3/4/09

Engineer-In-Training (EIT), NYS Board of Professional Engineers

KEY TRAINING/ CERTIFICATIONS

FEMA, Department of Homeland Security, Benefit-Cost Analysis Course (BCA), September 2008

FEMA Department of Homeland Security, Module Training in the Flood Full Data, Coastal A and V Zone Full Data, Limited Data, and Hurricane/Wind Modules, May 3, 2007

Tetra Tech Project Management Training - Level 101

Tetra Tech Project Management Training - Level 200

RELEVANT EXPERIENCE

Hazard Risk Assessment And Mitigation Planning Projects

Ms. Addonizio-Bianco has and currently manages local All-Hazard Mitigation Planning projects for counties and single jurisdictions in New York and New Jersey). These plans have included working with the mitigation division of FEMA – Region II, New York State Office of Emergency Management (NYSOEM), New Jersey State Police – Office of Emergency Management (NJOEM), and various federal, county and local agencies and organizations to identify hazards, collect relevant data, prepare loss estimates/risk assessments, and develop appropriate mitigation strategies. These planning projects aim to reduce losses to natural and man-made hazards. For this work, Ms. Addonizio-Bianco worked closely with state and municipal stakeholders.

These plans have included working with the New York State Office of Emergency Management (NYSOEM), New Jersey State Police – Office of Emergency Management (NJOEM), and various federal, county and local agencies and organizations to identify hazards, collect relevant data, prepare loss estimates/risk assessments, and develop appropriate mitigation strategies. In managing these projects, Ms. Addonizio-Bianco helped the counties identify opportunities and apply for DHS grant funding, served as the single point of contact with clients, controlled schedules and budgets, supervised staff performance, managed report preparation and provided follow up implementation and grant support services as needed.

TETRA TECH

Heather M. Apgar, CFM

Public Outreach

EXPERIENCE SUMMARY

Ms. Apgar has her education background in Environmental Science. With her current position with Tetra Tech, Ms. Apgar has gained hands-on field experience providing her with knowledge for approaching various environmental planning and natural resource projects. Ms. Apgar's current position has allowed her to become more involved with Federal, State and local environmental planning, asbestos, and telecommunication projects. Ms. Apgar has gained proficiency in multiple Hazard Mitigation Planning (HMP) projects, regulated under the Disaster Mitigation Act of 2000 (DMA 2000) for the states of New Jersey and New York. Ms. Apgar has also provided daily office support to both administrative and project management staff.

Ms. Apgar has been directly involved with various projects, which include: sampling activities for soil, groundwater, air and asbestos; site safety coordinator; Phase I site inspections; Tenant Inspection Program site inspections; wetland identification and delineations; data analysis and management for remedial projects; and preparing permit applications. Ms. Apgar has been responsible for the preparation and completion of Phase I Environmental Site Assessment (ESA) reports for Federal, State and Local agencies and private companies, including NEPA screening reports for telecommunication projects. Recent HMP efforts entail Ms. Apgar to conduct significant research and organization of an array of data for multiple counties and single jurisdictions for New Jersey and New York.

EDUCATION

BS, Environmental Science, University of New England, 2005

AREAS OF EXPERTISE

Environmental Science

Technical report preparation

Hazard mitigation

REGISTRATIONS/ AFFILIATIONS

Certified Floodplain Manager, 2009

Certified Wetlands Delineator, Rutgers University, NJ, 2005

KEY TRAINING/ CERTIFICATIONS

OSHA 8-Hour HAZWOPER Refresher, 2014

U.S. EPA HRS Training, 2010

FEMA ICS-100-200, 2009

RELEVANT EXPERIENCE

Hazard Mitigation

HMP Planning Efforts, multiple locations throughout the U.S., 2006 – Present.
Ms. Apgar supports local All-Hazard Mitigation Plan projects for state and local jurisdictions in New York, New Jersey, Pennsylvania, Massachusetts, Illinois, Puerto Rico and Oklahoma. Ms. Apgar's responsibilities include: researching all historical natural and non-natural hazard events which have occurred throughout each of the counties and jurisdictions and compiling all events into the HMP; contacting local, State and Federal employees to obtain relative documents for the HMP; researching general information about each county and/or jurisdiction, including county/jurisdiction history, geological features and climate, and population and demographic information; preparing and organizing documents for various meetings; attend various meetings, prepare meeting notes and minutes of meeting; and authoring various sections of the HMP.

Disaster Management

Administrative and Grant Support for the Morris County Office of Emergency Management (MCOEM), Morris County, New Jersey, 2012 – 2013. Ms. Apgar provides administrative and grant support to the MCOEM since March 2012. She has worked on numerous tasks for the MCOEM, including regular attendance to meetings and preparation of meeting minutes; corresponding with county and local officials; preparing various county plans, and providing administrative support to MCOEM staff that included file organization and cataloging of documentation, preparation of documents and spreadsheets, and assisting with projects. Ms. Apgar was the client manager and lead author of the County Debris Management Plan and responsible for working with various county departments to gather data in order to complete the plan. She assisted with the completion of the County Utility Interruption Plan. Ms. Apgar was also responsible for updating the County's equipment inventory database. Recently, Ms. Apgar assisted the County with completing the Hurricane Sandy After Action Report. Her responsibilities included attending meetings with the municipalities and county departments; preparing a questionnaire that was issued to all municipal OEM coordinators, which was then organized; meeting minutes; and the completion of the after-action report.

TETRA TECH

Zachary Baccala, CFM
GIS/HAZUS

EXPERIENCE SUMMARY

Mr. Baccala's nine years of GIS experience have primarily focused on floodplain mapping. His experience encompasses all facets of Digital Flood Insurance Rate Map (DFIRM) production, including floodplain delineations, panel cartography, base flood elevation (BFE) plotting, database creation and management, and Hazus annualized loss estimation. As a FEMA Authorized Hazus Instructor, Mr. Baccala has taught Hazus courses for the FEMA Region V office in Chicago, IL, FEMA Region X in Seattle, WA as well as for FEMA at the Emergency Management Institute in Emmitsburg, MD. These courses consist of 4 day hands-on instruction using Hazus and providing real world examples of how Hazus can be used for risk assessments and mitigation planning. Mr. Baccala has also been involved in developing innovative solutions using mobile applications for risk communication and engagement.

Mr. Baccala's understanding of Hazus and CDMS led to his development of a CDMS Mobile Data collection application for Android and iOS. This application enables communities to collect detailed inventory data through smartphones or tablets using the GPS capabilities of the device. The data collected is stored on the device, and as needed, uploaded to a server that aggregates the collected information to incorporate into a database. The data collected through this application includes essential facilities, high potential loss facilities and other user defined facilities. Mr. Baccala also coordinated the setup of a Hazus dedicated server, which consists of Hazus 2.1 running through a virtual machine and linked to a full version of SQL 2008. This allows for Hazus runs to be completed without concern of SQL database size limitations and much faster Hazus loss estimation analysis.

RELEVANT EXPERIENCE

Hazus Average Annualized Loss Study for FEMA Regions I, V, VII, X for FEMA Risk MAP Program. *Sr. GIS Analyst* This project was part of an effort to develop standardized flood loss estimates and increase awareness of potential flood losses on a nationwide basis. Deliverables for the 1,121 counties studied were individual Hazus-MH HPR files, summary tables for losses, and a report outlining the study procedures, issues and limitations. Mr. Baccala managed the analysis of more than 250 individual U.S. counties, completed on 10 machines, tied to a single SQL server repository. This effort included riverine and coastal counties and took more than three months to complete. Mr. Baccala coordinated the roll-up process of all the Hazus study regions for the contiguous United States, managing multiple SQL server installations and working closely with the Hazus developers to ensure all results were compiled.

CDMS Update for FEMA Region 10: Project Lead and GIS Analyst for incorporating local parcel data into the Hazus MR5 inventory for Lewis, Yakima, Grays Harbor and Cowlitz Counties in Washington, and Multnomah, Lane and Jackson Counties in Oregon. Mr. Baccala coordinated with federal, state, and local stakeholders to obtain the necessary data required for a Level 2 Hazus inventory update. He coordinated staff within multiple offices to ensure the project was completed to the standards required by the FEMA Region 10 office. Mr. Baccala later updated the data for Hazus 2.1 in order for the Region to continue using the improved inventory with the newer version of Hazus.

EDUCATION

B.S., Geography and Geosciences, Salisbury University, 2005

A.A.S., Culinary Arts, Baltimore International College, 2001

AREAS OF EXPERTISE

GIS/HAZUS Analyst

Hazard Mitigation

Flood Plain Management

REGISTRATIONS/ AFFILIATIONS

2011, Certified Floodplain Manager (CFM), Association of State Floodplain Managers (ASFPM) *(License No.US-11-05564)*

KEY TRAINING/ CERTIFICATIONS

FEMA E313 Basic Hazus

FEMA E317 Comprehensive Data Management for Hazus

FEMA E172 Hazus for Flood

FEMA E176 Hazus for Floodplain Managers

FEMA PTS Hazus Train-the-Trainer

2010, FEMA Certified Hazus Trainer (Basic, Flood and CDMS)

2013, FEMA Hazus Trained Practitioner

2011, ESRI Certified ArcGIS Desktop Associate 10 (V00E4B1FRE5ZMW)

2013, ESRI Certified ArcGIS Desktop Associate 10.1 (1LR0V4S21MEE2VJV)

U.S. EPA HRS Training, 2010

FEMA ICS-100-200, 2009

TETRA TECH

Laura D. Johnston
Public Outreach

EXPERIENCE SUMMARY

Laura Johnston has more than 25 years expertise in emergency management (FEMA support work, hazard mitigation planning, COOP, EOP, after action reports, etc.) and community outreach, current and long-range planning services for communities, cities, parishes, counties and regions for the response, recovery, growth and revitalization of urban, suburban and rural communities. Her professional and technical experience includes: pre disaster preparedness, post-disaster planning, hazard mitigation planning on the community, parish/county and state levels (independently and in tandem with the Department of Homeland Security and Federal Emergency Management Agency), current and long-range land use planning, negotiation assistance, public participation/stakeholder involvement, facility planning and analyses, and comprehensive planning. Laura has worked extensively in both the public and private sector which allows her to easily and effectively work with, relate to and interact with the full realm of a community – from residents to business leaders as well as local, state and federal partners before, during and post an event.

Laura is currently Tetra Tech's Operations Manager and Regional Manager for Emergency Management in Denver leading the Company's strategic outreach into the Colorado region and the emergency management market. As a longtime resident of the State of Colorado, Laura has worked with a variety of communities and counties across the State providing consulting expertise in planning, response and recovery. Laura has the proven ability to work with a variety of groups from residents, town boards, trustees and county commissioners, as well as State of Colorado Office of Emergency Management Offices, Department of Local Affairs and FEMA Region VIII representatives.

EDUCATION

B.A. Environmental Planning and Landscape Architecture.Utah State University, College of Natural Resources

AREA OF EXPERTISE

Emergency Management

Hazard Mitigation Planning

Disaster Response Planning

Community and Comprehensive Planning

Project management

Evacuation Planning

Strategic Planning

REGISTRATIONS/ AFFILIATIONS

Colorado Emergency Management Association (CEMA)

American Planning Association

Urban Land Institute Course

Prior to transferring to Denver, she was the Planning Program lead in the Gulf Coast Region and managed the Baton Rouge office for Dewberry. The planning program primarily provided support to local and state jurisdictions, developers and federal entities in the full array of planning activities. Prior to returning to Colorado she led Dewberry's efforts to provide post-disaster planning services to FEMA and GOHSEP in the aftermath of Hurricanes Katrina and Rita as well as extensive hazard mitigation work the Gulf Coast and most specifically across Louisiana. Her responsibilities also included the role as a team leader and project manager for multiple city and county and parish projects across the Gulf Coast, the Midwest and Colorado. These projects entailed providing day-to-day management of tasks including: community assistance in the development of FEMA-compliant hazard mitigation plan development; the updating and/or amendment of current plans and detailed scoping of mitigation actions through the review, approval and adoption phase; evacuation planning; federal, state, and local planning coordination; public outreach; housing assistance; and demographic tracking and projections.

RELEVANT EXPERIENCE

Emergency Management

El Paso County Colorado Hazard Mitigation Plan Update (2014) – Tetra Tech and Project Manager Laura Johnston were recently retained for the 2014 Update of the El Paso County Hazard Mitigation plan. This plan update process will kicked off in March of 2014 with a target draft delivery date to the State of December 14, 2014. Under Laura's leadership, the Tetra Tech Team will include interface with the El Paso County Project Manager, County leadership and participating community leaders in the development of fundable and implementable hazard mitigation projects including wildfire and flood actions. In addition, Laura is responsible for the public outreach, stakeholder education and participation portions of the plan process.

County seat the City of Colorado Springs and the surrounding County have been significantly impacted by the impacts of wildfire and post fire erosion and flooding runoff.

Fremont County Colorado Hazard Mitigation Plan Update (2014) – Tetra Tech and Project Manager Laura Johnston were recently retained for the 2014 Update of the Fremont County multi-jurisdictional hazard mitigation plan. This plan update process kicked off in February of 2014 with a target draft delivery date to the State of September 30, 2014. A significant portion of Laura's duties and responsibilities on this project will include interface with the Fremont County Project Manager, County leadership and participating community leaders in the development of fundable and implementable mitigation projects. In addition, Laura is responsible for the public outreach, stakeholder education and participation portions of the plan process.

Teller County Colorado Hazard Mitigation Plan Update (2013) – Laura is currently serving as the Project Manager for the 2013 Update of the Teller County multi-jurisdictional hazard mitigation plan. This fast-tracked plan update process was kicked off in May of 2013 with a target draft delivery date to the State of Colorado of October 2013. A significant portion of Laura's duties and responsibilities on this project include interface with the Teller County Project Manager, County leadership and participating community leaders. In addition, Laura is responsible for the public outreach, stakeholder education and participation portions of the plan process.

Park County Colorado Hazard Mitigation Plan Update (2013) – Laura is currently serving as the Project Manager for the 2013 Update of the Teller County multi-jurisdictional hazard mitigation plan. Laura's primary responsibilities include: interface with the Park County Emergency Manager, County leadership and participating community leaders; public outreach, stakeholder education and participation portions of the plan process as well as plan development, review and adoption. The project had a delivery date to the State of Colorado of October 2013.

Lake County Colorado Hazard Identification and Risk Assessment Plan - 2012. Laura served as Project Manager for the development of the 2012 Lake County HIRA as the first phase of a 2 phase process to develop a County Multi-Jurisdictional Hazard Mitigation Plan. The fast-paced project kicked off in March of 2012 and was completed in September of 2012. A portion of the funding for the plan development came from the Colorado Water Conservation Board. Funding for the flood portion of the Plan stipulated that all work funded under said grant must be completed by the 30th of June 2012. Phase 2 of the project is the development of mitigation actions and submission of the plan to COEM and FEMA. The Plan profiled nine (9) natural hazards applicable to this high alpine community. The project was completed on-time and under budget.

Adams County Colorado Integrated Hazard Mitigation, Comprehensive and Transportation Planning Process (Imagine Adams County). As a partner with Clarion & Associates and Felsburg, Holt & Ullevig, Laura served as Project Manager for the innovative integrated planning process entitled Imagine Adams County. Adams County initiated a fast-paced integrated planning process developing a countywide natural hazards mitigation plan (plus Tier II facilities) integrated into an update of the County's comprehensive and transportation plans. FEMA Region VIII representatives stated that this integrated process is one of the first of its kind in the Country and ensured that the mitigation action plan merged into the overarching comprehensive and transportation plans rather then become a standalone document. This process and plan was the subject of a recent presentation at the American Planning Association conference.

City of New Orleans, Louisiana Hazard Mitigation Plan 2011. As Project Manager, Laura lead a team of planning and engineering professionals in providing professional and technical assistance to the City of New Orleans/Orleans Parish Louisiana in the development of the City and Parish 2012 Hazard Mitigation Plan. This project encompassed the integration of new and developing data & information while working with an extraordinarily diverse group of stakeholders and client representatives in the development of a post-Katrina hazard mitigation plan for one of the most hazard prone areas in North America. The challenging project was completed on-time and within budget.

Mitigation Planning Support for 1603-LA. Laura served as Project Manager providing technical assistance to local communities, parishes, counties, universities and states in the preparation, development, review, and adoption of FEMA compliant hazard mitigation plans in Louisiana.

TETRA TECH

Alison M. Miskiman, CFM

GIS/HAZUS

EXPERIENCE SUMMARY

Alison Miskiman is a Project Manager and lead Mitigation Risk Assessor for Tetra Tech. She holds a Masters Degree in Earth Science and is a Certified Floodplain Manager. She has provided support to numerous government and private sector clients including FEMA, NOAA and EPA. Alison is currently the lead risk assessor for all local and state hazard mitigation planning projects at Tetra Tech. She is a FEMA-trained HAZUS analyst and customizes the application for hazard mitigation and THIRA risk assessments. She is also a Hazard Mitigation Assistance grant writer with extensive technical experience in the BCA application. Alison is currently managing and executing the New Jersey State Hazard Mitigation Plan update and provides on-going support to all local hazard mitigation planning projects in FEMA Regions I, II and III.

EDUCATION

M.S., Earth Science, University of New Hampshire

B.S., Environmental Science, University of Scranton

AREAS OF EXPERTISE

Expert in loss estimation using HAZUS-MH

DMA 2000 Risk Assessments

State Hazard Mitigation Planning

Benefit-Cost Analysis (BCA)

FEMA HMA grant author

GIS Analysis, data creation, map development

REGISTRATIONS/ AFFILIATIONS

ASFM Certified Floodplain Manager, No.: US-07-03029, issued 10/29/07

KEY TRAINING/ CERTIFICATIONS

OSHA 1910.120, 40-hour and 8-hour refresher

Protected Critical Infrastructure Information (PCII) Authorized User

RELEVANT EXPERIENCE

Data Collection and GIS Tools

Ms. Miskiman is managing the customization and implementation of a unique and secure web portal (ESRI Arc Flex) to simplify and streamline the collection and update of critical facility inventory data specifically for mitigation and emergency planning projects. Local officials are using this tool to review and edit their current inventory, as well as view established hazard boundaries (e.g., FEMA's Digital Flood Insurance Rate Maps), and evaluate the location of potential new development and future mitigation activities. By design, this tool provides real-time updates to the data without having mapping software installed on your computer. This web portal provides a means to capture a more accurate location of a facility while being compatible with HAZUS-MH and the Comprehensive Damage Management System (CDMS). This tool increases the accuracy of facility locations and thus the risk assessment results which are then used to develop strong and actionable mitigation strategies to manage their natural hazard risk and maximize grant funding opportunities.

State Hazard Mitigation Planning

State Hazard Mitigation Planning for the State of New Jersey (2012 – Present):
Ms. Miskiman is the project lead and manager role for the State of New Jersey HMP. In addition, Ms. Miskiman is also the technical lead for the State's risk assessment. As Project Manager, Ms. Miskiman manages the schedule, leads meetings with interagency teams and conducts outreach to partner State agencies and stakeholders. Ms. Miskiman is evaluating the impacts of natural hazards utilizing HAZUS-MH to quantify the potential population, structure and economic impacts to the State. The building inventory in HAZUS-MH is being updated with state-owned and leased facilities so that potential losses can be generated at the site-specific level. HAZUS-MH is being used for the riverine flood, coastal flood, sea-level rise, hurricane wind and surge, and seismic hazards.

Local Mitigation Planning (DMA 2000)

Ms. Miskiman is a Certified Floodplain Manager and manages the technical risk assessments for all DMA 2000 hazard mitigation planning projects for our state, county and single jurisdiction clients. These plans include working with the New York State Office of Emergency Management, New Jersey State Police – Office of Emergency Management, Massachusetts Office of Emergency Management, and various federal, county and local agencies and organizations to identify hazards, collect relevant data, prepare loss estimates/risk assessments, and develop appropriate mitigation strategies.

Ms. Miskiman is proficient in FEMA's HAZUS-MH GIS extension for conducting hazard analysis/risk assessment for the flood (riverine and coastal), wind and earthquake hazards; and has received formal FEMA training in its use and application. Ms. Miskiman received the HAZUS Excellence Award Winner in May 2014. Further, Ms. Miskiman is the lead author for the Risk Assessment and Vulnerability Assessment sections for drought, earthquake, extreme temperature, flood, geologic hazards such as landslide and subsidence, nor'easters, wind (hurricane, severe storms, coastal storms), and winter storms for the following projects:

- City Port Jervis, New York
- Village of Briarcliff Manor, New York
- Town of Cortlandt, New York
- Town of New Castle, New York
- Suffolk County, New York (2008, 2014**^)
- Fulton County, New York
- City of New Rochelle, New York
- Town and Villages of Greenburgh, New York
- Tioga County, New York**
- Delaware County, New York**
- Broome County, New York (2007, 2013**)
- Village of Scarsdale, New York
- Northampton County, Pennsylvania**
- Kau, Hawaii
- Town of Blooming Grove, New York
- Essex County, New Jersey#
- State of Massachusetts**
- State of New Jersey**#
- Greene County, New York
- Chenango County, New York
- Montgomery County, New York
- Onondaga County, New York
- Saratoga County, New York
- Cape May County, New Jersey
- Somerset County, New Jersey (2009, 2014**)
- Hudson County, New Jersey (2008, 2014**)
- Shandaken, New York*
- Rincón, Puerto Rico
- Utuado, Puerto Rico
- Lehigh County, Pennsylvania**
- Oklahoma County, Oklahoma
- Cortland County, New York
- Cayuga County, New York
- Town of Southampton, New York
- Burlington County, New Jersey
- Atlantic Four, New Jersey

*Flood Mitigation Plan and Flood Response Plan
** Hazard Mitigation Plan Update
# Project Manager
^ Tribal participants

Threat and Hazard Identification and Risk Assessment (THIRA) and Hazard Mitigation Planning (HMP) for the State of Massachusetts (2012 – 2013) Ms. Miskiman is the lead natural hazard risk assessor for both the State of Massachusetts THIRA and HMP and has assumed the Project Manager role for the HMP portion of the project due to a transition in staff. Ms. Miskiman evaluated the impacts of natural hazards utilizing HAZUS-MH to quantify the potential population, structure and economic impacts to the Commonwealth. HAZUS-MH was updated with a custom critical infrastructure/key resources and state-owned and leased facility inventory at the site-specific level for more accurate potential loss estimates. HAZUS-MH was customized and used to evaluate the riverine flood, coastal flood, hurricane and Nor'easter combination wind and surge, and seismic hazards.

Community Recovery Planning

New York Rising Community Recovery Program, New York State Governor's Office, 2013-2014. Ms. Miskiman worked with the State and the consultants hired to develop methodologies for the GIS and risk assessment portions of the New York Rising Community Recovery Program projects to assist in the local recovery from Hurricane Irene and Tropical Storm Lee in 2011. Ms. Miskiman led the cost-benefity analysis deliverable for three communities: Village of Washingtonville in Orange County, NY; Village of Margaretville in Delaware County, NY; and the Towns of Shandaken and Hardenburgh in Ulster County, NY. Ms. Miskiman also conducted quality reviews on the GIS deliverables.

TETRA TECH

Emily Slotnick, LEED Green Associate

GIS/HAZUS

EXPERIENCE SUMMARY

Emily Slotnick is a community and environmental planner with five years of experience at Tetra Tech and seven years of experience in the planning field, with developing expertise in community engagement in the context of Disaster Mitigation Act of 2000 (DMA 2000) Hazard Mitigation Planning (HMP). Ms. Slotnick has worked on HMP projects in the states of New Jersey, New York, Pennsylvania, and Washington. In addition, she has been a planner on community resiliency projects in New York State, and a variety of projects supporting USACE, including ecosystem restoration, floodplain management, and damage reduction General Investigation contracts. Much of her work has focused on environmental and hazard mitigation planning in coastal environments, including urban areas uniquely sensitive to climate change, sea level rise, and coastal storm hazards.

RELEVANT EXPERIENCE

Community Resiliency Planning

New York Rising Community Reconstruction Program, Catskill Mountain Region, NYS DOS, 2013-2014. Ms. Slotnick is a planner for four communities undertaking resiliency planning and project implementation through the NYRCR program. Responsibilities have included working with community members and NYS DOS staff planners to complete community asset inventories for a risk assessment analysis, obtaining public input, showcasing program goals and accomplishments, and all levels of coordination between local committee member representatives, NYS DOS, and other local and county agency contacts. She authored and oversaw final completion and timely submittal of the Community Reconstruction Plan for the Village of Washingtonville, NY, and was a lead contributing author and reviewer for plans from the Village of Margaretville, NY, and the Towns of Shandaken and Hardenburgh, NY. Final Reconstruction Plans proposed a list of shovel-ready high priority projects totaling at least $3 million for each participating community, to be implemented within a 2-year timeframe.

Hazard Mitigation Planning

Local and Regional Hazard Mitigation Plans, 2011 – Present. Ms. Slotnick is a contributing author for four single jurisdiction and eight County or regional Hazard Mitigation Plan projects throughout FEMA Regions I, II, III, and X. As a supporting planner on these projects, Ms. Slotnick performs hazard research and profiling, risk and capability assessment, client and public outreach, development of mitigation measures, and plan editing and review. Ms. Slotnick has worked directly with jurisdictional representatives to create unique mitigation strategies for numerous communities.

Hudson County Functional Needs/Senior Care & Senior Living Facility Capability Assessment, Hudson County, NY, 2011 – 2012. Ms. Slotnick served as deputy project manager on this project which broadly assessed facility evacuation plans of 27 senior care & senior living facilities throughout Hudson County, NJ. Emily's work included identifying in-house capabilities and the quantity, type, and makeup of outside assistance required to facilitate a regional evacuation of specific functional needs populations. The work lead to a report detailing findings including a current needs assessment, gap analysis and recommendations, as well as a summary of best practices as revealed through the plan review and external research.

EDUCATION

M.U.P., Urban Planning, University of Washington, 2010

B.A. Philosophy, University of Massachusetts, 2006

AREAS OF EXPERTISE

Community Resiliency

Hazard Mitigation

Urban and Environmental Planning

REGISTRATIONS/ AFFILIATIONS

APA, Environment, Natural Resources and Energy, Urban Design and Preservation Divisions, 2009 – Present

PA APA, 2012 – Present

NJAFPM, 2014

USGBC, 2012 – Present

KEY TRAINING/ CERTIFICATIONS

LEED Green Associate, 2012

40-hour OSHA HAZWOPER, 2011

CPR and Standard First Aid

OSHA 8-hour HAZWOPER refresher course, 2013

TETRA TECH

Dan Portman
Technical Editor

EXPERIENCE SUMMARY

Dan Portman, Tetra Tech's technical editor and illustrator since 1992, applies his writing, editing and graphics skills to ensure that Tetra Tech documents are thorough and clear. Formerly an engineer and a newspaper reporter and editor, Dan develops documents that convey complex information in a way that is both technically correct and easily understood. He works with in-house staff, clients and subconsultants to produce effective, readable documents that meet client goals and company standards. He also creates original documents—based on analysis by professional staff—for clients who need products specially targeted to the general public. Dan produces public-involvement materials such as fact sheets, newsletters, and informational signs. Skilled in the use of a wide range of illustration software, he generates graphics for reports and presentations that present technical information in clean, simple images. Dan has provided editorial, design and production assistance for the following documents:

EDUCATION

B.A., Communications, University of Washington, 1986

B.S., Aerospace Engineering, University of Notre Dame, 1980

AREAS OF EXPERTISE

General and Technical Writing and Editing

Computer Graphics

Document Design and Production

RELEVANT EXPERIENCE

Hazard Mitigation

Hazard Mitigation Plan, Hoh Indian Tribe, WA
Tetra Tech prepared a hazard mitigation plan for the Hoh Indian Tribe. The plan addresses drought, earthquake, flood, landslide, severe weather, tsunami, volcano and wildfire.

Hazard Mitigation Plan, Kittitas County, WA
Tetra Tech prepared a hazard mitigation plan for Kittitas County, Washington, with planning partners including four municipalities and seven special purpose districts. The plan addresses avalanche, dam failure, drought, earthquake, flood, landslide, severe weather, volcano and wildfire.

Hazard Mitigation Plan, Tehama County, CA
Tetra Tech prepared a hazard mitigation plan for Tehama County, California, with planning partners including three cities and five special purpose districts. The plan addresses dam failure, drought, earthquake, flood, landslide, severe weather, volcano and wildfire.

Hazard Mitigation Plan, Siskiyou County, CA
Tetra Tech prepared a hazard mitigation plan for Siskiyou County, California, with planning partners including seven municipalities and two special purpose districts. The plan addresses dam failure, drought, earthquake, flood, landslide, severe weather, volcano and wildfire.

Hazard Mitigation Plan Update, Ada County, ID
Tetra Tech prepared an update to a previous hazard mitigation plan for Ada County, Idaho, with planning partners including six cities and 15 special purpose districts. The plan addresses dam failure, drought, earthquake, flood, landslide, severe weather, volcano and wildfire.

Hazard Mitigation Plan Update, King County Flood Control District, WA
Tetra Tech prepared an update to a previous hazard mitigation plan for the King County Flood Control District. The plan addresses flood, dam failure, earthquake, landslide, severe weather, volcano and wildfire.

Hazard Mitigation Plan Update, Contra Costa County, CA
Tetra Tech prepared an update to a previous hazard mitigation plan for Contra Costa County, California, with planning partners including six cities and 29 special purpose districts. The plan addresses dam failure, drought, earthquake, flood, landslide, severe weather and wildfire.

Hazard Mitigation Plan Update, Humboldt County, CA
Tetra Tech prepared a hazard mitigation plan for Humboldt County, California, with planning partners including seven cities and 18 special purpose districts. The plan addresses dam failure, drought, earthquake, fish losses, flood, landslide, severe weather, tsunami and wildfire.

Humboldt Operational Area

Hazard Mitigation Plan Update

Volume 1: Planning-Area-Wide Elements

February 2014

TETRA TECH

Humboldt Operational Area

HAZARD MITIGATION PLAN UPDATE
VOLUME 1: PLANNING-AREA-WIDE ELEMENTS

DRAFT

FEBRUARY 2014

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Project #103S2497

Humboldt Operational Area
Hazard Mitigation Plan Update;
Volume 1—Planning-Area-Wide Elements

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Disaster Mitigation Act (DMA) is federal legislation that requires proactive, pre-disaster planning as a prerequisite for some funding available under the Robert T. Stafford Act. The DMA encourages state and local authorities to work together on pre-disaster planning. The enhanced planning network called for by the DMA helps local governments' articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects.

Hazard mitigation is the use of long- and short-term strategies to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. It is impossible to predict exactly when and where disasters will occur or the extent to which they will impact an area, but with careful planning and collaboration among public agencies, stakeholders and citizens, it is possible to minimize losses that disasters can cause. The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state and federal government.

Humboldt County and a partnership of local governments within the County have developed and maintained a hazard mitigation plan to reduce risks from natural disasters and to comply with the DMA. This plan will act, and has acted, as the key to funding under FEMA hazard mitigation grant programs.

PLAN UPDATE

Federal regulations require monitoring, evaluation and updating of hazard mitigation plans. An update provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is no longer in compliance with the DMA.

The initial Humboldt County Operational Area Hazard Mitigation Plan was approved by the Federal Emergency Management Agency (FEMA) on January 25, 2008. Since then, the partnership has completed or initiated ongoing action on over 68 percent of the 272 initiatives identified in the initial plan. A comprehensive progress report of the initial plan was prepared as part of the update effort and is included in appendix D of volume 1 of this plan. Highlights of the mitigation success stories from the initial plan include the following:

- Increased participation in the National Fire Protection Association's Firewise program. Six communities in Humboldt County have successfully achieved and maintained Firewise recognition: Bridgeville, Honeydew, Orleans, Petrolia, Upper Jacoby Creek, and Willow Creek.
- Humboldt County has received $495,000 in grant funds from the U.S. Forest Service to support the Fire-Adapted Landscapes and Safe Homes (FLASH) program. The program encourages property owners to mitigate wildfire hazards through vegetation management by awarding a rebate for the creation of defensible space around homes and strategic fuel breaks along escape routes and high-risk areas.
- The continuation of on-going earthquake and tsunami hazard mitigation programs through The Redwood Coast Tsunami Work Group (RCTWG).
- In response to significant earthquake hazards, many jurisdictions in Humboldt County have taken action in the past five years to mitigate their risk of damage. Ten jurisdictions have

taken steps toward seismic retrofitting critical facilities, such as water storage areas, fire stations, emergency operation centers, and wastewater treatment facilities.

- A Type 2 urban search and rescue (USAR) team has been established within the Humboldt Operational Area after years of planning, supported by significant training efforts, grant funding, and the placement locally of a California Emergency Management Agency (CalEMA) medium-cache USAR trailer. This is an important capacity for this earthquake-prone area that has the potential for being cut off from larger population centers after a large event. Citizens will need to depend on their own resources, and post-earthquake search and rescue in urban areas will be very important.
- The Humboldt Bay Municipal Water District (HBMWD) was successful in obtaining one Hazard Mitigation Grant and is in the process of finalizing the National Environmental Protection Act analysis for a second Hazard Mitigation Grant. Funding in the amount of $2.85 million was obtained to replace approximately 10,000 feet of HBMWD's 18-inch Techite pipeline from the Terminal Reservoir on Samoa to the Humboldt Bay Crossing, just before the pipe goes under the bay to the Humboldt Community Services District's (HCSD) Truesdale Pump Station.
- The City of Fortuna is in the process of finalizing paperwork for a $453,000 Hazard Mitigation Grant for the City's Wastewater Treatment Plant Flood Protection Project.
- Humboldt County completed a streambank stabilization project in 2008 along the right bank of the lower Mad River west of McKinleyville with funding from the USDA Natural Resources Conservation Service, the Governor's Office of Emergency Services, and adjacent landowners.
- Humboldt County completed a bluff stabilization project in 2012 near the end of one of the primary runways at the Arcata-Eureka Airport to remediate cumulative losses of the runway safety area due to erosion and landsliding. Work included mechanically stabilized earth walls up to 70 feet high.

Updating the plan consisted of the following phases:

- **Phase 1, Organize and Review**—A planning team was assembled to provide technical support for the plan update, consisting of key County staff from the Department of Public Works and a technical consultant. The first step in developing the plan update was to re-organize the planning partnership. The initial planning effort covered 26 local governments. This partnership was increased to 34 for the update as shown in Tables ES-1 and ES-2.

  A 14-member steering committee was assembled to oversee plan update, consisting of planning partner staff, citizens, and other stakeholders in the planning area. Coordination with other county, state and federal agencies involved in hazard mitigation occurred throughout the plan update process. This phase included a comprehensive review of the existing plan, the California State Hazard Mitigation Plan, and existing programs that may support or enhance hazard mitigation actions.

TABLE ES-1.
MUNICIPAL PLANNING PARTNERS

Humboldt County	Arcata	Blue Lake	Eureka
Ferndale	Fortuna	Rio Del	Trinidad

TABLE ES-2.
SPECIAL-PURPOSE DISTRICT PARTNERS

Humboldt Community Service District	Manila Community Service District
McKinleyville Community Service District	Orick Community Service District
Redway Community Service District	Weott Community Service District
Westhaven Community Service District	Willow Creek Community Service District
Arcata Fire Protection District	Briceland Fire Protection District
Fortuna Fire Protection District	Humboldt Fire Protection District No. 1
Loleta Fire Protection District	Petrolia Fire Protection District
Rio Dell Fire Protection District	Samoa Peninsula Fire Protection District
Willow Creek Fire Protection District	County Service Area #4
Garberville Sanitary District	Humboldt Bay Municipal Water District
Reclamation District #768	Shelter Cove Resort Improvement District No. 1
Humboldt Bay Harbor, Recreation and Conservation District	Southern Humboldt Community Healthcare District

- **Phase 2, Update the Risk Assessment**—Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. This process assesses the vulnerability of people, buildings and infrastructure to natural hazards. All facets of the risk assessment of the plan were re-visited by the planning team and updated with the best available data and technology. The work included the following:
  - Hazard identification and profiling
  - Assessment of the impact of hazards on physical, social and economic assets
  - Vulnerability identification
  - Estimates of the cost of potential damage.

  Risk assessment models devolved from the initial planning effort were enhanced with new data and technologies that have become available since 2008. There were some limitations in the modeling due to the lack of data. The need to address these data gaps was identified in some of the mitigation initiatives presented in this plan. The results of the risk assessment were used by the planning partnership to rank risk and to gauge the potential impacts of each hazard of concern on their jurisdiction.
- **Phase 3, Engage the Public**—A public involvement strategy developed by the Steering Committee was implemented by the planning team. It included public meetings to present the risk assessment as well as the draft plan, distribution of a hazard mitigation survey, a County-sponsored website for the plan update, and multiple media releases.
- **Phase 4, Assemble the Updated Plan**—The planning team and Steering Committee assembled key information into a document to meet the DMA requirements for all planning partners. The updated plan contains two volumes. Volume 1 contains components that apply to all partners and the broader planning area. Volume 2 contains all components that are jurisdiction-specific. Each planning partner has a dedicated chapter in Volume 2.

- **Phase 5, Plan Adoption/Implementation**—Once pre-adoption approval has been granted by CalEMA and FEMA Region IX, the final adoption phase will begin. Each planning partner will individually adopt the updated plan. The plan maintenance process includes a schedule for monitoring and evaluating the plan's progress periodically and producing a plan revision every 5 years. This plan maintenance strategy also includes processes for continuing public involvement and integration with other programs that can support or enhance hazard mitigation.

RISK ASSESSMENT RESULTS

Based on the results of the risk assessment, hazards were ranked as follows for the risk they pose to the overall Humboldt Operational Area (1 represents the greatest risk and 8 the lowest):

1. Earthquake
2. Severe weather
3. Flood
4. Wildfire
5. Landslide
6. Drought
7. Tsunami
8. Dam failure.

Each participating jurisdiction also ranked risks associated with natural hazards within its boundaries. Table ES-3 summarizes how many participating jurisdictions assigned each risk ranking (1 through 9, for highest risk to lowest risk) to each evaluated hazard of concern.

TABLE ES-3.
SUMMARY OF HAZARD RANKING RESULTS

	Number of Jurisdictions Assigning Ranking to Hazard									
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	Not Ranked
Dam Failure	0	0	1	0	4	4	7	10	1	4
Drought	0	0	2	5	1	12	6	5	0	0
Earthquake	24	7	0	0	0	0	0	0	0	0
Flood	0	7	13	4	4	0	0	3	0	0
Landslide	0	0	1	6	12	4	6	2	0	0
Severe Weather	3	15	7	6	0	0	0	0	0	0
Tsunami	2	0	5	3	3	4	3	4	6	1
Wildland Fire	2	2	2	7	7	6	4	1	0	0

The summary of risk ranking results indicates the following general patterns:

- Earthquake, severe weather and flood generally received the highest risk rankings.
- Tsunami and wildfire tended to receive high or low rankings based on the geographic location of each jurisdiction. Tsunami was ranked as a higher risk for coastal communities; wildfire was ranked higher for warmer, drier inland jurisdictions.
- Dam failure, drought and landslide generally were ranked lower than other hazards.

MITIGATION GUIDING PRINCIPLE, GOALS AND OBJECTIVES

The following principle guided the Steering Committee and the planning partnership in selecting the initiatives contained in this plan update:

> "Through partnerships and careful planning, identify and reduce the vulnerability to hazards in order to protect the health, safety, quality of life, environment, and economy of the communities within the Humboldt Operational Area."

The Steering Committee and the planning partnership established the following goals for the plan update:

1. Protect Health and Safety
2. Protect Property
3. Protect the Economy
4. Protect Quality of Life
5. Protect Environment
6. Promote Partnerships in Planning

The following objectives were identified that meet multiple goals, acting as a bridge between the mitigation goals and actions and helping to establish priorities:

1. Eliminate or minimize disruption of local government operations caused by hazards.
2. Increase resilience of (or protect and maintain) infrastructure and critical facilities.
3. Reduce hazard-related risks and vulnerability of the populations in Humboldt County.
4. Sustain reliable local emergency operations and facilities during and after a disaster.
5. Seek to enhance emergency response capabilities within the planning area.
6. Enhance understanding of hazards and the risk they pose through public education that emphasizes awareness, preparation, mitigation, response and recovery alternatives.
7. Continually improve understanding of the location and potential impacts of hazards that impact the planning area utilizing the best available data and science as it becomes available, and share this information with all stakeholders.
8. Establish a partnership among all levels of government and the business community to improve and implement methods to protect property.
9. Develop and implement hazard mitigation strategies that reduce losses to wildlife habitat and protect water supply and quality, while also reducing damage to development.
10. Integrate hazard identification information and mitigation policies into other planning-based processes that direct or impact land uses in the planning area.
11. Enhance building codes and their proper implementations so that new construction can withstand the impacts of hazards and lessen the impact of that development on the environment's ability to absorb the impact of hazards.
12. Seek to integrate and coordinate all phases of emergency management within the planning area.

MITIGATION INITIATIVES

Mitigation initiatives presented in this update are activities designed to reduce or eliminate losses resulting from natural hazards. The update process resulted in the identification 380 mitigation initiatives for implementation by individual planning partners, as presented in Volume 2 of this plan. In addition, the steering committee and planning partnership identified countywide initiatives benefiting the whole partnership, as listed in Table ES-4.

IMPLEMENTATION

Full implementation of the recommendations of this plan will require time and resources. The measure of the plan's success will be its ability to adapt to the changing climate of planet earth as well as the field of hazard mitigation. Funding resources are always evolving, as are state and federal mandates. Humboldt County and its planning partners will assume responsibility for adopting the recommendations of this plan and committing resources toward implementation. The framework established by this plan commits all planning partners to pursue initiatives when the benefits of a project exceed its costs. The planning partnership developed this plan with extensive public input, and public support of the actions identified in this plan will help ensure the plan's success.

TABLE ES-4.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

Hazards Addressed	Lead Agency	Possible Funding Sources or Resources	Time Line[a]	Objectives
CW-1—Continue to participate in the planning partnership and, to the extent possible based on available resources, provide coordination and technical assistance in applications for grant funding that include assistance in cost vs. benefit analysis.				
All Hazards	Planning Partners	Grant Funding	Short term, Ongoing	6, 8, 12
CW-2—Encourage the development and implementation of an operational area-wide hazard mitigation public-information strategy that meets the needs of all planning partners.				
All Hazards	Humboldt County, Planning Partners	Cost sharing from the Partnership General fund allocations Cost sharing with stakeholders	Short term, Ongoing	6, 7, 8, 12
CW-3—Coordinate updates to land use and building regulations as they pertain to reducing the impacts of natural hazards, to seek a regulatory cohesiveness within the planning area. This can be accomplished via a commitment from all planning partners to involve each other in their adoption processes, by seeking input and comment during the course of regulatory updates or general planning.				
All Hazards	Governing body of each eligible planning partner.	General funds	Short term, Ongoing	1, 3, 11, 12
CW-4—Sponsor and maintain a natural hazards informational website to include the following types of information: • Hazard-specific information such as GIS layers, private property mitigation alternatives, important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • Links to Planning Partners' pages, FEMA, Red Cross, NOAA, USGS and the National Weather Service. • Hazard mitigation plan information such as progress reports, mitigation success stories, update strategies, Steering Committee meetings.				
All Hazards	Humboldt County	General fund	Short term, Ongoing	6, 7, 8, 12
CW-5—Maintain the Hazard Mitigation Plan Steering Committee as a viable body over time to monitor progress of the plan, provide technical assistance to Planning Partners and oversee the update of the plan according to schedule. This body will continue to operate under the ground rules established at its inception.				
All Hazards	Humboldt County	Existing, ongoing programs	Short term, Ongoing	All
CW-6—Amend or enhance the Humboldt County Operational Area Hazard Mitigation Plan as well as the general Plans for each municipality as needed to comply with state or federal mandates (i.e., CA. Assembly Bill # 2140) as guidance for compliance with these programs become available.				
All Hazards	Humboldt County, each municipal planning partner	General funds	Short term, Ongoing	All
CW-7—Work with the Humboldt County Assessor to begin the capture of general building stock information such as area, date of construction and foundation type, to better support future risk assessments.				
All Hazards	Humboldt County	General fund	Long term, depending on funding	6, 7, 8

PART 1 —
THE PLANNING PROCESS

CHAPTER 1.
INTRODUCTION TO THE PLANNING PROCESS

1.1 WHY PREPARE THIS PLAN?

1.1.1 The Big Picture

Hazard mitigation is defined as a way to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster through long- and short-term strategies. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state, and federal government.

The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) required state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Prior to 2000, federal disaster funding focused on disaster relief and recovery, with limited funding for hazard mitigation planning. The DMA increased the emphasis on planning for disasters before they occur. Having a FEMA-approved hazard mitigation plan is a condition of eligibility for grants under FEMA's Hazard Mitigation Grant Program and other grant programs. In addition, the hazard mitigation plan is a valuable tool for analyzing the risks of natural disasters and promoting awareness of these risks among local agencies and the public.

The DMA encourages state and local authorities to work together on pre-disaster planning and promotes sustainability for disaster resistance. "Sustainable hazard mitigation" includes the sound management of natural resources and the recognition that hazards and mitigation must be understood in the largest possible social and economic context. The enhanced planning network called for by the DMA helps local governments articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk reduction projects.

1.1.2 Local Concerns

Several factors led Humboldt County to work with numerous local jurisdictions in the county to prepare an initial hazard mitigation plan in 2007:

- Humboldt County had previously received funding through the federal Hazard Mitigation Grant Program and sought to remain eligible for this type of funding.
- The County wanted to enhance its grant funding options by creating a plan that would be compliant with other grant funding programs such as the Pre-Disaster Mitigation Grant Program, and the Flood Mitigation Assistance Grant Program.
- The County wanted to be proactive in its preparedness for the probable impacts of natural hazards.

With these factors in mind, Humboldt County committed to the preparation of an initial plan by attaining funding for the effort through grants, and then securing technical assistance to facilitate a planning process that would comply with federal program requirements. The County chose to prepare the plan together with local planning partners under the guidance of a Steering Committee for a number of reasons:

- One of the benefits of multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. The Federal Emergency Management Agency (FEMA) encourages multi-jurisdictional planning under its guidance for the DMA.
- The County provides many services on a countywide basis that influence or directly impact all phases of emergency management.
- Due to limited financial resources at the municipal level, the ability of each city and district to prepare a DMA-compliant plan was uncertain.
- There is a natural planning area boundary that coincides with the jurisdictional boundaries of the County's emergency management function.

The initial hazard mitigation plan called for regular updates to be prepared every several years. This updated document achieves the update goal.

1.1.3 Purposes for Planning

This hazard mitigation plan update identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their citizens. The plan will help guide and coordinate mitigation activities throughout the planning area. The plan was developed to meet the following objectives:

- Meet or exceed requirements of the DMA.
- Enable all planning partners to continue using federal grant funding to reduce risk through mitigation.
- Meet the needs of each planning partner as well as state and federal requirements.
- Create a risk assessment that focuses on Humboldt County hazards of concern.
- Create a single planning document that integrates all planning partners into a framework that supports partnerships within the County, and puts all partners on the same planning cycle for future updates.
- Coordinate existing plans and programs so that high-priority initiatives and projects to mitigate possible disaster impacts are more likely to be funded and implemented.

1.2 WHO WILL BENEFIT FROM THIS PLAN?

All citizens and businesses of Humboldt County are the ultimate beneficiaries of this hazard mitigation plan update. The plan reduces risk for those who live in, work in, and visit the County. It provides a viable planning framework for all foreseeable natural hazards that may impact the County. Participation in development of the plan by key stakeholders in the County helped ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable countywide, and the plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.3 HOW TO USE THIS PLAN

This plan has been set up in two volumes so that jurisdiction-specific elements can be easily distinguished from those that apply to the whole planning area:

- **Volume 1**—Volume 1 includes all federally required elements of a disaster mitigation plan that apply to the entire planning area. This includes the description of the planning process, public involvement strategy, goals and objectives, countywide hazard risk assessment, countywide mitigation initiatives, and a plan maintenance strategy.
- **Volume 2**—Volume 2 includes all federally required jurisdiction-specific elements, in annexes for each participating jurisdiction. It includes a description of the participation requirements established by the Steering Committee, as well as instructions and templates that the partners used to complete their annexes. Volume 2 also includes "linkage" procedures for eligible jurisdictions that did not participate in development of this plan but wish to adopt it in the future.

All planning partners will adopt Volume 1 in its entirety and at least the following parts of Volume 2: Part 1; each partner's jurisdiction-specific annex; and the appendices.

The following appendices provided at the end of Volume 1 include information or explanations to support the main content of the plan:

- Appendix A—A glossary of acronyms and definitions
- Appendix B—2008 Hazard mitigation initiatives
- Appendix C—Public outreach information, including the hazard mitigation questionnaire and summary and documentation of public meetings.
- Appendix D— 2008 to 2013, 5-Year Progress Report
- Appendix E—Plan Adoption Resolutions from Planning Partners

CHAPTER 2.
PLAN UPDATE—WHAT HAS CHANGED

2.1 THE PREVIOUS PLAN

The 2008 Humboldt County Operational Area Hazard Mitigation Plan evaluated and ranked nine hazards for the risk that they posed to Humboldt County as a whole, the seven incorporated cities within the county, and 18 special purpose districts providing services in the county. The plan presented six hazard mitigation initiatives that apply to the entire county, as well as locally specific initiatives developed by each participating jurisdiction (272 local initiatives in all). The full list of initiatives is presented in Appendix B. The hazards evaluated in the 2008 plan were as follows:

- Dam failure
- Drought
- Earthquake
- Fish losses
- Flood
- Landslide
- Severe weather
- Tsunami
- Wildfire.

The plan also identified a guiding principle, six goals and 12 objectives for hazard mitigation in Humboldt County:

- Guiding Principle—Through partnerships and careful planning, identify and reduce the vulnerability to natural hazards in order to protect the health, safety, quality of life, environment, and economy of the communities within the Humboldt Operational Area.
- Goals:
  - G-1— Protect Health and Safety
  - G-2— Protect Property
  - G-3— Protect the Economy
  - G-4— Protect Quality of Life
  - G-5— Protect Environment
  - G-6— Promote Partnerships in Planning
- Objectives:
  - O-1—Eliminate or minimize disruption of local government operations caused by natural hazards.
  - O-2—Increase resilience of (or protect and maintain) infrastructure and critical facilities

- O-3—Reduce natural hazard-related risks and vulnerability to the populations in Humboldt County
- O-4—Sustain reliable local emergency operations and facilities during and after a disaster
- O-5—Seek to enhance the emergency response capability within the planning area
- O-6—Enhance understanding of natural hazards and the risk they pose through public education that emphasizes awareness, preparation, mitigation, response, and recovery alternatives.
- O-7—Continually improve understanding of the location and potential impacts of natural hazards that impact the planning area utilizing the best available data and science as it becomes available and share this information with all stakeholders.
- O-8—Establish a partnership among all levels of government and the business community to improve and implement methods to protect property
- O-9—Develop and implement natural hazard mitigation strategies that reduce losses to wildlife habitat and protect water supply and quality, while also reducing damage to development.
- O-10—Integrate hazard identification information and mitigation policies into other planning based processes that direct or impact land uses within the planning area.
- O-11—Enhance building codes and their proper implementations so that new construction can withstand the impacts of natural hazards and lessen the impact of that development on the environment's ability to absorb the impact of natural hazards.
- O-12—Seek to integrate/coordinate all phases of Emergency Management within the planning area.

2.2 MITIGATION SUCCESS STORIES—PROGRESS REPORTS

Progress reporting was not completed during the initial performance period for the 2007 plan. A review of the initial plan's maintenance strategy determined that annual progress reporting was not feasible due to the size and makeup of the planning partnership. However, the Steering Committee saw value in a progress report that tracked the five-year performance period of the plan. A five-year progress report covering the period from January 2008 to January 2013 was created as part of this plan update process. The progress report summarizes the status of the 272 initiatives identified in the plan and describes mitigation success stories from the reporting period. The report is provided in Appendix D of this volume.

The progress report was an integral part of the public outreach for this plan. It was posted on the hazard mitigation plan website, advertised via press releases, and made available at all public meetings. Humboldt County sees value in progress reporting as a key step in maintaining this plan. The plan maintenance strategy identified in this update calls for completing a five-year progress report during the next update process. Humboldt County is also committed to checking in annually with all planning partners about the plan and opportunities for hazard mitigation projects. This annual project development process will seek collaboration on the development of projects and pursuit of funding.

The progress report highlights some major steps and accomplishments that have been made in the last five years to mitigate various hazard risks in Humboldt County. Significant strides have been made to inform the public through community preparedness and education outreach, particularly in the way of wildfire, tsunami, and earthquake mitigation. Many groups have also taken action to reduce their vulnerability through seismically retrofitting critical facilities, implementing streambank and bluff stabilization

projects, and adding redundancy to water, power, and communication capabilities. Some of these projects were made possible through the acquisition of Hazard Mitigation Grants.

One planning partner, the Humboldt Bay Municipal Water District, was successful in obtaining two Hazard Mitigation Grants to support projects that help protect the District's capability to supply communities with potable water in case of a hazard event. One grant provides $2.85 million in funds for a project to replace 10,000 feet of a pipeline made of Techite, a fiberglass-wound pipe that has been found to fail catastrophically. The existing pipeline provides domestic water to approximately 7,400 people and provides an emergency intertie to the City of Eureka, helping ensure Eureka's water supply in case the primary water transmission line sustained damaged in an earthquake or other event. A second grant provides $2.27 million to fund a project to replace the Mad River crossing of the domestic water transmission main that feeds the City of Blue Lake and the Fieldbrook-Glendale Community Services District. The water supply pipeline is currently attached to a 1930s-era North Coast Railroad Authority bridge, which has not been used or maintained for many years, does not meet modern seismic standards, and has been found to be near the end of its functional life. This project will replace the bridge with an aerial overcrossing designed to meet current seismic codes, thus protecting these communities' sole domestic water supply service.

The City of Fortuna has also undertaken a hazard mitigation project to protect its wastewater treatment plant against flood events. Portions of the plant are constructed within the FEMA 100-year floodplain, and the City's gravity effluent outfall to Strongs Creek is below the 100-year flood elevation, potentially preventing discharge of treated effluent during flood events. The City acquired a $453,000 Hazard Mitigation Grant for the City's Wastewater Treatment Plant Flood Protection Project, which proposes a berm around the plant and construction of a treated effluent pump station. The pumps would be designed to supply pressure to the existing Strongs Creek effluent pipeline to allow the treatment plant to discharge during flood events.

Significant efforts to reduce risks from catastrophic wildfire have been undertaken by many Humboldt residents. For example, six communities throughout the county, including Bridgeville, Honeydew, Orleans, Petrolia, Upper Jacoby Creek, and Willow Creek, are nationally recognized Firewise communities. The Firewise Communities program provides many tools and resources to communities to help people identify actions to address local wildfire hazards and learn how to adapt to living with wildfire. Additionally, the County of Humboldt received $495,000 in U.S. Forest Service grant funds to support the Fire-adapted Landscapes and Safe Homes (FLASH) program, which encourages property owners to mitigate wildfire hazards through vegetation management by awarding a rebate for the creation of defensible space around homes and strategic fuel breaks along escape routes and high-risk areas. Thus far, nearly 200 landowners have participated in the program and over 350 acres of land has been treated to reduce wildfire risk for homesteads and access routes. The success of these efforts and accomplishments, particularly those that were made possible through the acquisition of Hazard Mitigation Grant funds, validates the importance of having a Hazard Mitigation Plan in place.

2.3 WHY UPDATE?

Title 44 of the Code of Federal Regulations (44 CFR) stipulates that hazard mitigation plans must present a schedule for monitoring, evaluating, and updating the plan. This provides an opportunity to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is not able to receive elements of federal funding under the Robert T. Stafford Act for which a current hazard mitigation plan is a prerequisite.

2.4 THE UPDATED PLAN—WHAT IS DIFFERENT?

The updated plan differs from the initial plan in a variety of ways:

- It addresses the following hazards of concern:
  - Dam failure
  - Drought
  - Earthquake
  - Flood
    - Coastal flooding
    - Levee failure
    - Sea-level rise
    - Sediment build-up (sediment-induced flooding)
    - Urban flooding
  - Landslide and other mass movement
  - Severe weather
  - Tsunami
  - Wildfire, including smoke impacts
  - Other hazards of concern (these hazards are profiled, but no risk assessment is performed for them):
    - Fish losses
    - Marine invasive species
    - Oil spills
    - Human-caused hazards
    - Volcanoes
- It provides a profile of the potential impacts of climate change on each hazard of concern
- It presents a revised progress reporting methodology
- It includes an enhanced capability assessment
- It includes an energy assurance plan component

Table 2-1 indicates the major changes between the two plans as they relate to 44 CFR planning requirements.

TABLE 2-1.
PLAN CHANGES CROSSWALK

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.	Volume 1 Chapters 1 – 6 describe the planning process for the initial plan, organization of resources, agency coordination and public involvement.	Volume 1 Chapters 1 – 4 describe the planning process for the plan update, organization of resources, agency coordination and public involvement. The narrative has been refined to reflect the process for a plan update.
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	Part 3 of Volume 1 presents a comprehensive risk assessment for the planning area that looks at nine hazards of concern: dam failure, drought, earthquake, fish losses, flood, landslide, severe weather, tsunami and wildfire.	Part 2 of Volume 1 presents a comprehensive risk assessment for the planning area that looks at eight hazards of concern: dam failure, drought, earthquake, flood, landslide, severe weather, tsunami and wildfire. This section also includes an aggregate profile of other hazards of concern that have a potential impact on the planning area but do not warrant a full risk assessment: fish losses, marine invasive species, oil spills, human-caused hazards and volcanoes.

TABLE 2-1.
PLAN CHANGES CROSSWALK

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(2)(i): [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	Volume 1 Part 3 includes countywide extent location mapping for all hazards of concern. Each municipal annex in Volume 2 has jurisdiction-specific hazard maps.	Volume 1 presents a comprehensive risk assessment of each hazard of concern in Chapter 8 through Chapter 15. Each chapter describes the following: • Hazard profile, including maps of extent and location, historical occurrences, frequency, severity and warning time • Secondary hazards • Climate change impacts • Exposure of people, property, critical facilities and environment • Vulnerability of people, property, critical facilities and environment • Future trends in development • Scenarios • Issues
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community	Vulnerability was estimated using GIS applications with an emphasis on exposure and land use. Level 1 HAZUS analysis was used for exposure analyses only. HAZUS outputs were modeled for all hazards of concern.	Vulnerability was assessed for all hazards of concern. The HAZUS-MH computer model was used for the dam failure, earthquake, flood and tsunami hazards. These were abbreviated Level 2 analyses using planning partner and County data. Site-specific data on County-identified critical facilities was entered into the HAZUS-MH model. HAZUS-MH outputs were generated for other hazards by applying an estimated damage function to affected assets. The asset inventory was extracted from the HAZUS-MH model. Best available data was used for all analyses.

TABLE 2-1.
PLAN CHANGES CROSSWALK

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods	This was not a Section 201.6 planning requirement when the initial plan was done. However, Chapter 15.5.2 did include discussion on FEMA repetitive losses per CRS planning criteria.	The repetitive loss section was significantly enhanced to meet new DMA and CRS planning requirements. The update includes a comprehensive analysis of repetitive loss areas that includes an inventory of the number and types of structures in the repetitive loss area. Repetitive loss areas were delineated, causes of repetitive flooding were cited, and these areas were reflected on maps.
§201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.	A complete inventory of the numbers and types of structures (assets) was developed using the census block level data on general building stock and critical facilities contained in HAZUS. An enhanced definition of critical facilities was developed by the Steering Committee.	A complete inventory of the numbers and types of buildings exposed was generated for each hazard of concern at the census block/tract level. This data was updated with relevant current assessor's data where available. The Steering Committee retained the critical facility definition from the initial planning effort, with the addition of levees as critical facilities. Each hazard chapter provides a discussion on future development trends as they pertain to each hazard.
§201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) and a description of the methodology used to prepare the estimate.	HAZUS-MH was used to estimate damage for the earthquake, flood and tsunami hazards. These were Level 1 analyses using HAZUS default data. For the non-HAZUS hazards, vulnerability was discussed in qualitative terms, with an emphasis on exposure and land use. No loss-estimation models were used in the risk assessment.	Estimates of dollar loss were generated for all hazards of concern. These were generated by HAZUS-MH for the dam failure, earthquake, flood and tsunami hazards. For the other hazards, loss estimates were generated by applying a regionally relevant damage function to the exposed inventory. In all cases, a damage function was applied to an asset inventory. The asset inventory was the same for all hazards and was generated in the HAZUS-MH model.

TABLE 2-1.
PLAN CHANGES CROSSWALK

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	A qualitative analysis of future trends in development was applied to all hazards of concern.	The same methodology was applied to the plan update.
§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	The plan identifies 263 countywide and jurisdiction-specific mitigation initiatives. The countywide initiatives are in Volume 1; the jurisdiction-specific initiatives are in Volume 2.	The update includes both countywide initiatives and jurisdiction-specific initiatives. A crosswalk is provided in the plan update to identify the status of actions identified in the initial plan.
§201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	The Steering Committee identified a guiding principal, 6 goals and 12 objectives, as described in Chapter 5.	The Steering Committee determined that the original guiding principal, goals and objectives are still relevant for the updated plan. The Steering Committee decided to replace the term "natural hazards" with simply "hazards" in the guiding principal and objectives, since the risk assessment now includes a generic profile of other hazards of concern that include non-natural hazards.
§201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	A catalog of mitigation alternatives was developed via a facilitated planning process that looked at strengths, weaknesses, obstacles and opportunities within the planning area. This catalog supported each planning partner in identification of actions for the plan.	An enhanced mitigation catalog was utilized by the partners during the update process. The catalog supported each planning partner as it did during the initial plan development process. The mitigation catalog is included in the body of the report of the update, and not as an appendix, as it was in the initial plan. An analysis was added to each jurisdictional annex to identify which of six mitigation categories each initiative meets. This helps to illustrate the comprehensive range of actions identified.

TABLE 2-1.
PLAN CHANGES CROSSWALK

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.	This was not a section 201.6 planning requirement when the initial plan was done.	All municipal planning partners that participate in the National Flood Insurance Program (NFIP) have identified an action stating their commitment to maintain compliance and good standing under the NFIP. An assessment of program capabilities under the NFIP was added to the capability assessment of each municipal planning partner.
§201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	Each recommended initiative is prioritized using a qualitative methodology that looked at the objectives the project will meet, the timeline for completion, how the project will be funded, the impact of the project, the benefits of the project and the costs of the project. This prioritization scheme is detailed in Chapter 1 of Volume 2 of the plan.	The same prioritization scheme was carried over to the updated plan. This scheme is described in Chapter 1 of Volume 2 of the updated plan.
§201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	Chapter 7 of Volume 1 details a plan maintenance strategy that includes maintaining a steering committee, annual progress reporting, a 5-year update protocol, a strategy for continuing public involvement, and methods for incorporation into other planning mechanisms.	This plan maintenance strategy was revised to change progress reporting from an annual approach to a plan performance period approach (5-years). All other components of the strategy were maintained. The strategy is presented in Chapter 19.

TABLE 2-1.
PLAN CHANGES CROSSWALK

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	Chapter 7 details recommendations for incorporating the plan into other planning components such as: • Partnership emergency response plans • Capital improvement programs • Municipal codes • Community design guidelines • Water-efficient landscape design guidelines • Stormwater management programs • Water system vulnerability assessments • Humboldt County Master Fire Protection Plan.	This component of the initial plan maintenance strategy has been carried over to the plan update and is presented in Chapter 19.
§201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.	Chapter 7 details a strategy for continuing public involvement such as: • Website • Libraries • Publication of a progress report	This component of the initial plan maintenance strategy has been carried over to the plan update and is presented in Chapter 19.
§201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commission, Tribal Council).	Volume 1, Chapter 6.	Volume 1, Section 19.4.

2.5 CHANGES IN DEVELOPMENT

Section 201.6(d)(3), 44 CFR requires that plan updates be revised to reflect changes in development that occurred within the planning area during the past performance period of the plan. The plan must describe changes in development that have occurred in hazard-prone areas and increased or decreased the vulnerability of each jurisdiction since the last plan was approved. If no changes in development impacted the jurisdiction's overall vulnerability, plan updates may validate the information in the previously approved plan. The intent of this requirement is to ensure that the mitigation strategy continues to address the risk and vulnerabilities to existing and potential development and takes into consideration possible future conditions that can impact the vulnerability of the community.

2.5.1 Development-Related Information Provided in This Update

Changes in development are addressed in multiple locations throughout this plan. Chapter 6 of Volume 1 includes detailed discussion about population changes within the planning area that have occurred during the past 20 years as well as discussion of future development trends. At the end of each hazard profile in Part 2 of Volume 1 is detailed discussion on future trends in development as they pertain to that hazard. For hazards with a clearly defined extent and location, an existing land use analysis has been performed that includes identifying vacant lands that have the potential to be developed.

Volume 2 of this plan provides information about each municipal planning partner's legal and regulatory capability, administrative and technical capability, fiscal capability and compliance with the programmatic requirements of the National Flood Insurance Program (NFIP). It also lists each jurisdiction's community classifications, which are indicators of fire suppression, code enforcement, and floodplain management capabilities. These classifications are utilized by the insurance industry to set insurance rates. Classifications such as the Public Protection Classification (PPC), Building Code Effectiveness Grading Schedule (BCEGS) and Community Rating Systems (CRS) are excellent indicators of code enforcement capability.

Explanation of Community Classifications

BCEGS- The Building Code Effectiveness Grading Schedule (BCEGS®) assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards. The BCEGS program assigns each municipality a BCEGS grade of 1 (exemplary commitment to building code enforcement) to 10.

PPC- the Public Protection Classification Program provides important, up-to-date information about municipal fire protection services in a community. Grading's from 1 to 10 are assigned based upon:

- emergency communications systems, including facilities for the public to report fires, staffing, training, certification of telecommunications, and facilities for dispatching fire departments
- the fire department, including equipment, staffing, training, and geographic deployment of fire companies
- the water supply system, including the inspection and flow testing of hydrants and a careful evaluation of the amount of available water compared with the amount needed to suppress fires
- community efforts to reduce the risk of fire, including fire prevention codes and enforcement, public fire safety education, and fire investigation programs

CRS- The Community Rating System is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

2.5.2 Evaluation of Development Changes, 2008 – 2013

This section presents an evaluation of changes in development within the planning area from 2008 to 2013, focusing on municipal planning partners that have permit/land use authority and therefore can regulate development. Special purpose district planning partners that do not have permit/land use authority are not addressed.

Population Change

There was marginal growth within the planning area within the performance period of the initial plan, as reflected in Table 2-2. The total population for the planning area increased by 2.46 percent, an average of less than 0.5 percent per year. For hazards such as earthquake and severe weather, whose extent covers the entire planning area, it is logical to assume that all new development in the planning area associated with the growth in population could be impacted.

TABLE 2-2.
ESTIMATED CHANGES IN POPULATION

	2007 Population	2013 Population	% Change
Arcata	17,244	17,836	3.43
Blue Lake	1,152	1,260	9.38
Eureka	27,208	27,021	-0.69
Ferndale	1,411	1,366	-3.19
Fortuna	11,207	11,885	6.05
Rio Dell	3,240	3,363	3.80
Trinidad	311	365	17.36
Unincorporated County	70,186	72,113	2.75
Total	**131,959**	**135,209**	**2.46**

The amount of new development exposed to hazards with clearly defined hazard areas, such as flood, landslide, tsunami and wildfire, is not known. It is not standard practice in the planning area to track development permits by their interface with known hazard areas. This has been noted as a capability deficiency by the municipal planning partners; it is hoped that it can be addressed for future plan updates.

Community Classifications

The State of California has enabled municipal governments within the state to manage future growth to avoid increased risk. State mandates such as the California General Planning Law, Assembly Bills 162 and 2140, and the California Building Code (see Section 6.9.2) provide each municipal partner with a high degree of capability to manage future growth.

It is the position of the planning partnership that it is more important to track municipalities' ability to manage future growth than to track permits. To accomplish this, community classifications were reviewed to determine if there has been any loss of capability to use the tools established by California State mandates. Since this plan update was developed similarly to the initial plan, it is easy to compare the community classifications identified by the two planning processes. An improvement in classification would represent an increase in capability. A retrograde in classification would represent a decrease in

capability. No change in classification would represent maintenance of the status quo. The result of this analysis is shown in Table 2-3.

TABLE 2-3.
SUMMARY OF COMMUNITY CLASSIFICATIONS

	PPC		BCEGS		CRS	
	2008	2013	2008	2013	2008	2013
Arcata	4/8B	4/8B	99/99*	8/8	NP	NP
Blue Lake	5/8	5/8	9/9	9/9	NP	NP
Eureka	3/9	3/9	4/4	4/4	NP	NP
Ferndale	5/8	5/8	9/9	8/8	NP	NP
Fortuna	5/8B	5/8B	9/9	9/9	NP	NP
Rio Dell	7/9	7/9	99/99*	8/8	NP	NP
Trinidad	6/9	6/9	9/9	8/8	NP	NP
Unincorporated County	--	--	9/9	3/3	NP	NP

* 99 = Did not participate

The analysis shows that no planning partners retrograded during the performance period, and some improved their classifications. The classification average for BCEGS improved marginally and the PPC average remained unchanged. This means that there was no decline in code enforcement or fire suppression capability during the performance period. There is still no participation in the CRS program within the planning area, but there was no determination of non-compliance with the program requirements of the NFIP by the Community Assistance Visit process (see municipal annex tables in Volume 2).

Communities that have prepared Community Wildfire Protection Plans (CWPP) also have a significant capability to manage the wildfire risk. Humboldt County recently completed a comprehensive update to its CWPP, which included a comprehensive assessment of its wildfire risk.

Conclusions

The status of community classifications, combined with the marginal growth in the planning area over the performance period, lead to the conclusion that there has been no significant increase in risk due to new development in the planning area since the initial plan. The percentage of increased development for this performance period would probably correlate to the percentage of population increase. The planning partners' capabilities to manage this development with the tools provided by the state remain more than adequate. This conclusion is substantiated by the fact that there was no significant property damage to new development caused by any hazard event in the planning area during the performance period.

2.6 LOCAL ENERGY ASSURANCE PLANNING INITIATIVE

California Local Energy Assurance Planning (CaLEAP) is a project sponsored by the California Energy Commission to help local governments prepare plans to ensure that key assets are resilient to disaster events that impact energy. The emphasis on key assets is to ensure functionality of essential services, thus protecting safety and public health and minimizing economic loss.

The CaLEAP process considers all aspects of emergency management—preparation, response, recovery and mitigation—and Humboldt County and the Steering Committee recognized significant overlap between that process and hazard mitigation planning. The County and the Steering Committee decided to integrate the two processes where appropriate, identifying ways that the two can support or enhance each other's objectives. The County and the Steering Committee worked with CaLEAP staff to adapt the Humboldt Operational Area Hazard Mitigation Plan so that both volumes of this update include critical components of a CaLEAP and identify actions to promote or enhance energy resilience.

CHAPTER 3.
PLAN METHODOLOGY

To develop the Humboldt Operational Area Hazard Mitigation Plan Update, the County followed a process that had the following primary objectives:

- Secure grant funding
- Form a planning team
- Establish a planning partnership
- Define the planning area
- Establish a steering committee
- Coordinate with other agencies
- Review existing programs
- Engage the public.

These objectives are discussed in the following sections.

3.1 GRANT FUNDING

This planning effort was supplemented by a Pre-Disaster Mitigation grant from FEMA. The Humboldt County Department of Public Works was the applicant agent for the grant. The grant was applied for in 2011, and funding was appropriated in 2012. It covered 75 percent of the cost for development of this plan; the County and its planning partners covered the balance through in-kind contributions.

3.2 FORMATION OF THE PLANNING TEAM

Humboldt County hired Tetra Tech, Inc. to assist with development and implementation of the plan update. The Tetra Tech project manager assumed the role of the lead planner, reporting directly to a County-designated project manager. A planning team was formed to lead the planning effort, made up of the following members:

- Cybelle Immitt, Humboldt County Department of Public Works, Natural Resources Planning
- Hank Seemann, Humboldt County Department of Public Works
- Danielle Allred, Humboldt County Department of Public Works, Natural Resources Planning
- Rob Flaner, Tetra Tech Inc., Lead Project Planner
- Pat Kaspari, GHD
- Carol Bauman, Tetra Tech Inc., Risk Assessment/GIS lead
- Laura Johnston, Tetra Tech Inc., Hazard Profiler
- Kristen Gelino, Tetra Tech Inc., Cartographer
- Dan Portman, Tetra Tech Inc., Technical Editor.

3.3 ESTABLISHMENT OF THE PLANNING PARTNERSHIP

Humboldt County opened this planning effort to all eligible local governments in the county. The planning team made a presentation at a meeting on December 3, 2012 to introduce the mitigation planning process and solicit planning partners. Key meeting objectives were as follows:

- Provide an overview of the Disaster Mitigation Act.
- Describe the reasons for a plan.
- Outline the County work plan.
- Outline planning partner expectations.
- Seek commitment to the planning partnership.
- Seek volunteers for the Steering Committee.

Each jurisdiction desiring to join the planning partnership was asked to provide a "letter of intent to participate" that designated a point of contact and confirmed the jurisdiction's commitment to the process and understanding of expectations. Linkage procedures have been established for any jurisdiction wishing to link to the plan in the future (see Volume 2). The municipal planning partners covered under this plan are shown in Table 3-1. The special purpose district planning partners are shown in Table 3-2.

3.4 THE STEERING COMMITTEE

A steering committee was formed to oversee development of the plan. Members included key planning partner staff, citizens, and other stakeholders from within the planning area. The planning team assembled a list of candidates representing interests within the planning area that could have recommendations for the plan or be impacted by its recommendations. Table 3-3 lists the committee members. Leadership roles and ground rules were established during the Steering Committee's initial meeting on February 6, 2013. The Steering Committee agreed to meet monthly as needed throughout the plan's development. The planning team facilitated each Steering Committee meeting, which addressed objectives based on the work plan established for the update. The Steering Committee met seven times from February through October. Meeting agendas, notes and attendance logs are available for review upon request.

TABLE 3-1.
COUNTY AND CITY PLANNING PARTNERS

Jurisdiction	Point of Contact	Title
Humboldt County	Daniel Larkin	Emergency Services Coordinator
City of Arcata	Karen Diemer	Deputy Director of Environmental Services
City of Blue Lake	John Berchtold	City Manager
City of Eureka	Bill Gillespie	Assistant Fire Chief
City of Ferndale	Jay Parish	City Manager
City of Fortuna	Liz Shorey	Deputy Director Community Development Department
City of Rio Dell	Carla Ralston	Public Works Admin. Tech.
City of Trinidad	Bryan Buckman	Director of Public Works

TABLE 3-2.
SPECIAL PURPOSE DISTRICT PLANNING PARTNERS

District	Point of Contact	Title
Briceland Community Services District		
Humboldt Community Services District	Tim Latham	Maintenance Supervisor
Manila Community Services District	Christopher Drop	General Manager
McKinleyville Community Services District	Gregory P. Orsini	General Manager
Orick Community Services District	Karla Youngblood	Board Member
Orleans Community Services District	James Trask	Water Treatment Operator
Redway Community Services District	Debra Evans	Business Manager
Weott Community Services District	Lou Iglesias	Director
Westhaven Community Services District	Richard Swisher	General Manager
Willow Creek Community Services District	Lonnie Danel	Chief Operator
Arcata Fire Protection District	Justin McDonald	Asst. Chief/Operations
Briceland Fire Protection District	Tim Olsen	Fire Chief
Fortuna Fire Protection District	Stephen Underwood	Firefighter
Humboldt Fire Protection District No. 1	William M. Reynolds	Battalion Chief
Loleta Fire Protection District	Kenneth Nielson	Fire Chief
Petrolia Fire Protection District	Travis Howe	Fire Chief
Rio Dell Fire Protection District	Shane Wilson	Fire Chief
Samoa Peninsula Fire Protection District	Troy Nicolini	Board Chair
Willow Creek Fire Protection District	Nathan Falk	Fire Chief
Garberville Sanitary District	Tina Stillwell	Business Manager
Humboldt Bay Harbor, Recreation, and Conservation District	Jack Crider	Chief Executive Officer
Humboldt Bay Municipal Water District	John Friedenbach	Business Manager
Reclamation District #768	Domingo Santos	Board President
Shelter Cove Resort Improvement District No. 1	Philip W. Young	General Manager
Southern Humboldt Community Healthcare District	Harry Jasper	Administrator/CEO

TABLE 3-3.
STEERING COMMITTEE MEMBERS

Name	Title	Jurisdiction/Agency
Jay Parrish (Chair)	City Manager	City of Ferndale
Hank Seemann (vice-Chair)	Deputy Director of Public Works	Humboldt County
Bill Gillespie	Assistant Fire Chief	City of Eureka
Karen Diemer	Deputy Director of Environmental Services	City of Arcata
Lou Iglesias	Director/Board member	Weott Community Services District
John Friedenbach	Business Manager	Humboldt Bay Municipal Water District
Daniel Larkin	Emergency Services Coordinator	Humboldt County Office of Emergency Services
Jody Brundin	Emergency Manager	Blue Lake Rancheria, Office of Emergency Services
Chris Jones Koczera	—	Red Cross, Humboldt County Chapter
Steve Underwood	Disaster Preparedness Coordinator	Fortuna Fire Protection District
Desmond Cowan	Assistant Fire Chief	Arcata Fire Protection District
Judith A. Warren	Regional Coordinator	Humboldt State University, Regional Training Institute, Community Disaster Preparedness
Tom Nix	Battalion Chief	CAL FIRE
Alison Talbott	Government Relations	Pacific Gas and Electric

3.5 COORDINATION WITH OTHER AGENCIES

Opportunities for involvement in the planning process must be provided to neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (44 CFR, Section 201.6(b)(2)). This task was accomplished by the planning team as follows:

- **Steering Committee Involvement**—Agency representatives were invited to participate on the Steering Committee.
- **Agency Notification**—The following agencies were invited to participate in the plan development from the beginning and were kept apprised of plan development milestones:
  - FEMA Region IX
  - Federal Bureau of Land Management
  - California Emergency Management Agency (CalEMA)
  - California Department of Water Resources
  - California Energy Commission
  - California Department of Forestry and Fire Protection (CAL FIRE)
  - Red Cross.

These agencies were informed of the availability of meeting announcements, meeting agendas and meeting minutes on the hazard mitigation plan website. They supported the effort by attending meetings or providing feedback on issues.

– **Pre-Adoption Review**—All the agencies listed above were provided an opportunity to review and comment on this plan, primarily through the hazard mitigation plan website (see Section 3.8). Each agency was sent an e-mail message informing them that draft portions of the plan were available for review. In addition, the complete draft plan was sent to CalEMA for a pre-adoption review to ensure program compliance.

3.6 DEFINING THE PLANNING AREA

The planning area was defined to consist of all of the Humboldt Operational Area. All partners to this plan have jurisdictional authority within this planning area.

3.7 REVIEW OF EXISTING PROGRAMS

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports and technical information (44 CFR, Section 201.6(b)(3)). Chapter 6 of this plan provides a review of laws and ordinances in effect within the planning area that can affect hazard mitigation initiatives. In addition, the following programs can affect mitigation within the planning area:

- Humboldt Operational Area Emergency Response Plan—This is an emergency support function-based plan that directs emergency response actions in the planning area
- Humboldt County General Plan: Comprehensive update, March 19, 2012 draft—This plan directs land use policy in Humboldt County
- RePower Humboldt; A Strategic Plan for Renewable Energy Security and Prosperity (summer 2012 draft)
- Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Assessment (January 2013)
- Humboldt Bay Region Sea Level Rise Data Synthesis, Humboldt County, California; Executive Summary
- Humboldt County Community Wildfire Protection Plan, Approved by the Board of Supervisors May 28, 2013.

An assessment of all planning partners' regulatory, technical and financial capabilities to implement hazard mitigation initiatives is presented in Chapter 19 and in the individual jurisdiction-specific annexes in Volume 2. Many of these relevant plans, studies and regulations are cited in the capability assessment.

3.8 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)).

3.8.1 Strategy

The strategy for involving the public in this plan emphasized the following elements:

- Include members of the public on the Steering Committee.

- Use a questionnaire to determine the public's perception of hazard risks, assess what steps are being taken to enhance emergency preparedness, identify support for specific types of hazard mitigation projects, and evaluate whether these trends have changed since the initial planning process.
- Attempt to reach as many planning area citizens as possible using multiple media.
- Identify and involve planning area stakeholders.

Stakeholders and the Steering Committee

Stakeholders are the individuals, agencies and jurisdictions that have a vested interest in the recommendations of the hazard mitigation plan, including planning partners. The effort to include stakeholders in this plan update included stakeholder participation on the Steering Committee. All members of the Steering Committee live or work within the planning area. Stakeholder interests represented on the Steering Committee include the following:

- Tribal—Blue Lake Rancheria
- Academia—Humboldt State University
- Utilities—Pacifica Gas and Electric, Humboldt Bay Municipal Water District
- State Agencies—CAL FIRE
- Planning Partners.

The Steering Committee met throughout the course of the plan's development. All Steering Committee meetings were open to the public, and agendas and meeting notes were posted to the hazard mitigation plan website. Protocols for handling public comments were established in the ground rules developed by the Steering Committee.

Questionnaire

A hazard mitigation plan questionnaire was developed by the planning team with guidance from the Steering Committee (see Figure 3-1). The questionnaire was used to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. This questionnaire was designed to help identify areas vulnerable to one or more natural hazards. The answers to its 39 questions helped guide the Steering Committee in selecting goals, objectives and mitigation strategies. The principle distribution of the survey was via the internet. A web link to the survey was posted on the hazard mitigation plan website and was advertised by multiple press releases.

One thousand pocket business cards (see Figure 3-2) that advertised the survey and public meeting schedule were distributed throughout the planning area. All planning partners were provided these cards to pass out in their areas. Hard copies of the survey were made available at the public meetings as well as other venues, such as farmer's markets and safety fairs. Over 1,000 questionnaires were completed. The complete questionnaire and a summary of its findings can be found in Appendix C of this volume.

Humboldt County Survey: Hazard Mitigation Planning

1. Survey Introduction

A partnership of local governments and other stakeholders in Humboldt County is working together to update the Humboldt County Operational Area Hazard Mitigation Plan. This plan was created in 2007 in response to Federal programs that enable the partnership to use pre- and post-disaster financial assistance to reduce the exposure of County residents to risks associated with natural hazards.

In order to identify and plan for future natural disasters with an emphasis on identifying projects that will reduce/avoid future loss, we need your assistance. This questionnaire is designed to help us gage the level of knowledge local citizens already have about natural disaster issues and to find out from local residents about areas vulnerable to various types of natural disasters. The information you provide will help us coordinate activities and identify projects to reduce the risk of injury or damage to property from future hazard events.

The survey consists of 39 questions plus an opportunity for any additional comments at the end. The survey should take less than 10 minutes to complete and is anonymous. When you have finished the survey, please click "Done" on the final page.

The Humboldt County Hazard Mitigation Planning Partnership thanks you for taking the time to participate in this information-gathering process.

*1. Where in Humboldt County do you live?

- ALDERPOINT/BLOCKSBURG
- ARCATA
- AVENUE OF THE GIANTS (FRUITLAND RIDGE, HOLMES, MIRANDA, MYERS FLAT, PEPPERWOOD, PHILLIPSVILLE, REDCREST, SHIVELY, WEOTT)
- BAYSIDE
- BIG LAGOON
- BLUE LAKE
- BRICELAND
- BRIDGEVILLE/DINSMORE
- CARLOTTA/HYDESVILLE/ALTON/ROHNERVILLE
- CUTTEN
- EUREKA
- FORT SEWARD/MCCANN/EEL ROCK
- FERNBRIDGE
- FERNDALE
- FIELDBROOK/GLENDALE
- FIELDS LANDING/KING SALMON
- FORTUNA
- FRESHWATER
- GARBERVILLE/REDWAY/BENBOW
- HARRIS/PALO VERDE
- HOOPA
- KNEELAND
- KORBEL
- LOLETA/TABLE BLUFF
- MANILA/SAMOA/FAIRHAVEN
- MAPLE CREEK
- MCKINLEYVILLE
- ORICK
- ORLEANS
- PETROLIA/HONEYDEW
- RIO DELL
- SCOTIA/STAFFORD
- SHELTER COVE
- TRINIDAD
- WEITCHPEC
- WESTHAVEN
- WHITETHORN/ETTERSBURG
- WILLOW CREEK
- HOOPA RESERVATION
- YUROK RESERVATION
- Other (please specify)

Figure 3-1. Sample Page from Questionnaire Distributed to the Public

Figure 3-2. Pocket Business Card Advertising Public Meetings and Hazard Survey

Public Meetings

Open-house public meetings were held from 6:00 to 8:00 PM on Wednesday July 10, 2013, in Fortuna, and on Thursday July 11, 2013 in Arcata, (see Figure 3-3 through Figure 3-6). The meeting format allowed attendees to examine maps and handouts and have direct conversations with project staff. Reasons for planning and information generated for the risk assessment were shared with attendees via a PowerPoint presentation. Tables were set up for each primary hazard of concern. Stakeholder agencies such as NOAA, the Red Cross, Humboldt State University Regional Training Institute, the Sea Level Rise Adaptation Working Group, local fire protection services, and CAL FIRE were present to provide information on their interests that overlap hazard mitigation: tsunamis, earthquakes, the Community Wildfire Protection Plan, sea level rise, Firewise and CERT.

A HAZUS-MH workstation allowed citizens to see information on their property, including exposure to the identified hazards of concern. Participating property owners were given printouts of this information for their properties. This tool was effective in illustrating risk to the public. Planning partners and the planning team were present to answer questions. Each citizen attending the open houses was asked to complete a questionnaire, and each was given an opportunity to provide written comments to the Steering Committee. Local media outlets were informed of the open houses by a press release from the County.

Figure 3-3. Opening Statements at Public Open House in Fortuna

Figure 3-4. Citizens Learn About Risk at Public Open House in Arcata

Figure 3-5. Citizens View HAZUS Workstation at Arcata Open House

Figure 3-6. NOAA Representatives Providing Information on Tsunami

Press Releases

Three press releases were distributed over the course of the plan's development as key milestones were achieved and prior to each public meeting. The planning effort received the following press coverage:

- Article in the McKinleyville Reporter on March 12, 2013 (http://mckinleyvillepress.com/local-governments-planning-now-to-reduce-impacts-of-hazards-and-natural-disasters/).
- Radio interview on KMUD with Cybelle Immitt and Jay Parish on April 4, 2013 (http://www.kmud.org/programs-mainmenu-11/kmud-audio-archive)
- Both public open houses were recorded and edited into a broadcast that was replayed 25 times on Access Humboldt, public access television Channel 10, on a variety of days and times. The broadcast is also available on-line at http://archive.org/details/AH-humboldt_hazard_mitigation_planning .

Internet

At the beginning of the plan development process, a website was created to keep the public posted on plan development milestones and to solicit relevant input (see Figure 3-7):

http://co.humboldt.ca.us/natural-resources/hazardmitigation/

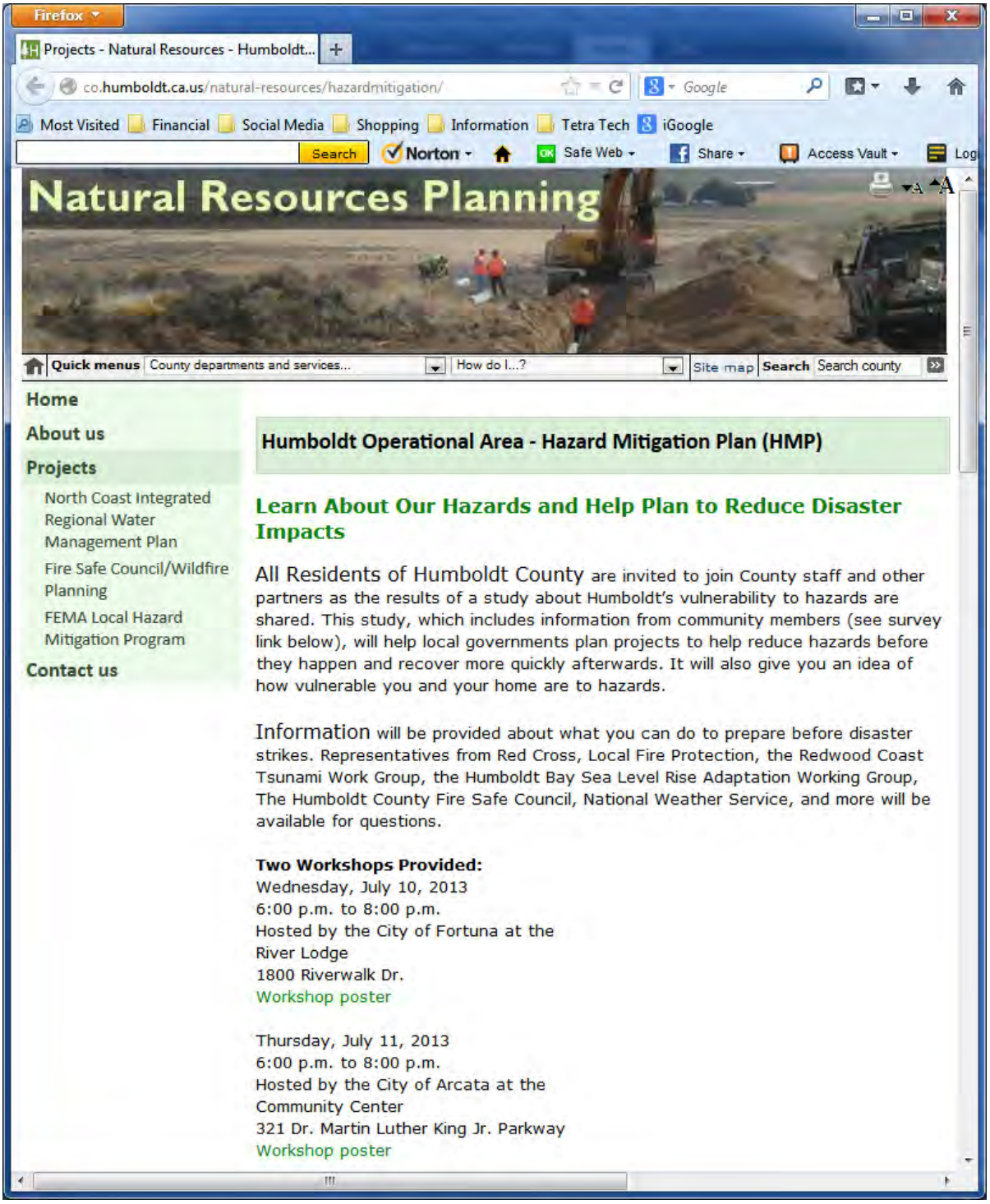


Figure 3-7. Sample Page from Hazard Mitigation Plan Web Site

The site's address was publicized in all press releases, mailings, questionnaires and public meetings. Information on the plan development process, the Steering Committee, the questionnaire and phased drafts of the plan was made available to the public on the site throughout the process. The County intends to keep a website active after the plan's completion to keep the public informed about successful mitigation projects and future plan updates.

3.8.2 Public Involvement Results

By engaging the public through the public involvement strategy, the concept of mitigation was introduced to the public, and the Steering Committee received feedback that was used in developing the components of the plan. Details of attendance and comments received are summarized in Table 3-4.

3.9 PLAN DEVELOPMENT CHRONOLOGY/MILESTONES

Table 3-5 summarizes important milestones in the development of the plan.

TABLE 3-4.
SUMMARY OF PUBLIC MEETINGS

Date	Location	Number of Citizens in Attendance	Number of Comments Received	Number of Questionnaires Received
July 10, 2013	Fortuna, CA	19	3	7
July 11, 2013	Arcata, CA	17	3	5
Total		**36**	**6**	**12**

TABLE 3-5.
PLAN DEVELOPMENT MILESTONES

Date	Event	Description	Attendance
2012			
8/15	Initiate Consultant Procurement	Seek a planning expert to facilitate the process	N/A
9/26	Select Tetra Tech to Facilitate Plan Development	Facilitation contractor secured	N/A
11/15	Identify Planning Team	Formation of the planning team	N/A
12/3	Planning Partner Kickoff Meeting	Initial meeting with potential planning partners. Attendees were advised of planning partner expectations and asked to formally commit to the process. Steering Committee volunteers were solicited. Group was also introduced to the energy assurance planning concept.	34
2013			
1/11	Planning Partnership Finalized	Deadline for submittal of letters of intent to participate in the planning effort	N/A
1/25	Steering Committee Formed	Steering Committee formalized. The planning team received commitments from 14 members, finalizing the formation of the Steering Committee.	N/A
2/6	Steering Committee Meeting #1	• Review purposes for update • Organize Steering Committee • Review/revise Steering Committee ground rules • Plan review • Evaluate action plan progress • Develop public involvement strategy	27
2/15	Public Outreach	Hazard mitigation plan website is updated to include information on the plan update.	N/A
3/1	Public Outreach	1st press release distributed to all Humboldt County media outlets, advertising the plan update process and the hazard mitigation plan website	N/A
3/6	Steering Committee Meeting #2	• Risk assessment update • Plan review observations • Guiding principal, goals and objectives • Critical facilities • Public outreach	20
3/12	Public Outreach	Press coverage in the McKinleyville Reporter on the plan update in response to the 1st press release	N/A
4/3	Steering Committee Meeting #3	• Risk assessment update • Hazards of concern • Critical facilities • Public outreach • Next steps	20
4/4	Public Outreach	Radio coverage on plan update on KMUD	N/A

TABLE 3-5.
PLAN DEVELOPMENT MILESTONES

Date	Event	Description	Attendance
5/1	Steering Committee Meeting # 4	• Risk assessment update • Approve critical facilities inventory • Review progress report • Review plan maintenance strategy • Public outreach	17
5/22	Public Outreach	2nd press release distributed to all Humboldt County media outlets, advertising the hazard mitigation plan website and survey	N/A
6/5	Steering Committee Meeting #5	• Risk assessment update • Preview maps • What to do about earthquake • The energy assurance plan • Survey status • Public meeting preparation • Miscellaneous updates	9
6/26	Public Outreach	3rd press release distributed to all Humboldt County media outlets, advertising the public open house schedule and meeting locations	N/A
7/10	Public Outreach (Phase 1)	1st public open house held in Fortuna from 6:00 to 8:00 PM	—
7/11	Public Outreach (Phase 1)	2nd public open house held in Arcata from 6:00 to 8:00 PM	—
8/6	Jurisdictional Annex Workshops (Round 1)	Mandatory session for planning partners. Workshop focused on how to complete the jurisdictional annex template. Two sessions were held—one for municipal governments and one for special purpose districts.	24
8/7	Jurisdictional Annex Workshops (Round 2)	Mandatory session for planning partners. Workshop focused on how to complete the jurisdictional annex template. One session was held for both municipal governments and special purpose district planning partners.	12
9/4	Steering Committee Meeting #6	• Status report • Finalize plan maintenance strategy • Identify countywide actions • Review portions of the plan • Public outreach-Phase 2	18
9/20	Draft Plan	Internal review draft provided by planning team to Steering Committee	N/A

CHAPTER 4.
GUIDING PRINCIPLE, GOALS AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). The Steering Committee for this plan update enhanced the guiding principle, set of goals and measurable objectives identified in the initial plan. The planning components were validated by data from the preliminary risk assessment and the results of the public involvement strategy. The guiding principle, goals, objectives and actions in this plan all support each other. Goals were selected to support the guiding principle. Objectives were selected that met multiple goals. Actions were prioritized based on the action meeting multiple objectives.

4.1 GUIDING PRINCIPLE

A guiding principle focuses the range of objectives and actions to be considered. This is not a goal because it does not describe a hazard mitigation outcome, and it is broader than a hazard-specific objective. The guiding principle for the Humboldt Operational Area Hazard Mitigation Plan Update is as follows:

> "Through partnerships and careful planning, identify and reduce the vulnerability to hazards in order to protect the health, safety, quality of life, environment, and economy of the communities within the Humboldt Operational Area."

4.2 GOALS

The following are the mitigation goals for this plan:

1. Protect Health and Safety
2. Protect Property
3. Protect the Economy
4. Protect Quality of Life
5. Protect Environment
6. Promote Partnerships in Planning

The effectiveness of a mitigation strategy is assessed by determining how well these goals are achieved.

4.3 OBJECTIVES

Each selected objective meets multiple goals, serving as a stand-alone measurement of the effectiveness of a mitigation action, rather than as a subset of a goal. The objectives also are used to help establish priorities. The objectives are as follows:

1. Eliminate or minimize disruption of local government operations caused by hazards.
2. Increase resilience of (or protect and maintain) infrastructure and critical facilities.
3. Reduce hazard-related risks and vulnerability of the populations in Humboldt County.
4. Sustain reliable local emergency operations and facilities during and after a disaster.
5. Seek to enhance emergency response capabilities within the planning area.

6. Enhance understanding of hazards and the risk they pose through public education that emphasizes awareness, preparation, mitigation, response and recovery alternatives.
7. Continually improve understanding of the location and potential impacts of hazards that impact the planning area utilizing the best available data and science as it becomes available, and share this information with all stakeholders.
8. Establish a partnership among all levels of government and the business community to improve and implement methods to protect property.
9. Develop and implement hazard mitigation strategies that reduce losses to wildlife habitat and protect water supply and quality, while also reducing damage to development.
10. Integrate hazard identification information and mitigation policies into other planning-based processes that direct or impact land uses in the planning area.
11. Enhance building codes and their proper implementations so that new construction can withstand the impacts of hazards and lessen the impact of that development on the environment's ability to absorb the impact of hazards.
12. Seek to integrate and coordinate all phases of emergency management within the planning area.

PART 2 —
RISK ASSESSMENT

CHAPTER 5.
IDENTIFIED HAZARDS OF CONCERN AND RISK ASSESSMENT METHODOLOGY

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. It allows emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- Hazard identification—Use all available information to determine what types of disasters may affect a jurisdiction, how often they can occur, and their potential severity.
- Vulnerability identification—Determine the impact of natural hazard events on the people, property, environment, economy and lands of the region.
- Cost evaluation—Estimate the cost of potential damage or cost that can be avoided by mitigation.

The risk assessment for this hazard mitigation plan update evaluates the risk of natural hazards prevalent in the planning area and meets requirements of the DMA (44 CFR, Section 201.6(c)(2)).

5.1 IDENTIFIED HAZARDS OF CONCERN

For this plan, the Steering Committee considered the full range of natural hazards that could impact the planning area and then listed hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as information on the frequency, magnitude and costs associated with hazards that have impacted or could impact the planning area. Anecdotal information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, this plan addresses the following hazards of concern:

- Dam failure
- Drought
- Earthquake
- Flood
- Landslide
- Severe weather
- Tsunami
- Wildfire.

An additional chapter provides a profile of other hazards of concern, calling attention to hazards that may impact the planning area but whose risk is difficult to quantify due to a lack of data or well-established assessment parameters. This chapter provides a profile of these hazards but does not assess them to the same level of detail as the primary hazards of concern. These "other" hazards are not included in the risk ranking for this plan update.

5.2 CLIMATE CHANGE

Climate includes patterns of temperature, precipitation, humidity, wind and seasons. Climate plays a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. "Climate change" refers to changes in climatic patterns over a long period of time. It is generally perceived that climate change will have a measurable impact on the occurrence and severity of natural hazards around the world. Impacts include the following:

- Snow cover losses will continue, and declining snowpack will affect snow-dependent water supplies and stream flow levels around the world.
- The risk of drought and the frequency, intensity, and duration of heat waves are expected to increase.
- More extreme precipitation is likely, increasing the risk of flooding.
- The world's average temperature is expected to increase.

Climate change will affect communities in a variety of ways. Impacts could include an increased risk for extreme events such as drought, storms, flooding, and forest fires; more heat-related stress; and the spread of existing or new vector-born disease into a community. In many cases, communities are already facing these problems to some degree. Climate change changes the frequency, intensity, extent, and/or magnitude of the problems.

This hazard mitigation plan update addresses climate change as a secondary impact for each identified hazard of concern. Each chapter addressing one of the hazards of concern includes a section with a qualitative discussion on the probable impacts of climate change for that hazard. While many models are currently being developed to assess the potential impacts of climate change, there are currently none available to support hazard mitigation planning. As these models are developed in the future, this risk assessment may be enhanced to better measure these impacts.

5.3 METHODOLOGY

The risk assessments in Chapter 8 through Chapter 15 describe the risks associated with each identified hazard of concern. Each chapter describes the hazard, the planning area's vulnerabilities, and probable event scenarios. The following steps were used to define the risk of each hazard:

- Identify and profile each hazard—The following information is given for each hazard:
  - Geographic areas most affected by the hazard
  - Event frequency estimates
  - Severity estimates
  - Warning time likely to be available for response.
- Determine exposure to each hazard—Exposure was determined by overlaying hazard maps with an inventory of structures, facilities, and systems to determine which of them would be exposed to each hazard.
- Assess the vulnerability of exposed facilities—Vulnerability of exposed structures and infrastructure was determined by interpreting the probability of occurrence of each event and assessing structures, facilities, and systems that are exposed to each hazard. Tools such as GIS and FEMA's hazard-modeling program called HAZUS-MH were used to perform this assessment for the flood, dam failure and earthquake hazards. Outputs similar to those from HAZUS were generated for other hazards, using maps generated by the HAZUS program.

5.4 RISK ASSESSMENT TOOLS

5.4.1 Dam Failure, Earthquake and Flood—HAZUS-MH

Overview

In 1997, FEMA developed the standardized Hazards U.S., or HAZUS, model to estimate losses caused by earthquakes and identify areas that face the highest risk and potential for loss. HAZUS was later expanded into a multi-hazard methodology, HAZUS-MH, with new models for estimating potential losses from hurricanes and floods.

HAZUS-MH is a GIS-based software program used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facility, transportation and utility lifeline, and multiple models to estimate potential losses from natural disasters. The program maps and displays hazard data and the results of damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Levels of Detail for Evaluation

HAZUS-MH provides default data for inventory, vulnerability and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the planning area:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

Application for This Plan

The following methods were used to assess specific hazards for this plan:

- **Flood**—An updated inventory was used in place of the HAZUS-MH defaults for essential facilities. HAZUS-MH was used to create Humboldt County 100- and 500-year flood depth

grids integrating a 10-meter digital elevation model. A Level 1 HAZUS analysis estimated potential losses from both the 100- and 500-year flood events.

- **Dam Failure**—Dam failure inundation mapping for the planning area was collected where available. This data was imported into HAZUS-MH and a modified Level 2 analysis was run using the flood methodology described above.

- **Earthquake**—A Level 2 analysis was performed to assess earthquake risk and exposure. Earthquake scenario and probabilistic data prepared by the U.S. Geological Survey (USGS) were used for the analysis of this hazard. An updated inventory of essential facilities was used in place of the HAZUS-MH defaults. A modified version of the Washington State National Earthquake Hazard Reduction Program soils and liquefaction inventory was used. One scenario event and two probabilistic events were modeled:
  - The selected scenario events were a Magnitude-9.0 Cascadia Subduction zone earthquake, a Magnitude-7.2 event on the Trinidad fault, a Magnitude-6.5 event on the Ferndale fault and a Magnitude-5.6 event on the Punta Gorda/Cape Mendocino Fault.
  - The standard HAZUS analysis was run for the 100- and 500-year probabilistic events.

5.4.2 Tsunami—Modified HAZUS-MH

Although HAZUS-MH does not directly model tsunami damage, model inputs, including damage functions, may be changed to help assess the hazard. HAZUS-MH has been adapted by Tetra Tech to analyze the tsunami hazard. Damage functions from coastal storm surge models contained in HAZUS-MH were modified and applied to general building stock and critical facilities inventories. This level of analysis is considered to be Level 2 or higher.

To model the tsunami hazard, a tsunami hazard zone was created using state and local map data as well as reviewing historical events. Two procedures were used to analyze and model the potential damage due to tsunami. The first procedure involved identifying the exposure to the tsunami hazard. The second procedure involved altering the HAZUS-MH coastal flood model to develop loss estimates.

To analyze exposure, the tsunami hazard zones were overlaid with the HAZUS-MH inventory. Buildings in the hazard zones were then added. This is not a true loss estimate since it shows all buildings in the tsunami hazard zone.

FEMA has developed a methodology to model storm surge during a hurricane using HAZUS-MH. This methodology involves setting up a coastal flood scenario using the surge height as the 100-year still-water elevation. After running the analysis, the 100-year results show damage due to the storm surge. A similar methodology was used to model the tsunami loss. Tsunami heights taken from the hazard zones created by the planning team were input into the model as the incremental still-water elevations.

The tsunami damage functions are different from those of a typical coastal storm, but damage functions may be edited in HAZUS-MH. To edit the damage functions, the tsunami damage components were compared to those of a coastal flood. The tsunami damage function includes the following:

- Breaking wave forces—Breaking wave forces typically take place offshore with the exception of very steep beaches. Due to the beaches' physical characteristics derived from the elevation data, these forces were removed from consideration.
- Hydrostatic forces—Hydrostatic forces act on buildings during a tsunami.

- Buoyant forces—Buoyant forces act vertically through the center of mass of the displaced volume and are a major concern for wood frame buildings. This component needs to be captured for certain structures.
- Hydrodynamic forces—Hydrodynamic forces occur when steady water flows around a building. These forces are captured in the model's damage function but they need to be modified slightly. In the model's damage function, water deeper than 3 feet causes substantially more damage than water less than 3 feet. In a tsunami, there may be substantial damage below 3 feet, so this component was modified accordingly.
- Surge forces—Surge forces are caused by the leading edge of a surge of water.
- Impact forces—Impact forces are caused by debris impacting the structures. This component may be significant near piers and ports, where boats may behave as missile-like debris. HAZUS was used to identify the pier and port locations. A separate damage function was developed for census tracts near these locations.

These updated damage functions were applied to the asset inventory using typical HAZUS protocol to estimate damage costs.

5.4.3 Landslide, Severe Weather and Wildfire

For landslide, severe weather and wildfire, historical data was not adequate to model future losses. However, HAZUS-MH is able to map hazard areas and calculate exposures if geographic information is available on the locations of the hazards and inventory data. Areas and inventory susceptible to some of the hazards of concern were mapped and exposure was evaluated. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment. Locally relevant information was gathered from a variety of sources. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists and others. The primary data source was the Humboldt County GIS database, augmented with state and federal data sets. Additional data sources for specific hazards were as follows:

- **Landslide**—Data on landslide susceptibility was provided by the 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.
- **Severe Weather**—Temperature and precipitation data was provided by the National Water and Climatic Center's PRISM project. Wind data was provided by the National Renewable Energy Laboratory.
- **Wildfire**—Fire hazard severity zone data was provided by CAL FIRE. CAL FIRE mapped areas of significant fire hazards based on fuels, terrain, weather and other relevant factors.

5.4.4 Drought

The risk assessment methodologies used for this plan focus on damage to structures. Because drought does not impact structures, the risk assessment for drought was more limited and qualitative than the assessment for the other hazards of concern.

5.4.5 Limitations

Loss estimates, exposure assessments and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise

in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic or economic parameter data
- The unique nature, geographic extent and severity of each hazard
- Mitigation measures already employed
- The amount of advance notice residents have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. The results do not predict precise results and should be used only to understand relative risk. Over the long term, Humboldt County and its planning partners will collect additional data to assist in estimating potential losses associated with other hazards.

CHAPTER 6.
HUMBOLDT COUNTY PROFILE

Humboldt County is located on California's northern coast, bordered by Del Norte County on the north, Siskiyou County on the north and east, Trinity County on the east, and Mendocino County on the south (see Figure 6-1). It is the 35th most populous county in the state.

6.1 COMMUNITIES, LAND USE AND TRANSPORTATION

The major population centers in Humboldt County are the incorporated cities of Eureka, Arcata and Fortuna and the unincorporated McKinleyville community. Other incorporated cities are Rio Dell, Ferndale, Blue Lake and Trinidad. Eureka, along the coast in the center of the county, is the county seat. It lies at the north end of Humboldt Bay, which is the focal point of the County. The bay serves as the primary port and center of commerce, as well as a significant natural resource area, including the Humboldt Bay National Wildlife Area.

Humboldt County covers 2.3 million acres, 80 percent of which is forestlands, protected redwoods and recreation areas. The natural resources and scenic beauty of Humboldt County make it a popular tourist destination and attract permanent residents as well. The Coast Range dominates the landscape of much of the County, and includes the Eel, Van Duzen, Mattole, and Mad River drainages in the central and southern areas, and the Redwood Creek drainage in the northwest. In the northeast, the higher, steeper terrain of the Klamath Mountains province is drained by the Klamath and Trinity Rivers.

Thirty percent of Humboldt County is state or federal public lands, with major land holdings including Redwood National and State Parks in the north, Six Rivers National Forest in the east, King Range National Conservation Area along the south coast, and Humboldt Redwoods State Park along the Avenue of the Giants in the south central area.

Humboldt County typically leads the state in timber production. Agriculture and fishing are other important base industries. The extensive bottom-land floodplains of Humboldt Bay and the Eel River delta support the County's dairy industry. Humboldt Bay provides most of California's oyster production. Offshore of Cape Mendocino is an area of intensive ocean upwelling and rich marine productivity.

The southern border of the County is 225 miles north of San Francisco, the closest major metropolitan city. The County is linked by Coastal Highway 101 to the rest of California to the south and the Oregon Coast to the north. Highway 299 links the County to Interstate 5 to the east. The County's Arcata/Eureka airport in McKinleyville has daily flights to San Francisco, Sacramento, Portland and Seattle. Fog along the coastline for much of the year often delays passenger flights at the airport.

6.2 HISTORICAL OVERVIEW

Native Americans were the first residents of the Humboldt area. Multiple tribes occupied specific territories—the Wiyot, Yurok, Hupa, Karuk, Chilula, Whilkut, and the southern Athabascans, including the Mattole and Nongatl. These tribes spoke languages of several different stocks and had similar but different social and cultural structures.

Figure 6-1. Main Features of the Planning Area

The first record of European explorers in the Humboldt area was by the Spanish at Trinidad in 1775. The first entrance to Humboldt Bay was made by an American in 1806. The Gregg-Wood Party entered the region by land in December 1849. In 1850, ships entered Humboldt and Trinidad bays bringing explorers, generally from the United States, on their way to gold mining districts on the Klamath, Salmon and Trinity rivers. Eureka, Union (Arcata), and Trinidad were first settled as points of arrival and as supply centers for these interior mines. Douglas Ottinger and Hans Buhne named the bay Humboldt in honor of a naturalist and explorer. Humboldt County was established on May 12, 1853. The County seat, Eureka, was created on that same date. When the rush for gold subsided, the economy shifted to the region's premiere resources: trees, salmon and land.

The area's multi-cultural makeup was further established with the arrival of new groups from different cultures. The Chinese came first to mine on the Klamath and Salmon rivers, work in the fish canneries on lower Eel River, and later to build railroads. They were forcibly expelled in 1885. Americans and later Italians fished commercially on lower Eel River, the Italians acting as the buyers for San Francisco firms. Canadians from the Maritime Provinces, particularly Nova Scotia and New Brunswick, came to work in Humboldt's woods. William Carson developed logging and milling operations around the bay and recruited workers from his home in New Brunswick. People of Slavic origins came at the turn-of-the-century to work in Humboldt County's woods and mills. The French made homes in Blue Lake and Arcata, published newspapers, developed town sites, and opened restaurants. The interior prairies of the Bald Hills, Kneeland, Showers Pass, Bridgeville and the headwaters of the Van Duzen, Mad and North Fork Eel rivers were settled by Americans who ran cattle and sheep operations.

Up to and through the Second World War, this demographic and occupational structure prevailed; and the population and work remained fairly stable. The natural resources of the North Coast continued to provide livelihoods for most of Humboldt County's people. Large timber companies, such as Hammond, Northern Redwood Lumber Co., Pacific Lumber Company, and Dolbeer and Carson kept people employed. After the war, a new Douglas fir/plywood industry brought woods and mill workers from Oregon and Washington. Workers from Arkansas and Oklahoma found ready work. The town of Manila became a settlement of the new arrivals, many of whom brought home scrap wood from the mill at Samoa to build their houses. In 1947, Arcata was a lumber boom town with 30 mills in operation and more to come. Railroad shipments of lumber broke records year after year.

Timber dominated the economic and political life of the county well into the 1970s. By then, college students, back-to-the-land refugees, and environmentalists brought a new perspective to resource use. What had once been a totally resource-extractive economy became a more diverse economy that included education, health and social services, resource protection and restoration, and government. New groups of immigrants arrived, notably Hispanic workers and their families and refugees from countries impacted by the Vietnam War.

6.3 MAJOR PAST HAZARD EVENTS

Presidential disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. A presidential disaster declaration puts federal recovery programs into motion to help disaster victims, businesses and public entities. Some of the programs are matched by state programs. Humboldt County has experienced 29 hazard events since 1954 for which presidential disaster declarations were issued. These events are listed in Table 6-1. Review of these events helps identify targets for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. Still, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for hazards of concern.

TABLE 6-1.
PRESIDENTIAL DISASTER DECLARATIONS FOR HAZARD EVENTS IN THE PLANNING AREA

Event Description	Disaster Declaration #	Event Start Date
Flood & Erosion[a]	15	2/5/1954
Flood[a]	47	12/23/1955
Forest Fire[a]	65	12/29/1956
Heavy Rainstorms & Flood[a]	82	4/4/1958
Fire (Los Angeles County)[a]	119	11/16/1961
Floods[a]	122	3/6/1962
Severe Storms & Flooding[a]	138	10/24/1962
Severe Storms, Heavy Rains & Flooding[a]	145	2/25/1963
Flood Due to Broken Dam[a]	161	12/21/1963
Seismic Sea Wave[a]	169	4/1/1964
Heavy Rains & Flooding	183	12/24/1964
Severe Storms & Flooding	212	1/22/1966
Severe Storms & Flooding	253	1/26/1969
Severe Storms & Flooding	329	4/5/1972
Severe Storms & Flooding	412	1/25/1974
Severe Storms, Flood, Mudslides & High Tide	651	12/19/1981
Coastal Storms, Floods, Slides & Tornadoes	677	1/21/1983
Severe Storms & Flooding	758	2/12/1986
Earthquake & Aftershocks	943	4/25/1992
Severe Winter Storm, Mud & Land Slides, & Flooding	979	1/5/1993
The El Nino (The Salmon Industry)	1038	5/1/1994
Severe Winter Storms, Flooding, Landslides, Mud Flows	1044	1/3/1995
Severe Winter Storms, Flooding Landslides, Mud Flow	1046	2/13/1995
Severe Storms, Flooding, Mud and Landslides	1155	12/28/1996
Severe Winter Storms, and Flooding	1203	2/2/1998
Severe Storms, Flooding, Mudslides, And Landslides	1628	12/17/2005
California Wildfires	3140	8/24/1999
Hurricane Katrina Evacuation	3248	8/29/2005
Wildfires	3287	6/20/2008

a. Declarations prior to 1964 are California-statewide, not Humboldt County specific; FEMA did not begin distinguishing declarations by county until 1964.

Source: FEMA 2012

6.4 PHYSICAL SETTING

6.4.1 Geology

The bedrock geology of the County is divided generally into two provinces: the Klamath Mountains province in the northeast, and the Coast Ranges province in the central and southwest portion of the County. The dividing line between the two provinces is the South Fork Mountain Ridge, which separates the Trinity River basin from the Mad River and Redwood Creek drainages.

The bedrock geology is poorly mapped in much of the county, particularly the inland areas. Lack of detailed mapping in most cases precludes determining specific site stability without a site investigation. However, it may be valid to conclude varying degrees of relative risk based on general mapping of rock units when averaged over time.

Coast Ranges

The Coast Ranges province is the dominant geologic province in the county, trending northwest and drained by the Mad, Eel, and Mattole River drainages. The Franciscan and Yager complexes dominate inland, with sand and other alluvial deposits dominating in the lower reaches of the river basins and the area surrounding Humboldt Bay:

- The Franciscan complex can be divided into two units:
  - Franciscan sandstone consists mainly of sandstone and siltstone. Although this sandstone unit is frequently sheared, there is little evidence of massive rock deformation. Slopes are fairly stable, but subject to debris sliding along steep river banks and in steep headwater drainages.
  - Franciscan mélange consists of a rubble of sheared sandstone and siltstone with blocks of volcanic rock, chert, and schist. Mélange terrain is generally unstable and characterized by rolling hummocky slopes that are highly susceptible to mass movement.
- The Yager formation is predominantly shale and sandstone. Local shearing occurs, but in general the formation is much less deformed and more stable than the Franciscan. However, it is subject to debris slides on steep slopes and river banks.
- In the lower reaches of the river basins and in the area surrounding Humboldt Bay, alluvial sediments dominate. These unconsolidated-to-partially-consolidated sediments have been mildly folded and faulted, but when forested or gently sloped, are generally stable.

Klamath Mountains

The Klamath Mountains province is an area of high alpine peaks, some attaining elevations of 8,000 feet and more, east of the Humboldt County line. The province is drained by the Klamath and Trinity Rivers, and farther north by the Smith River. Rocks in the Klamath Mountains province are generally older than those in the Coast Ranges. Rocks of sedimentary origin such as sandstone, chert, slate and schist occur abundantly, with occasional granite intrusions.

6.4.2 Soils

Agricultural Soils

Some of the more abundant agricultural and lowland soils in Humboldt County are the Ferndale series, a deep, well-drained soil formed on recent floodplains; the Bayside and the Loleta series, both deep, poorly drained soils found in depressed areas or on nearly level alluvial fans; and the Rohnerville, Carlotta and Hookton soils series, all moderately well-drained soils. Rohnerville soils are found on relatively flat, high

marine terraces. The Hookton soils are on sloping, dissected marine terraces and the Carlotta soils are found on flat, low-lying terraces. Most of these agricultural soils are rated 80 to 100 in the Storie Index of Agricultural Productivity (good to excellent productivity), except the Bayside soils where drainage problems may reduce agricultural potential.

Forest Soils

The forest soils of the County are, in general, medium textured, acidic, and generally increasing in acidity with depth. They are permeable and well drained. In the lowlands they are formed on alluvial floodplains or low-lying terraces. Here they are either unclassified or of the Carlotta and Ferndale groups. The most superlative old growth redwood groves are found on these soils.

Grassland Soils

The general characteristics of grassland soils range from shallow loamy soils to deep clay soils. Their permeability ranges from moderate to slow. The general nutrient level of these grassland soils is higher than that of the adjacent forest soils. The major portion of these soils is intermingled with other soils in the Douglas fir zone beyond the fog belt. Some of these soils are formed on Franciscan parent material. Many of these are found in the shear zone or fault gouge material or on the mélange material of the Franciscan. This parent material weathers rapidly, forming a grey-blue clay subsoil (commonly called “blue goo”) that tends to slip when wet. Thus, because of the parent material, these soils are found in landslide topography.

Woodland Soils

Most of the woodland soils are inland beyond the cool, foggy belt. They are intermingled with the conifer forest soils of the Douglas fir belt and the adjacent grassland soils. These are shallow soils, usually well drained, but permeability may be slow in some locations. The natural nutrient level of these soils tends to be somewhat higher than for the neighboring forest soils. Because the parent material is predominantly Franciscan mélange, one should expect these soils to be relatively unstable.

6.4.3 Climate

The location of Humboldt County is such that climatic elements produce a marine-type climate on the coast, while inland the climate has both continental and marine characteristics. The coastal area has a cool, stable temperature regime. With distance from the ocean, the marine influence becomes less pronounced, and inland areas experience wider variations of temperature. Two factors affect the climate:

- **Mountain ranges**—The coastal mountains affect rainfall. The first major release of rain occurs along the coast, and the second is along the west slopes of the Klamath Mountains.
- **Location and intensity of semi-permanent pressure areas over the Pacific Ocean**—During summer and fall, circulation of air around a high-pressure area over the North Pacific brings a prevailing flow of comparatively dry, cool and stable air into the Pacific Northwest. As the air moves inland, it becomes warmer and drier, resulting in a dry season. In winter and spring, the high pressure is further south and low pressure prevails in the Northeast Pacific. Circulation of air around both pressure centers brings a prevailing flow of mild, moist air into the Pacific Northwest. Condensation occurs as the air moves inland over the cooler land and rises on the slopes of the mountains. This results in a wet season beginning in late October or November, reaching a peak in winter, and gradually decreasing by late spring.

On the coast, summers are cool and relatively dry while winters are mild, wet and generally cloudy. About 90 percent of the total rain falls from October through April. During the wet season, rainfall is usually of light to moderate intensity and continuous over a long period rather than occurring in heavy

downpours for brief periods; heavier intensities occur along the windward slopes of the mountains. Because of the moisture and moderate temperature, the average relative humidity is high. Fog is also present along the coastline for much of the year.

Measurable rainfall occurs on 118 days each year at Humboldt Bay and on 190 days in the mountains. Thunderstorms occur up to 10 days each year over the lower elevations and up to 15 days in the mountainous regions. Damaging hailstorms rarely occur in Northern California. During July and August, the driest months, two to four weeks can pass with only a few showers; however, in December and January, the wettest months, precipitation is frequently recorded on 20 to 25 days or more each month. The range in annual precipitation is from about 38 inches along Humboldt Bay to 100 inches along the southern Humboldt Coast. The mountainous interior of Humboldt County averages close to 90 inches of rain per year. Snowfall is light in the lower elevations and heavier in the mountains.

Temperatures along the coast vary only 10º from summer to winter, although a greater range is found over inland areas. Temperatures of 32ºF 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 80ºF on the coast, while readings over 100ºF occur frequently in the mountain valleys. July mean maximum readings are in the 60s in the area 15 to 30 miles wide along the coast.

The strongest winds are generally from the south or southwest and occur during the winter and spring. In interior valleys, wind velocities reach 40 to 50 mph each winter, and 75 to 90 mph a few times every 50 years. The highest summer and lowest winter temperatures generally occur during periods of easterly winds. During most of the year, the prevailing wind is from the southwest or west. The frequency of northeasterly winds is greatest in the fall and winter. Wind velocities ranging from five to 10 knots can be expected 60 to 80 percent of the time; 10 to 15 knots, 30 to 45 percent of the time; and 20 knots or higher, two to 15 percent of the time. The highest wind velocities are from the southwest or west and are frequently associated with rapidly moving weather systems. Extreme wind velocities on the coast generally reach 50 mph at least once in two years; 60 to 70 mph once in 50 years; and 80 mph once in 100 years. The highest wind gust recorded in Eureka was 69 mph on Jan 31, 1981.

6.5 CRITICAL FACILITIES AND INFRASTRUCTURE

Critical facilities and infrastructure are those that are essential to the health and welfare of the population. Critical facilities typically include police and fire stations, schools and emergency operations centers. Critical infrastructure includes roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need, and the utilities that provide water, electricity and communication to the community. Also included are “Tier II” facilities and railroads, which hold or carry significant amounts of hazardous materials (Hazmat) with a potential to impact public health and welfare in a hazard event.

For this hazard mitigation plan update, a critical facility is defined as infrastructure or a facility that is critical to the health and welfare of the population. These become especially important after any hazard/natural disaster event occurs. Critical facilities include the following:

- Essential Facilities:
  - **Medical and Shelter Facilities and Vulnerable Populations—**Facilities likely to be used as a sheltering or community assembly location, and structures likely to contain occupants who may not be sufficiently mobile to avoid death or injury during and after a hazard/natural disaster event, including but not limited to: hospitals, schools, skilled nursing facilities, board and care homes, pharmacies, clinics, fairgrounds, community centers, ambulance services, and veterinary hospitals.

- **Emergency Response—**Facilities and emergency operations centers that are needed for response and recovery activities before, during, and after a hazard/natural disaster event, including but not limited to: police stations, fire stations, local, state and federal vehicle and equipment storage facilities, and emergency response staging sites.
- **Utility Services—**Public and private utility facilities that are vital to maintaining or restoring normal services to impacted areas before, during, and after a hazard/natural disaster event, including but not limited to: primary and secondary transportation infrastructure, municipal water pumps and wells, water treatment plants, water storage, sewage treatment facilities, lift stations, water and sewer mainlines, substations, electric power generating infrastructure, gas transmission infrastructure, telecommunications, repeater stations, radio stations and towers, fuel storage facilities, aviation control towers, standby power-generating equipment, and grocery stores.
- **Levees—**Levees are soil embankments situated along the bank or shoreline of a waterway (river, creek, slough, or bay) to prevent or limit flooding impacts on the adjacent floodplain. Levees may be engineered structures or un-engineered fills. The level of flood protection varies from levee to levee due to capacity, quality of design and construction, aging and deterioration, history of flood damage, and level of maintenance. The consequences of a levee failure can be severe due to the sudden and unpredictable distribution of water and/or debris to the land and structures behind the levee.

• Hazardous Facilities:

- **Major Dams**
- **Risk Management Plan Hazardous Material Sites**—These sites include but are not limited to facilities that use or store acutely hazardous materials as defined by California Code of Regulations Title 19, Division 2, Chapter 4.5, Section 2770.5.
- **Additional Hazmat Sites**—Additional hazmat sites may include nuclear material storage sites, retail and wholesale fuel facilities, hazardous materials yards, and pulp mills.

Maps 6-1 and 6-2 show the locations of critical facilities and infrastructure in Humboldt County. Critical facilities within the cities participating in this plan are shown in maps for each city provided in Volume 2 of the plan. Due to the sensitivity of this information, a detailed list of facilities is not provided. The list is on file with each planning partner. Table 6-2 and Table 6-3 provide summaries of the general types of critical facilities and infrastructure, respectively, in each municipality and unincorporated county areas. All critical facilities/infrastructure were analyzed in HAZUS to help rank risk and identify mitigation actions. The risk assessment for each hazard qualitatively discusses critical facilities with regard to that hazard.

TABLE 6-2.
CRITICAL FACILITIES BY JURISDICTION AND CATEGORY

Jurisdiction	Medical and Health Services	Government Function[a]	Protective Function[b]	Schools	Societal Function[c]	Hazmat	Other Critical Function[d]	**Total**
Arcata	8	1	3	28	19	4	2	65
Blue Lake	1	1	2	2	2	0	0	8
Eureka	28	9	8	37	43	3	24	152
Ferndale	2	1	2	2	0	0	2	9
Fortuna	8	1	6	14	7	1	0	37
Rio Dell	0	1	2	3	2	1	1	10
Trinidad	0	1	2	2	2	0	1	8
Unincorporated County	33	5	83	121	57	24	60	**383**
Total	**80**	**20**	**108**	**209**	**132**	**33**	**90**	**672**

a. Government functions are those associated with continuity of operations at the federal, state or local level.
b. Protective functions are those associated with protecting the public and include police, fire and ambulance.
c. Societal functions include facilities that aid society in dealing with the impacts of natural disasters. This inventory includes mainly food stores and major goods and services providers.
d. Other critical functions include all of those facilities that have been identified to provide critical functions, but do not fit into an assigned category. These include parks, campgrounds, fairgrounds, etc.

TABLE 6-3.
CRITICAL INFRASTRUCTURE BY JURISDICTION AND CATEGORY

Jurisdiction	Water Supply	Water Storage	Waste Water	Power	Fuel storage	Communications	Bridges	**Total**
Arcata	2	0	1	1	8	0	15	**27**
Blue Lake	0	0	1	0	1	0	1	**3**
Eureka	1	4	3	1	20	2	9	**40**
Ferndale	0	0	0	0	0	1	0	**1**
Fortuna	0	0	1	0	8	0	4	**13**
Rio Dell	0	1	1	1	1	0	7	**11**
Trinidad	0	1	0	0	1	0	1	**3**
Unincorporated County	6	75	9	13	36	9	174	**322**
Total	**9**	**81**	**16**	**16**	**75**	**12**	**211**	**420**

6.6 DEMOGRAPHICS

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. Elderly people, for example, may be more likely to require additional assistance. Research has shown that people living near or below the poverty line, the elderly (especially older single men), the disabled, women, children, ethnic minorities and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members would assist the County in extending focused public outreach and education to these most vulnerable citizens.

6.6.1 Population Characteristics

Knowledge of the composition of the population and how it has changed in the past and how it may change in the future is needed for making informed decisions about planning for the future. Information about population is a critical part of planning because it directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. Humboldt County is the 35th largest of California's 58 counties. The California Department of Finance estimated the county's population at 134,923 as of July 2012 (California Department of Finance, 2012a).

Population changes are useful socio-economic indicators. A growing population generally indicates a growing economy, while a decreasing population signifies economic decline. Figure 6-2 shows the population growth trends in Humboldt County from 1900 to 2000 compared to that of the State of California (California Department of Finance, 2012b). The state and county both experienced 10-year growth rates of about 50 percent in the 1940s and 1950s. Since then, the County has seen much lower growth rates, of less than 10 percent per decade (including a 5-percent decline from 1960 to 1970), and the state growth rate has gradually declined to about 10 percent over the 10-year period from 2000 to 2010.

Table 6-4 shows the population of incorporated municipalities and the combined unincorporated areas in Humboldt County from 1990 to 2012. The portion of the planning area's residents living outside incorporated areas has been relatively constant over that period, changing from 52 percent in 1990 to 53 percent in 2012. Overall growth in unincorporated areas was 15 percent from 1990 to 2012, while the incorporated areas of the county grew about 10 percent during the same timeframe.

6.6.2 Income

In the United States, individual households are expected to use private resources to prepare for, respond to and recover from disasters to some extent. This means that households living in poverty are automatically disadvantaged when confronting hazards. Additionally, the poor typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in earthquakes and floods than other types of housing. In urban areas, the poor often live in older houses and apartment complexes, which are more likely to be made of un-reinforced masonry, a building type that is particularly susceptible to damage during earthquakes. Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level have a great deal to lose during an event and are the least prepared to deal with potential losses. The events following Hurricane Katrina in 2005 illustrated that personal household economics significantly impact people's decisions on evacuation. Individuals who cannot afford gas for their cars will likely decide not to evacuate.

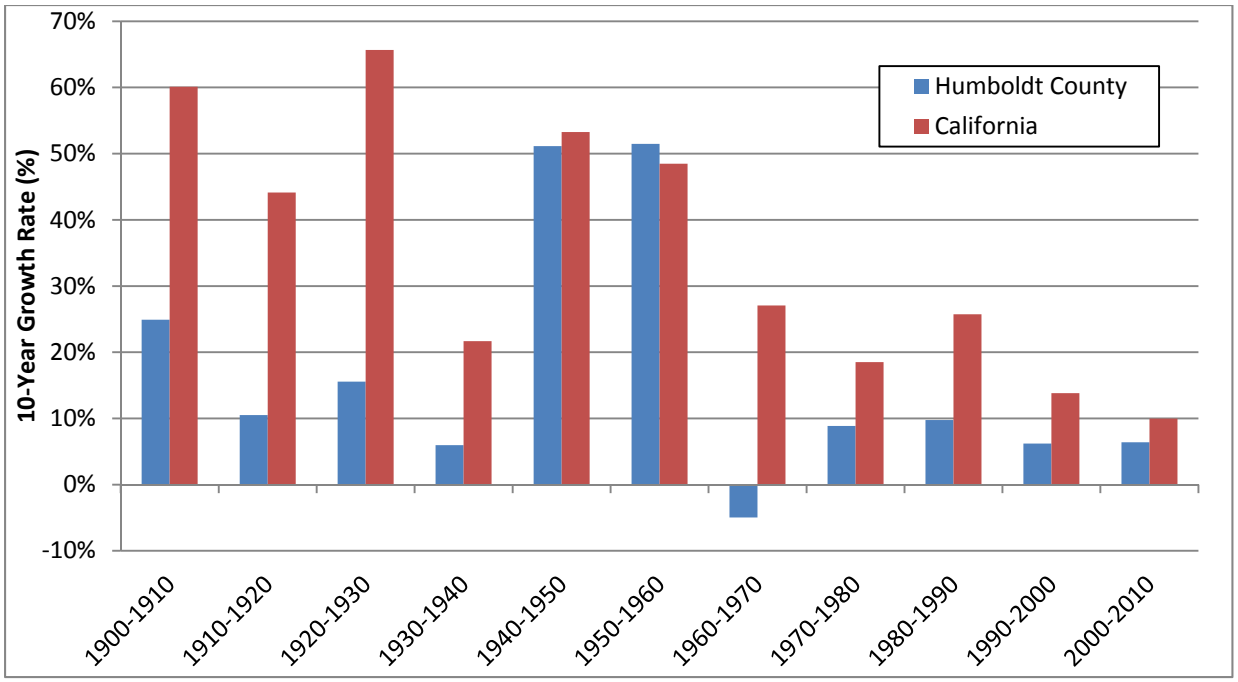


Figure 6-2. California and Humboldt County Population Growth Rates

TABLE 6-4.
ANNUAL POPULATION DATA

	Population[a]				
	April 1, 1990	April 1, 2000	April 1, 2010	January 1, 2011	January 1, 2012
Arcata	15,197	16,651	17,231	17,681	17,752
Blue Lake	1,235	1,135	1,253	1,254	1,255
Eureka	27,025	26,128	27,191	27,034	26,960
Ferndale	1,331	1,382	1,371	1,362	1,362
Fortuna	8,788	10,497	11,926	11,871	11,840
Rio Dell	3,012	3,174	3,368	3,351	3,344
Trinidad	362	311	367	365	364
Unincorporated	62,168	67,240	71,916	71,667	71,710
Humboldt County Total	**119,118**	**126,518**	**134,623**	**134,585**	**134,587**

a. 1990 - 2010 data from California Department of Finance, 2012b; 2011, 2012 data from California Department of Finance, 2012c

Based on U.S. Census Bureau estimates, per capita income in the planning area in 2011 was $22,840 and the median household income was $39,527. It is estimated that about 17.8 percent of households in the planning area received an income above $100,000 in 2011 and 31.3 percent of the households make less than $25,000 per year. An estimated 11.9 percent of planning area families were below the poverty level in 2011, including 19 percent of families with children under 18 years old.

6.6.3 Age Distribution

As a group, the elderly are more apt to lack the physical and economic resources necessary for response to hazard events and are more likely to suffer health-related consequences making recovery slower. They are more likely to be vision, hearing, and/or mobility impaired, and more likely to experience mental impairment or dementia. Additionally, the elderly are more likely to live in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. These facilities are typically identified as "critical facilities" by emergency managers because they require extra notice to implement evacuation. Elderly residents living in their own homes may have more difficulty evacuating their homes and could be stranded in dangerous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to isolation caused by the event. Specific planning attention for the elderly is an important consideration given the current aging of the American population.

Children under 14 are particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards.

The overall age distribution for the planning area is illustrated in Figure 6-3. Based on U.S. Census data estimates, 13.2 percent of the planning area's population is 65 or older. According to U.S. Census data, 6.9 percent of the County's over-65 population have incomes below the poverty line. It is estimated that 16.4 percent of the County's population is 14 or younger and that children under 18 account for nearly 22.2 percent of individuals who are below the poverty line.

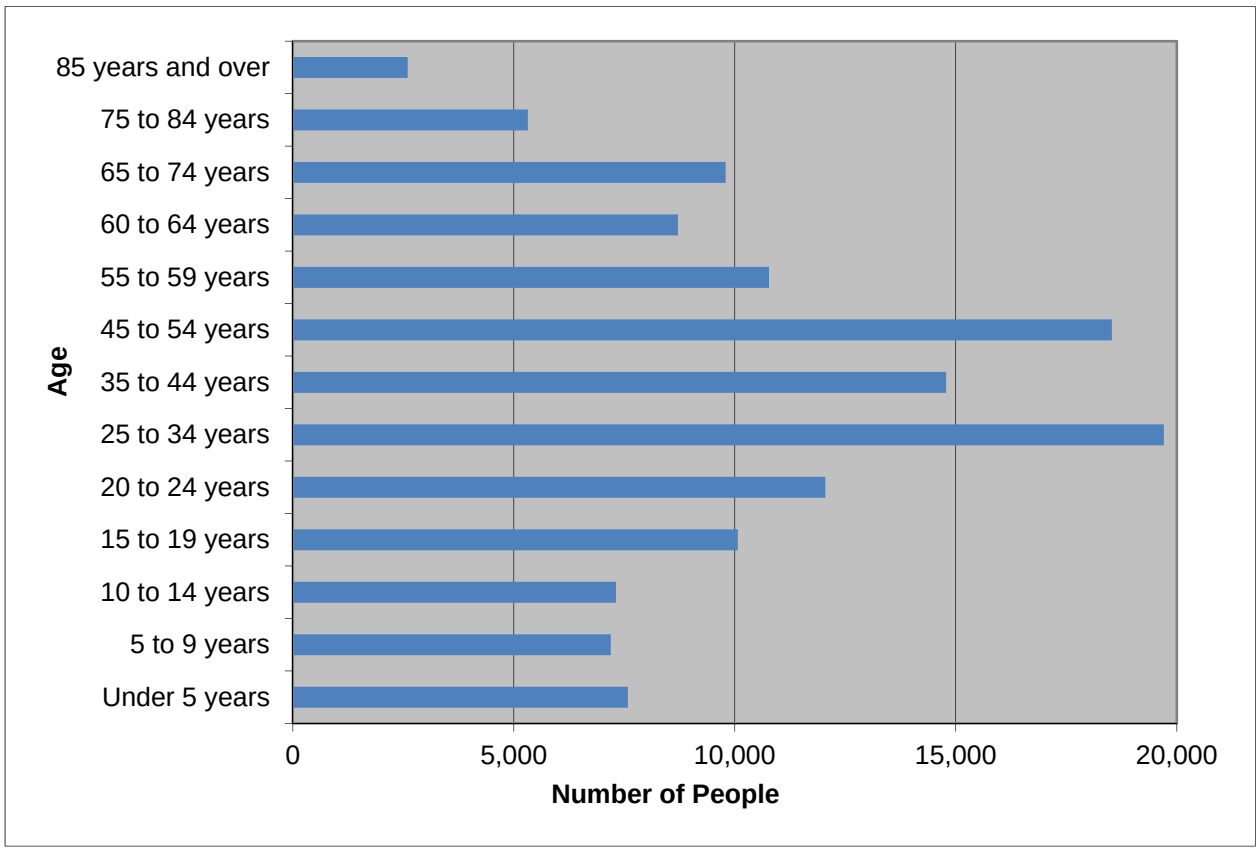


Figure 6-3. Planning Area Age Distribution

6.6.4 Race, Ethnicity and Language

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event. Post-disaster recovery can be ineffective and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability. According to the U.S. Census, the racial composition of the planning area is predominantly white, at about 83 percent. The largest minority populations are American Indian at 6.2 percent and Asian at 2.3 percent. Figure 6-4 shows the racial distribution in the planning area.

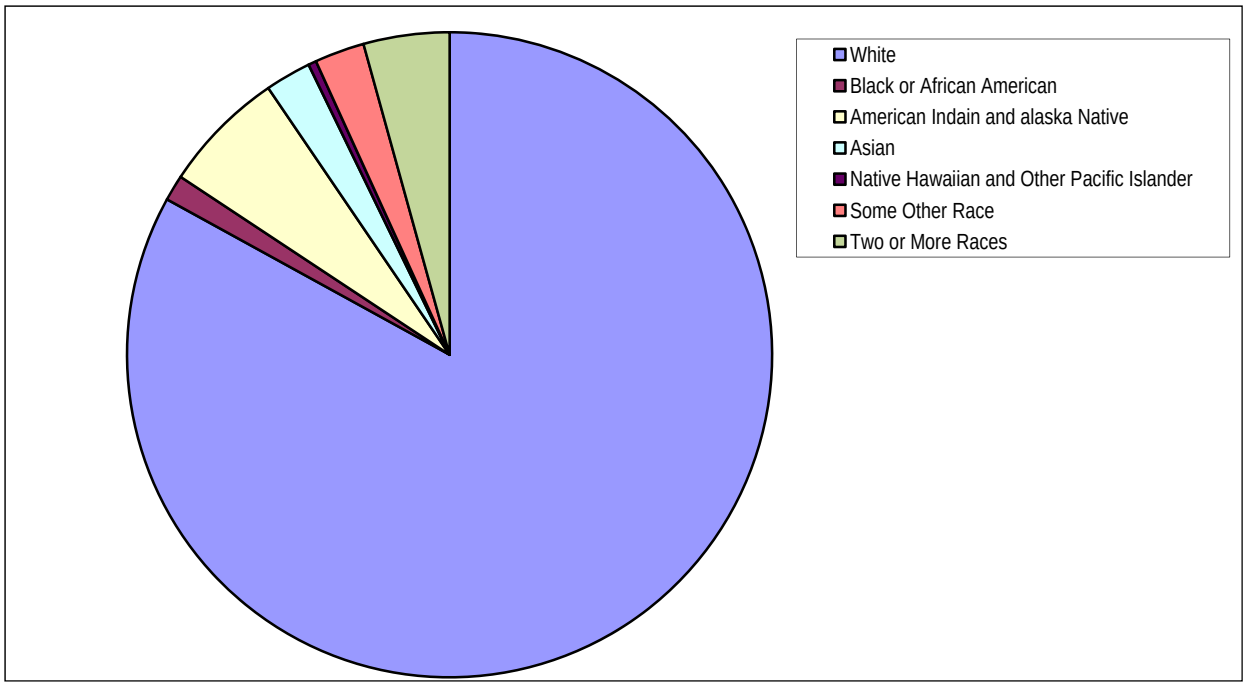


Figure 6-4. Planning Area Race Distribution

The planning area has a 5.7-percent foreign-born population. Other than English, the most commonly spoken language in the planning area is Spanish. The Census estimates 3.4 percent of the residents speak English "less than very well."

6.6.5 Disabled Populations

The 2010 U.S. Census estimated that one-in-five non-institutionalized Americans with disabilities live in the U.S. People with disabilities are more likely to have difficulty responding to a hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs.

According to 2011 Census estimates, 15 percent of the planning area population has some form of disability within the planning area. This includes 39.9 percent of those 65 and over and 4.6 percent of those under 18.

6.7 ECONOMY

Humboldt County's economy is resource-extraction oriented. The area's many natural resources support its primary industries of timber, fisheries, agriculture and recreation-tourism. The County's economy experiences the problems typical of primary production economics, such as cyclical and seasonal instability, high unemployment rates and slow growth rates. Historically, cyclical instability has been a function of changes in the national demand for lumber, which has caused timber production in Humboldt County to fluctuate accordingly.

6.7.1 Industry, Businesses and Institutions

The planning area's economy is strongly based in the education, health care and social assistance industry (25 percent of employment), followed by the arts, entertainment, recreation, accommodation and food services industry (13 percent of employment). Wholesale trade and information make up the smallest sources of the local economy, each with about 2 percent of the planning area's employment. Figure 6-5 shows the breakdown of industry types in Humboldt County.

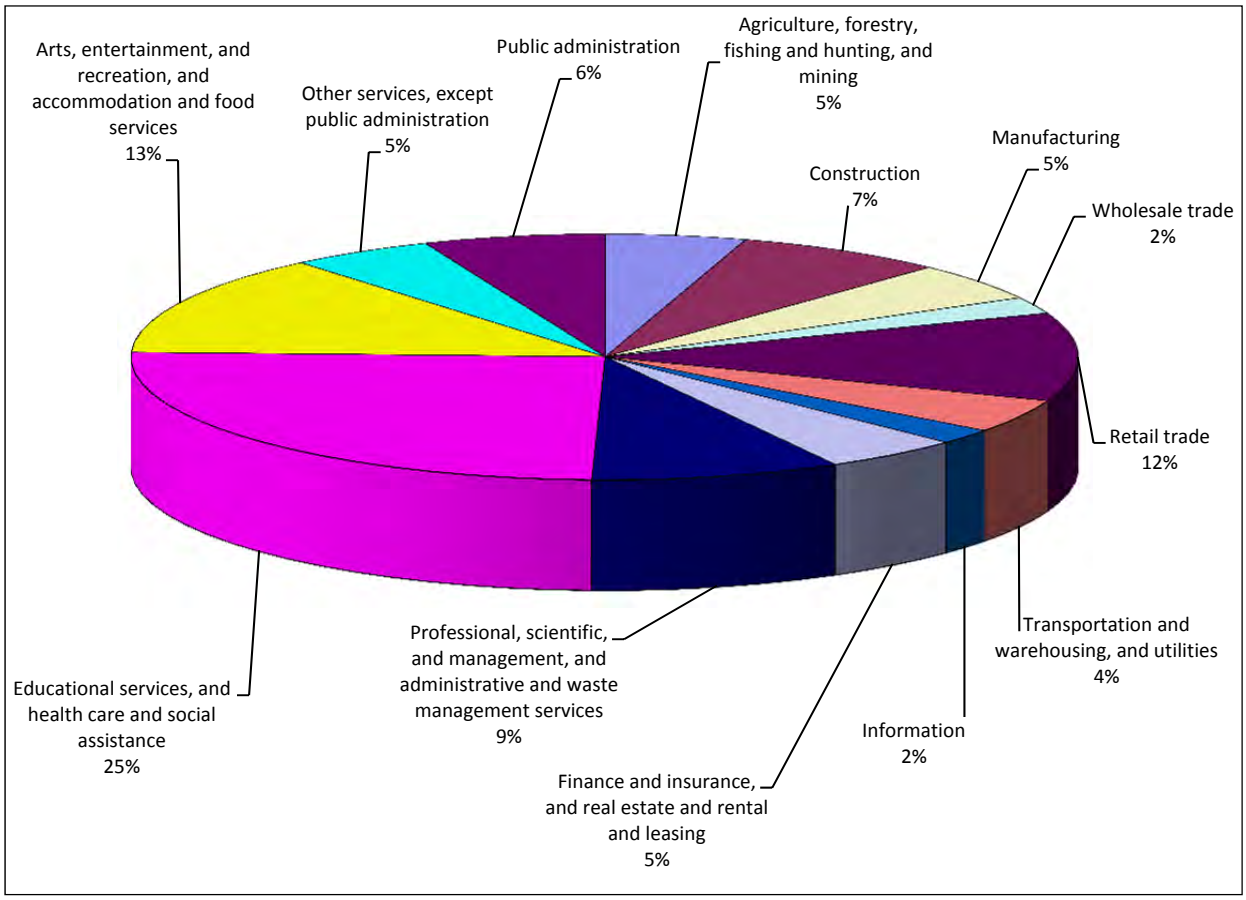


Figure 6-5. Industry in the Planning Area

The planning area benefits from a variety of business activity. Major employers include Humboldt County, Mad River Community Hospital, St. Joseph Health System, Sun Valley Group, the City of Eureka and Green Diamond Resource Co. (California Employment Development Department, 2013). Major educational and research institutions in the county include Humboldt State University, which is also a major employer in the region, and the College of the Redwoods.

6.7.2 Employment Trends and Occupations

According to the American Community Survey, about 60.6 percent of Humboldt County's population 16 and older is in the labor force, including 55.6 percent of females. Figure 6-6 compares California's and Humboldt County's unemployment trends from 2006 through July 2013. Humboldt County's unemployment rate was lowest in 2006, at 5.5 percent. Unemployment rates peaked at 11.4 percent in 2010 and 2011, but have shown decreases in 2012 and 2013. I t is anticipated that the unemployment rates will equalize to rates seen in 2006 over the next three to five years as the economy continues to recover from the recession of 2008.

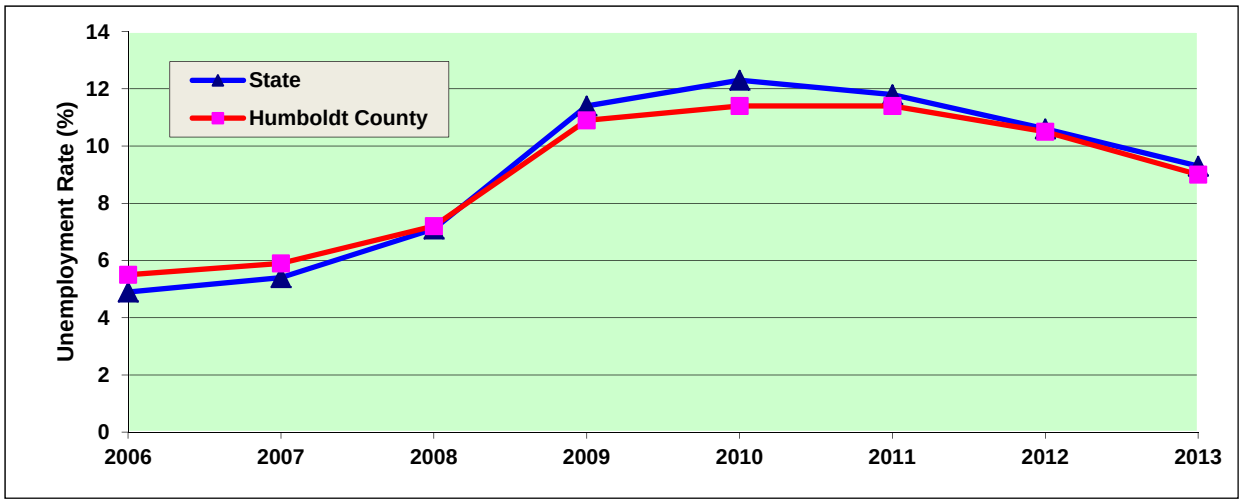


Figure 6-6. California and Humboldt County Unemployment Rate

Management, business, science and arts occupations make up 33 percent of the jobs in the planning area. Other major occupations are sales and office (25 percent) and service (22 percent) (see Figure 6-7).

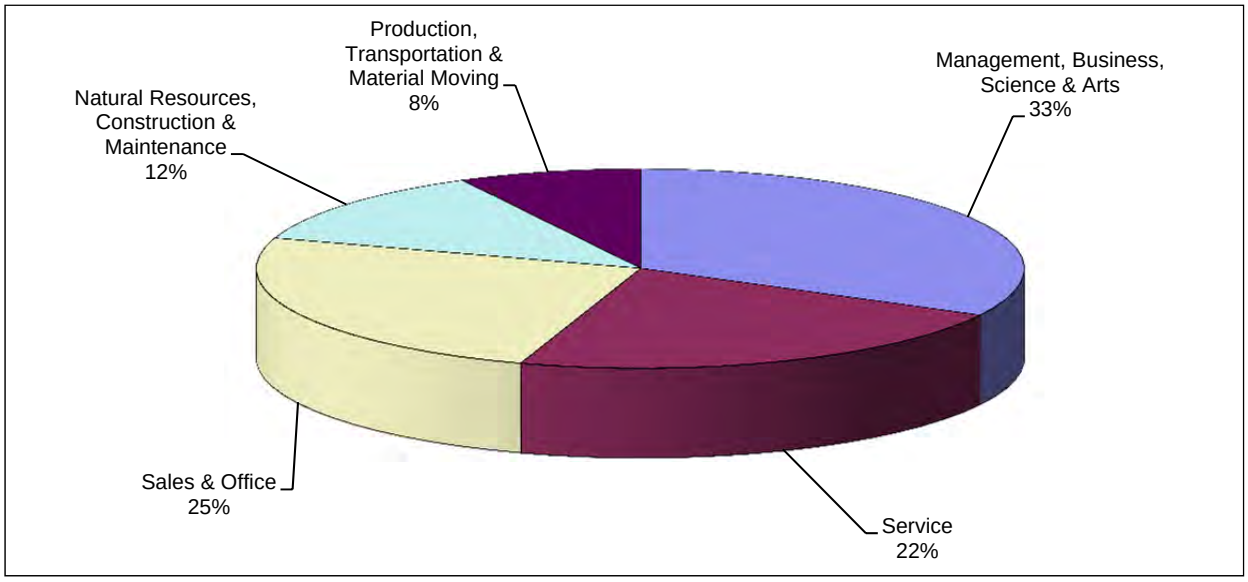


Figure 6-7. Occupations in the Planning Area

The U.S. Census estimates that over 72 percent of Humboldt County workers commute alone (by car, truck or van) to work, and mean travel time to work is 17 minutes.

6.8 FUTURE TRENDS IN DEVELOPMENT

According to population projections by the California Department of Finance, Humboldt County's population should increase to 147,000 by 2030. This represents an 8 percent increase from the 2012 population, and would be a moderate rate of growth over the next 18 years. About 66 percent of the County's population currently lives in the Humboldt Bay area. The municipal planning partners have adopted general plans that govern land use decision and policy making their jurisdictions. Decisions on land use will be governed by these programs. This plan will work together with these programs to support wise land use in the future by providing vital information on the risk associated with natural hazards in the planning area.

All municipal planning partners will incorporate this hazard mitigation plan update in their general plans by reference. This will ensure that future development trends can be established with the benefits of the information on risk and vulnerability to natural hazards identified in this plan.

6.9 LAWS AND ORDINANCES

Existing laws, ordinances and plans at the federal, state and local level can support or impact hazard mitigation initiatives identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Pertinent federal and state laws are described below. Each planning partner has individually reviewed existing local plans, studies, reports, and technical information in its jurisdictional annex, presented in Volume 2.

6.9.1 Federal

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Grant Program funds are available to communities. This Plan is designed to meet the requirements of DMA, improving the planning partners' eligibility for future hazard mitigation funds.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species or their habitat and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- **Endangered** means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)

- **Threatened** means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- **Critical habitat** means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- **Section 4: Listing of a Species**—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- **Section 7: Consultation**—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- **Section 9: Prohibition of Take—**It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- **Section 10: Permitted Take**—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- **Section 11: Citizen Lawsuits**—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

With the listing of salmon and trout species as threatened or endangered, the ESA has impacted most of the Pacific Coast states. Although some of these areas have been more impacted than others by the ESA due to the known presence of listed species, the entire region has been impacted by mandates, programs and policies based on the presumption of the presence of listed species. Most West Coast jurisdictions must now take into account the impact of their programs on habitat.

The Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) provides federally backed flood insurance in exchange for communities enacting floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. The County and most of the partner cities for this plan participate in the NFIP and have adopted regulations that meet the NFIP requirements. At the time of the preparation of this plan, all participating jurisdictions in the partnership were in good standing with NFIP requirements.

6.9.2 State

California General Planning Law

California state law (Cal. Gov. Code §65300 et seq.) requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The general plan expresses the community's goals, visions, and policies relative to future public and private land uses. The general plan forms the basis for most local government land use decision-making. It must consist of an integrated and internally consistent set of goals, policies and implementation measures. It must focus on issues of the greatest concern to the community and be written in a clear and concise manner. Local government actions—such as those relating to land use allocations, annexations, zoning, subdivision, design review, redevelopment and capital improvements—must be consistent with the plan.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) was passed in 1970 to institute a statewide policy of environmental protection. CEQA requires state and local agencies in California to follow a protocol of analysis and public disclosure of the potential environmental impacts of development projects. CEQA makes environmental protection a mandatory part of every California state and local agency's decision-making process.

For any project under CEQA's jurisdiction with potentially significant environmental impacts, agencies must identify mitigation measures and alternatives by preparing an environmental impact report and may approve only projects with no feasible mitigation measures or environmentally superior alternatives.

Assembly Bill 162: Flood Planning

This 2007 California State Assembly Bill requires cities and counties to address flood-related matters in the land use, conservation, and safety and housing elements of their general plans. The land use element must identify and annually review the areas covered by the general plan that are subject to flooding as identified in floodplain mapping by either FEMA or the California Department of Water Resources (DWR). Upon the next revision of the housing element, the conservation element of the general plan must identify rivers, creeks, streams, flood corridors, riparian habitat, and land that may accommodate floodwater for the purposes of groundwater recharge and stormwater management. The safety element must identify information regarding flood hazards including:

- Flood hazard zones

- Maps published by FEMA, DWR, the U.S. Army Corps of Engineers, the Central Valley Flood Protection Board, CalEMA, etc.
- Historical data on flooding
- Existing and planned development in flood hazard zones.

The general plan must establish goals, policies and objectives to protect from unreasonable flooding risks including:

- Avoiding or minimizing the risks of flooding new development
- Evaluating whether new development should be located in flood hazard zones
- Identifying construction methods to minimize damage.

Assembly Bill 162 establishes procedures for the determination of available land suitable for urban development, which may exclude lands where FEMA or DWR has determined that the flood management infrastructure is not adequate to avoid the risk of flooding.

Assembly Bill 2140: General Plans: Safety Element

This bill provides that the state may allow for more than 75 percent of public assistance funding under the California Disaster Assistance Act only if the local agency is in a jurisdiction that has adopted a local hazard mitigation plan as part of the safety element of its general plan. The local hazard mitigation plan needs to include elements specified in the legislation. In addition, this bill requires CalEMA to give federal mitigation funding preference to cities and counties that have adopted such plans. The intent of the bill is to encourage cities and counties to create and adopt hazard mitigation plans.

Assembly Bill 70: Flood Liability

This bill provides that a city or county may be required to contribute a fair and reasonable share to compensate for property damage caused by a flood to the extent that it has increased the state's exposure to liability for property damage by unreasonably approving new development in a previously undeveloped area that is protected by a state flood control project, unless the city or county meets specified requirements.

Assembly Bill 32: The California Global Warming Solutions Act

Assembly Bill 32 establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020 (a reduction of approximately 25 percent from forecast emission levels) with further reductions to follow. The law requires the state Air Resources Board to do the following:

- Establish a program to track and report greenhouse gas emissions.
- Approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions from sources of greenhouse gas emissions.
- Adopt early reduction measures to begin moving forward.
- Adopt, implement and enforce regulations—including market mechanisms such as "cap and-trade" programs—to ensure that the required reductions occur.

The Air Resources Board recently adopted a statewide greenhouse gas emissions limit and an emissions inventory, along with requirements to measure, track, and report greenhouse gas emissions by the industries it determined to be significant sources of greenhouse gas emissions.

Senate Bill 97: Guidelines for Greenhouse Gas Emissions

Senate Bill 97, enacted in 2007, amends the CEQA to clearly establish that greenhouse gas emissions and their effects are appropriate subjects for CEQA analysis. It directs the Governor's Office of Planning and Research to develop draft CEQA guidelines for the mitigation of greenhouse gas emissions or their effects and directs the California Natural Resources Agency to certify and adopt the CEQA guidelines.

California State Building Code

California Code of Regulations (CCR) Title 24, also known as the California Building Standards Code, is a compilation of building standards from three sources:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from national model code standards to meet California conditions
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes, adopted to address particular California concerns.

The state Building Standards Commission is authorized by California Building Standards Law (Health and Safety Code Sections 18901 through 18949.6) to administer the processes related to the adoption, approval, publication, and implementation of California's building codes. These building codes serve as the basis for the design and construction of buildings in California. The national model code standards adopted into Title 24 apply to all occupancies in California except for modifications adopted by state agencies and local governing bodies. Since 1989, the Building Standards Commission has published new editions of Title 24 every three years.

Standardized Emergency Management System

CCR Title 19 establishes the Standardized Emergency Management System to standardize the response to emergencies involving multiple jurisdictions. This system is intended to be flexible and adaptable to the needs of all emergency responders in California. It requires emergency response agencies to use basic principles and components of emergency management. Local governments must use the system in order to be eligible for state funding of response-related personnel costs under CCR Title 19 (Sections 2920, 2925 and 2930). Individual agencies' roles and responsibilities contained in existing laws or the state emergency plan are not superseded by these regulations.

California State Hazard Mitigation Plan

Under the DMA, California must adopt a federally approved state multi-hazard mitigation plan in order to be eligible for certain disaster assistance and mitigation funding. The intent of the *California State Hazard Mitigation Plan* is to reduce or prevent injury and damage from hazards through the following:

- Documenting statewide hazard mitigation planning in California
- Describing strategies and priorities for future mitigation activities
- Facilitating the integration of local and tribal hazard mitigation planning activities into statewide efforts
- Meeting state and federal statutory and regulatory requirements.

The plan is an annex to the State Emergency Plan, and it identifies past and present mitigation activities, current policies and programs, and future mitigation strategies. The plan will be updated annually to reflect changing conditions and new information, especially information on local planning activities.

Governor's Executive Order S-13-08

Governor's Executive Order S-13-08 enhances the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation and extreme weather events. There are four key actions in the executive order:

- Initiate California's first statewide climate change adaptation strategy to assess expected climate change impacts, identify where California is most vulnerable, and recommend adaptation policies by early 2009. This effort will improve coordination within state government so that better planning can more effectively address climate impacts on human health, the environment, the state's water supply and the economy.
- Request that the National Academy of Science establish an expert panel to report on sea level rise impacts in California, to inform state planning and development efforts.
- Issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplain areas for new projects.
- Initiate a report on critical infrastructure projects vulnerable to sea level rise.

6.9.3 Cities and County

Each planning partner has prepared a jurisdiction-specific annex to this plan (see Volume 2). In preparing these annexes, each partner completed a capability assessment that looked at its regulatory, technical and financial capability to carry out proactive hazard mitigation. Refer to these annexes for a review of regulatory codes and ordinances applicable to each planning partner.

COUNTY OF HUMBOLDT

Map 6-1.
Critical Facilities

COUNTY OF HUMBOLDT

Map 6-2. Critical Infrastructure

CHAPTER 7.
HUMBOLDT COUNTY ENERGY PROFILE

This chapter presents statewide and local supply and demand data on the types of energy used in Humboldt County: electricity, crude oil, natural gas, and propane. The data can be used to help identify potential vulnerabilities and determine ways to safeguard operations during an energy outage. It also offers an understanding of the potential role of renewable energy sources and energy efficiency. The data was taken from the Humboldt County General Plan Update (Humboldt County, 2013), the Redwood Coast Energy Authority (2013a and 2013b), the Schatz Energy Research Center at Humboldt State University (2013), and the California Energy Commission (2013a – 2013h).

The draft update Energy Element of the Humboldt County General Plan recognizes linkages between energy, land use, development, transportation and conservation. The General Plan update supports sustainable, renewable energy, reducing energy usage through improved energy efficiency, and seeking ways to become more self-sufficient. Still, additional actions can be taken that would improve local resiliency to energy disruptions. The County and its cities, communities, energy providers, and emergency response organizations must be aware of the energy demand of key facilities and plan for backup energy support for their operations in the event of an extended energy outage.

7.1 CALIFORNIA ENERGY SUPPLY

California produces much of its own energy (see Figure 7-1), ranking ninth in the nation in overall energy production. California Energy Commission data indicate that in-state resources supply 71 percent of the state's demand for electricity, 12 percent of its demand for natural gas, and 38 percent of its demand for crude oil. Almost half of California's crude oil demand is met by foreign oil imports.

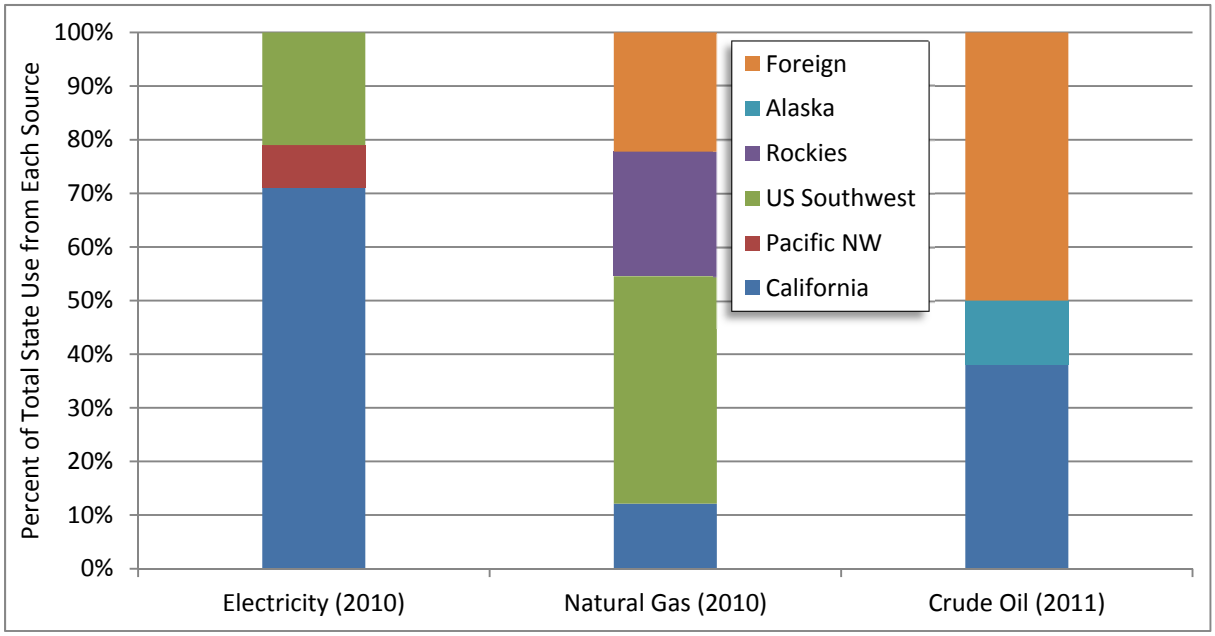


Figure 7-1. California Energy Sources

Types of renewable energy sources in California include biomass, geothermal, small hydroelectric, solar and wind. Under California law, all electricity retailers are required to increase procurement of eligible renewable energy resources to 20 percent of total procurement by 2013, 25 percent by 2016, and 33 percent by 2020. In 2011, 19 percent of Pacific Gas & Electric's (PG&E) electrical generation came from eligible renewable energy sources, slightly higher than the statewide average of 16.6 percent.

7.2 HUMBOLDT COUNTY ENERGY SUPPLY

Much of the energy used in Humboldt County is imported, with the exception of biomass energy produced as a byproduct of the local lumber industry. Most of the county's electricity is generated in the county, but imported natural gas is used to produce much of that electricity. Approximately 90 percent of the natural gas the county uses for all purposes, including electricity generating and commercial and residential customers, is imported. The county's transportation fuels are primarily imported as well.

7.2.1 Electricity

Humboldt County has three advantages when it comes to electrical energy:

- It has a small electrical demand (170 megawatts (MW) peak).
- Its electrical system is geographically isolated from the larger California grid, so major disruptions to that grid have a limited impact on the county energy supply.
- It has a wealth of local renewable energy resources (both realized and potential), including wind, wave and biomass.

The disadvantage of Humboldt County's electrical energy system is that it has only two connections to the larger electric grid and only one connection to the larger natural gas grid, which is the primary fuel for almost half of electricity generated in the county. This lack of redundancy can create electrical energy issues if any connections are lost. The capacity of the electrical transmission lines that connect Humboldt County to the larger grid is approximately 60 to 70 MW, less than half of the County's 170-MW peak electrical demand. This is why Humboldt County generates most of its own electricity.

Electricity is generated from a variety of sources to support local demand. According to *A Strategic Plan for Renewable Energy Security and Prosperity* prepared by the Schatz Energy Research Center, electricity production in 2010 was as follows: 51 percent was generated at the Humboldt Bay Power Plant, fueled by natural gas, 24.6 percent was generated in wood-fired (biomass) power plants (Fairhaven, Scotia, and Blue Lake), 5.4 percent was generated by hydropower, 0.01 percent was generated by solar technology, and the remaining 19 percent was imported.

Table 7-1 lists the capacity of the seven electrical generating plants in the county as of 2011. Not all energy from these plants is used locally; the energy produced in the county is combined and distributed throughout the state.

TABLE 7-1.
2011 CAPACITY AND USE OF HUMBOLDT COUNTY ELECTRICITY GENERATING PLANTS

Plant Name	Fuel Type	Installed Generating Capacity (MW)	2011 Production (MW-hours)
Pacific Lumber Co./Scotia	Biomass	32.5	120,561
Humboldt Bay Gen Station/Fairhaven Power Co.	Biomass	15	117,228
Blue Lake	Biomass	13.8	9,621
Baker Creek	Hydro	1.5	N/A
Mill & Sulfur Creek	Hydro	0.995	N/A
Humboldt Bay Gen Station/ PG&E Wartsila	Natural Gas	163	467,971
CSU Humboldt	Natural Gas	0.35	N/A
Total		**227.15 MW**	**715,381**

7.2.2 Natural Gas and Crude Oil

Natural gas enters Humboldt County through a single PG&E pipeline. The pipeline comes from a compressor station in Gerber in the Central Valley and follows a route roughly parallel to Highway 36. There are no natural gas storage fields in the area, though there are some native gas fields in the Eel River Valley. Up to 70 percent of households in Humboldt County have access to natural gas.

Petroleum-based transportation fuels are primarily imported by barge to a single terminal in Eureka. An extended disruption to the delivery or operational systems at this terminal could result in fuel shortages in the county. There is approximately a 10-day fuel supply storage capacity at the terminal (this is a peak demand estimate that includes summer tourism).

7.2.3 Renewable Energy

A 2005 report prepared for the Humboldt County General Plan Energy Element found that Humboldt County's renewable energy resources could meet all of the county's energy needs for electricity, transportation and heating (Schatz, 2005). Local biomass-fired generators already support approximately a third of the local demand. It has been estimated that local renewable resources could generate as much as 1,500 MW of energy and over 6,000 gigawatt-hours (GWh) per year. This includes primarily power from waves, wind and biomass, with smaller contributions from small hydroelectric and solar. Table 7-1 includes 2011 renewable energy capacity and production data (biomass and hydro) for Humboldt County.

Numerous renewable energy projects are currently being considered for development. PG&E recently re-powered a local natural-gas-fired power plant with 10 high-efficiency 16-MW generators that are well suited to following changes in the intermittent supply of renewable electricity.

7.3 HUMBOLDT COUNTY ENERGY DEMAND

In Humboldt County, energy is used primarily for transportation fuel and for electrical power and heating in homes, businesses, industries and agriculture. It is estimated that Humboldt County's 2008 end-use energy consumption totaled about 18 trillion British thermal units, about half of it for transportation fuel (gasoline and diesel).

7.3.1 Electricity

Humboldt County electricity use totaled 914 GWh in 2011. This was used primarily in the residential, commercial and industrial sectors. Lighting and refrigeration were the primary end-uses in the residential and commercial sectors. The Humboldt area's peak demand of about 170 MW occurs in winter. Average demand is 110 MW, and base load usage accounts for about 70 MW.

7.3.2 Natural Gas

Natural gas consumption in Humboldt County was an estimated 34 million therms in 2011, not including gas used to produce electricity. More than half of the natural gas is consumed by the residential sector for home heating and cooking. The rest is consumed by the commercial, industrial, agricultural and mining sectors.

7.3.3 Crude Oil

Gasoline and diesel consumption in Humboldt County in 2008 was about 68 million gallons. The use of transportation fuels is closely linked to the number of vehicle miles traveled. Due to its rural nature, the county averages more vehicle miles traveled per capita than many more densely populated areas.

7.4 ENERGY EFFICIENCY

California utility-customer energy-efficiency programs date to the 1970s and have grown and evolved substantially over four decades. The state's energy efficiency policies have had a significant impact on per capita electricity use, which has remained essentially constant over the past 30 years. Humboldt County has a variety of energy-efficiency initiatives underway:

- The Redwood Coast Energy Watch is a local partnership of the Redwood Coast Energy Authority and PG&E that was created in 2006 to help Humboldt County utility customers lower their energy bills and enjoy a cleaner environment.
- Humboldt County participates in the Energy Upgrade California program to offer rebates and incentives for projects that increase the energy efficiency of residential homes. Redwood Coast Energy Authority provides referrals to participating contractors and helps energy users navigate the program's rebates and incentives, as well as other available funding options.
- The Redwood Neighborhood Energy Challenge is a community-based competition in Humboldt County through which neighbors reduce their energy usage as part of teams sponsoring local schools. The team with the greatest savings throughout the challenge wins an energy upgrade for the school.

Figure 7-2 is a 2010 energy flow diagram for Humboldt County, showing energy sources, uses and resulting greenhouse gas emissions. The percentage labels on the emissions arrows at right represent percent of total emissions; all other percentage labels represent percent of total primary energy. The red line from electricity to heat represents electric space and water heating.

Source: RePower Humboldt: A Strategic Plan for Renewable Energy and Prosperity (Schatz Energy Research Center)

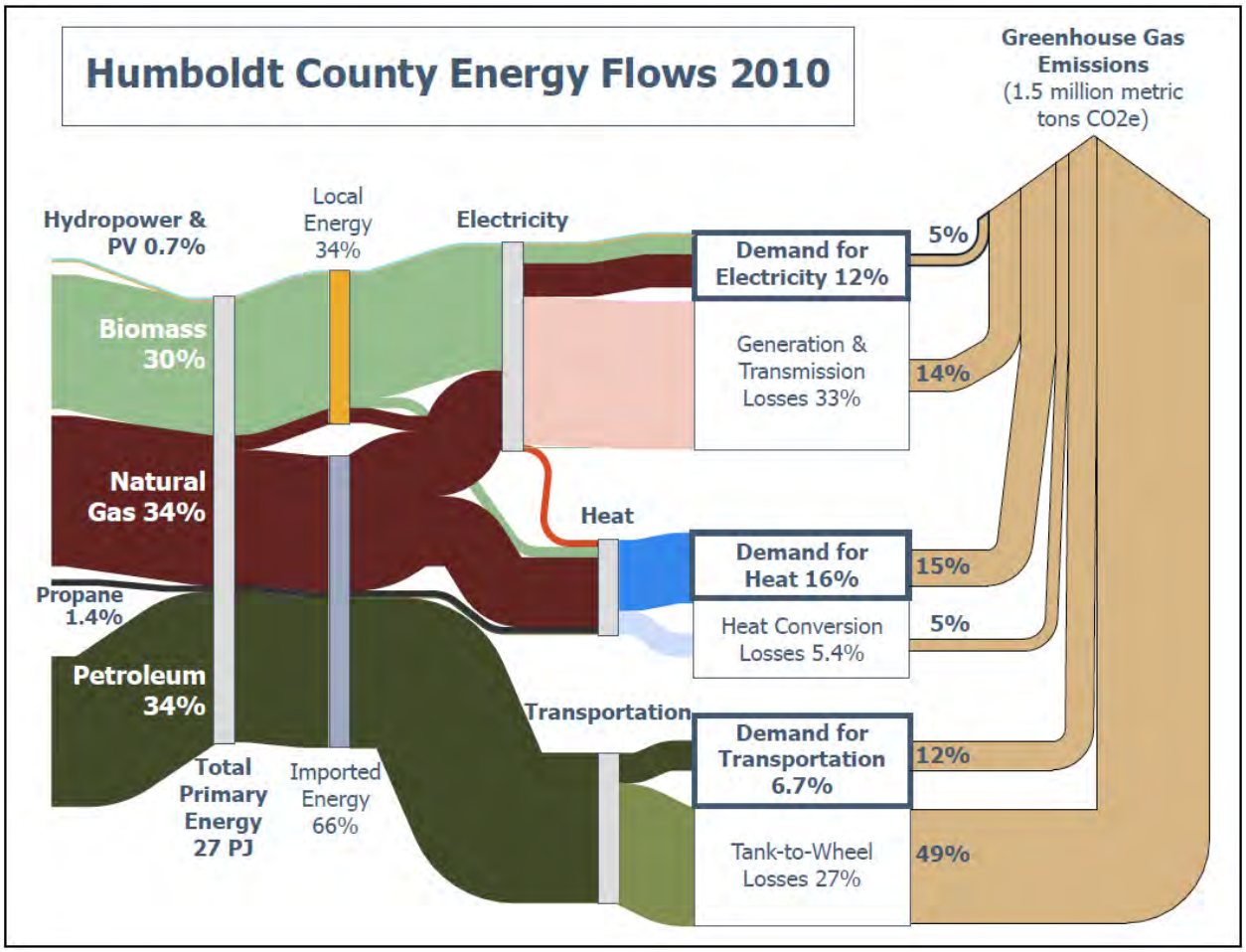


Figure 7-2. 2010 Humboldt County Energy Sources, Uses and Resulting Emissions

CHAPTER 8.
DAM FAILURE

8.1 GENERAL BACKGROUND

8.1.1 Causes of Dam Failure

Dam failures in the United States typically occur in one of four ways (see Figure 8-1):

- Overtopping of the primary dam structure, which accounts for 34 percent of all dam failures, can occur due to inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.
- Foundation defects due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30 percent of all dam failures.
- Failure due to piping and seepage accounts for 20 percent of all failures. These are caused by internal erosion due to piping and seepage, erosion along hydraulic structures such as spillways, erosion due to animal burrows, and cracks in the dam structure.
- Failure due to problems with conduits and valves, typically caused by the piping of embankment material into conduits through joints or cracks, constitutes 10 percent of all failures.

The remaining 6 percent of U.S. dam failures are due to miscellaneous causes. Many dam failures in the United States have been secondary results of other disasters. The prominent causes are earthquakes, landslides, extreme storms, massive snowmelt, equipment malfunction, structural damage, foundation failures, and sabotage. The most likely disaster-related causes of dam failure in the planning area are earthquake, landslides and climate change impacts.

Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

DEFINITIONS

Dam—Any artificial barrier, together with appurtenant works, that does or may impound or divert water, which either (a) is or will be 25 feet or more in height from the natural bed of the stream or watercourse at the downstream toe of the barrier, as determined by the Department of Water Resources, or from the lowest elevation of the outside limit of the barrier, as determined by the Department of Water Resources, if it is not across a stream channel or watercourse, to the maximum possible water storage elevation or (b) has or will have an impounding capacity of 50 acre-feet or more. (California Water Code, Div. 3, Part 1, Section 6000.)

Dam Failure—An uncontrolled release of impounded water due to structural deficiencies in dam.

Emergency Action Plan—A document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency. (FEMA 64)

High Hazard Dam—Dams where failure or operational error will probably cause loss of human life. (FEMA 333)

Significant Hazard Dam—Dams where failure or operational error will result in no probable loss of human life but can cause economic loss, environmental damage or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure. (FEMA 333)

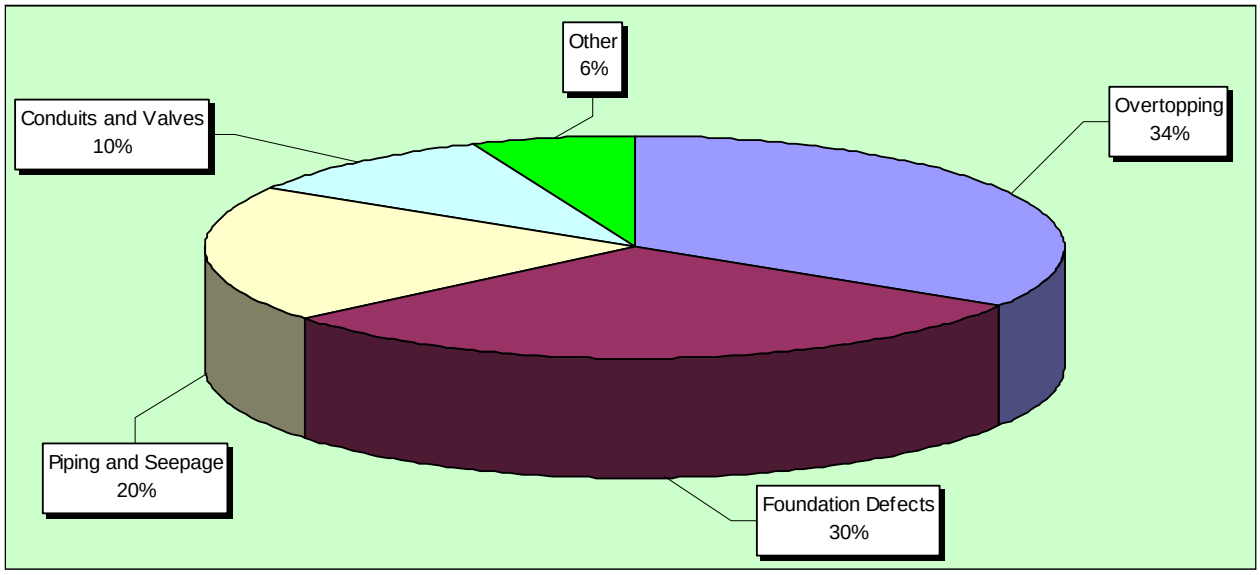


Figure 8-1. Historical Causes of Dam Failure

8.1.2 Regulatory Oversight

California Division of Safety of Dams

The failure of the 2-year-old St. Francis Dam in Southern California in March 1928, one of California's worst catastrophes, prompted the State Legislature, on August 14, 1929, to create what is today the Division of Safety of Dams, under the California Department of Water Resources. The Division's web site describes its role as follows:

> "Division engineers and engineering geologists review and approve plans and specifications for the design of dams and oversee their construction to insure compliance with the approved plans and specifications. Reviews include site geology, seismic setting, site investigations, construction material evaluation, dam stability, hydrology, hydraulics, and structural review of appurtenant structures. In addition, Division engineers inspect over 1200 dams on a yearly schedule to insure they are performing and being maintained in a safe manner."

According to California's 2010 Adopted Hazard Mitigation Plan, there are currently 1,250 dams under the jurisdiction of the Division of Safety of Dams. In addition, there are currently 149 dams owned by federal government agencies, such as the U.S. Forest Service, Bureau of Reclamation, Army Corps of Engineers, and the U.S. military, which are not subject to state jurisdiction except as provided by federal law.

U.S. Army Corps of Engineers Dam Safety Program

The potential for catastrophic flooding due to dam failures led to passage of the National Dam Safety Act (Public Law 92-367). The National Dam Safety Program requires a periodic engineering analysis of every major dam in the country. The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect the lives and property of the public.

The U.S. Army Corps of Engineers is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety (U.S. Army Corps of Engineers, 1997).

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) has the largest dam safety program in the United States. The FERC cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. There are 3,036 dams that are part of regulated hydroelectric projects are in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC staff inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent consulting engineer, approved by the FERC, must inspect and evaluate projects with dams higher than 32.8 feet or with a total storage capacity of more than 2,000 acre-feet.

FERC staff monitors and evaluates seismic research in geographic areas where there are concerns about seismic activity. This information is applied in investigating and performing structural analyses of hydroelectric projects in these areas. FERC staff also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC staff visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication *Engineering Guidelines for the Evaluation of Hydropower Projects* guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

The FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

8.2 HAZARD PROFILE

8.2.1 Past Events

According to the 2010 California State Hazard Mitigation Plan, there have been nine dam failures in the state since 1950, none of them in Humboldt County. Overtopping caused two of the failures, and the others were caused by seepage or leaks. One failure, the 1963 Baldwin Hills Dam Failure, resulted in three deaths because the leak turned into a washout. The historical record indicates that California has had about 45 failures of non-federal dams. The failures occurred for a variety of reasons, the most common being overtopping. Other reasons include shortcomings in the dams or an inadequate assessment of surrounding geomorphologic characteristics.

California’s first notable dam failure was in 1883 in Sierra County, and the most recent failure was in 1965. The most catastrophic event was the failure of William Mulholland’s St. Francis Dam, which failed in 1928 and killed an estimated 426 people. However, San Francisquito Canyon, which was flooded in the event, was home to hundreds of transients who were not accounted for in the death estimate (Lund, 2013).

8.2.2 Location

According to California's Division of Safety of Dams, there are 15 dams within the planning area or with inundation areas that extend into the planning area, as listed in Table 8-1. Three are owned by the U.S. Bureau of Reclamation, and the remainder are under the jurisdiction of the state.

TABLE 8-1.
DAMS IN THE PLANNING AREA OR WITH INUNDATION AREAS THAT EXTEND INTO THE PLANNING AREA (IN ORDER OF STORAGE CAPACITY)

Name	County	Water Course	Owner	Year Built	Crest Elevation (feet)	Dam Type	Crest Length (feet)	Height (feet)	Storage Capacity (acre-feet)	Use[a]
Trinity	Trinity	Trinity River	U.S. Bureau of Reclamation	1962	2,395.0	Earth	2,450	458	2,447,650	MULTI, IRR, REC, POW
Link River Diversion Dam	Klamath, Oregon	Klamath/ Link River	U.S. Bureau of Reclamation	1928	4,145.0		435	22	735,000	DIV
Copco No. 1	Siskiyou	Klamath River	PacifiCorp	1922	2,613.0	Gravity	415	132	77,000	STO, DIV, POW
Scott	Lake	Eel River	Pacific Gas and Electric	1921	1924.6	Gravity	815	138	73,000	STO, POW
Robert W Matthews	Trinity	Mad River	Humboldt Bay Municipal Water District	1962	2,686.0	Earth	630	150	61,000	STO, POW, MUN, REC
Iron Gate	Siskiyou	Klamath River	PacifiCorp	1962	2,343.0	Earth and Rock	745	188	58,000	STO, REG, POW
Lewiston	Trinity		U.S. Bureau of Reclamation	1963	1,910.0	Earth	745	73	14,660	MULTI
JC Boyle	Klamath, Oregon	Klamath River	PacifiCorp	1958	3,800.0	Earth	693	68	3,495	POW,
Benbow	Humboldt	S. Fork Eel River	CA Dept. of Parks and Recreation	1932	374.0	Slab and Buttress	283	16	1,060	STO, REC
Big Lagoon	Humboldt	Big Lagoon	Green Diamond Resource Company	1947	17.2	Earth	3,700	16	780	STO, IND
Van Arsdale	Mendocino	South Eel River	Pacific Gas and Electric	1907	1,519.0	Gravity	515	96	700	STO, DIV, POW
Scotia Log Pond	Humboldt	Tributary Eel River	Humboldt Redwood Company	1910	135.0	Earth	3,700	24	210	STO, IND
Jones Ranch	Trinity	Tributary Trinity River	Eleanor Jones	1980	1,905.5	Earth	350	36	58	STO, REC

TABLE 8-1.
DAMS IN THE PLANNING AREA OR WITH INUNDATION AREAS THAT EXTEND INTO THE PLANNING AREA (IN ORDER OF STORAGE CAPACITY)

Name	County	Water Course	Owner	Year Built	Crest Elevation (feet)	Dam Type	Crest Length (feet)	Height (feet)	Storage Capacity (acre-feet)	Use[a]
Copco No. 2	Siskiyou	Klamath River	PacifiCorp	1925	2,484.0	Gravity	148	37	55	DIV, POW
Arcata	Humboldt	Jolly Giant Creek	City Of Arcata	1937	455.0	Earth	160	50	46	STO, DOM, MUN

a. Use codes: DIV = Diversion; DOM = Domestic; IND = Industrial; IRR = Irrigation; MULTI = Multi-purpose; MUN = Municipal; POW = Power Generation; REC = Recreation; REG = Regulation; STO = Storage

Dams on the Klamath, Trinity, Mad, and Eel Rivers pose the major threats to people or property in Humboldt County because they hold the most water and would inundate the widest area. The Scotia Log Pond, which impounds up to 210 acre-feet of water on a tributary to the Eel River, poses the most immediate threat to life. A total failure of this dam would inundate some or all of the 49 homes immediately downstream within 60 feet to 400 feet of the dam. At this proximity, inundation would occur without warning.

Map 8-1 shows worst-case inundation areas from dam failure on the large rivers. The Klamath and Trinity Rivers are displayed together, though they are impounded by unconnected systems. The total impact area is 22,769 acres for the Klamath/Trinity Rivers, 8,074 acres for the Mad River, and 16,673 acres for the Eel River. Combined, this accounts for just over 2 percent of the total area of Humboldt County. However, streamside and riverfront properties are often more heavily populated and more highly valued than other areas. Therefore, the potential impact of dam failures on human life and property in the County is considerable. In addition, there could be a significant cultural impact on Tribal lands in dam failure inundation areas.

8.2.3 Frequency

Dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides and excessive rainfall and snowmelt. There is a “residual risk” associated with dams. Residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of any type of dam failure is low in today’s regulatory and dam safety oversight environment. No dam failures have been recorded in Humboldt County.

8.2.4 Severity

The California Division of Safety of Dams assigns a “total class weight” to dams under its jurisdiction representing the hazard potential of each dam. The total class weight is calculated from points assigned based on the following parameters (California Division of Safety of Dams, 2013):

- Reservoir capacity:
  - Extreme damage potential: 100,000 acre-feet or more (6 points)
  - High damage potential: 1,000 to 99,999 acre-feet (4 points)

  - Moderate damage potential: 100 to 999 acre-feet (2 points)
  - Low damage potential: 15 to 99 acre-feet (0 points)
- Dam height:
  - Extreme damage potential: 150 feet or more (6 points)
  - High damage potential: 100 to 149 feet (4 points)
  - Moderate damage potential: 50 to 99 feet (2 points)
  - Low damage potential: 6 to 49 feet (0 points)
- Estimated number of people to be evacuated in the event of a pending dam failure:
  - Extreme damage potential: 1,000 or more (12 points)
  - High damage potential: 100 to 999 (8 points)
  - Moderate damage potential: 1 to 99 (4 points)
  - Low damage potential: none (0 points)
- Potential downstream property damage:
  - High damage potential (12 points)
  - Moderate damage potential (8 points)
  - Low damage potential (4 points)
  - No damage potential (0 points)

A similar point system based on age, general condition, geologic setting and seismic setting is used to classify each dam's condition as poor, fair, good or excellent (Association of State Dam Safety Officials, 2000).

The U.S. Army Corps of Engineers developed the classification system shown in Table 8-2 for the hazard potential of dam failures. The State of California System and the Corps of Engineers hazard rating systems are both based only on the potential consequences of a dam failure; neither system takes into account the probability of such failures.

8.2.5 Warning Time

Warning time for dam failure varies depending on the cause of the failure. In events of extreme precipitation or anticipated massive snowmelt, evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, it is possible that there would be no warning time.

A dam's structural type also affects warning time. Earthen dams, which far outnumber all other types of dams, do not tend to completely fail, nor do they fail instantaneously. Once a developing breach has been initiated, the discharging water will erode the breach until either the reservoir water is depleted or the breach resists further erosion. Concrete gravity dams also tend to have a partial breach as one or more monolith sections formed during the dam construction are forced apart by the escaping water. The time for breach formation is in the range of a few minutes to a few hours (U.S. Army Corps of Engineers, 1997).

TABLE 8-2.
CORPS OF ENGINEERS HAZARD POTENTIAL CLASSIFICATION

Hazard Category[a]	Direct Loss of Life[b]	Lifeline Losses[c]	Property Losses[d]	Environmental Losses[e]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

a. Categories are assigned to overall projects, not individual structures at a project.
b. Loss of life potential based on inundation mapping of area downstream of the project. Analyses of loss of life potential should take into account the population at risk, time of flood wave travel, and warning time.
c. Indirect threats to life caused by the interruption of lifeline services due to project failure or operational disruption; for example, loss of critical medical facilities or access to them.
d. Damage to project facilities and downstream property and indirect impact due to loss of project services, such as impact due to loss of a dam and navigation pool, or impact due to loss of water or power supply.
e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: U.S. Army Corps of Engineers, 1995

The time from dam failure until the resulting floodwaters reach developed portions of the County would be 5.5 hours on the Mad River, about 6 hours on the Eel River, and 7 hours on the Trinity River. The number of people to be alerted and evacuated can vary widely. There may be few people along the river in winter, when only permanent residents are apt to be present; but there may be many people in summer, when seasonal cabins are occupied and there are fishermen and campers along all the rivers. Another factor that must be considered is the initial flow in the river when the failure occurs. This initial flow is normally very low on all the rivers from May through October. During winter, the initial flow is much higher and, at times, may even be equal to or greater than flood stage. This wide variation in initial flow has a significant impact on the areas that must be evacuated.

8.3 SECONDARY HAZARDS

Dam failure can cause severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat.

8.4 CLIMATE CHANGE IMPACTS

Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of

increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams are already experiencing increases in stream flows from earlier releases from dams.

Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

8.5 EXPOSURE

The flood module of HAZUS-MH was used for a Level 2 assessment of dam failure. HAZUS-MH uses census data at the block level and FEMA floodplain data, which has a level of accuracy acceptable for planning purposes. Where possible, the HAZUS-MH data for this risk assessment was enhanced using GIS data from county, state and federal sources. Loss estimates were generated only for dams for which inundation mapping was available in a format to support the HAZUS analysis.

8.5.1 Population

Failure or improper operation at any of the major dams is likely to cause loss of human life. All populations in a dam failure inundation zone would be exposed to the risk of a dam failure. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation. The population within the inundation areas of the Klamath, Trinity, Mad, and Eel Rivers is 24,509, or 18.29 percent of the total County population. Table 8-3 summarizes the at-risk population in the planning area by city.

TABLE 8-3.
POPULATION WITHIN DAM FAILURE INUNDATION AREAS

River System	Affected Population	% of Total Population
Klamath/Trinity	8,105	6.04%
Mad	12,956	9.67%
Eel	3,448	2.57%
Total	**24,509**	**18.29%**

8.5.2 Property

Based on assessor parcel data, the HAZUS-MH model estimated that there are 10,615 structures, 17.24 percent of the County total within the mapped dam failure inundation areas in the planning area. The value of exposed buildings in the planning area was generated using HAZUS-MH and is summarized in Table 8-4. This methodology estimated $2.42 billion worth of building-and-contents exposure to dam failure inundation, representing 15.6 percent of the total assessed value of the planning area.

TABLE 8-4.
EXPOSURE AND VALUE OF STRUCTURES IN DAM FAILURE INUNDATION AREAS

	Buildings Exposed		Value Exposed			% of Total Assessed Value
River System	Number	% of County Total	Building	Contents	**Total**	
Klamath/Trinity	3,509	5.7%	$379,680,000	$219,859,000	$599,539,000	3.86%
Mad	5,613	9.12%	$909,217,000	$622,335,000	$1,531,552,000	9.87%
Eel	1,493	2.43%	$184,951,000	$105,642,000	$290,593,000	1.87%
Total	**10,615**	**17.24%**	**$1,473,848,000**	**$947,836,000**	**$2,421,684,000**	**15.60%**

GIS analysis was used to determine the land use types of parcels within the mapped inundation areas. The estimated 9,765 parcels that face the possibility of inundation in the event of dam failure range from just downstream of the dams to coastal riverfront areas. Nearly half of the exposed parcels are zoned residential: about 30 percent occupied rural residential and 16 percent unoccupied rural residential. Figure 8-2 shows the distribution of general land use types in the dam inundation areas.

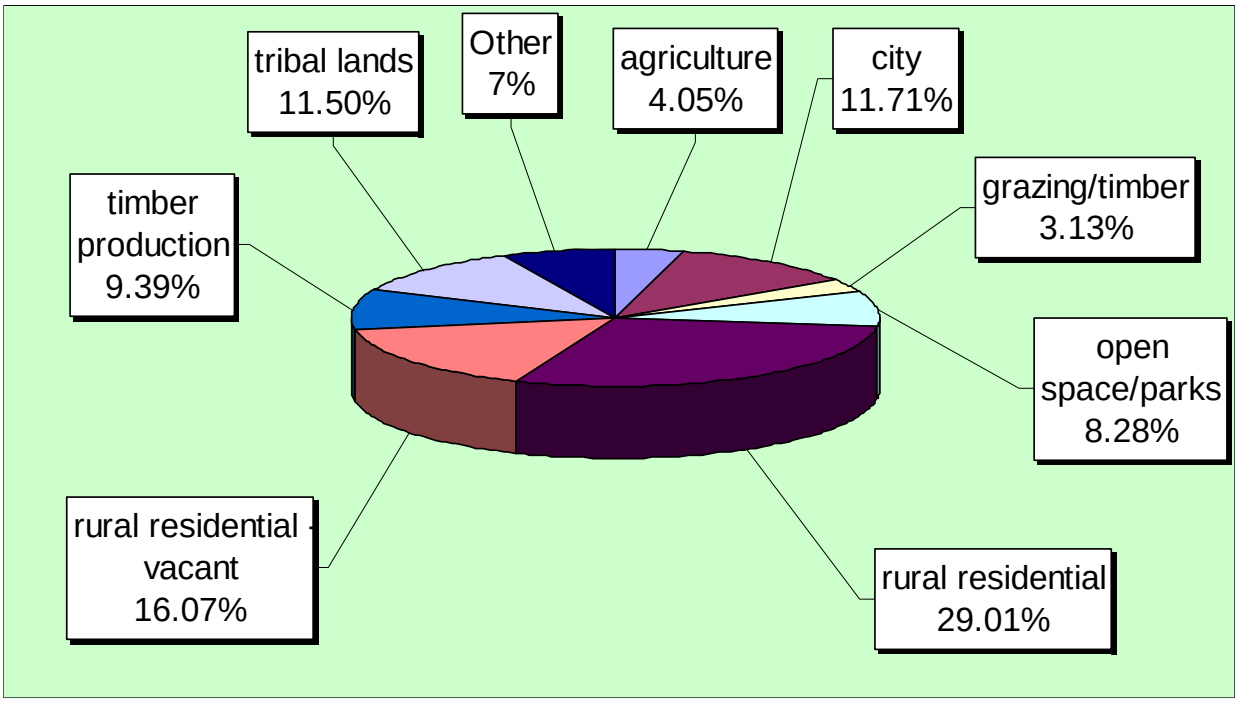


Figure 8-2. Land Use Types in Dam Inundation Areas

8.5.3 Critical Facilities

GIS analysis determined that 213 of the planning area's critical facilities and infrastructure (19.5 percent) are in the mapped inundation areas, as summarized in Table 8-5 and Table 8-6.

TABLE 8-5.
CRITICAL FACILITIES IN DAM FAILURE INUNDATION AREAS

River System	Medical & Health Services	Government Function	Protective Function	Schools	Societal Function	Hazardous Materials	Other Critical Function	**Total**
Klamath/ Trinity	6	1	11	13	3	0	5	39
Mad	3	1	4	21	11	4	2	46
Eel	0	0	0	1	2	6	1	**10**
Total	**9**	**2**	**15**	**35**	**16**	**10**	**8**	**95**

TABLE 8-6.
CRITICAL INFRASTRUCTURE IN DAM FAILURE INUNDATION AREAS

River System	Water Storage	Wastewater	Power	Fuel Storage	Communications	Bridges	Transportation	**Total**
Klamath/ Trinity	7	1	2	3	1	33	2	49
Mad	12	11	2	7	1	11	0	44
Eel	3	3	0	1	0	18	**0**	**25**
Total	**22**	**15**	**4**	**11**	**2**	**62**	**2**	**118**

8.5.4 Environment

Reservoirs held behind dams affect many ecological aspects of a river. River topography and dynamics depend on a wide range of flows, but rivers below dams often experience long periods of very stable flow conditions or saw-tooth flow patterns caused by releases followed by no releases. Water releases from dams usually contain very little suspended sediment; this can lead to scouring of river beds and banks.

The environment would be exposed to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways. This could result in destruction of downstream habitat and could have detrimental effects on many species of animals, especially endangered species such as salmon.

8.6 VULNERABILITY

8.6.1 Population

Vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television, internet or radio emergency warning system.

8.6.2 Property

Vulnerable properties are those closest to the dam inundation area. These properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the dam

waters would collect. Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues.

It is estimated that there could be up to $347.8 million of loss from a dam failure affecting the planning area. This represents 14.36 percent of the total exposure within the inundation area, or 2.24 percent of the total assessed value of the planning area. Table 8-7 summarizes the loss estimates for dam failure.

TABLE 8-7.
LOSS ESTIMATES FOR DAM FAILURE

	Estimated Loss Associated with Dam Failure			% of
River System	Structure	Contents	**Total**	Total Assessed Value
Klamath/Trinity	$105,714,000	$72,991,000	$178,705,000	1.15%
Mad	$65,282,000	$78,995,000	$144,277,000	0.93%
Eel	$14,845,000	$9,934,000	$24,779,000	0.16%
Total	**$185,841,000.00**	**$161,920,000.00**	**$347,761,000.00**	**2.24%**

8.6.3 Critical Facilities

Water distribution infrastructure, such as pumps and collector sites, is vulnerable to inundation from dam failure and has the potential to be severely damaged, leaving communities without potable water. Transportation routes are also vulnerable and have the potential to be severely damaged, creating isolation issues. This includes all roads, railroads and bridges in the path of the dam inundation. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas, as well as areas near the inundation areas.

HAZUS-MH was used to estimate the loss potential to critical facilities identified as exposed to dam failure inundation. Using depth/damage function curves to estimate the percent of damage to the building and the building contents, HAZUS-MH correlates these estimates to an estimate of functional downtime (the estimated time it will take to restore a facility to 100 percent of its functionality):

- On average, critical facilities would receive 2.3 percent damage to the structure and 42.9 percent damage to the contents during a dam failure event.
- The estimated average time to restore damaged facilities to full functionality is 534 days.

8.6.4 Environment

The environment would be vulnerable to a number of risks in the event of dam failure. Inundation can introduce foreign elements and debris into local waterways. This could result in destruction of downstream habitat and could have detrimental effects on many species of animals, especially endangered species such as salmon. The extent of vulnerability of the environment is the same as the extent of exposure.

8.7 FUTURE TRENDS IN DEVELOPMENT

Land use in the planning area will be directed by general plans adopted under state law. The safety elements of the general plans establish standards and plans for the protection of the community from hazards. Dam failure is currently not addressed as a standalone hazard in the safety elements, but flooding is. The municipal planning partners have established comprehensive policies regarding sound land use in identified flood hazard areas. Most of the areas vulnerable to the more severe impacts from dam failure intersect the mapped flood hazard areas. Flood-related policies in the general plans will help to reduce the risk associated with the dam failure hazard for all future development in the planning area.

8.8 SCENARIO

An earthquake in the region could lead to liquefaction of soils around a dam. This could occur without warning during any time of the day. A human-caused failure such as a terrorist attack also could trigger a catastrophic failure of a dam that impacts the planning area. While the probability of dam failure is very low, the probability of flooding associated with changes to dam operational parameters in response to climate change is higher. Dam designs and operations are developed based on hydrographs with historical record. If these hydrographs experience significant changes over time due to the impacts of climate change, the design and operations may no longer be valid for the changed condition. This could have significant impacts on dams that provide flood control. Specified release rates and impound thresholds may have to be changed. This would result in increased discharges downstream of these facilities, thus increasing the probability and severity of flooding.

8.9 ISSUES

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

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

COUNTY OF HUMBOLDT

Map 8-1. Dam Failure Inundation Areas

- Scott Dam inundation area
- Robert W Matthews Dam summer flood inundation area
- Robert W Matthews Dam winter flood inundation area
- Copco No 1 Dam inundation area
- Trinity Dam inundation area
- Iron Gate Dam inundation area

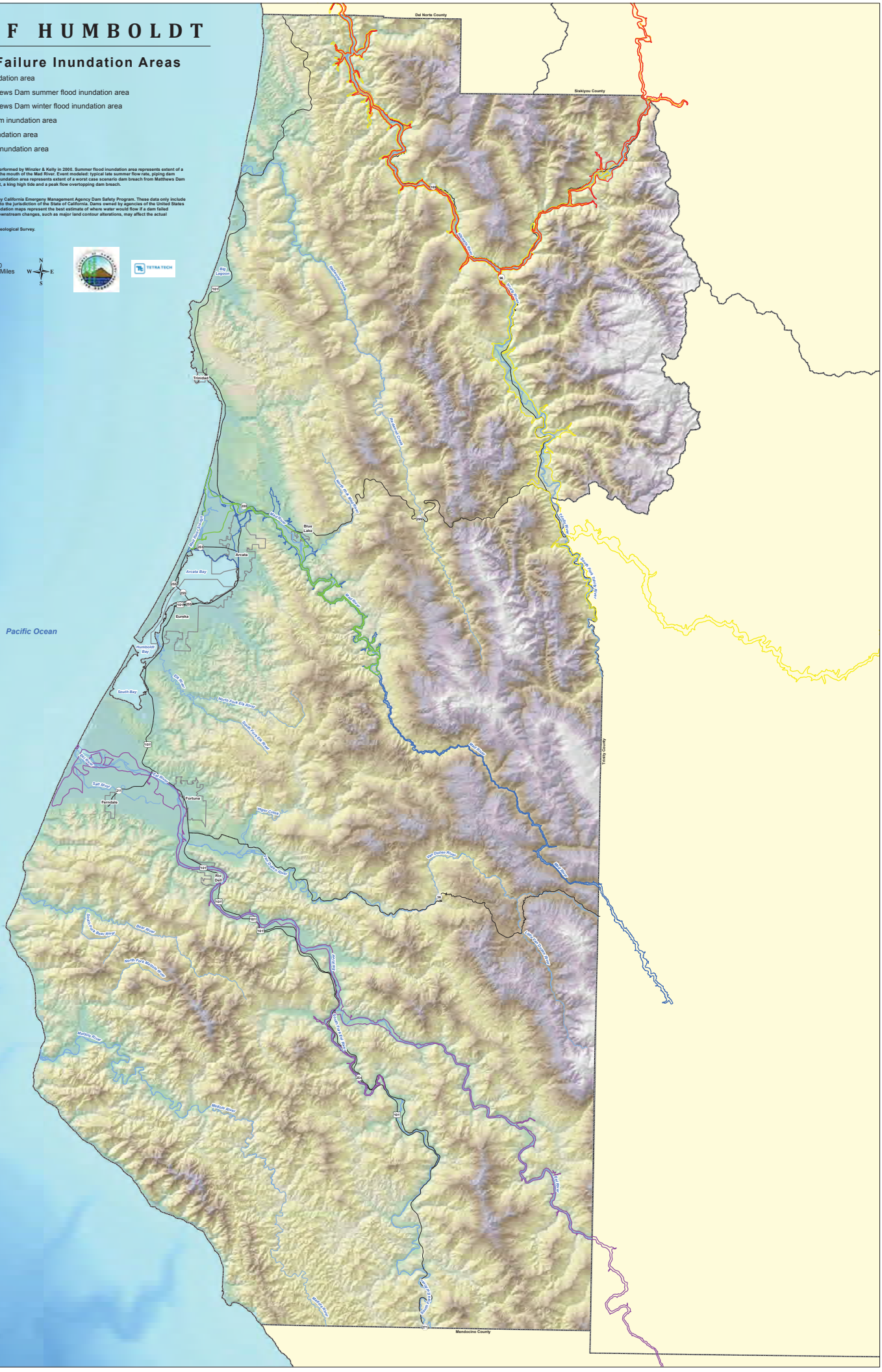
Robert W Matthews Dam inundation areas data from a model performed by Winzler & Kelly in 2000. Summer flood inundation area represents extent of a summer low-flow scenario dam breach from Matthews Dam to the mouth of the Mad River. Event modeled: typical late summer flow rate, piping dam failure, and king tide lower boundary condition. Winter flood inundation area represents extent of a worst case scenario dam breach from Matthews Dam to the mouth of the Mad River. Event modeled: 1964 flood event, a king high tide and a peak flow overtopping dam breach. Winzler & Kelly/GHD; Steve Allen and Gary Davison.

All other dam failure inundation area data from 2007 provided by California Emergency 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, U.S. Geological Survey.

0 2.5 5 10 Miles

N W E S



CHAPTER 9.
DROUGHT

9.1 GENERAL BACKGROUND

Drought is a prolonged period of dryness severe enough to reduce soil moisture, water and snow levels below the minimum necessary for sustaining plant, animal and economic systems. Droughts are a natural part of the climate cycle.

Drought can have a widespread impact on the environment and the economy, depending upon its severity, although it typically does not result in loss of life or damage to property, as do other natural disasters. The National Drought Mitigation Center uses three categories to describe likely drought impacts:

- Agricultural—Drought threatens crops that rely on natural precipitation.
- Water supply—Drought threatens supplies of water for irrigated crops and for communities.
- Fire hazard—Drought increases the threat of wildfires from dry conditions in forest and rangelands.

DEFINITIONS

Drought—The cumulative impacts of several dry years on water users. It can include deficiencies in surface and subsurface water supplies and generally impacts health, well being, and quality of life.

Hydrological Drought—Deficiencies in surface and subsurface water supplies.

Socioeconomic Drought—Drought impacts on health, well being and quality of life.

9.1.1 Drought in California

In the past century, the State of California has experienced a number of drought episodes, including several that lasted for more than a single season: 1928 to 1932, 1992 to 1994, 1996 to 1997, 1988, 1990, 1991, 2001, 2002, 2007, 2008 and 2009. The State Hazard Mitigation Plan states: "Normally, one dry year does not constitute a drought in California, but rather serves as a reminder of the need to plan for droughts. California's extensive system of water supply infrastructure (reservoirs, groundwater basins, and interregional conveyance facilities) generally mitigates the effects of short-term dry periods for most water users."

Most of California's precipitation comes from storms moving across the Pacific Ocean. The path followed by the storms is determined by the position of an atmospheric high pressure belt that normally shifts southward during the winter, allowing low pressure systems to move into the state. On average, 75 percent of California's annual precipitation occurs between November and March, with 50 percent occurring between December and February. If a persistent Pacific high pressure zone takes hold over California mid-winter, there is a tendency for the water year to be dry.

A typical water year produces about 100 inches of rainfall over the North Coast, 50 inches of precipitation (combination of rain and snow) over the Northern Sierra, 18 inches in the Sacramento area, and 15 inches in the Los Angeles area. In extremely dry years, these annual totals can fall to as little as one half, or even one third of these amounts.

Defining when drought begins is a function of the impacts of drought on water users, and includes consideration of the supplies available to local water users as well as the stored water they may have available in surface reservoirs or groundwater basins. Different local water agencies have different criteria

for defining drought conditions in their jurisdictions. Some agencies issue drought watch or drought warning announcements to their customers. Determinations of regional or statewide drought conditions are usually based on a combination of hydrologic and water supply factors.

9.1.2 Drought in Humboldt County

Although Humboldt County has abundant water resources as groundwater and surface water supplied by high levels of rainfall with several major rivers, the County faces water-related challenges that impact water supply and demand, cultural values, and economic, social and environmental conditions. California's North Coast region contributes 26 percent of California's water supply (Guivetchi, 2001). The largest portions of the Klamath and Eel Rivers, California's second and third largest rivers, flow through Humboldt County. Both have major diversion projects outside the county, and have economic, social, cultural and ecological impacts affecting the state as a whole.

Humboldt County has large rural, agricultural, timber, cultural, sand and gravel extraction, and fisheries interests that all rely on the abundant water supply. Humboldt County's urban area is concentrated around Humboldt Bay. Lack of sufficient water supply would affect not only residents and businesses that rely on water for their daily household, employee, and industrial needs, but also an economy and culture that rely on the replenishment of rivers, creeks, and groundwater to grow trees and grass/grain for livestock and to support healthy fish populations.

Water Supply Goals and Standards

The Water Resources Element of the Humboldt County General Plan uses a comprehensive approach to ensure water reliability for customers. The County has a diverse set of water supply options, including surface water and groundwater wells to ensure that even after a period of dry years, a combination of water supplies and water conservation measures will ensure that the community has adequate water. The Humboldt County General Plan Update presents two principle goals in respect to Humboldt County's water supply:

- Maintain or enhance the quality of the County's water resources and the fish and wildlife habitat using those resources,
- Maintain a dependable water supply sufficient to meet existing and future domestic, agricultural and industrial needs, and to ensure that new development is consistent with the limitations of the local water supply.

Water Facilities

Many facilities in Humboldt County depend on an adequate and abundant supply of water. Any stress or reduction of the water supply could have harmful effects on how these facilities are maintained and operated. According the County's General Plan, the major purveyor of domestic and industrial water in Humboldt County is the Humboldt Bay Municipal Water District. This district supplies water to the cities of Eureka, Arcata and Blue Lake, and to the community of Fairhaven and various special districts in the Humboldt Bay area.

The County's inland and southern special districts, with few exceptions, have sufficient water supply to meet present needs. The districts in Willow Creek, Jacoby Creek, Hydesville, Miranda, Redway, Orick, Alderpoint, and Orleans appear to have adequate water supply and capacity. Water supply or capacity is questionable in Weott and Shelter Cove.

Wastewater treatment and disposal services are provided to some of the more densely populated areas of Humboldt County. Six of the County's incorporated cities have wastewater systems (Arcata, Eureka, Blue

Lake, Ferndale, Fortuna, and Rio Dell). Six of the special districts also have such systems (the Humboldt, McKinleyville, and Redway community services districts, the Garberville and Loleta Sanitary Districts, and the Shelter Cove Resort Improvement District). The remainder of the County relies on septic systems to dispose of wastewater. The average home generates about 40 to 50 gallons of wastewater per day (not including outside uses such as lawn watering). The County Health Department and Regional Water Quality Control Board have control over design, construction, operation, and maintenance of wastewater treatment systems within their jurisdictions.

Surface Water Supply

Surface water in Humboldt County varies with the time of year and the amount of rainfall. Insufficient summer flows are experienced in many areas of the county due to the hot dry conditions typically seen in the County just 5 miles inland of the coastal fog belt and because of the seasonal disparity of rainfall and flow conditions. The hydraulic basins in Humboldt County provide very large surface water volumes. Mean annual runoff in Humboldt County from the major rivers and streams is approximately 23 million acre-feet. In comparison, total groundwater yield of the entire County is approximately 100,000 acre-feet. The largest drainage area of the County is that of the Eel River and its tributaries. The contributory surface area is over 763,000 acres, more than a third of the surface area of the County.

The total average annual runoff of the rivers running through the County reflects almost 30 percent of the total runoff of the State of California, but there is an extreme variation in river flows. The Mattole River has a maximum recorded winter discharge in excess of 90,000 cubic feet per second and a minimum summer flow of under 20 cubic feet per second, highlighting the seasonal extremes. The majority of water usage in the County is needed during the lowest flow regimes, further reinforcing the need for drought preparedness and planning. Insufficient summer flows could create problems in the future.

The flows of all of the rivers in the County except the Trinity and Klamath Rivers are directly related to rainfall in the County, and over 80 percent of the flows of these streams occur from November through March. A 1975 report concluded that the major rivers and their perennial tributaries should meet the future domestic water demand of the rural communities. Updated population projections are well within those used in the report. However, facilities to distribute this supply are in many cases inadequate to meet the projected demand and unprepared for drought conditions as experienced presently in the counties immediately south and east.

Groundwater Supply

Humboldt County has four principle groundwater basins in the North Coast Hydrologic Area: Hoopa Valley, Mad River Valley, Eureka Plain, and Eel River Valley (see Table 9-1). All but the Hoopa Valley are a part of the Coastal Basins.

Groundwater development in the rural area of Humboldt County has generally been directed to individual domestic requirements or to the irrigation demands of the more extensively farmed areas of the Eel River delta and Mad River delta areas. The prime source of groundwater, by quantity, is in the Eel River and Van Duzen delta. Though the storage capacity is about 136,000 acre-feet, the usable yield of this groundwater storage is estimated to be 40,000 to 60,000 acre-feet annually. A little more than 10,000 acre-feet of groundwater is currently being pumped from the basin for agricultural uses (Winzler and Kelly, 1970). The Mad River basin has been reported to have a yield of about 45,000 acre-feet annually (Baruth and Yoder, 1971). Other groundwater basin areas include Hoopa Valley, Prairie Creek, Big Lagoon, Mattole River Valley, Honeydew, Pepperwood, Weott, Garberville, Larabee Valley and Dinsmore.

TABLE 9-1.
GROUNDWATER BASINS IN HUMBOLDT COUNTY

Groundwater Basin	Tributaries	Size (sq. mi.)	Average Well Yield (gallons/ minute)	Maximum Well Yield (gallons/ minute)	Storage Capacity (acre-feet)
Eel River Valley	Eel and Van Duzen Rivers	120	400	1,200	136,000
Eureka Plain	Freshwater, Salmon, and Jacoby Creeks and the Elk River	60	400	1,200	n/a
Mad River Valley	Mad River	60	400	n/a	60,000
Hoopa Valley	Lower Trinity and Lower Klamath Rivers	5	300	n/a	19,000

More wells are being drilled each year to serve new development, yet little is known about the location or capacity of the groundwater aquifers. Better estimates of groundwater availability is needed so that development will not surpass the capacity and for planning and modeling of potential drought conditions.

9.2 HAZARD PROFILE

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-term pattern that result in short-term wet spells. Likewise, it is possible for a long-term wet circulation pattern to be interrupted by short-term weather spells that result in short-term drought.

9.2.1 Past Events

The California Department of Water Resources has state hydrologic data back to the early 1900s (watersupplyconditions.water.ca.gov). The hydrologic data show multi-year droughts from 1912 to 1913, 1918 to 1920 and 1922 to 1924. Since then, three prolonged periods of drought occurred in California, all of which impacted the planning area to some degree:

- **1929 to 1934 Drought**—The 1929 to 1934 drought established the criteria for designing many large Northern California reservoirs. The Sacramento Valley runoff was 55 percent of average for the time period from 1901 to 1996, with only 9.8 million acre-feet received.
- **1975 to 1977 Drought**—California had one of its most severe droughts due to lack of rainfall during the winters of 1976 and 1977. 1977 was the driest period on record in California, with the previous winter recorded as the fourth driest in California's hydrological history. The cumulative impact led to widespread water shortages and severe water conservation measures throughout the state. Only 37 percent of the average Sacramento Valley runoff was received, with just 6.6 million acre-feet recorded. Over $2.67 billion in crop damage was recorded in 31 counties. A federal disaster declaration was declared in some counties.
- **1987-1992 Drought**—California received precipitation well below average levels for four consecutive years. While the Central Coast was most affected, the Sierra Nevadas in Northern California and the Central Valley counties were also affected. During this drought, only 56 percent of average runoff for the Sacramento Valley was received, totaling just 10 million

acre-feet. By February 1991, all 58 counties in California were suffering from drought conditions, and urban areas as well as rural and agricultural areas were impacted.

The 1977 extreme California drought conditions affected water supplies for civilian and industrial interests throughout Humboldt County and were some of the worst in the County's history. Not only were water supplies compromised for the County's use, but the drought forced neighboring counties to petition for additional drawdown of water resources allotted from Humboldt County.

Over 70 percent of the Trinity River is dammed and diverted for Central Valley agricultural projects. Flows from the Klamath River are also diverted for agricultural uses. Significant percentages of the Eel River are diverted to the three moderately drought-stricken and rapidly developing counties to the south (Mendocino, Sonoma, Marin) serving over 350,000 people plus agricultural interest. If Humboldt County were to experience a drought like that of 1975-77 season, the economic, cultural, environmental, and social impact could be devastating not only to Humboldt County but also to counties and state projects that depend on water received from Humboldt County.

9.2.2 Location

The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure drought impacts and severity and to map their extent and locations:

- The ***Palmer Crop Moisture Index*** measures short-term drought on a weekly scale and is used to quantify drought's impacts on agriculture during the growing season.
- The ***Palmer Z Index*** measures short-term drought on a monthly scale. Figure 9-1 shows this index for March 2011.
- The ***Palmer Drought Index (PDI)*** measures the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month is dependent on the current weather patterns plus the cumulative patterns of previous months. Weather patterns can change quickly from a long-term drought pattern to a long-term wet pattern, and the PDI can respond fairly rapidly. Figure 9-2 shows this index for March 2011.
- The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop and it takes longer to recover from them. The ***Palmer Hydrological Drought Index (PHDI)***, another long-term index, was developed to quantify hydrological effects. The PHDI responds more slowly to changing conditions than the PDI. Figure 9-3 shows this index for March 2011.
- While the Palmer indices consider precipitation, evapotranspiration and runoff, the ***Standardized Precipitation Index (SPI)*** considers only precipitation. In the SPI, an index of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The SPI is computed for time scales ranging from one month to 24 months. Figure 9-4 shows the 24-month SPI map for April 2009 through March 2011.

9.2.3 Frequency

With the exception of the 1940s through the 1960s, California's drought history indicates that there have been multiyear droughts every decade between 1900 and 2000, all of which had mild to moderate effects in Humboldt County. Conservatively speaking, Humboldt County can experience the direct effects of drought at least once every decade. This does not include the effects that would result from droughts impacting water dependent counties that rely on Humboldt County water. No data are available regarding how much of an effect the present and 2001 drought have had on the County.

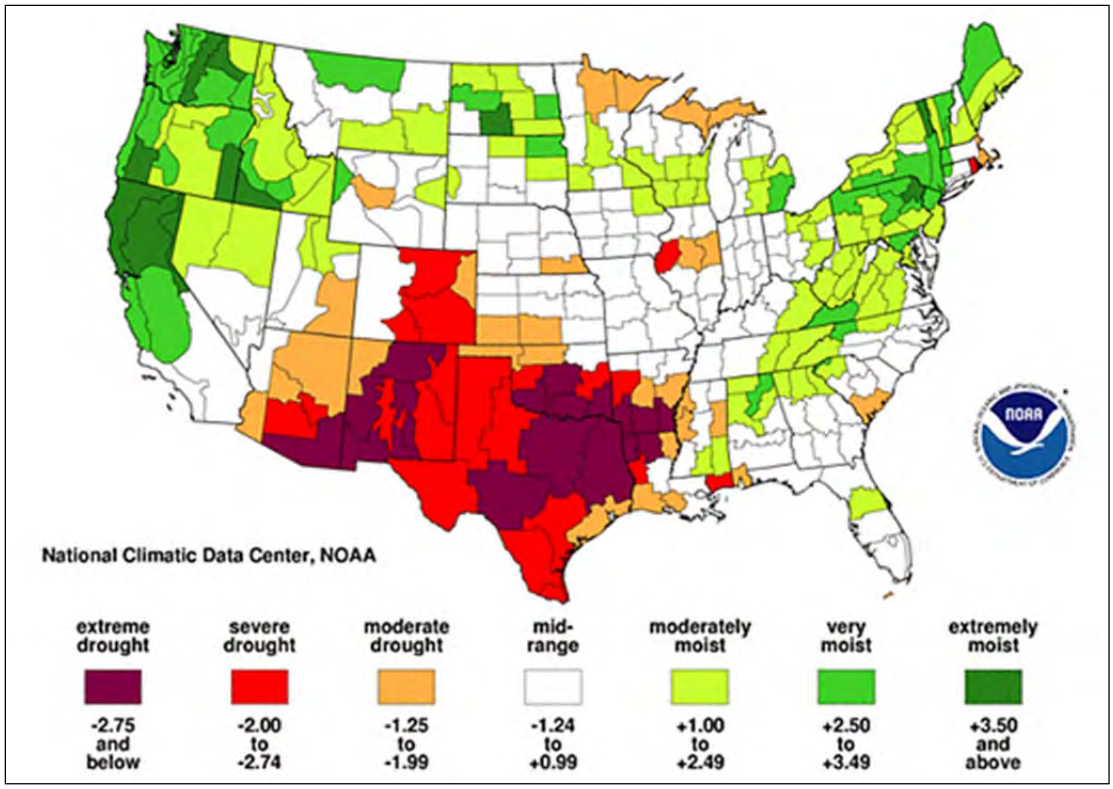


Figure 9-1. Palmer Z Index Short-Term Drought Conditions (March 2011)

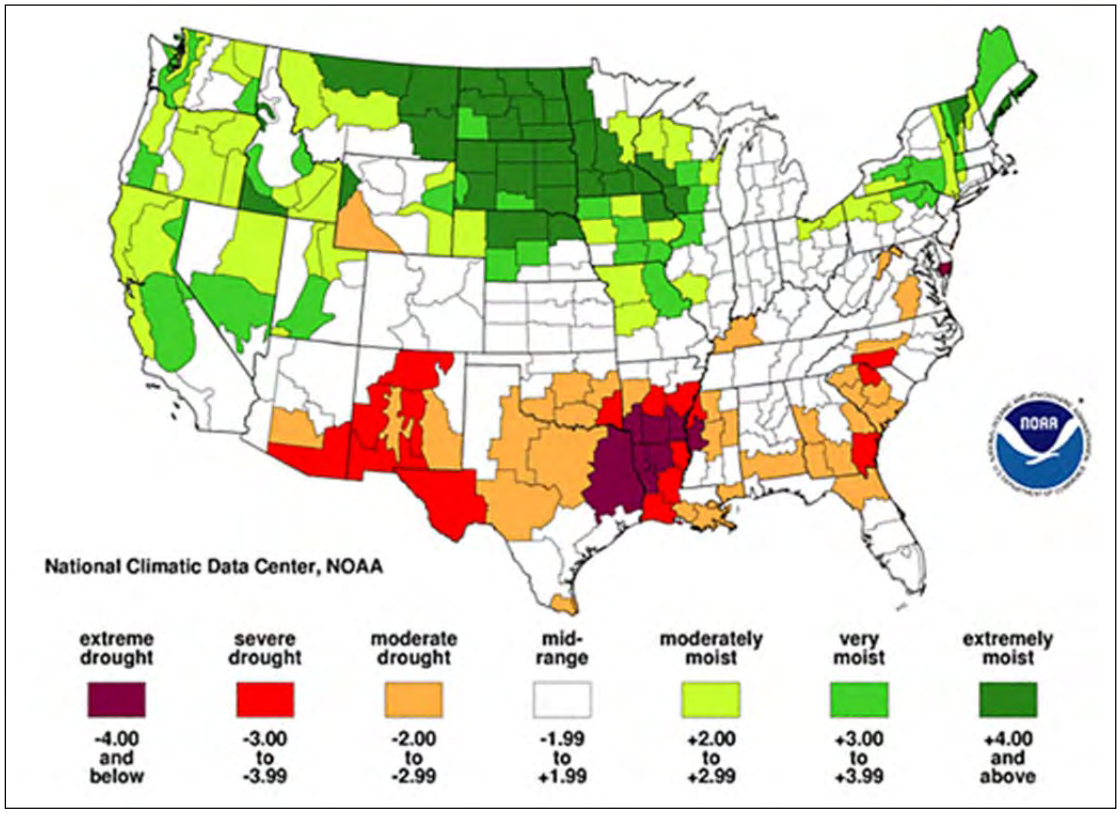


Figure 9-2. Palmer Drought Index Long-Term Drought Conditions (March 2011)

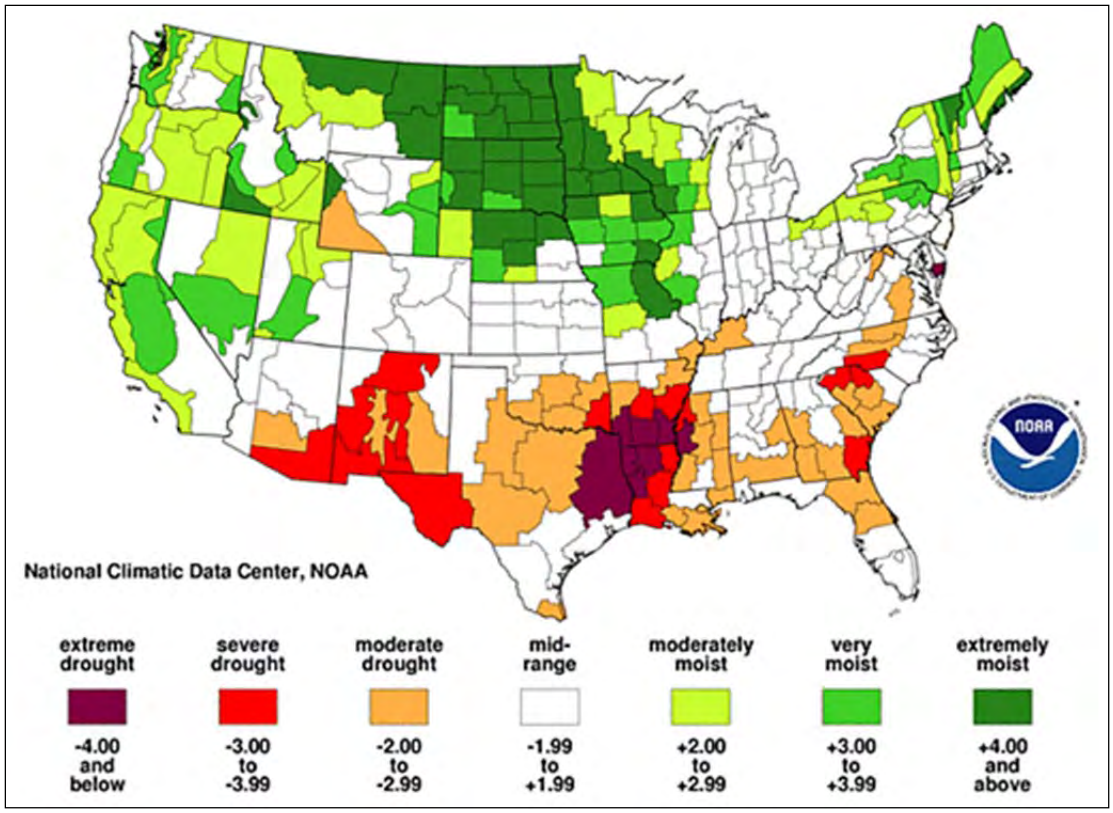


Figure 9-3. Palmer Hydrological Drought Index Long-Term Hydrologic Conditions (March 2011)

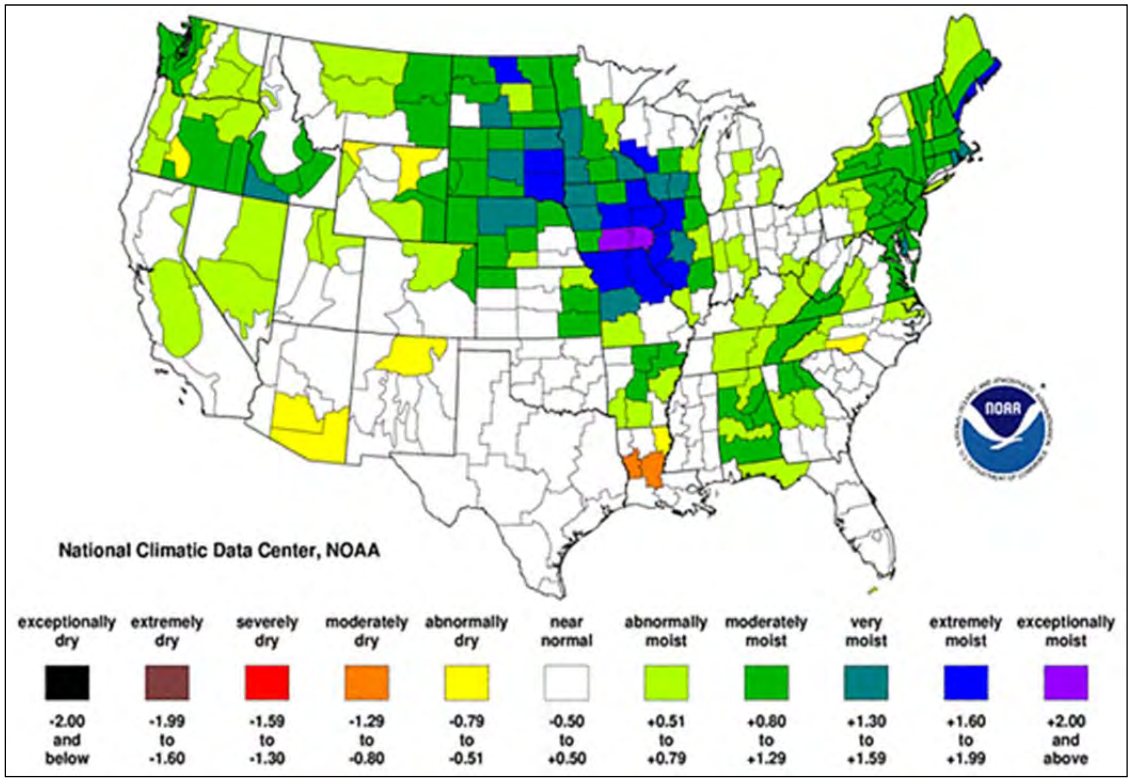


Figure 9-4. 24-Month Standardized Precipitation Index (April 2009—March 2011)

9.2.4 Severity

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture, which can impact people indirectly. When measuring the severity of droughts, analysts typically look at economic impacts on a planning area.

To date, Humboldt County has only experienced mild to moderate drought conditions. Due to its dry farming practices and reliance on generally abundant groundwater and surface water resources, Humboldt County does not experience the severity of drought experienced in the central and southern parts of the state that have large irrigation and urban demands.

9.2.5 Warning Time

Droughts are climatic patterns that occur over long periods of time. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions.

Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.

Scientists at this time do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

9.3 SECONDARY HAZARDS

The secondary hazard most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends.

9.4 CLIMATE CHANGE IMPACTS

The long-term effects of climate change on regional water resources are unknown, but global water resources are already experiencing the following stresses without climate change:

- Growing populations
- Increased competition for available water
- Poor water quality
- Environmental claims
- Uncertain reserved water rights
- Groundwater overdraft
- Aging urban water infrastructure.

With a warmer climate, droughts could become more frequent, more severe, and longer-lasting. From 1987 to 1989, losses from drought in the U.S. totaled $39 billion (OTA, 1993). More frequent extreme events such as droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages.

The best advice to water resource managers regarding climate change is to start addressing current stresses on water supplies and build flexibility and robustness into any system. Flexibility helps to ensure a quick response to changing conditions, and robustness helps people prepare for and survive the worst conditions. With this approach to planning, water system managers will be better able to adapt to the impacts of climate change.

9.5 EXPOSURE

All people, property and environments in the planning area would be exposed to some degree to the impacts of moderate to extreme drought conditions. The following sections describe specific assets at risk to the drought hazard.

9.5.1 Natural Resources

Natural resources are highly valued by residents of Humboldt County for their contribution to the local quality of life, and as an economic development asset that attracts tourist-related expenditures.

9.5.2 Agricultural and Timber Resources

Agricultural resources include rangelands, timberlands, cultivated farmlands and dairy lands. Agricultural lands are an important element of the Humboldt County identity and economy. Any shortage of water supply would have significant economic impacts. In addition, drought conditions greatly increase the likelihood of wildfires, the major threat to timber resources.

9.5.3 Cultural Resources

The Humboldt County General Plan Cultural Resources section provides an overview of culturally sensitive resources in the county:

> Before European settlement, the Humboldt County area was one of the most culturally diverse regions of California, being home to nearly a dozen distinct peoples. In large part, Native American tribes occupied distinct areas conforming largely to the natural watershed basins. Culturally sensitive areas are sites and regions of special importance to Native Americans, primarily coastlines and riverbanks with outstanding religious or resource-producing importance. Over 32,000 acres of land in Humboldt County are designated as culturally sensitive, with notable concentrations along the Lower Klamath River, the Lower Trinity River, the lower end and North Fork of the Mad River, and the Van Duzen River, as well as the eastern shore of Humboldt Bay (Humboldt County, 1984).

Culturally sensitive areas exist on both public and private lands. While some locations are publicly identified, others are held as confidential information by Native American governments or cultural leaders. The Northwest Information Center at Sonoma State University maintains records for cultural resource sites, including cemeteries, villages, and lithic scatters (surface-visible concentrations of stone chips, flakes, and tools). Three-quarters of these resources are located along rivers and major tributaries; the remainder are in flat mountainous areas or prairies. High-density sites (villages, cemeteries, and ceremonial and gathering areas) are concentrated in the Hoopa, Yurok and Karuk tribal lands and riverine

areas. Ridgelines along rivers and creeks, where traveling between villages likely occurred, and lithic scatters around Trinidad, Humboldt Bay, the Eel delta and Shelter Cove are considered medium-density resource sites. Water shortages and severe drought conditions would have a significant impact on those cultures' way of life in fishing and farming subsistence.

9.5.4 Scenic Resources

There is a broad range of scenic resources in Humboldt County, including the coastline and Pacific Ocean, mountains, hills, ridgelines, inland water features, forests, agricultural features and distinctive rural communities. Many of these resources are vulnerable to drought as well as the increased likelihood of wildfires associated with droughts.

Coastal Views

Humboldt County's varied and extensive coastline allows for a wide range of scenic vistas from State Highway 101 and from beaches, state parks and coastal access points. The County's Local Coastal Program includes a technical study on visual resources. The study includes a detailed inventory of local visual resources along the coastline and identifies areas as "highly scenic" and "visually degraded areas" (Humboldt County, 1979). A more recent discussion of Humboldt County's existing scenic resources, viewshed evaluation and policy discussion is contained in *Natural Resources and Hazards*, which was prepared for use in the General Plan Update (Dyett and Bhatia, 2002). Drought could impact these views.

Forests

Forestlands define much of the visual landscape of Humboldt County. Redwood National Park, Six Rivers National Forest, Redwoods State Park, and King Range National Conservation Area are all significant protected forests in the County. Forestland is abundant well beyond these protected areas. The scenic value of these natural resources, viewed from within or from outside, is of great importance. Drying up or dying off of any of these forests could reduce ecological and eco-tourist values.

9.6 VULNERABILITY

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provide services. Drought can affect a wide range of economic, environmental and social activities. The vulnerability of an activity to the effects of drought usually depends on its water demand, how the demand is met, and what water supplies are available to meet the demand. California's 2005 Water Plan indicates that water demand in the state will increase through 2030. Although the Department of Water Resources predicts a modest decrease in agricultural water use, the agency anticipates that urban water use will increase by 1.5 to 5.8 million acre-feet per year.

The areas of Humboldt County most vulnerable to drought are timberlands and rural residential areas. The timber industry relies on a relatively long and wet winter to provide the necessary conditions for fast, vigorous new growth of harvested lands. Any shortfall of rain for a period of time would not only reduce productivity, but also greatly increase the risk of fire.

Rural residences at higher elevations, or in the south and east of the county are also vulnerable to drought conditions. They depend on adequate winter rains to replenish their ground and surface water supplies. Due to the nature of the hot dry summers, steep topography, and the low-to-moderate groundwater potential, a period of extreme drought conditions could render those areas uninhabitable.

9.6.1 Population

No significant life or health impacts are anticipated as a result of drought within the planning area.

9.6.2 Property

No structures are anticipated to be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

9.6.3 Critical Facilities

Critical facilities as defined in this plan will continue to be operational during a drought. Critical facility elements such as landscaping may not be maintained due to limited resources, but the risk to the planning area's critical facilities inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

9.6.4 Environment

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

9.6.5 Economic Impact

Economic impact will be largely associated with industries that use water or depend on water for their business. For example, landscaping businesses were affected in the droughts of the past as the demand for service significantly declined because landscaping was not watered. The County's water conservation programs work to ensure that businesses whose product relies on water receive their allotments to continue operating. The timber, gravel and sand, and agricultural industries will be impacted if water usage is restricted for irrigation.

9.7 FUTURE TRENDS IN DEVELOPMENT

Each municipal planning partner in this effort has an established general plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local municipal level to protect future development from the impacts of drought. All planning partners reviewed their general plans under the capability assessments performed for this effort. Deficiencies identified by these reviews can be identified as mitigation actions to increase the capability to deal with future trends in development.

The California Department of Water Resources is moving forward with aggressive water conservation programs to reduce the state's water demand and consumption. The goal is to reduce per capita water consumption by 20 percent by 2020. Conservation efforts include the following:

- Encouraging increased widespread implementation of cost-effective conservation programs by urban and agricultural water suppliers
- Helping water agencies develop water shortage contingency plans so they are prepared for future dry conditions or supply interruptions
- Implementing programs to conserve water in landscaping and helping irrigation districts, farmers, and managers of large urban landscapes stretch their available water by providing daily information on plant water needs.

9.8 SCENARIO

An extreme multiyear drought more intense than the 1976-1977 and 1987-1992 droughts could impact the region with little warning. Combinations of low precipitation and unusually high temperatures could occur over several consecutive years. Intensified by such conditions, extreme wildfires could break out throughout Humboldt County, increasing the need for water. Surrounding communities, also in drought conditions, could increase their demand for water supplies relied upon by the planning partnership, causing social and political conflicts. If such conditions persisted for several years, the economy of Humboldt County could experience setbacks, especially in water dependent industries.

9.9 ISSUES

The planning team has identified the following drought-related issues:

- There are existing residences in drought-prone areas in south and east Humboldt County that normally experience water shortages.
- Drought in the county could increase and expand fire-prone areas and adversely affect the timber economy.
- Planning must address the degree of future development in drought-prone areas.
- Counties to the south and east are in a persistent drought and are, at differing levels, dependent on Humboldt County water. The future water demand for those counties if the drought intensifies is presently unknown.
- The diverse fisheries stock is dependent on abundant water availability. Any drop in fisheries productivity due to drought conditions would have immediate and long-term consequences for the economy, culture and ecological structure.
- More studies need to be done regarding overall county water usage and how it relates to the economy to prepare for a worst-case scenario drought.
- With the possibility of climate change, drought may become a larger issue due to warming trends and wider fluctuations in rainfall patterns.
- Alternative water supplies need to be identified and developed.
- Groundwater recharge techniques can be used to stabilize the groundwater supply
- Active water conservation should be promoted even during non-drought periods.

CHAPTER 10.
EARTHQUAKE

10.1 GENERAL BACKGROUND

10.1.1 How Earthquakes Happen

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds. The 2010 State Hazard Mitigation Plan notes:

> "Earthquakes are a significant concern for California for several reasons. First, California has a chronic and destructive earthquake history. Since 1950, only 8 percent (12) of federally declared disasters in the state were the result of earthquakes. During this time, however, earthquake disasters have claimed 203 lives and resulted in 18,962 injuries and over $8 billion in CalEMA-administered disaster costs. Second, California has widespread earthquake vulnerability as indicated by California Geological Survey mapping of potential earthquake shaking intensity zones, with their common presence near many populated areas (see Figure 10-1). Third, nearly all local governments that have submitted Local Hazard Mitigation Plans have identified earthquakes as an important hazard."

DEFINITIONS

Earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

Epicenter—The point on the earth's surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.

Fault—A fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other.

Focal Depth—The depth from the earth's surface to the hypocenter.

Hypocenter—The region underground where an earthquake's energy originates

Liquefaction—Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

California is seismically active because it sits on the boundary between three of the earth's tectonic plates. Most of the state—everything east of the San Andreas Fault—is on the North American Plate. Monterey, Santa Barbara, Los Angeles, and San Diego are on the Pacific Plate, which trends offshore at Cape Mendocino. North of Cape Mendocino, the offshore subducting Gorda Plate strongly influences seismicity of Humboldt and Del Norte counties. The relative movement between the Pacific and North American plates is primarily a strike-slip movement, whereas the movement between the Gorda and North American plates is primarily a thrust subduction. The area where the three tectonic plates intersect is known as the Mendocino Triple Junction.

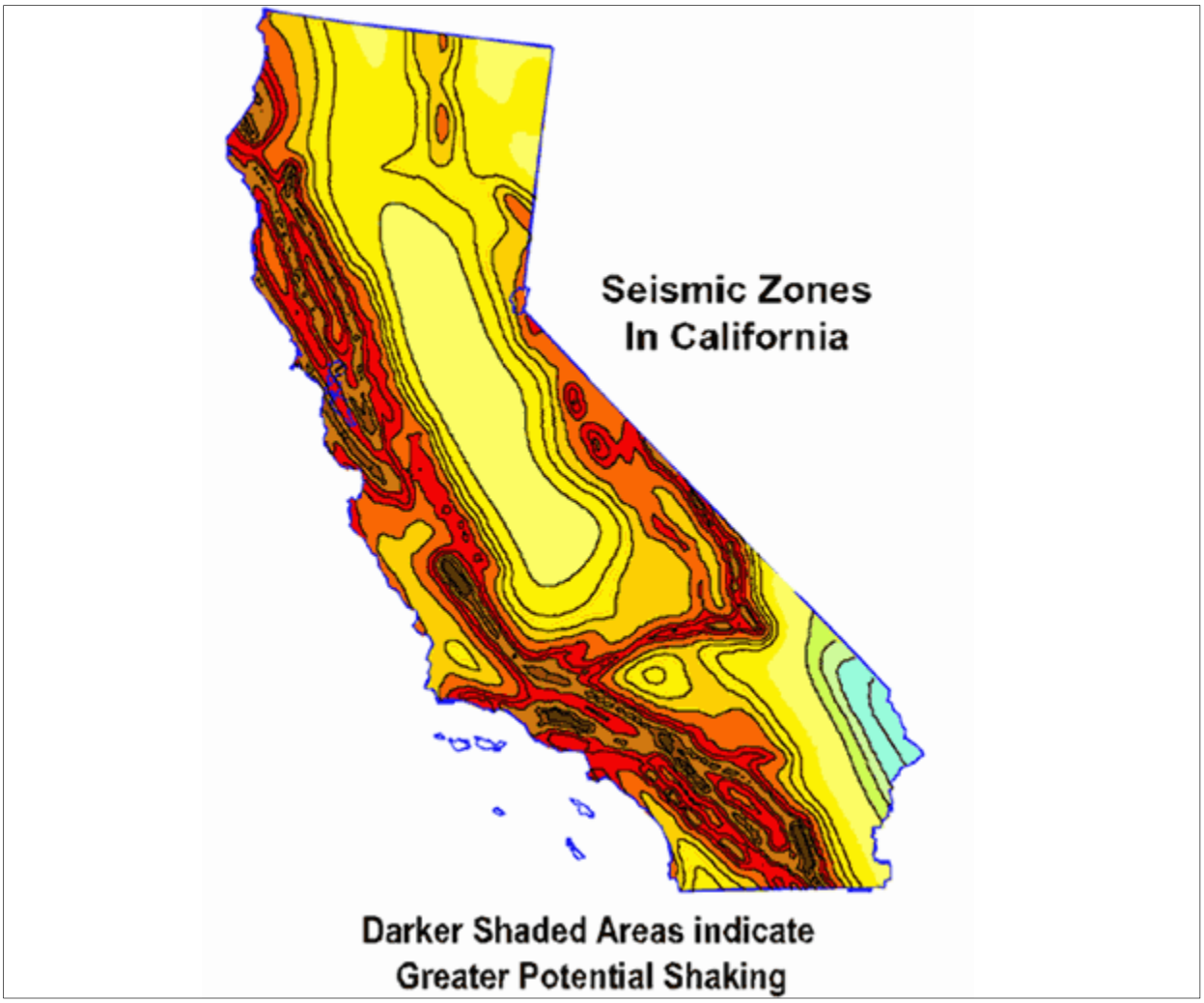


Figure 10-1. Seismic Zones in California

Earthquakes tend to reoccur along faults, which are zones of weakness in the crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur.

Geologists classify faults by their relative hazards. Active faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). Potentially active faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years). Determining if a fault is “active” or “potentially active” depends on geologic evidence, which may not be available for every fault. Although there are probably still some unrecognized active faults, nearly all the movement between the two plates, and therefore the majority of the seismic hazards, are on the well-known active faults.

Faults are more likely to have earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve accumulating tectonic stresses. A direct relationship exists between a fault’s length and location and its ability to generate damaging ground motion at a given site. In some areas, smaller, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant

as a result of the fault's proximity to the area. In contrast, large regional faults can generate great magnitudes but, because of their distance and depth, may result in only moderate shaking in the area.

10.1.2 Earthquake Classifications

Earthquakes are typically classified in one of two ways: by the amount of energy released, measured as **magnitude**; or by the impact on people and structures, measured as **intensity**.

Magnitude

Currently the most commonly used magnitude scale is the moment magnitude (M_w) scale, with the following classifications of magnitude:

- Great—$M_w \geq 8$
- Major—$M_w = 7.0 - 7.9$
- Strong—$M_w = 6.0 - 6.9$
- Moderate—$M_w = 5.0 - 5.9$
- Light—$M_w = 4.0 - 4.9$
- Minor—$M_w = 3.0 - 3.9$
- Micro—$M_w < 3$

Estimates of moment magnitude roughly match the local magnitude scale (ML) commonly called the Richter scale. One advantage of the moment magnitude scale is that, unlike other magnitude scales, it does not saturate at the upper end. That is, there is no value beyond which all large earthquakes have about the same magnitude. For this reason, moment magnitude is now the most often used estimate of large earthquake magnitudes.

Intensity

Currently, the most commonly used intensity scale is the modified Mercalli intensity scale, with ratings defined as follows (USGS, 1989):

- I. Not felt except by a very few under especially favorable conditions
- II. Felt only by a few persons at rest, especially on upper floors of buildings.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it is an earthquake. Standing cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like a heavy truck striking building. Standing cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight in well-built ordinary structures; considerable in poorly built or badly designed structures. Some chimneys broken.

- VIII. Damage slight in specially designed structures; considerable damage in ordinary buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
- XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

10.1.3 Ground Motion

Earthquake hazard assessment is also based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most commonly mapped ground motion parameters are the horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage “short period structures” (e.g. single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 10-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

TABLE 10-1.
MERCALLI SCALE AND PEAK GROUND ACCELERATION COMPARISON

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X - XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA measured in percent of g, where g is the acceleration of gravity
Sources: USGS, 2008; USGS, 2010

10.1.4 Effect of Soil Types

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the quake, and liquefaction, a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. Liquefaction generally occurs in soft, unconsolidated sedimentary soils. A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. Table 10-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

TABLE 10-2.
NEHRP SOIL CLASSIFICATION SYSTEM

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

10.2 HAZARD PROFILE

Humboldt County is located within the two highest of five seismic risk zones specified by the Uniform Building Code, and offshore Cape Mendocino has the highest concentration of earthquake events anywhere in the continental United States. The area near Cape Mendocino is a complex, seismically active region, where three crustal plates, the Pacific Plate, the Gorda Plate, and North American Plate intersect to form the Mendocino Triple Junction.

The subducting Gorda Plate, together with the Juan de Fuca Plate, forms the “Cascadia Subduction Zone,” which runs north offshore of Humboldt and Del Norte Counties, Oregon, and Washington. Recent investigations have shown that this system has moved in unison in a series of great earthquakes (magnitude 8 to 9) over the last 20,000 years, most recently about 300 years ago, with events occurring at 300- to 500-year intervals. The local seismic setting has the potential to cause significant ground shaking, leading to the following:

- A serious liquefaction and subsidence hazard, particularly around the muds and sands of Humboldt Bay
- A nearshore tsunami striking the coast within 15 minutes of ground-shaking
- A significant landslide hazard countywide
- A surface fault rupture along the San Andreas, and possibly along the Little Salmon and Mad River fault zones, and other active or potentially active faults in the county.

10.2.1 Past Events

According to the California State Hazard Mitigation Plan, two earthquakes between 1950 and 2003 caused sufficient damage in Humboldt County for the State to proclaim a state of emergency. The Cape Mendocino Earthquake on April 25, 1992 caused enough damage in Humboldt County and the region to warrant a presidential disaster declaration (DR-943). Table 10-3 lists seismic events with a magnitude of 5.0 or larger that were felt within the planning area since 2000.

TABLE 10-3.
RECENT EARTHQUAKES MAGNITUDE 5.0 OR LARGER FELT IN HUMBOLDT COUNTY

		Epicenter Location		
Date	Magnitude	Distance	Direction	Nearest City or Place
January 9, 2010	6.5	35 km	WNW	Ferndale, CA
February 26,2007	5.4	51 km	W	Ferndale, CA
July 16, 2006	5.0	6 km	WNW	Punta Gorda, CA
March 25, 2006	5.0	3 km	WNW	Punta Gorda, CA
June 14, 2005	7.2	156 km	W	Trinidad, CA
August 15, 2003	5.3	121 km	WNW	Ferndale, CA
June 17, 2002	5.27	37 km	W	Eureka, CA
September 20, 2001	5.10	80 km	WNW	Punta Gorda, CA
January 13, 2001	5.19	92 km	WNW	Ferndale, CA
March 16, 2000	5.59	N/A	N/A	Offshore Punta Gorda, Cape Mendocino

Source: Earthquake Catalogs, Northern California Earthquake Data Center, 2013

10.2.2 Location

The area affected by an earthquake is largely a function of the following components:

- Source (fault mapping)
- Ground shaking (ground motion accelerations)
- Liquefaction (soil instability)
- Distance from the source (both horizontally and vertically).

Mapping that assesses these components was used to locate earthquake hazard zones in the planning area. While the impacts from these components can build upon each other during an earthquake event, the mapping looks at each component individually. The mapping is described below.

Fault Mapping

A key component of earthquake risk is proximity to the source. A fault is a fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other and is a principle source of earthquake activity. How close an asset is to a source of the earthquake is a critical component of earthquake risk assessment. Map 10-1 shows the known fault complexes within the Humboldt Operational Area.

Shake Maps

Earthquake shaking is measured by instruments called accelerographs that are triggered by the onset of shaking and record levels of ground motion at stations throughout a region. These readings are recorded historically by state and federal agencies tasked with monitoring and predicting seismic activity. A probabilistic seismic hazard map is a map that shows the hazard from earthquakes that geologists and seismologists agree could occur in California. The analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site.

The maps are typically expressed in terms of probability of exceeding a certain ground motion. For example, maps for 10-percent probability of exceedance in 50 years show levels of ground shaking that have only a 10 percent chance of being exceeded in the next 50 years (a 90-percent chance of NOT being exceeded in 50 years). This level of ground shaking has been used for designing buildings in high seismic areas. Figure 10-2 illustrates the estimated ground motion for a 500-year probabilistic earthquake.

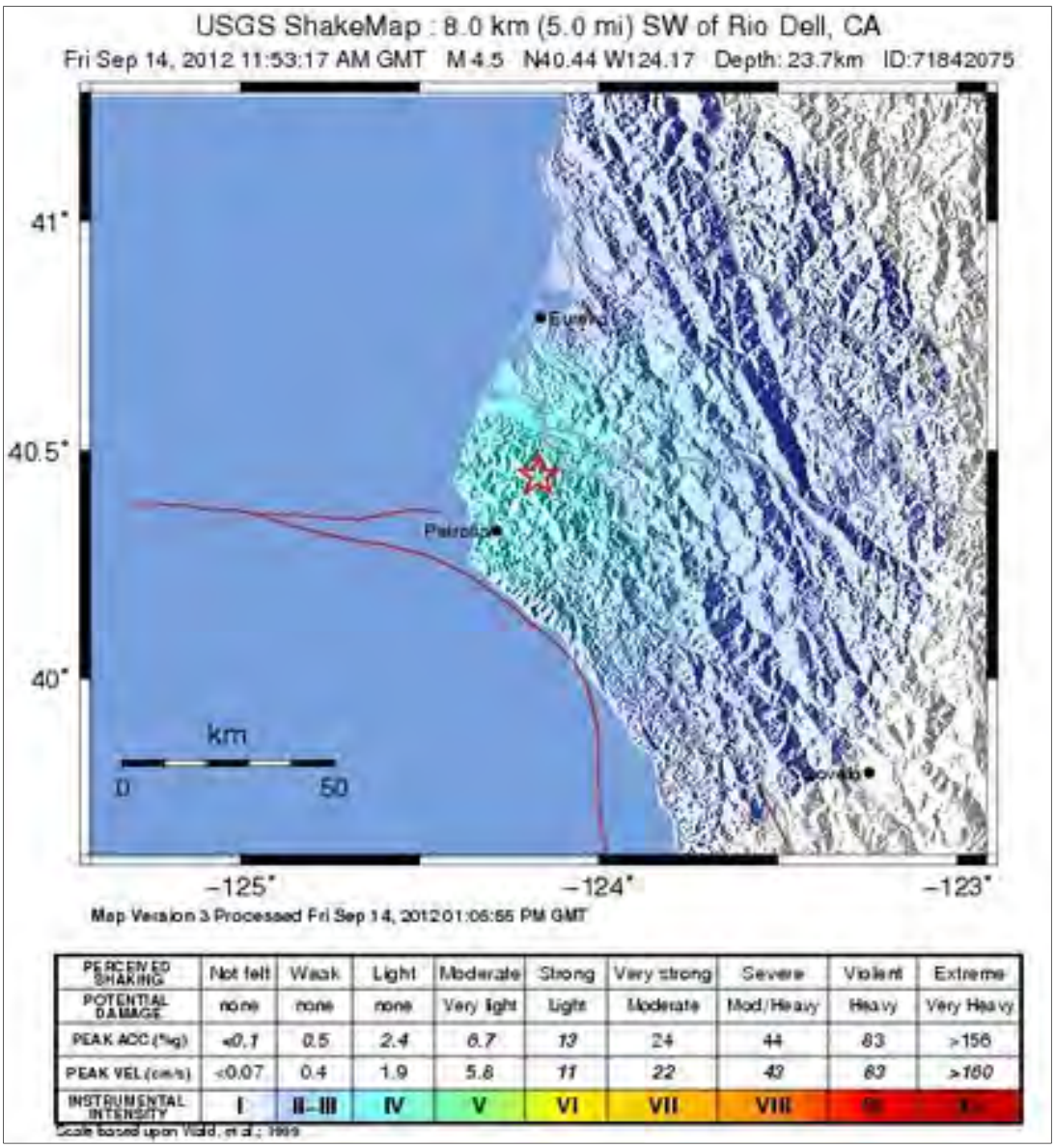


Figure 10-2. Estimated Ground Motion for a 500-Year Probabilistic Earthquake

A shake map is a representation of ground shaking produced by an earthquake. The information it presents is different from the earthquake magnitude and epicenter that are released after an earthquake because shake maps focus on the ground shaking resulting from the earthquake, rather than the parameters describing the earthquake source. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the extent and variation of ground shaking in a 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 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. Two types of shake maps are typically generated from the data:

- A probabilistic seismic hazard map shows the hazard from earthquakes that geologists and seismologists agree could occur. The maps are expressed in terms of probability of exceeding a certain ground motion, such as the 10-percent probability of exceedance in 50 years. This level of ground shaking has been used for designing buildings in high seismic areas. Maps 10-2 and 10-3 show peak ground accelerations for the 100-year and 500-year probabilistic events.
- Earthquake scenario maps describe the expected ground motions and effects of hypothetical large earthquakes for a region. Maps of these scenarios can be used to support all phases of emergency management. The following scenarios were chosen by the Steering Committee for this plan:
  - Cascadia Subduction Zone Fault Scenario—A Magnitude 9.0 event with an epicenter approximately 60 miles west-northwest of Tillamook, Oregon. See Map 10-4.
  - Ferndale Fault Scenario—A Magnitude 6.5 event with an epicenter 23.1 miles west-northwest of Ferndale. See Map 10-5.
  - Punta Gorda/Cape Mendocino Fault Scenario—A Magnitude 5.6 event with an epicenter offshore of Punta Gorda/Cape Mendocino at Latitude 40.39 North, Longitude 125.28 West. See Map 10-6.
  - Trinidad Fault Scenario—A Magnitude 7.2 event with an epicenter 96.9 miles west of Trinidad. See Map 10-7.

NEHRP Soil Maps

NEHRP soil types define the locations that will be significantly impacted by an earthquake. NEHRP Soils B and C typically can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP Soils D, E and F. Map 10-8 shows NEHRP soil classifications in the county.

10.2.3 Frequency

The Humboldt County planning area has experienced at least nine seismic events with a magnitude of 5.0 or higher in a 7-year period (see Table 10-3). The USGS has created probabilistic hazard maps based on peak ground acceleration that takes into account new information on several fault zones. The northern California area, including Humboldt County, is in a high-risk area, with a 10-percent probability in a 50-year period of ground shaking from a seismic event exceeding 30 percent of gravity. Figure 10-3 shows the expected peak horizontal ground motions for this probability (USGS Website, 2007).

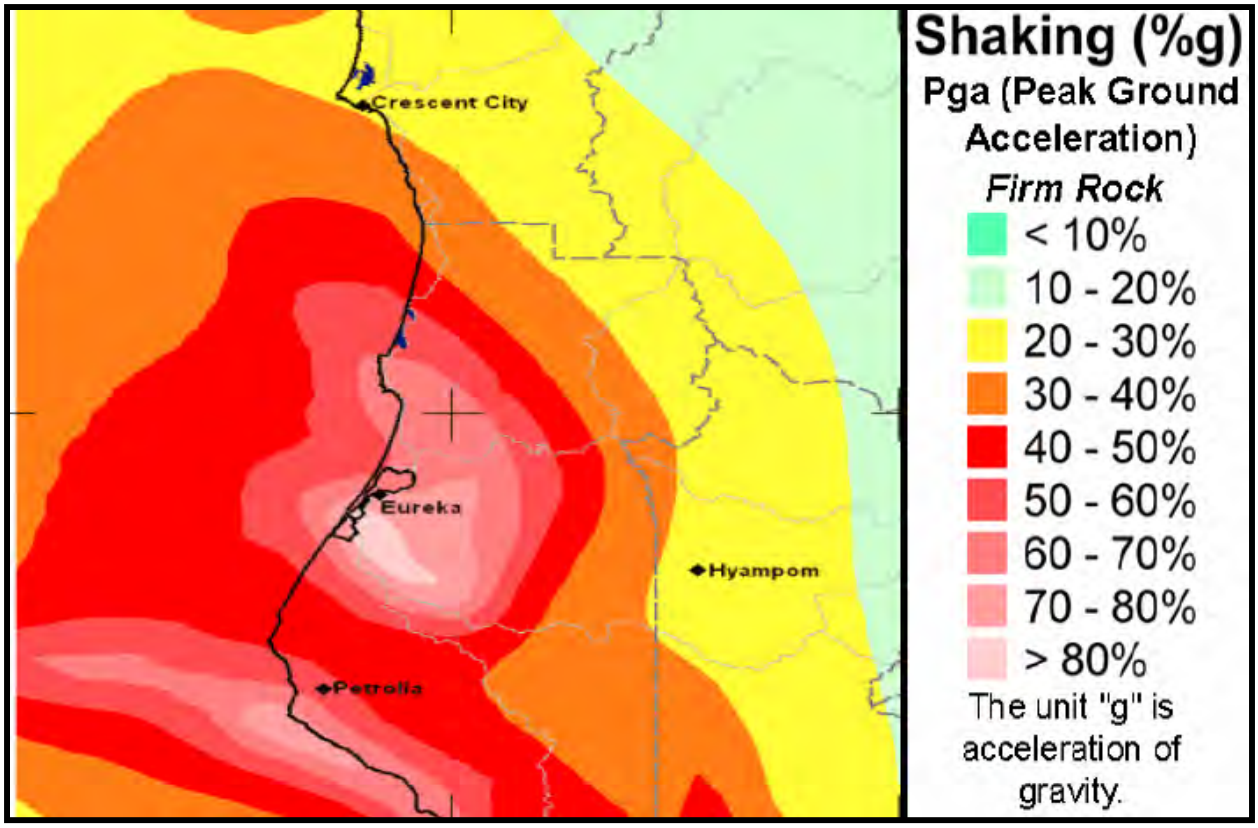


Figure 10-3. PGA with 10-Percent Probability of Occurrence in 50 Years

10.2.4 Severity

The severity of an earthquake can be expressed in terms of both intensity and magnitude. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. It varies from place to place within the disturbed region depending on the location with respect to the earthquake epicenter. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of the earthquake waves recorded on instruments, which have a common calibration. Magnitude is thus represented by a single, instrumentally determined value.

Past events suggest that earthquakes typical for the Humboldt County planning area would cause light to moderate damage. However, severity can increase based on soil type and proximity to the hypocenter of the event. There are soft soils in Humboldt County that have a high degree of vulnerability to earthquakes. The USGS estimates that there is at least a 5-percent probability that an earthquake with a magnitude of 7.5 or greater could occur within 50 km of the planning area within the next 5 years (Figure 10-4). The probability that a quake of magnitude 5.0 or higher will hit in some part of California in the next 30 years is over 95 percent. This probability of occurrence, mixed with potential vulnerable soil stability, could lead to a scenario of an earthquake event causing severe damage in the planning area.

Magnitude is related to the amount of seismic energy released at the hypocenter of an earthquake. It is determined by the amplitude of the earthquake waves recorded on instruments. Whereas intensity varies depending on location with respect to the earthquake epicenter, magnitude is represented by a single, instrumentally determined value for each earthquake event.

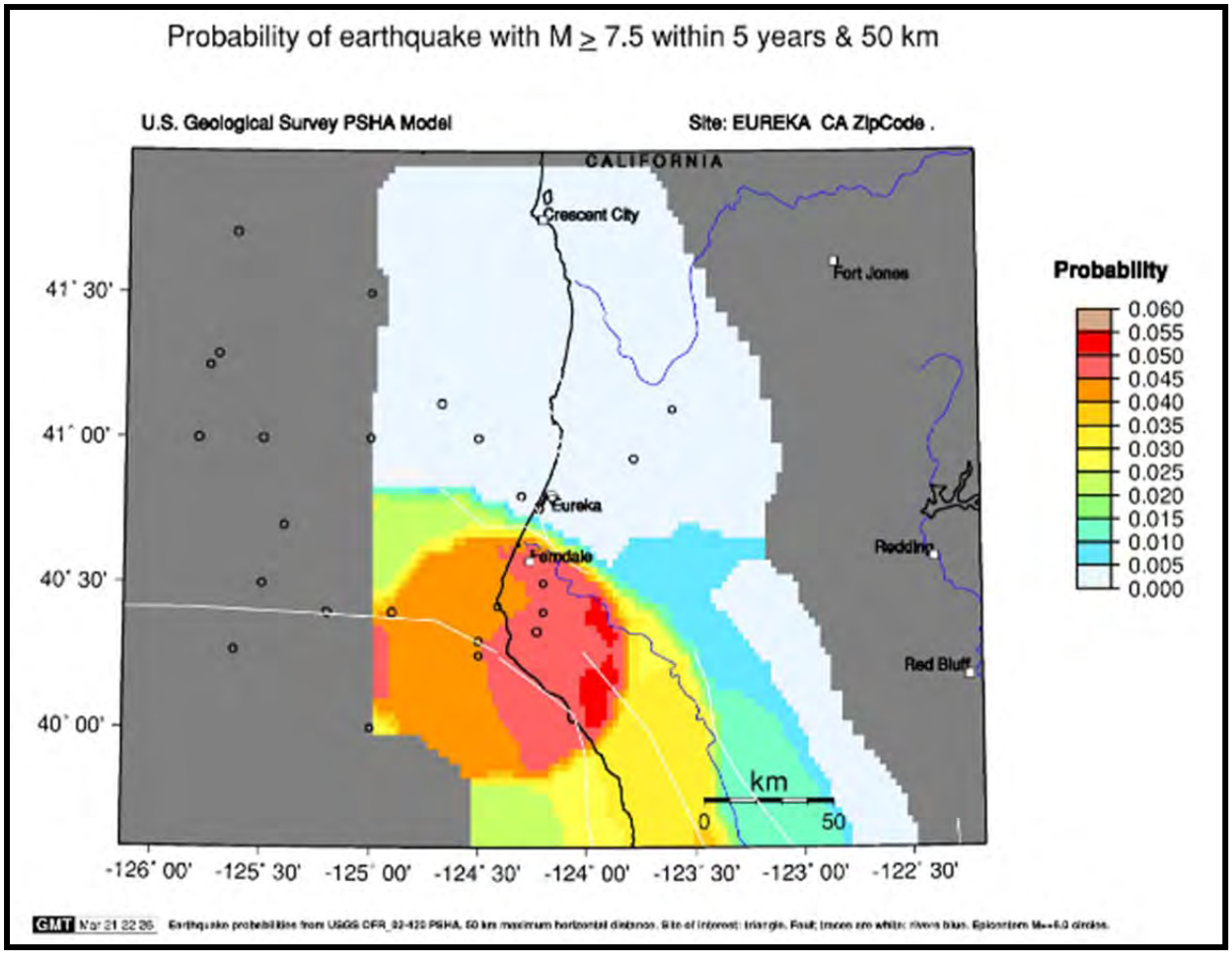


Figure 10-4. Earthquake Recurrence Probability Map for Humboldt County

In simple terms, the severity of an earthquake event can be measured in the following terms:

- How hard did the ground shake?
- How did the ground move? (Horizontally or vertically)
- How stable was the soil?
- What is the fragility of the built environment in the area of impact?

10.2.5 Warning Time

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that use the low energy waves that precede major earthquakes. These potential warning systems give approximately 40 seconds notice that a major earthquake is about to occur. The warning time is very short but it could allow for someone to get under a desk, step away from a hazardous material they are working with, or shut down a computer system.

10.3 SECONDARY HAZARDS

Earthquakes can cause large and sometimes disastrous landslides and mudslides. River valleys are vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose

contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Earthen dams and levees are highly susceptible to seismic events and the impacts of their eventual failures can be considered secondary risks for earthquakes.

10.4 CLIMATE CHANGE IMPACTS

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity, according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004). Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by storms could experience liquefaction during seismic activity. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts.

10.5 EXPOSURE

10.5.1 Population

The entire population of Humboldt County is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of the structures people live in, the soil type their homes are constructed on, their proximity to fault location, etc. Whether directly impacted or indirectly impacted, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of utility functions could impact populations that suffered no direct damage from an event itself.

10.5.2 Property

According to County Assessor records, there are 53,137 buildings in the planning area, with a total assessed value of $15.521 billion. All these structures are susceptible to earthquake impacts to varying degrees. Most of the buildings (83 percent) are residential.

10.5.3 Critical Facilities and Infrastructure

All critical facilities in the planning area (see Table 6-2 and Table 6-3) are exposed to the earthquake hazard. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

10.5.4 Environment

Secondary hazards associated with earthquakes will likely have some of the most damaging effects on the environment. Earthquake-induced landslides can significantly impact surrounding habitat. It is also possible for streams to be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

10.6 VULNERABILITY

Earthquake vulnerability data was generated using a Level 2 HAZUS-MH analysis. Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up.

10.6.1 Population

A geographic analysis of demographics was performed using the HAZUS-MH model. The inventoried data included total population, age, gender, and race distribution and other data obtained from the U.S. Census Bureau and Dun & Bradstreet. The demographics were aggregated at the Census-block level. The vulnerable populations are those living below the poverty level, those over 65 and those under 16. This spatial analysis provides a basis for identifying populations most vulnerable in the event of an earthquake and for working on mitigation efforts including education and outreach with them.

Impacts on persons and households in the planning area were estimated for the 100-year and 500-year earthquakes and the four scenario events through the Level 2 HAZUS-MH analysis. Table 10-4 summarizes the results.

TABLE 10-4.
ESTIMATED EARTHQUAKE IMPACT ON PERSONS AND HOUSEHOLDS

	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
100-Year Earthquake	203	147
500-Year Earthquake	2,643	1,876
Cascadia Subduction Zone Scenario	969	7.8
Ferndale Scenario	31	22
Punta Gorda/Cape Mendocino Scenario	0	0
Trinidad Scenario	0	0

10.6.2 Property

Building Age

Table 10-5 identifies significant milestones in building and seismic code requirements that directly affect the structural integrity of development. Using these time periods, the planning team used HAZUS to identify the number of structures in the planning area by date of construction. The number of structures does not reflect the number of total housing units, as many multi-family units and attached housing units are reported as one structure. The planning area's structures constructed after the Uniform Building Code was amended in 1994 to include seismic safety provisions make up 17.7 percent of the total inventory. Those built before 1933, when there were no building permits, inspections, or seismic standards, account for 4.4 percent.

TABLE 10-5.
AGE OF STRUCTURES IN PLANNING AREA

Time Period	Number of Current Planning Area Structures Built in Period	Significance of Time Frame
Pre-1933	2,325	Before 1933, there were no explicit earthquake requirements in building codes. State law did not require local governments to have building officials or issue building permits.
1933-1940	5,425	In 1940, the first strong motion recording was made.
1941-1960	12,413	In 1960, the Structural Engineers Association of California published guidelines on recommended earthquake provisions.
1961-1975	15,055	In 1975, significant improvements were made to lateral force requirements.
1976-1994	8,501	In 1994, the Uniform Building Code was amended to include provisions for seismic safety.
1994 - present	9,418	Seismic code is currently enforced.
Total	**53,137**	

Loss Potential

Property losses were estimated through the Level 2 HAZUS-MH analysis for the 100-year and 500-year earthquakes and the four scenario events. Table 10-6, Table 10-7 and Table 10-8 show the results for two types of property loss:

- Structural loss, representing damage to building structures
- Non-structural loss, representing the value of lost contents and inventory, relocation, income loss, rental loss, and wage loss.

A summary of the property-related loss results is as follows:

- For a 100-year probabilistic earthquake, the estimated damage potential is $323.21 million, or 2.08 percent of the total assessed value for the planning area.
- For a 500-year probabilistic earthquake, the estimated damage potential is $1.678 billion, or 10.81 percent of the total assessed value for the planning area.
- For a 9.0-magnitude event on the Cascadia Subduction Zone, the estimated damage potential is $1.099 billion, or 7.08 percent of the total assessed value for the planning area.
- For a 6.5-magnitude event on the Ferndale Fault, the estimated damage potential is $118.5 million, or 0.76 percent of the total assessed value for the planning area.
- For a 5.6-magnitude event on the Punta Gorda/Cape Mendocino Fault, the estimated damage potential is $180,000 or 0.0012 percent of the total assessed value for the planning area.
- For a 7.2-magnitude event on the Ferndale Fault, the estimated damage potential is insignificant and not measurable by the model.

The HAZUS-MH analysis also estimated the amount of earthquake-caused debris in the planning area for the 100-year and 500-year earthquakes and the two scenario events, as summarized in Table 10-9.

TABLE 10-6.
LOSS ESTIMATES FOR PROBABILISTIC EARTHQUAKES

	Estimated Loss Associated with Earthquake					
	100- Year Earthquake			500-Year Earthquake		
	Structure	Contents	**Total**	Structure	Contents	**Total**
Arcata	$20,457,999	$6,652,031	**$27,110,030**	$107,046,223	$8,966,759	**$116,012,982**
Blue Lake	$7,909	$2,317	**$10,227**	$76,975	$13,676	**$90,651**
Eureka	$62,446,663	$20,876,521	**$83,323,184**	$452,102,366	$53,722,675	**$505,825,040**
Ferndale	$43,493	$14,220	**$57,713**	$148,911	$25,833	**$174,744**
Fortuna	$5,568,258	$1,583,307	**$7,151,565**	$16,398,033	$2,703,773	**$19,101,806**
Rio Dell	$215,538	$68,125	**$283,663**	$804,763	$139,920	**$944,683**
Trinidad	$4,212	$1,208	**$5,421**	$40,815	$6,835	**$47,651**
Unincorporated	$159,902,322	$48,365,484	**$205,267,806**	$888,196,745	$147,838,306	**$1,036,035,051**
Total	**$248,646,394**	**$77,563,213**	**$323,209,609**	**$1,464,814,831**	**$213,417,777**	**$1,678,232,608**

TABLE 10-7.
LOSS ESTIMATES FOR CASCADIA AND FERNDALE FAULT SCENARIO EARTHQUAKES

	Estimated Loss Associated with Earthquake					
	Cascadia Subduction Zone			Ferndale		
	Structure	Contents	**Total**	Structure	Contents	**Total**
Arcata	$68,879,174	$18,855,761	**$87,734,935**	$1,359,461	$737,245	**$2,096,706**
Blue Lake	$27,036	$9,137	**$36,173**	$716	$314	**$1,030**
Eureka	$282,483,116	$76,908,235	**$359,391,351**	$47,526,836	$17,417,860	**$64,944,695**
Ferndale	$99,328	$26,774	**$126,102**	$3,121	$1,416	**$4,537**
Fortuna	$14,798,871	$3,564,016	**$18,362,887**	$1,004,580	$392,236	**$1,396,816**
Rio Dell	$582,007	$158,733	**$740,741**	$14,644	$6,939	**$21,583**
Trinidad	$21,674	$7,316	**$28,990**	$16	$9	**$25**
Unincorporated	$493,037,744	$139,784,286	**$632,832,030**	$36,034,192	$14,004,542	**$50,038,734**
Total	**$859,928,950**	**$239,314,258**	**$1,099,253,209**	**$85,943,566**	**$32,560,561**	**$118,504,126**

TABLE 10-8.
LOSS ESTIMATES FOR PUNTA GORDA AND TRINIDAD FAULT SCENARIO EARTHQUAKES

	Estimated Loss Associated with Earthquake					
	Punta Gorda/Cape Mendocino			Trinidad		
	Structure	Contents	**Total**	Structure	Contents	**Total**
Arcata	$9,384	$5,910	**$15,294**	$0	$0	**$0**
Blue Lake	$7	$4	**$12**	$0	$0	**$0**
Eureka	$33,302	$21,696	**$54,998**	$0	$0	**$0**
Ferndale	$10	$6	**$16**	$0	$0	**$0**
Fortuna	$1,354	$798	**$2,152**	$0	$0	**$0**
Rio Dell	$67	$41	**$108**	$0	$0	**$0**
Trinidad	$0	$0	**$0**	$0	$0	**$0**
Unincorporated	$66,080	$40,807	**$106,887**	$0	$0	**$0**
Total	**$110,204**	**$69,262**	**$179,467**	**$ 0**	**$ 0**	**$ 0**

TABLE 10-9.
ESTIMATED EARTHQUAKE-CAUSED DEBRIS

	Debris to Be Removed (tons)
100-Year Earthquake	94.66
500-Year Earthquake	699.69
Cascadia Scenario	435.75
Ferndale Scenario	24.85
Punta Gorda/Cape Mendocino Scenario	0.01
Trinidad Scenario	0.00

10.6.3 Critical Facilities and Infrastructure

Level of Damage

HAZUS-MH classifies the vulnerability of critical facilities to earthquake damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a vulnerability category to each critical facility in the planning area except hazmat facilities and "other infrastructure" facilities, for which there are no established damage functions. For the 100-year and 500-year events, the analysis was completed only for critical facilities; critical infrastructure was not included. Critical facilities and infrastructure were analyzed for the Cascadia and the Ferndale Fault scenarios. The results are summarized in Table 10-10 through Table 10-13.

TABLE 10-10.
ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM CASCADIA SCENARIO

Category[a]	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Medical and Health	0	0	8	27	45
Government Functions	0	0	2	5	13
Protective Functions	0	5	13	42	48
Schools	0	8	41	53	107
Other Critical Functions	0	2	5	34	49
Bridges	55	139	7	10	0
Water supply	10	50	30	0	0
Wastewater	0	2	8	6	0
Power	0	4	12	0	0
Communications	0	4	5	0	0
Total	**65**	**214**	**131**	**177**	**262**

a. Vulnerability not estimated for hazmat facilities or for "other infrastructure" facilities.

TABLE 10-11.
ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM FERNDALE SCENARIO

Category[a]	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage
Medical and Health	6	1	73	0	0
Government Functions	3	0	17	0	0
Protective Functions	16	10	81	1	0
Schools	32	6	170	1	0
Other Critical Functions	15	8	67	0	0
Bridges	199	12	0	0	0
Water supply	72	18	0	0	0
Wastewater	16	0	0	0	0
Power	12	4	0	0	0
Communications	9	0	0	0	0
Total	**380**	**59**	**408**	**2**	**0**

a. Vulnerability not estimated for hazmat facilities or for "other infrastructure" facilities.

TABLE 10-12.
ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM 100-YEAR EARTHQUAKE

Category[a]	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage	**Total**
Medical and Health	6	1	73	0	0	**80**
Government Functions	3	0	17	0	0	**20**
Protective Functions	16	10	81	1	0	**108**
Schools	32	6	168	2	1	**209**
Societal Functions	6	2	124	0	0	**132**
Other Critical Functions	15	8	67	0	0	**90**
Total	**78**	**27**	**530**	**3**	**1**	**639**

a. Vulnerability not estimated for hazmat facilities or for critical infrastructure.

TABLE 10-13.
ESTIMATED DAMAGE TO CRITICAL FACILITIES FROM 500-YEAR EARTHQUAKE

Category[a]	No Damage	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage	**Total**
Medical and Health	0	0	8	27	45	**80**
Government Functions	0	0	2	5	13	**20**
Protective Functions	0	5	13	42	48	**108**
Schools	0	8	41	53	107	**209**
Societal Functions	0	0	1	5	126	**132**
Other Critical Functions	0	2	5	34	49	**90**
Total	**0**	**15**	**70**	**166**	**388**	**639**

a. Vulnerability not estimated for hazmat facilities or for critical infrastructure.

Time to Return to Functionality

HAZUS-MH estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, HAZUS-MH may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95-percent chance of being fully functional at Day 90. The analysis of critical facilities in the planning area was performed for the 100-year, Cascadia and Ferndale earthquake events. The "societal function" category was included in "other critical functions" for this analysis. Table 10-14, Table 10-15 and Table 10-16 summarize the results.

TABLE 10-14.
FUNCTIONALITY OF CRITICAL FACILITIES FOR 100-YEAR EVENT

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	80	68.3	88.4	92.1	96.6	98.8	99.7
Government Functions	20	1.8	5.6	40.3	48.6	65.9	81.6
Protective Functions	108	55.9	67.5	76.9	78.9	84.0	90.1
Schools	209	0.1	0.3	9.5	9.7	28.5	42.2
Other Critical functions	222	59.7	78.7	89.7	92.2	93.4	97.0
Bridges	211	76.4	79.7	82.4	82.7	85.3	89.7
Water supply	90	41.0	77.9	85.9	87.0	90.0	98.2
Wastewater	16	24.7	55.6	78.9	82.9	84.5	96.6
Power	16	0.0	0.2	6.6	6.8	23.5	37.1
Communications	12	65.5	82.4	87	90.6	94.6	96.4
Total/Average	**984**	**39.3**	**53.6**	**64.9**	**67.6**	**74.6**	**82.9**

TABLE 10-15.
FUNCTIONALITY OF CRITICAL FACILITIES FOR CASCADIA SCENARIO

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	80	1.80	1.97	9.83	10.01	19.96	28.01
Government Functions	20	5.83	5.95	11.89	12.02	19.23	26.79
Protective Functions	108	15.10	15.51	33.83	34.27	45.28	52.64
Schools	209	9.67	10.29	36.94	37.60	55.49	59.86
Other Critical functions	222	92.0	96.3	97.8	97.9	98.1	99.2
Bridges	211	86.40	90.42	92.21	92.56	92.93	95.64
Water supply	90	51.7	84.6	90.6	91.4	93.4	98.8
Wastewater	16	18.09	43.44	66.79	71.09	73.81	93.04
Power	16	24.42	55.47	83.83	94.43	97.49	99.90
Communications	12	57.8	79.38	85.21	93	97.14	99.41
Total/Average	**984**	**26.36**	**37.38**	**48.71**	**50.97**	**57.38**	**64.97**

TABLE 10-16.
FUNCTIONALITY OF CRITICAL FACILITIES FOR FERNDALE SCENARIO

Planning Unit	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Medical and Health	80	18.01	19.00	60.82	61.85	81.43	87.44
Government Functions	20	16.88	17.94	62.34	63.42	83.60	89.18
Protective Functions	108	43.32	44.30	84.70	85.67	95.12	96.94
Schools	209	49.13	49.89	81.86	82.62	92.80	95.29
Other Critical functions	222	8.20	9.43	60.78	62.05	83.63	89.28
Bridges	211	98.59	99.19	99.37	99.40	99.42	99.64
Water supply	90	85.46	97.81	99.06	99.14	99.35	99.83
Wastewater	16	67.94	89.92	97.44	98.44	98.58	99.71
Power	16	76.47	93.11	98.71	99.56	99.82	99.90
Communications	12	92.13	98.21	98.87	99.50	99.82	99.9
Total/Average	**984**	**55.0**	**60.68**	**83.73**	**84.49**	**93.05**	**95.54**

10.6.4 Environment

The environment vulnerable to earthquake hazard is the same as the environment exposed to the hazard.

10.7 FUTURE TRENDS IN DEVELOPMENT

Land use in the planning area will be directed by general plans adopted under California's General Planning Law. The safety elements of the general plans establish standards and plans for the protection of the community from hazards. The information in this plan provides the participating partners a tool to ensure that there is no increase in exposure in areas of high seismic risk. Development in the planning area will be regulated through building standards and performance measures so that the degree of risk will be reduced. The geologic hazard portions of the planning area are heavily regulated under California's General Planning Law. The International Building Code establishes provisions to address seismic risk.

10.8 SCENARIO

Based on history and geology, the Humboldt County planning area will be frequently impacted by earthquakes. The degree and magnitude of these impacts are difficult to predict, but some areas in the county are more susceptible to damage than other areas due to soil instability. The damage potential from earthquakes is greater on areas with softer soils. There is also a large inventory of structures that were built under less stringent building codes than are currently being applied, and this older building stock would be at higher risk.

The worst-case scenario in the planning area is a higher magnitude (5.0 or higher) event with an epicenter within 50 miles of Humboldt County. The higher degree of damage would be to older structures located on soft soils. Bridges and utilities that cross these poor soils would likely fail, causing loss of critical infrastructure and utilities. River valley and coastal hydraulic-fill sediment areas are also vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Soil liquefaction would occur in water-saturated sands, silts or gravelly soils. Building and road foundations would lose load-bearing strength. Injuries could occur from debris, such as parapets and chimneys that could topple or be shaken

loose and fall on those walking or driving below. An earthquake may also cause minor landslides along unstable slopes. This would be even more likely if the earthquake occurred during the wet winter and early spring months.

Any seismic activity of 6.0 or greater on faults within the planning area would have significant impacts throughout the county. Potential warning systems could give approximately 40 seconds notice that a major earthquake is about to occur. This would not provide adequate time for preparation. Earthquakes of this magnitude or higher would lead to massive structural failure of property on NEHRP C, D, E, and F soils. Levees and revetments built on these poor soils would likely fail, representing a loss of critical infrastructure. These events could cause secondary hazards, including landslides and mudslides that would further damage structures. River valley hydraulic-fill sediment areas are also vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Soil liquefaction would occur in water-saturated sands, silts or gravelly soils.

10.9 ISSUES

Many secondary effects could be caused by an earthquake in Humboldt County. These include but are not limited to the following:

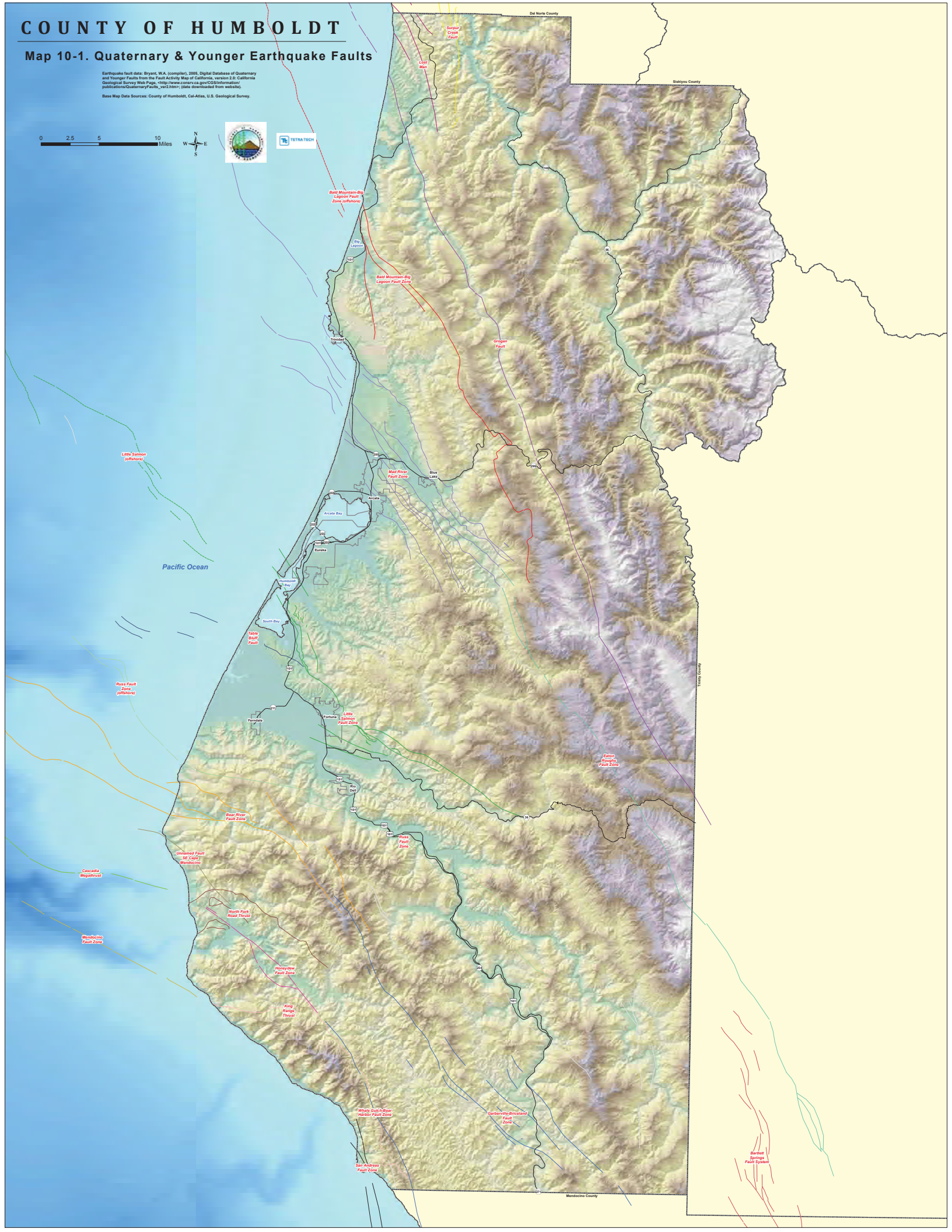
- Neighborhoods and communities could become isolated. Several vulnerable populations are on NEHRP C, D and E soils.
- Wooden homes could experience fires, essential buildings such as fire stations could collapse, dams could fail, and bridge collapse could lead to isolated communities.
- 66 percent of the planning area's building stock was built prior to 1975, when seismic provisions became uniformly applied through building code applications.
- Landslides and tsunamis are major natural secondary hazards that could have a widespread effect on cities and the county.
- Earthquakes pose risks to major infrastructure such as roads, bridges and railroads that cross vulnerable soils.
- A high number of critical facilities in the planning area are at risk and would have a fairly significant amount of functional downtime post-event. This creates a need not only for mitigation but also for continuity of operations planning to develop procedures for providing services without access to essential facilities.
- Critical facility owners should be encouraged to create or enhance continuity of operations plans using the information on risk and vulnerability contained in this plan.
- Geotechnical standards should be established that take into account the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- The county has earthen levees and revetments on soft, unstable soils. These soils are prone to liquefaction, which would severely undermine the integrity of these facilities.
- Earthquakes could trigger other natural hazard events such as dam failures and landslides, which could severely impact the county.
- A worst-case scenario would be the occurrence of a large seismic event during a flood or high-water event. Levee failures would happen at multiple locations, increasing the impacts of the individual events.

COUNTY OF HUMBOLDT

Map 10-1. Quaternary & Younger Earthquake Faults

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, <http://www.consrv.ca.gov/CGS/information/publications/QuaternaryFaults_ver2.htm>. (date downloaded from website).

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



COUNTY OF HUMBOLDT

Map 10-2.
100-Year Earthquake Peak Ground Acceleration

Mercalli Scale, Potential Shaking

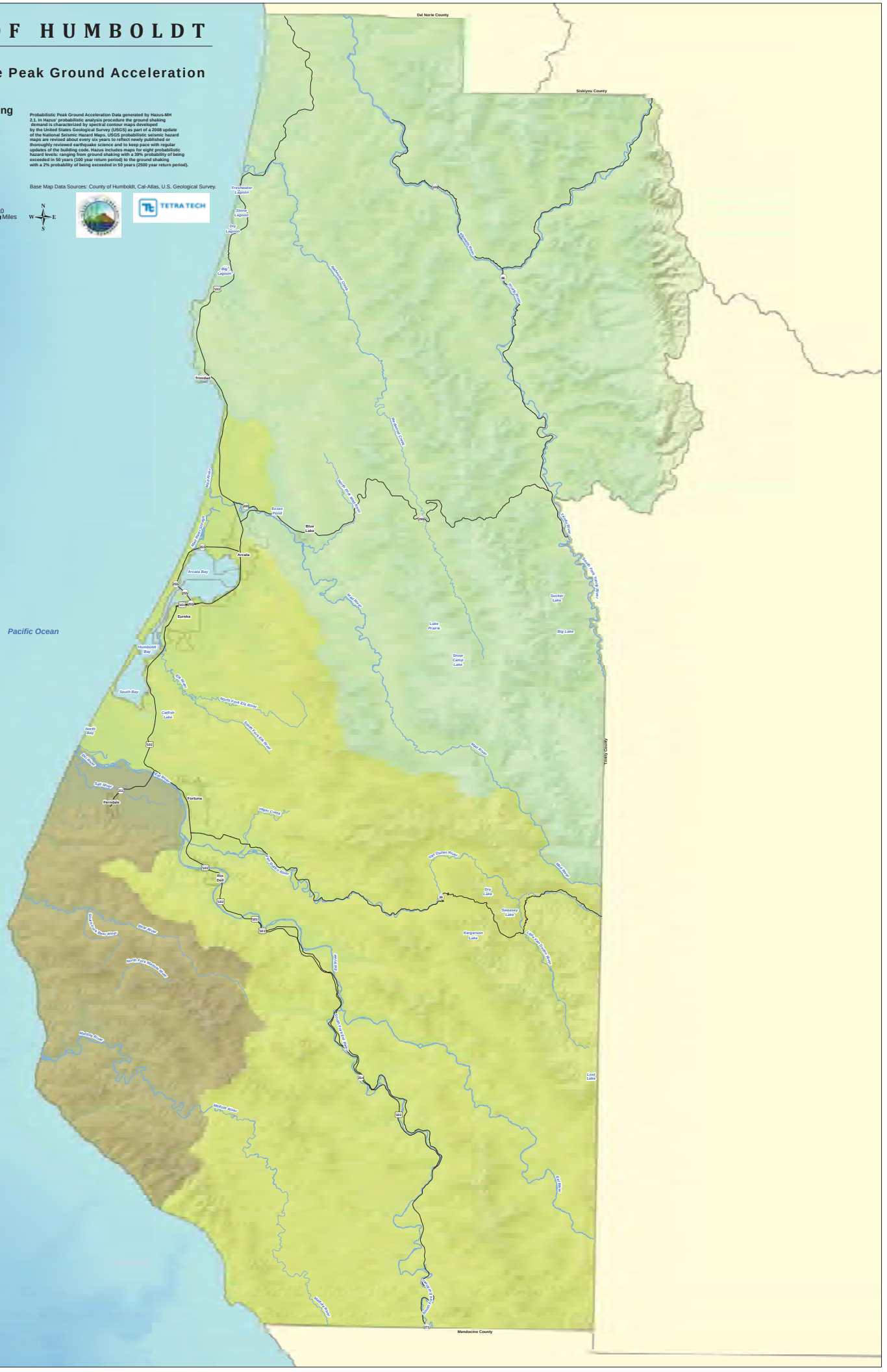
- I (Not Felt)
- II - III (Weak)
- IV (Light)
- V (Moderate)
- VI (Strong)
- VII (Very Strong)
- VIII (Severe)
- IX (Violent)
- X+ (Extreme)

0 2.5 5 10 Miles

N W E S

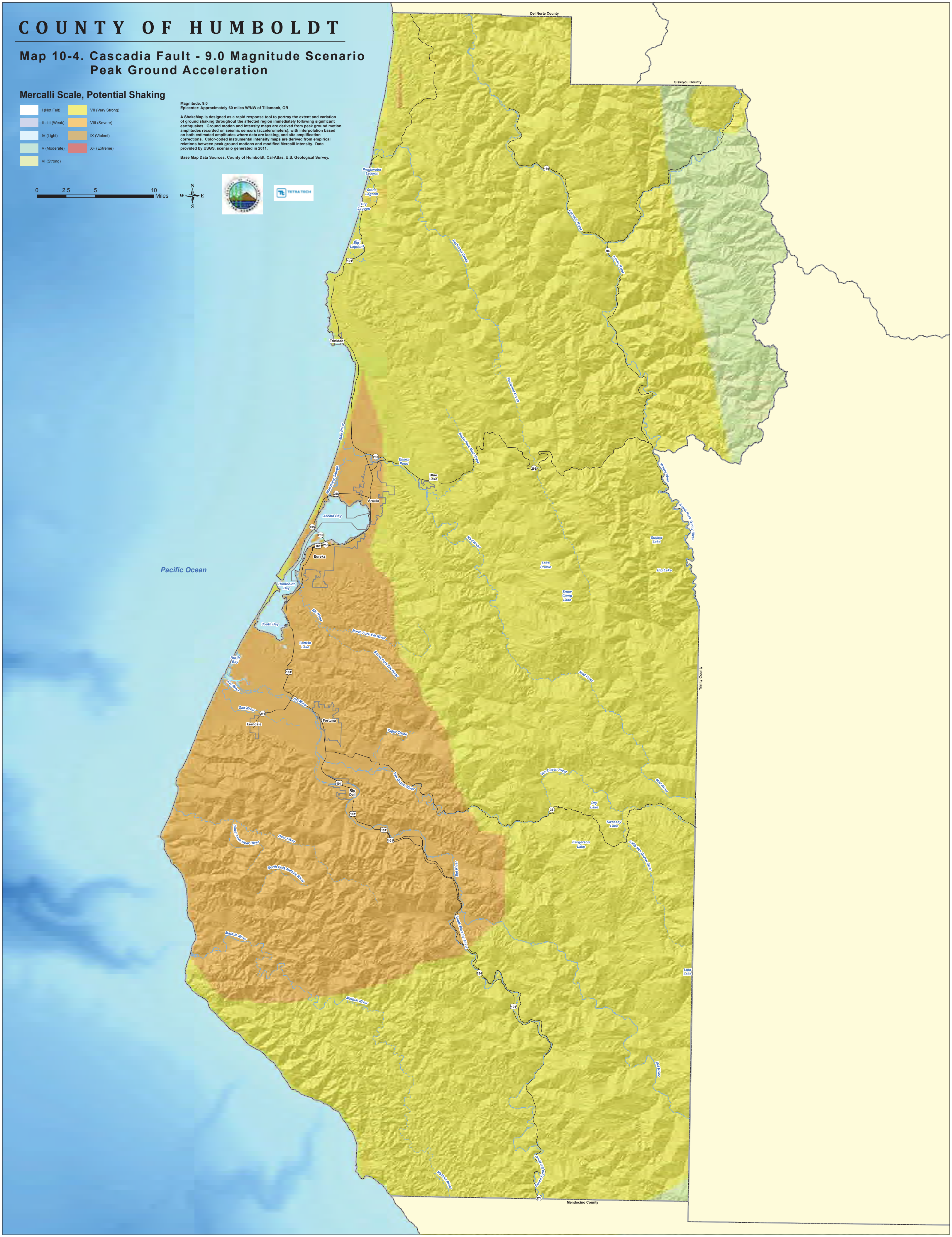
Probabilistic Peak Ground Acceleration Data generated by Hazus-MH 2.1. In Hazus' probabilistic analysis procedure the ground shaking demand is characterized by spectral contour maps developed by the United States Geological Survey (USGS) as part of a 2008 update of the National Seismic Hazard Maps. USGS probabilistic seismic hazard maps are revised about every six years to reflect newly published or thoroughly reviewed earthquake science and to keep pace with regular updates of the building code. Hazus includes maps for eight probabilistic hazard levels: ranging from ground shaking with a 39% probability of being exceeded in 50 years (100 year return period) to the ground shaking with a 2% probability of being exceeded in 50 years (2500 year return period).

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



COUNTY OF HUMBOLDT

Map 10-3. 500-Year Earthquake Peak Ground Acceleration


COUNTY OF HUMBOLDT
Map 10-4. 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, U.S. Geological Survey.
0
2.5
5
10
Miles
N
W
E
S
TETRA TECH
Del Norte County
Siskiyou County
Trinity County
Mendocino County
Pacific Ocean
Trinidad
Arcata
Arcata Bay
Eureka
Humboldt Bay
South Bay
Blue Lake
Fortuna
Ferndale
Rio Dell
Freshwater Lagoon
Stone Lagoon
Dry Lagoon
Big Lagoon
Essex Pond
Mad River
Eel River
Van Duzen River
Mattole River
Klamath River
Trinity River
Redwood Creek
Yager Creek
Elk River
Salt River
Bear River
Lake Prairie
Snow Camp Lake
Sucker Lake
Big Lake
Lost Lake
Kerlgerson Lake
Dry Lake
Swasey Lake
101
299
96
36
211
254
255
200
169
271

COUNTY OF HUMBOLDT

Map 10-5. Ferndale M6.5 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)

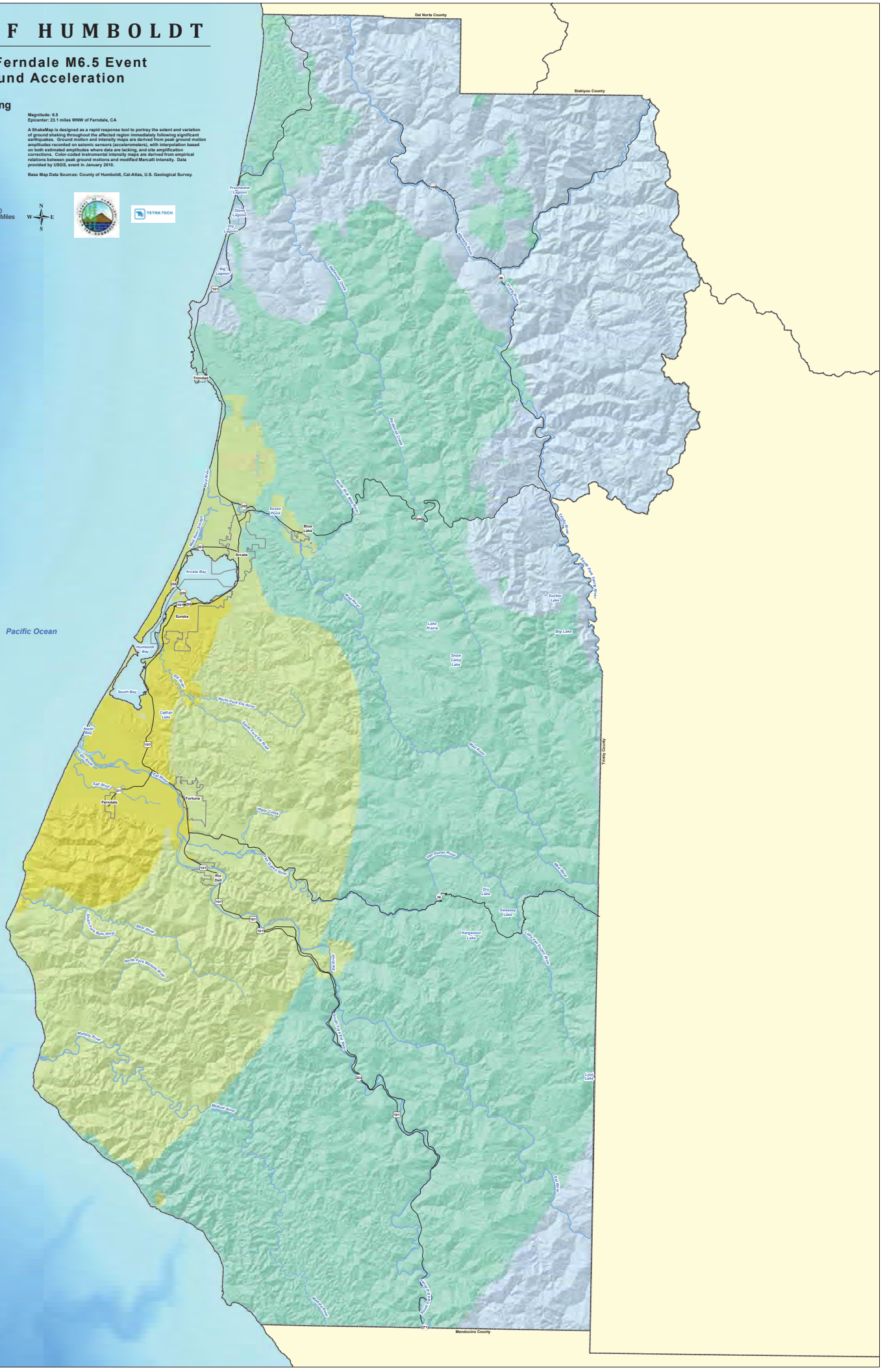
0 2.5 5 10 Miles

N W E S

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 between peak ground motions and modified Mercalli intensity. Data provided by USGS, event in January 2010.

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



COUNTY OF HUMBOLDT

Map 10-6. Offshore Punta Gorda/Point Mendocino M5.6 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)

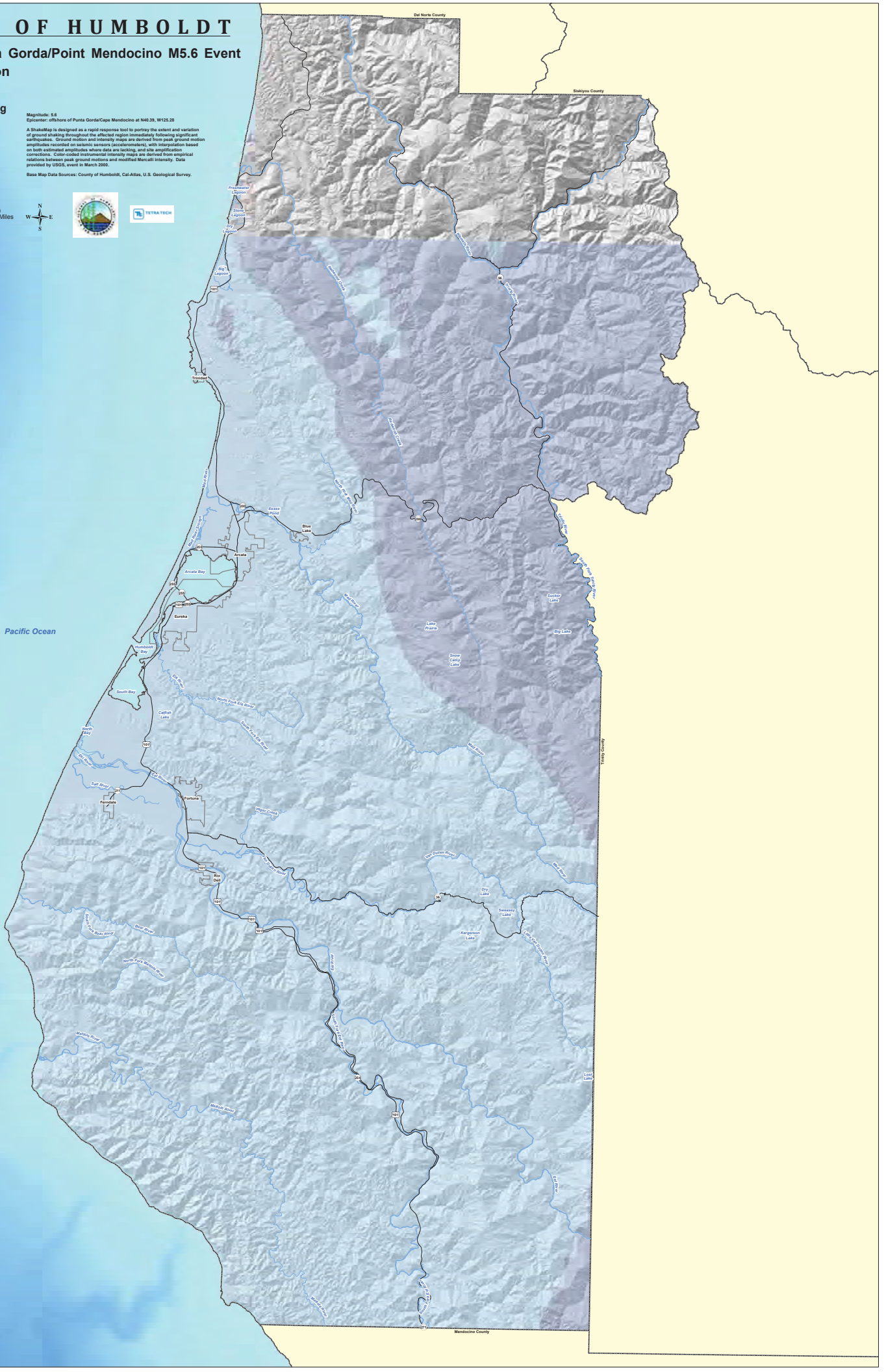
0 2.5 5 10 Miles

N W E S

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

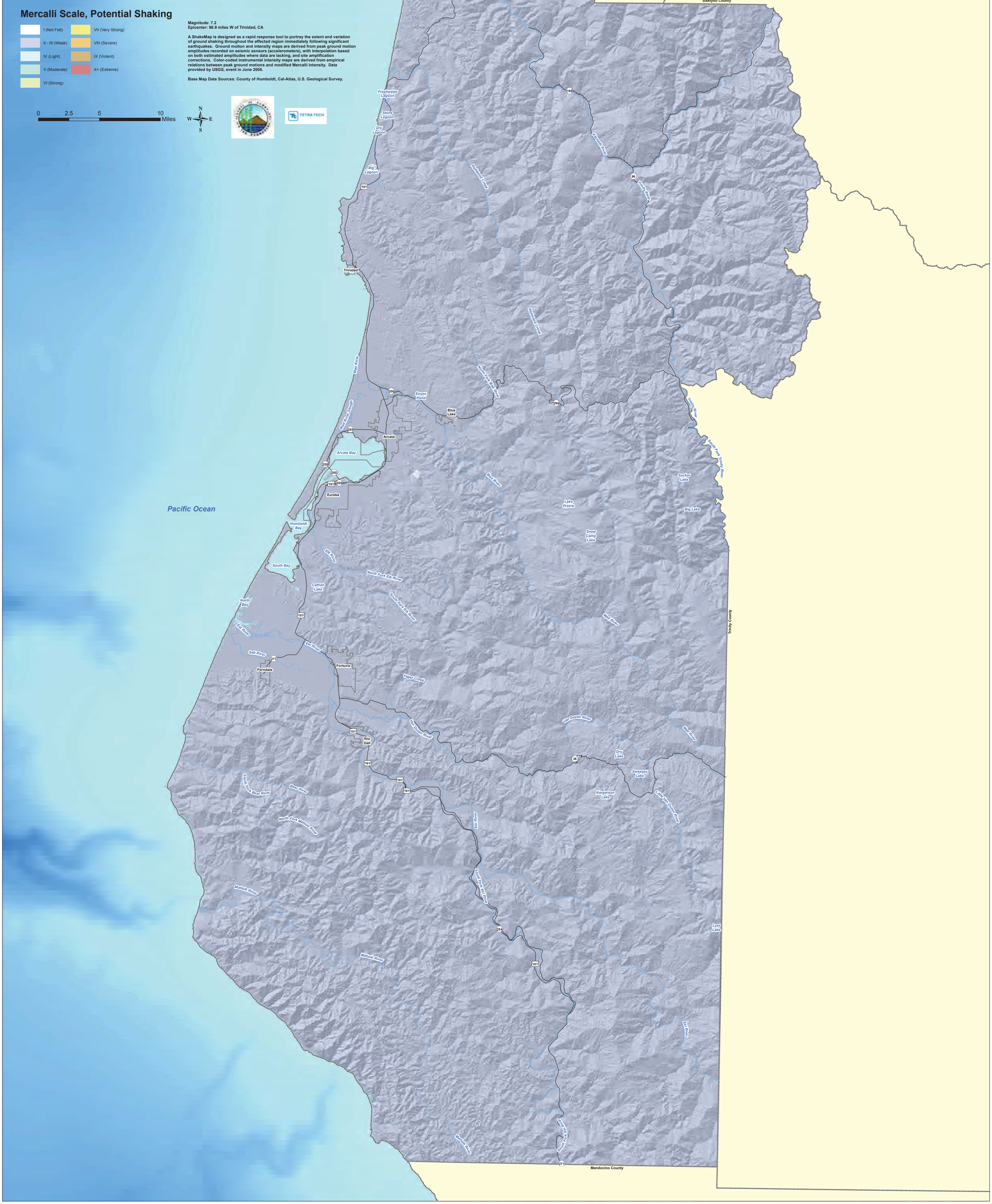
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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, U.S. Geological Survey.



COUNTY OF HUMBOLDT

Map 10-7. Trinidad M7.2 Event
Peak Ground Acceleration



COUNTY OF HUMBOLDT

Map 10-8. National Earthquake Hazard Reduction Program (NEHRP) Soil Classification

- Site Class B - Rock
- Site Class C - Very Dense Soil, Soft Rock
- Site 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, U.S. Geological Survey.

0 2.5 5 10 Miles

N W E S

CHAPTER 11.
FLOOD

11.1 GENERAL BACKGROUND

A floodplain is the area adjacent to a river, creek or lake that becomes inundated during a flood. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain unconsolidated sediments (accumulations of sand, gravel, loam, silt, and/or clay), often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

DEFINITIONS

Flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

Floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

100-Year Floodplain—The area flooded by a flood that has a 1-percent chance of being equaled or exceeded each year. This is a statistical average only; a 100-year flood can occur more than once in a short period of time. The 1-percent annual chance flood is the standard used by most federal and state agencies.

Return Period—The average number of years between occurrences of a hazard (equal to the inverse of the annual likelihood of occurrence).

Riparian Zone—The area along the banks of a natural watercourse.

11.1.1 Measuring Floods and Floodplains

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1-percent chance of being equaled or exceeded in any given year. The “annual flood” is the greatest flood event expected to occur in a typical year. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher recurrence interval to occur in a short time period. The same flood can have different recurrence intervals at different points on a river.

The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used as the regulatory boundary by many agencies, including FEMA for the National Flood Insurance Program (NFIP). Also referred to as the special flood hazard area, this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water-surface

elevations describe the elevation of water that will result from a given discharge level, which is one of the most important factors used in estimating flood damage.

11.1.2 Floodplain Ecosystems

Floodplains can support ecosystems that are rich in plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick-growing compared to non-riparian trees.

11.1.3 Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

11.1.4 Federal Flood Programs

National Flood Insurance Program

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood and the 0.2-percent annual chance flood (the 500-year flood). Base flood elevations and the boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principle tool for identifying the extent and location of the flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program. Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

Humboldt County entered the NFIP on July 19, 1982, and FIRMs were developed in the mid-1980s. Structures permitted or built in the county before then are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." The insurance rate is different for the two types of structures. FEMA is in the process of updating the countywide FIRM, which will be made available on a digital platform as a digital flood insurance rate map (DFIRM). Humboldt County entered into a cooperative technical partnership with FEMA in 2011 to perform technical studies to support the update of the FIRMs for Orick and Blue Lake, two communities that are each protected by a federal flood control project (levee). The updated countywide FIRM is expected to become effective in 2014.

All seven incorporated cities in the planning area also participate in the NFIP. The county and cities are currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff and by the California Department of Water Resources under a contract with FEMA. Maintaining compliance under the NFIP is an important component of flood risk reduction. All planning partners that participate in the NFIP have identified initiatives to maintain their compliance and good standing.

The Community Rating System

The Community Rating System (CRS) is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

Figure 11-1 shows the nationwide number of CRS communities by class as of May 2012, when there were 1,211 communities receiving flood insurance premium discounts under the CRS program. CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks. No communities in the Humboldt Operational Area currently participate in the CRS.

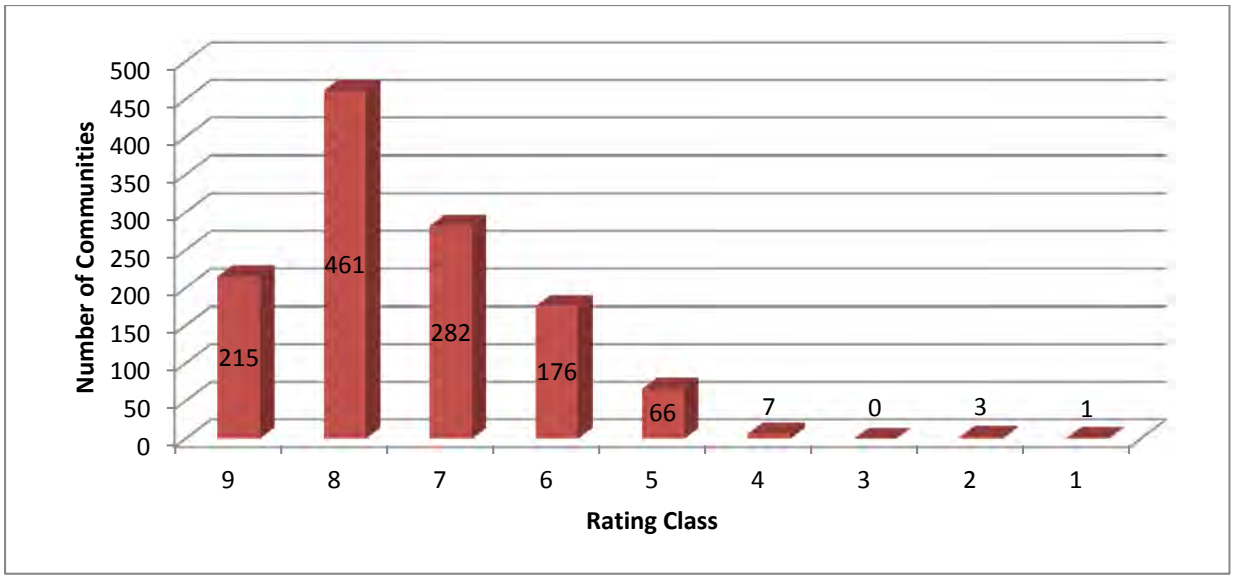


Figure 11-1. CRS Communities by Class Nationwide as of May 2012

11.2 HAZARD PROFILE

11.2.1 Principal Flooding Sources

Riverine Flooding

The principal sources of riverine flooding in Humboldt County are as follows:

- **Eel River Basin—**This 3,260-square-mile basin drains a predominantly mountainous area in the southern portion of the county. The Eel River flows through a narrow canyon from its junction with the Middle Fork downstream to its confluence with the Van Duzen River. Downstream of the confluence with the Van Duzen River, the Eel River meanders through a wide coastal plain between the City of Fortuna and the Pacific Ocean. The second largest tributary in this basin is the South Fork Eel River. The South Fork joins the Eel River at Dryerville and flows through steep-walled canyons for most of its length. The Van Duzen River drains an area of approximately 430 square miles to its confluence with the Eel River. The Van Duzen floodplain is narrow for most of its length, widening only in its downstream portions near Cummings Creek Camp. The average annual precipitation in this basin ranges from 59 to 70 inches, depending on the location in the basin. The duration of floods in this basin is relatively short. Stages can rise from normal flow to extreme peaks in 16 to 44 hours. Flooding generally has a duration of 50 to 55 hours.
- **Mad River Basin—**The Mad River drains an area of approximately 500 square miles at its confluence with the Pacific Ocean. The river flows through narrow canyons for the majority of its 100-mile length. The river enters a wide coastal floodplain just north of Arcata, which continues to its confluence with the Pacific Ocean. The average annual precipitation for this basin is 64 inches upstream of the gauge located at the mouth of the Mad River.
- **Freshwater Creek Basin—**Freshwater Creek drains a small coastal basin of 34 square miles before it enters Ryan Slough. Ryan Slough flows into Eureka Slough, a brackish-water stream, which in turn empties into Arcata Bay just north of Eureka. The floodplain in this basin is moderately wide and situated between a narrow stream course in the mountains, widening as it enters the coastal plain. The average annual precipitation for this basin in 54 inches upstream of the gauge located at the confluence with Jacoby Creek.

- **Jacoby Creek Basin—**Jacoby Creek is a coastal stream just north of Freshwater Creek. Its headwaters are in the Coast range and it flows west from there into Arcata Bay. The creek drains an area of 16 square miles at its mouth. The majority of this stream meanders through the Arcata Bay coastal plain. The average annual precipitation for this basin is 54 inches upstream of the gauge located at the confluence with Freshwater Creek.
- **Trinity River Basin—**As the largest tributary to the Klamath River, the Trinity River drains a total area of 2,969 square miles, most of which is in Trinity County. The river flows through a mountainous, heavily forested area in the eastern portion of Trinity County. Detailed flood insurance studies have been generated for the mountain valley downstream of the confluence with the South Fork Trinity River in the northeastern portion of Humboldt County. The average annual precipitation for this basin is 55 inches upstream of the gauge located at the mouth of the Trinity River.
- **Klamath River Basin—**The largest river in the region is the Klamath River, which originates in Oregon and drains 12,120 square miles. A 50-mile stretch runs through the mountainous forested northern part of Humboldt County, with its mouth draining to the Pacific Ocean in neighboring Del Norte County to the north. Detailed flood insurance studies have not been undertaken for the Humboldt portion of the Klamath.

Coastal Flooding

Coastal flooding occurs when intense, offshore low-pressure systems drive ocean water inland. The water pushed ashore is called storm surge. Flooding along the Pacific coast near Humboldt Bay is often associated with the simultaneous occurrence of very high tides, large waves, and storm swells during the winter. Storm centers from the southwest produce the type of storm pattern most commonly responsible for most of the serious coastal flooding. The strong winds and high tides that accompany these storms can create storm surges in excess of 10 feet above mean high tide. Portions of Humboldt County are subject to flooding from storm surge. The highest tidal surge in Humboldt Bay was measured at 6.5 feet, on February 4, 1958.

The configuration of Humboldt Bay protects the coastal communities of Humboldt County from direct exposure to coastal storm flooding. The Samoa Peninsula and South Spit block the effects of normal storm waves and sea swells. A single channel, defined by jetties and seawalls, provides passage for water into and out of Humboldt Bay. The unincorporated community of King Salmon is located on an artificially constructed peninsula along the eastern margin of Humboldt Bay. Old channel dredgings were stockpiled on the site until 1948, when residential development in the area began. The elevation of the King Salmon vicinity is a few inches higher than the normal maximum high tide. Flooding can occur in this area during unusually high tides accompanied by storm surges.

Extreme storm events overtopped the Samoa Peninsula and South Spit during the winters of 1978 and 1983. The winter of 1983 brought an extremely unusual series of high tides, storm surges, and storm waves. Virtually all of the U.S. Coast Guard mooring docks were destroyed. In King Salmon, homes were flooded with 6 to 12 inches of water.

According to FEMA, the coastal high hazard area (or “V zone,” where V stands for velocity wave action) is the most hazardous part of the coastal floodplain, due to its exposure to wave effects. The V zone has an increased degree of flood risk compared to coastal flood areas not within the coastal high hazard area (A zones), and is subject to more stringent regulatory requirements. Figure 11-2 is a typical transect illustrating the coastal V and A zones and the effects of energy dissipation and regeneration of a wave as it moves inland. Wave elevations are decreased by obstructions such as buildings, vegetation and rising ground surface.

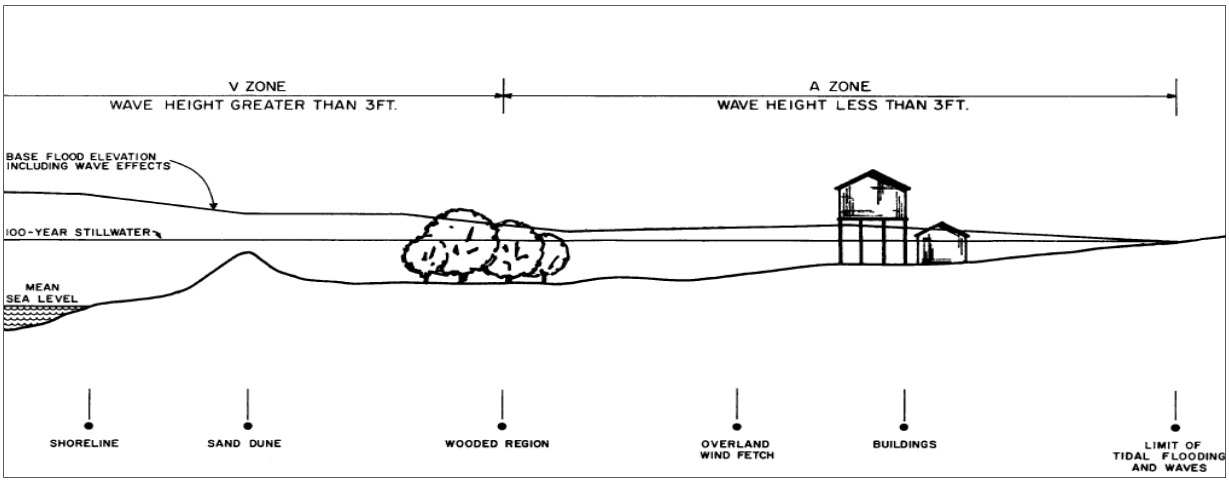


Figure 11-2. Typical Transect Schematic

Sediment Build-up (Sediment-Induced Flooding)

Many rivers and streams in Humboldt County are impaired with excess sediment that reduces channel capacity and increases the frequency and/or magnitude of overbank flooding. Examples of watersheds with severe sediment-induced flooding include the Salt River and its tributaries in Ferndale and Elk River south of Eureka. Sedimentation also severely reduces the flood conveyance capacity of the Redwood Creek flood control project in Orick.

Urban Flooding

Like many areas in Northern California, Humboldt County has experienced rapid change due to urban development in once rural areas. The drainage facilities in these recently urbanized areas are often a patchwork of pipes, roadside ditches and channels rather than a coordinated system as found in a mature utility. The two key factors that contribute to urban flooding are rainfall intensity and duration. Topography, soil conditions, urbanization and groundcover also play an important role. Urban flooding occurs when available conveyance systems lack the capacity to convey rainfall runoff to nearby creeks, streams and rivers. As drainage facilities are overwhelmed, roads and transportation corridors become conveyance facilities.

Urban floods can be a great disturbance of daily life in urban areas. Roads can be blocked and people may be unable to go to work or school. Economic damage can be high but the number of casualties is usually limited, because of the nature of the flood. When the city is on flat terrain, the flow speed is low and people can still drive through it. The water rises relatively slowly and usually does not reach life endangering depths.

11.2.2 Past Events

Seventy percent of precipitation in Humboldt County occurs from November to March; major floods have resulted from successions of intense storms during these months. Table 11-1 summarizes the 11 federally declared disasters in Humboldt County related to flooding between 1955 and 2006. The two worst flood events in Humboldt County occurred in December 1955 and December 1964. These events caused tens of millions of dollars in damage and numerous fatalities. The following sections summarize available information on the most significant Humboldt County flood events.

December 1955 Flood Event

The December 1955 flood occurred following weeks of above-normal precipitation in the county, with rainfall measurements reaching as high as 24 inches over three days in Cummings. Damage in the Eel River Basin exceeded $22 million, with one reported fatality and 43,000 acres flooded. Heavy debris carried by high velocity river flows caused the majority of the damage.

TABLE 11-1.
HUMBOLDT COUNTY FEDERAL DISASTERS DUE TO FLOODING

Date	Declaration #	Type of event	Type of Assistance	Estimated Damage
February 3, 2006	1628	Flooding, severe winter storms, landslides	PA	$20.3 million[a]
February 9, 1998	1203	Severe winter storms, flooding	PA	$7.75 million
January 4, 1997	1155	Severe winter storms, flooding	IA, PA	$35 million
March 12, 1995	1046	Severe winter storms, flooding		$1.3 million[a]
January 9, 1995	1044	Winter storms, flooding, landslides, mud flows	IA, PA	$15 million
February 25, 1992	935	Flooding	N/A	N/A
February 21, 1986	758	Flooding	N/A	$5.0 million[a]
January 25, 1983	677	Coastal storms, floods, slides, tornados	N/A	$3.84 million[a]
February 8, 1973	364	Severe storms, high tides, flooding	N/A	N/A
December, 1964	N/A	Severe winter storms, flooding	N/A	$100 million
December 1955	N/A	Severe winter storms, flooding	N/A	$22 million

a. Data obtained from Spatial Hazard Events and Losses Database for the United States (SHELDUS)
N/A = Information is not available

December 1964 Flood Event

Heavy rains accompanied by runoff from an unusually large snowpack led to flooding of the Mad and Eel Rivers in December 1964. Total damage reached $100 million, with entire communities (including Pepperwood, the site of the 1955 fatality) being destroyed and 19 fatalities reported. Millions of board feet of lumber, thousands of acres of prime farmland, and 4,000 head of livestock were also lost, causing a tremendous economic impact on the county.

January 1995 Flood Event

Flooding caused one death and over $15 million in damage. Flood damage was reported throughout much of the county, but the most severely impacted area was the Eel River Valley. The county received both a governor's proclamation and a presidential disaster declaration.

March 1995 Flood Event

Continued winter storms and flooding in the months following the January 1995 event caused an additional $2 million in damage throughout the county. The county received a second presidential declaration in March 1995.

January 1997 Flood Event

The January 1997 flood event was the fifth largest flood on record in Humboldt County. The U.S. Forest Service reported that the storms of December and January produced two to three times the monthly average precipitation on the Klamath National Forest. The flood moved soil, rock, and organic debris from hill slopes on the Klamath National Forest to stream channels at a scale not experienced since 1974. Most the reported damage was from landslides and road failures. The estimated damage to road facilities exceeded $35 million within the Klamath National Forest.

11.2.3 Location

Map 12-1 shows the extent and location of the flood hazard in Humboldt County based on the currently effective FIRMs generated by FEMA for Humboldt County under the National Flood Insurance Program. The FIRMs are the principle tool used to identify the extent and location of the flood hazard. FEMA and the floodplain management community acknowledge that FIRMs are not a total depiction of an area's flood risk. The FIRMs represent the best data source available, but the level of risk they indicate may be understated or overstated compared to current conditions. The following limitations to the accuracy of these maps need to be recognized:

- FIRMs are based on hydrologic conditions at the time they are prepared. FIRMs are not set up to account for changes in hydrology that can occur over time. The age of the FIRMs used for this assessment range from 10 years to 25 years. Therefore, these maps do not reflect the conditions of the watershed as they exist today.
- FIRMs do not account for the flood protection benefits of levees unless the levees are certified as providing 100-year flood protection (according to criteria specified in Section 65.10 of 44 CFR). The national levee policy is in a state of flux in light of the impacts of Hurricane Katrina in 2005. Some levees in Humboldt County are recognized as 100-year levees on the FIRM, others are not. The age of the maps draws into question the level of protection provided by the levees today. The potential for levees to be certifiable in their current condition requires costly, detailed risk-based analyses.

11.2.4 Frequency

Floods are commonly described as having a 10-, 50-, 100-, or 500-year recurrence interval, meaning that floods of these magnitudes have, respectively, a 10-, 2-, 1-, or 0.2-percent chance of occurring in any given year. These measurements reflect averages of likelihood; it is possible for two or more floods with a 100-year or higher recurrence interval to occur within a short time period. Assigning recurrence intervals to floods is valuable as a rough comparison among the magnitudes of floods on a given waterway, and as a way of showing the intensity of a storm over a large area. For example, the 1964 flood event was determined to have a 290-year recurrence interval on the Eel River, while the recurrence interval for the Mad River was determined to be a 50-year event. This illustrated how watersheds react differently to storm events.

Recent history has shown that Humboldt County can expect an average of one episode of minor river flooding each winter. Winter floods inundate most of the county's 100-year floodplain at intervals of three to 10 years. Large, damaging floods typically occur every 10 years. The frequency of flooding in smaller streams and basins can be expected to increase somewhat as a result of increased development in Humboldt County, increasing the amount of impervious surfaces.

11.2.5 Severity

The severity of flooding is typically measured by the amount of damage it could cause. This can be evaluated by reviewing past flood damage estimates or by examining flow rates of the rivers based on the

peak discharges used by FEMA in mapping floodplains. Table 11-2 summarizes the peak discharges for rivers and streams in Humboldt County. Table 11-3 summarizes the still-water elevations along the Humboldt Bay coastline, representing the steady state water depth not accounting for breaking waves. These are the projected elevations of floodwaters in the absence of waves resulting from wind or seismic effects. In coastal areas, still-water elevations are determined when modeling coastal storm surge; the results of overland wave modeling are used in conjunction with the still-water elevations to develop the coastal base flood elevations.

TABLE 11-2.
SUMMARY OF PEAK DISCHARGES IN HUMBOLDT COUNTY

Source/Location	Drainage Area (square miles)	Peak Discharge (cubic feet/second)			
		10-Year	50-Year	100-Year	500-Year
Eel River, at the Mouth	3,620	390,000	601,000	695,000	924,000
Eel River, at Scotia	3,113	331,000	521,000	680,000	820,000
Van Duzen River, at the Mouth	426	60,000	84,000	94,000	117,000
Van Duzen River, at confluence with Yaeger Creek	280	39,000	54,000	60,000	75,000
South Fork Eel River, at Redway	507	104,000	159,000	166,000	213,000
Mad River, near Arcata	485	58,360	81,720	90,960	113,480
Mad River, downstream of confluence with North Fork	443	53,790	74,910	83,840	104,600
Jacoby Creek, at Myrtle Avenue	16.6	4,050	6,400	7,400	10,700
Williams Creek, at Grizzly Bluff Road	5.57	—	—	1,985	—
Janes Creek, at “Q” Street	3.51	—	—	1,030	—
Freshwater Creek, at Myrtle Ave.	32.4	5,400	8,600	10,000	14,200
Freshwater Creek, upstream of confluence with Little Freshwater Creek	28.5	5,100	8,000	9,500	13,200
Trinity River, downstream of confluence with Kirkham Creek	2,016	3,110	4,560	5,070	6,290
Eastside Channel, upstream of Van Ness Avenue	N/A (breakout from Francis Creek)	—	—	140	—

TABLE 11-3.
SUMMARY OF STILLWATER ELEVATIONS ALONG HUMBOLDT BAY

Flooding Source/Location	Still-Water Elevation[a] (feet)			
	10-Year	50-Year	100-Year	500-Year
Humboldt Bay At Eureka (southwestern Corporate Limits)	8.87	9.27	9.37	9.67
Humboldt Bay At King Salmon	8.87	9.27	9.37	9.67

a. Elevation in 1988 North American Vertical Datum

11.2.6 Warning Time

Due to the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advanced of potential flash flooding danger.

As major storm systems approach, the National Weather Service, in coordination with the California Department of Water Resources, monitors weather conditions and real-time precipitation and river stage data; forecasts the amount and timing of expected precipitation; and issues official river forecasts and hydrologic statements. Updated a minimum of twice daily, these river forecasts are available as both text products and as graphical river guidance plots, which provide river stage information for each official forecast point for the next five days following the forecast issuance. As storm events continue with streams and rivers rising to threatening levels, these forecasts may be updated more frequently if needed. Graphical river guidance plots can be accessed at these websites:

- http://www,cnrfc.noaa.gov
- http://cdec.water.ca.gov/guidance_plots/

The Humboldt County Emergency Operations Plan outlines the planned response to emergency situations associated with natural disasters, technological incidents, and national security emergencies in or affecting Humboldt County. The Emergency Operations Plan guides the overall actions of emergency responders. Mitigation actions involving flooding incidents are normally classified as either pre-flooding readiness or emergency response:

- **Pre-Flooding Readiness Actions**—Actions when flooding has not occurred but prevailing conditions and forecasts indicate possible flooding within a specified time period:
  - Close monitoring of weather forecasts and water levels within rivers and levees
  - Dissemination of flood awareness and preparedness information to the public
  - Mobilization of response resources
  - Possible activation of the Emergency Operations Center in preparation for potential flooding
- **Flood Emergency Response Actions**—Actions when flooding is occurring or has occurred and immediate mitigation and emergency response measures are required:
  - Emergency Operations Center activation (Level 2 minimum) – Level 2 means the incident commander, the command staff, the section chiefs, and other branches, units and agency representatives as are appropriate for the situation
  - Deployment of flood fighting and public safety resources throughout impacted areas
  - Rescue of persons imperiled or trapped by flood conditions
  - Appropriate public information broadcasts
  - Initiation of preparatory and emergency evacuation of threatened populations
  - Protection of essential services and critical infrastructure.

11.3 SECONDARY HAZARDS

The most problematic secondary hazard for flooding is bank erosion, which in some cases can be more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients,

where floodwaters may pass quickly and without much damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers or storm sewers.

11.4 CLIMATE CHANGE IMPACTS

11.4.1 Hydrologic Changes

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

The amount of snow is critical for water supply and the environment, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain area to contribute to peak storm runoff. High frequency flood event s (e.g. 10 -year floods) in particular will likely increase with a changing climate. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

As hydrology changes, what is currently considered a 100-year flood may strike more often, leaving many communities at greater risk. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, floodways, bypass channels and levees, as well as the design of local sewers and storm drains.

According to the *California Adaptation Planning Guide* prepared by CalEMA and the California Natural Resources Agency, the hydrograph for the North Coast region of California will see significant changes over the next 100 years. Annual precipitation will vary by location, with a subtle decrease throughout the century in most areas. Areas of heavy rainfall (80 inches or more) are projected to lose 5 to 7 inches by 2050 and 11 to 15 inches by the end of the century. Slightly drier places are projected to see a decrease of around 3 to 4 inches by 2050 and 6 inches of precipitation by 2100.

11.4.2 Sea Level Rise

Local sea level rise is produced by the combined effects of the following:

- Global sea level rise
- Seasonal ocean elevation changes due to atmospheric effects
- Local vertical land deformation, caused by phenomena such tectonic movement or isostatic rebound (the rising of compressed earth after removal of a load such as glaciers).

The melting of mountain glaciers and the Greenland and Antarctic ice sheets, along with the thermal expansion of the oceans, will likely continue to increase sea level for many hundreds of years into the future. Figure 11-3 depicts some of the causes associated with sea level rise.

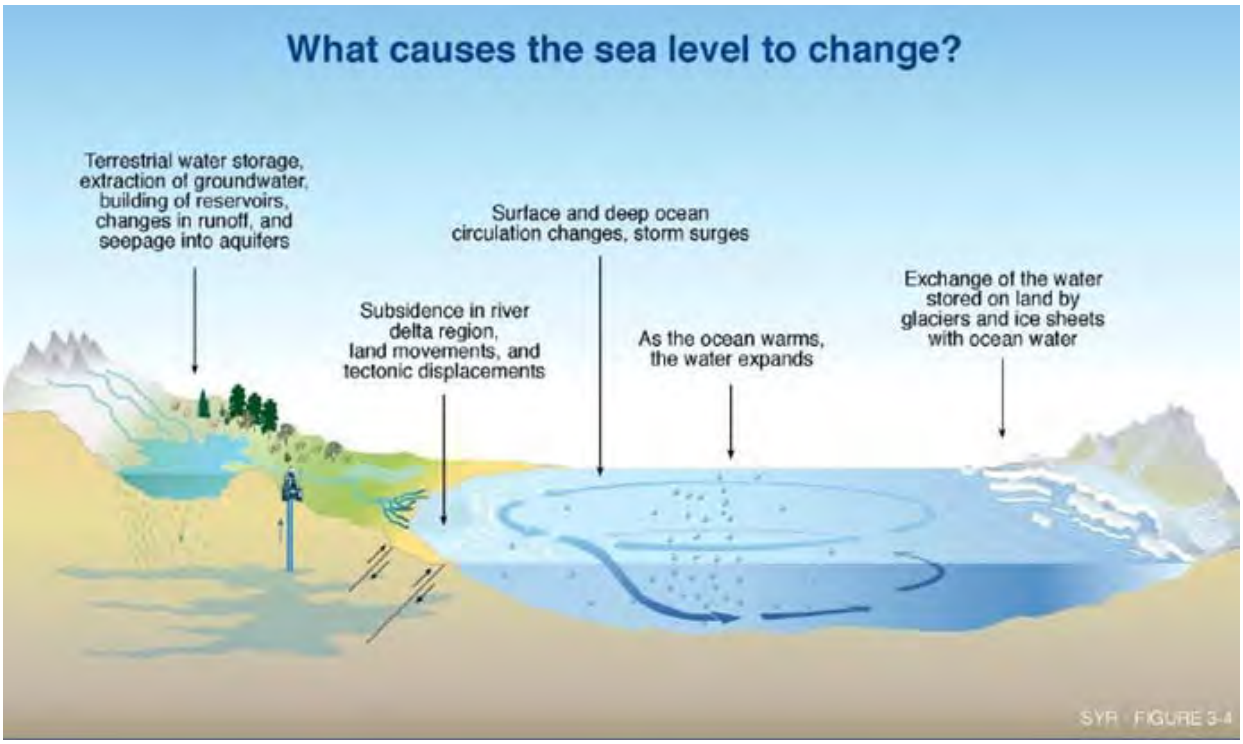


Figure 11-3. Causes of Sea Level Rise

Projections of Future Sea Level Rise

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change projects global sea level rise over the course of this century to be between 7 and 15 inches for the lowest emissions scenario, and between 10 and 23 inches for the highest emissions scenario. According to the International Panel on Climate Change, current model projections indicate substantial variability in future sea level rise between different locations. Some locations could experience sea level rise higher than the global average projection, while others could have a fall in sea level.

Based on current science, CalEMA and the California Natural Resources Agency have estimated that the sea level rise for the North Coast region of California may reach 55 inches by 2100. This will pose threats to many areas in the region, particularly in bays and estuaries. The increase in acreage vulnerable to 100-year floods due to sea level rise in the region will be 18 percent in Humboldt County.

Potential Impacts of Higher Sea Level

With sea level rise, low-lying coastal areas will eventually be inundated by seawater or periodically over-washed by waves and storm surges. Coastal wetlands will become increasingly brackish as seawater inundates freshwater wetlands. New brackish and freshwater wetland areas will be created as seawater inundates low-lying inland areas or as the freshwater table is pushed upward by the rising seawater. Some of the potential impacts of sea level rise on the North Coast of California are as follows:

- Loss of coastal habitats and resources
- Increased beach-bluff-dune-marsh erosion
- Loss of recreation resources (beaches, marshes)
- Saltwater intrusion to water wells, septic systems
- Elevated storm-surge flooding levels
- Greater, more frequent coastal inundation
- Increased risk to urban infrastructure
- Greater risk to human safety and development.

Sea level rise's primary impact on Humboldt Bay will be flooding. Salt water intrusion will also be a concern. Maximum high tides of the year, called king tides, average 8.78 feet at the North Spit tide gage. In some years, king tides have reached as high as 9.5 feet, and dikes have been overtopped or breached. Much of the area's critical infrastructure is at risk from tidal flooding because it was constructed on vulnerable former tidelands. For example, Highway 101, the Eureka and Arcata wastewater treatment plants, and miles of water, gas and electrical transmission lines are located behind earthen dikes or railroad grade on former tidelands. Some public facilities, businesses, residential communities, and agricultural areas also are at risk from tidal flooding (Humboldt Bay HRCD, 2013).

Humboldt Bay Sea Level Rise Adaptation Planning Project

The State Coastal Conservancy is funding a two-phase sea-level rise project on Humboldt Bay. The first phase, completed in January 2013, was the Humboldt Bay Shoreline Inventory, Mapping and Sea Level Rise Vulnerability Project. The second phase, currently underway, is the Humboldt Bay Sea Level Rise Adaptation Planning Project. The second phase consists of inundation modeling and mapping, along with adaptation planning. The Humboldt Bay Harbor, Recreation and Conservation District and Humboldt County Public Works formed the Adaptation Planning Working Group. Adaptation planning will encourage a consistent regional strategy to address impacts associated with sea level rise in the Humboldt Bay region. Sea level rise adaptation planning begins with understanding existing conditions, assessing what areas are vulnerable and what assets are at risk, and developing bay-wide strategies to deal with flooding (Humboldt Bay HRCD, 2013).

11.5 EXPOSURE

The Level 2 HAZUS-MH protocol was used to assess the risk and vulnerability to flooding in the planning area. The model used census data at the block level and FEMA floodplain data, which has a level of accuracy acceptable for planning purposes. Where possible, the HAZUS-MH default data was enhanced using local GIS data from county, state and federal sources.

11.5.1 Population

Population counts of those living in the floodplain in the planning area were generated by analyzing census blocks that intersect with the 100-year and 500-year floodplains identified on FIRMs. Census

blocks do not follow the boundaries of the floodplain. Therefore, the methodology used to generate these estimates counted census block groups whose centers are in the floodplain or where the majority of the population most likely lives in or near the floodplain. HAZUS-MH estimated the number of buildings within the floodplain in each block, and then estimated the total population by multiplying the number of residential structures by the average Humboldt County household size of 2.31 persons per household.

Using this approach, it was estimated that the county population within the 100-year floodplain is 46,105 (34 percent of the total county population) and the population within the 500-year floodplain is 47,728 (35.3 percent of the total). Of these exposed populations, 77 percent live in the unincorporated county.

11.5.2 Property

Structures in the Floodplain

Table 11-4 summarizes the total area and number of structures in the floodplain by municipality. The HAZUS-MH model determined that there are 19,959 structures within the 100-year floodplain and 23,000 structures within the 500-year floodplain. In the 100-year floodplain, about 77 percent of these structures are in unincorporated areas. Ninety-two percent are residential, and 8 percent are commercial, industrial or agricultural.

TABLE 11-4.
AREA AND STRUCTURES IN THE 100-YEAR FLOODPLAIN

	Area in 100-Year Floodplain (Acres)	Number of Structures in Floodplain					
		100-Year			500-Year		
		Residential	Other	**Total**	Residential	Other	**Total**
Arcata	7,001.04	1524	82	**1606**	2922	145	**3067**
Blue Lake	147.26	104	25	**129**	611	25	**636**
Eureka	11,266.50	560	48	**608**	908	48	**956**
Ferndale	51.62	385	30	**415**	435	30	**465**
Fortuna	1,190.68	1,124	95	**1,219**	1,783	95	**1,878**
Rio Dell	813.91	596	8	**604**	673	8	**681**
Trinidad	5.92	28	1	**29**	28	1	**29**
Unincorporated	92,114.43	14,098	1,251	**15,349**	14,337	1,251	**15,588**
Total	**112,591.36**	**18,419**	**1,540**	**19,959**	**21,697**	**1,603**	**23,300**

Land Use in the Floodplain

Some land uses are more vulnerable to flooding, such as single-family homes, while others are less vulnerable, such as agricultural land or parks. Table 11-5 shows the existing land use of all parcels in the 100-year floodplain, including vacant parcels and those in public/open space uses, broken down for the planning area. For parcels in cities, residential, commercial and public/open space are the dominant land uses. In unincorporated areas, residential and timber/forest are the dominant land uses. This assessment also found that 24 percent of the parcels within the 100-year floodplain are vacant or undeveloped. Combining the vacant lands with open space or low-density land uses, 57 percent of the parcels within the 100-year floodplain have existing uses considered to be lower-risk uses for the floodplain.

TABLE 11-5.
GENERAL LAND USE OF PARCELS IN 100-YEAR FLOODPLAIN

	Parcels in 100-Year Floodplain								
Land Use	Arcata	Blue Lake	Eureka	Ferndale	Fortuna	Rio Dell	Trinidad	Unincorporated County	**Total**
Residential	277	1	44	74	162	70	4	2969	**3601**
Commercial	17	3	24	11	57	3	0	81	**196**
Light Industrial	14	1	22	0	5	0	0	28	**70**
Heavy Industrial	1	0	4	0	2	0	0	24	**31**
Agricultural	1	0	0	0	0	0	0	94	**95**
Timber/Forest	0	0	0	0	0	0	0	1474	**1474**
Public Lands	59	10	146	9	23	12	0	1229	**1488**
Vacant lands	62	2	64	17	50	17	3	1929	**2144**
Total	**431**	**17**	**304**	**111**	**299**	**102**	**7**	**7828**	**9099**

Exposed Value

Table 11-6 and Table 11-7 summarize the estimated value of exposed buildings in the planning area. This methodology estimated $5.2 billion worth of building-and-contents exposure to the 100-year flood, representing 33.54 percent of the total assessed value of the planning area, and $6.1 billion worth of building-and-contents exposure to the 500-year flood, representing 39.4 percent of the total.

TABLE 11-6.
VALUE OF STRUCTURES IN 100-YEAR FLOODPLAIN

	Value Exposed			% of Total
	Structure	Contents	**Total**	Assessed Value
Arcata	$333,479,000	$232,288,000	**$565,767,000**	25.80
Blue Lake	$15,267,000	$11,077,000	**$26,344,000**	24.42
Eureka	$209,225,000	$171,121,000	**$380,346,000**	9.80
Ferndale	$66,971,000	$40,004,000	**$106,975,000**	49.53
Fortuna	$234,821,000	$157,617,000	**$392,438,000**	30.96
Rio Dell	$68,448,000	$36,966,000	**$105,414,000**	37.45
Trinidad	$3,178,000	$2,045,000	**$5,223,000**	7.88
Unincorporated	$2,282,818,000	$1,339,655,000	**$3,622,473,000**	48.24
Total	**$3,214,207,000.00**	**$1,990,773,000.00**	**$5,204,980,000.00**	**33.54**

TABLE 11-7.
VALUE OF STRUCTURES IN 500-YEAR FLOODPLAIN

	Value Exposed			% of Total
	Structure	Contents	**Total**	Assessed Value
Arcata	$646,949,260	$489,397,359	**$1,136,346,619**	51.81
Blue Lake	$35,014,799	$18,177,395	**$53,192,194**	49.31
Eureka	$269,893,863	$206,743,189	**$476,637,051**	12.28
Ferndale	$72,202,012	$42,023,871	**$114,225,883**	52.89
Fortuna	$339,815,679	$215,969,121	**$555,784,800**	43.84
Rio Dell	$76,761,203	$41,414,879	**$118,176,082**	41.98
Trinidad	$3,178,000	$2,045,000	**$5,233,000**	7.88
Unincorporated	$2,311,859,778	$1,344,331,716	**$3,656,191,494.00**	48.69
Total	**$3,755,674,594.00**	**$2,360,102,530.00**	**$6,115,787,123.00**	**39.4**

11.5.3 Critical Facilities and Infrastructure

Table 11-8 through Table 11-10 summarize the critical facilities and infrastructure in the 100-year and 500-year floodplains of the planning area. Details are provided in the following sections.

TABLE 11-8.
CRITICAL FACILITIES IN THE 100-YEAR FLOODPLAIN

Jurisdiction	Medical and Health Services	Government Function	Protective	Hazardous Materials	Schools	Other	**Total**
Arcata	1	0	0	1	1	0	**3**
Blue Lake	0	0	0	0	0	0	**0**
Eureka	0	0	0	4	0	8	**12**
Ferndale	0	0	0	0	0	0	**0**
Fortuna	0	0	0	4	0	4	**8**
Rio Dell	0	0	0	0	0	0	**0**
Trinidad	0	0	0	0	0	0	**0**
Unincorporated	0	4	4	1	0	15	**24**
Total	**1**	**4**	**4**	**10**	**1**	**27**	**47**

TABLE 11-9.
CRITICAL FACILITIES IN THE 500-YEAR FLOODPLAIN

Jurisdiction	Medical and Health Services	Government Function	Protective	Hazardous Materials	Schools	Other	**Total**
Arcata	1	0	0	1	1	1	**4**
Blue Lake	0	0	0	0	0	0	**0**
Eureka	0	0	0	4	0	8	**12**
Ferndale	0	0	0	0	0	0	**0**
Fortuna	0	0	0	4	0	4	**8**
Rio Dell	0	0	0	0	0	0	**0**
Trinidad	0	0	0	0	0	0	**0**
Unincorporated	0	4	4	1	1	16	**26**
Total	**1**	**4**	**4**	**10**	**2**	**29**	**50**

TABLE 11-10.
CRITICAL INFRASTRUCTURE IN THE 100-YEAR FLOODPLAIN

Jurisdiction	Bridges	Water Supply	Wastewater	Power	Communications	Other	**Total**
Arcata	2	1	4	0	1	0	**8**
Blue Lake	1	0	0	0	0	0	**1**
Eureka	5	0	3	0	1	7	**16**
Ferndale	0	0	0	0	0	0	**0**
Fortuna	1	0	6	0	0	0	**7**
Rio Dell	2	0	0	0	0	0	**2**
Trinidad	0	0	0	0	0	0	**0**
Unincorporated	117	23	17	5	3	11	**176**
Total	**128**	**24**	**30**	**5**	**5**	**18**	**210**

Tier II Facilities

Tier II facilities are those that use or store materials that can harm the environment if damaged by a flood. Sixty-one businesses in the 100-year floodplain and 62 businesses in the 500-year floodplain report having Tier II hazardous materials. During a flood event, containers holding these materials can rupture and leak into the surrounding area, having a disastrous effect on the environment as well as residents.

Utilities and Infrastructure

It is important to determine who may be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the county, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Dikes can fail or be overtopped, inundating the land that they protect. The following sections describe specific types of critical infrastructure.

Roads

Several roads in Humboldt County have been affected by past flood events, both inside and outside the 100-year floodplain. The following major roads in Humboldt County pass through the 100-year floodplain and thus are exposed to flooding:

- Highway 101
- Highway 211
- Highway 255
- Highway 254
- Highway 96
- Highway 1
- Highway 36
- Highway 299
- King Salmon Ave.

Many of these roads are built above the flood level, and many others function as levees to prevent flooding. Nonetheless, in certain events these roads may be blocked or damaged by flooding, preventing access to many areas.

Bridges

Flooding events can significantly impact road bridges. These are important because often they provide the only ingress and egress to some neighborhoods. An analysis showed that there are 128 bridges that are in or cross over the 100-year floodplain.

Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers and streams.

Levees

The County maintains levees on the Mad River near the City of Blue Lake, the Eel River near the City of Fortuna and on Redwood Creek near Orick. The Mad River levee was built by the Corps of Engineers in 1955 and the Eel River levee was built by the Corps of Engineers in 1958-1959. Congress authorized construction of the Redwood Creek flood control project with the Flood Control Act of 1962, and construction was completed in 1968. In addition, the county as a whole contains nearly 100 non-federal levees.

11.5.4 Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, with human development factored in, flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments and levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

11.6 VULNERABILITY

Many of the areas exposed to flooding may not experience serious flooding or flood damage. This section describes vulnerabilities in terms of population, property, infrastructure and environment.

11.6.1 Population

A geographic analysis of demographics using the HAZUS-MH model identified populations vulnerable to the flood hazard as follows:

- **Economically Disadvantaged Populations**—Recent catastrophic events on a national scale have shown that economically disadvantaged populations tend to make decisions on their risk exposure based on the net economic impact to their family. It costs money for people to evacuate their homes. If the level of risk is not perceived as high, people often choose to "ride out" the impacts of flood events. For the purposes of this risk assessment, the planning team and the Steering Committee defined "economically disadvantaged" as households with a net annual income of $20,000 or less, based on county demographic data and national standards established for this type of analysis. Based on these parameters, 12.47 percent of the people in the 100-year floodplain are economically disadvantaged.
- **Population over 65 Years Old**—It is estimated that 12 percent of the population in the census blocks that intersect the floodplain and floodway in the planning area are over 65 years old. This group makes up about 1.02 percent of the total population for the planning area. This population group is vulnerable because they are more likely to need special medical attention. During flood events, this may not be available due to isolation caused by flooding. Furthermore, elderly residents have more difficulty leaving their homes during flood events and could be stranded in dangerous situations. Approximately 5 percent of the over-65 population also have incomes considered to be economically disadvantaged and would be considered to be extremely vulnerable.
- **Population under 16 Years Old**—It is estimated that 21 percent of the population within census blocks located in or near the 100-year floodplain are under 16 years of age. This represents 1.76 percent of the total population for the planning area. This population is vulnerable because of their young age and dependence on others for basic necessities such as food, water and clothing. Very young children are also vulnerable to injury or sickness; this vulnerability can be worsened during a flood because they may not understand the measures that need to be taken to protect themselves from hazards.

Impacts on persons and households in the planning area were estimated for the 100-year and 500-year flood events through the Level 2 HAZUS-MH analysis. Table 11-11 summarizes the results.

TABLE 11-11.
ESTIMATED FLOOD IMPACT ON PERSONS AND HOUSEHOLDS

	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
100-Year Flood	9,762	7,080
500-Year Flood	11,519	7,930

11.6.2 Property

HAZUS-MH calculates losses to structures from flooding by looking at depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local data on facilities was used instead of the default inventory data provided with HAZUS-MH.

The analysis is summarized in Table 11-12 and Table 11-13 for the 100-year and 500-year flood events, respectively. It is estimated that there would be up to $100.5 million of flood loss from a 100-year flood event in the planning area. This represents 1.93 percent of the total exposure to the 100-year flood and 0.65 percent of the total assessed value for the county. It is estimated that there would be $116.7 million of flood loss from a 500-year flood event, representing 1.91 percent of the total exposure to a 500-year flood event and 0.75 percent of the total assessed value.

TABLE 11-12.
LOSS ESTIMATES FOR 100-YEAR FLOOD EVENT

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	18	$956,000	$917,000	**$1,873,000**	0.09
Blue Lake	6	$55,000	$28,000	**$83,000**	0.08
Eureka	25	$807,000	$894,000	**$1,701,000**	0.04
Ferndale	14	$193,000	$416,000	**$609,000**	0.28
Fortuna	41	$1,528,000	$1,585,000	**$3,113,000**	0.25
Rio Dell	104	$5,522,000	$3,945,000	**$9,467,000**	3.36
Trinidad	3	$130,000	$117,000	**$247,000**	0.37
Unincorporated	1,060	$43,488,000	$39,927,000	**$83,415,000**	1.11
Total	**1,271**	**$52,679,000**	**$47,829,000**	**$100,508,000**	**0.65**

a. Impacted structures are those structures with finished floor elevations below the 100-year water surface elevation. These structures are the most likely to receive significant damage in a 100-year flood event

TABLE 11-13.
LOSS ESTIMATES FOR 500-YEAR FLOOD EVENT

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	36	$1,106,155	$1,036,489	**$2,142,644**	0.10
Blue Lake	12	$101,658	$49,351	**$151,009**	0.14
Eureka	48	$910,171	$1,284,618	**$2,194,789**	0.06
Ferndale	27	$193,040	$416,048	**$609,088**	0.28
Fortuna	87	$2,400,341	$2,443,936	**$4,844,277**	0.38
Rio Dell	256	$7,066,960	$5,025,919	**$12,092,879**	4.30
Trinidad	5	$130,000	$117,000	**$247,000**	0.37
Unincorporated	2,560	$48,805,365	$45,671,557	**$94,479,482.00**	1.26
Total	**3,031**	**$60,713,690**	**$56,044,918**	**$116,761,168**	**0.75**

a. Impacted structures are those structures with finished floor elevations below the 500-year water surface elevation. These structures are the most likely to receive significant damage in a 500-year flood event

National Flood Insurance Program

Table 11-14 lists flood insurance statistics for the planning area. Seven communities in the planning area participate in the NFIP, with 1,002 flood insurance policies providing $199.4 million in insurance coverage. According to FEMA statistics, 188 flood insurance claims were paid between January 1, 1978 and July 31, 2013, for a total of $2.336 million, an average of $12,428 per claim.

TABLE 11-14.
FLOOD INSURANCE STATISTICS

Jurisdiction	Date of Entry Initial FIRM Effective Date	# of Flood Insurance Policies as of 07/31/2013	Insurance In Force	Total Annual Premium	Claims, 11/1978 to 07/31/2013	Value of Claims paid, 11/1978 to 07/31/2013
Arcata	05/02/1983	146	$31,457,000	$144,042	16	$186,652.55
Blue Lake	09/30/1982	12	$2,321,300	$10,871	2	$7,851.86
Eureka	06/01/1982	26	$6,369,700	$24,656	4	$30,889.91
Ferndale	12/01/1993	19	$4,871,600	$12,770	2	$18,364.05
Fortuna	05/03/1982	62	$14,913,600	$52,617	4	$5,968.84
Rio Dell	05/03/1982	2	$83,000	$944	5	30,939.89
Unincorporated	07/19/1982	735	$139,358,000	$750,799	155	$2,055,832.68
Total		**1,002**	**$199,374,200**	**$996,699**	**188**	**$2,336,500**

Properties constructed after a FIRM has been adopted are eligible for reduced flood insurance rates. Such structures are less vulnerable to flooding since they were constructed after regulations and codes were adopted to decrease vulnerability. Properties built before a FIRM is adopted are more vulnerable to flooding because they do not meet code or are located in hazardous areas. The first FIRMs in Humboldt County were available in 1982.

The following information from flood insurance statistics is relevant to reducing flood risk:

- The use of flood insurance in the planning area is below the national average. Only 5 percent of insurable buildings in the county are covered by flood insurance. According to an NFIP study, about 49 percent of single-family homes in special flood hazard areas are covered by flood insurance nationwide.
- The average claim paid in the planning area represents about 2 percent of the 2010 average assessed value of structures in the floodplain.
- There was a 5-percent increase in flood insurance claims over the performance period of this plan (2008 to 2013)
- The policy base within the planning area decreased by 6-percent over the performance period of the plan.
- The total value of insurance coverage in force represents 3.8 percent of the total building exposure value.
- The percentage of policies and claims outside a mapped floodplain suggests that not all of the flood risk in the planning area is reflected in current mapping. Based on information from the

NFIP, of total claims paid, 27.7 percent were for properties outside an identified 100-year floodplain.

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

Repetitive loss properties make up only 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation's flood insurance claim payments. In 1998, FEMA reported that the NFIP's 75,000 repetitive loss structures have already cost $2.8 billion in flood insurance payments and that numerous other flood-prone structures remain in the floodplain at high risk. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A recent report on repetitive losses by the National Wildlife Federation found that 20 percent of these properties are outside any mapped 100-year floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

Figure 11-4 shows the repetitive loss areas in Humboldt County. FEMA's list of repetitive loss properties identifies 10 such properties in the Humboldt County planning area, as of May 1, 2012, as summarized in Table 11-15. None of these properties are outside an identified floodplain. They likely were flooded by flood events typical for the floodplain reflected in the current mapping. The dates of loss coincide with major flood events that have impacted the planning area. Therefore, it can be concluded that the overall cause of repetitive flooding is the same as has been identified for the river basins in which each repetitive loss area is found. It can also be concluded that the entire mapped floodplain within Humboldt County can be and is subject to repetitive flooding. Therefore, the Planning Team has defined the Repetitive Loss Area to be contiguous with the currently mapped and regulated 100-year floodplain.

TABLE 11-15.
REPETITIVE LOSS PROPERTIES IN HUMBOLDT COUNTY

Jurisdiction	Repetitive Loss Properties	Properties That Have Been Mitigated	Number of Corrections	Corrected Number of Repetitive Loss Properties
Arcata	1	0	0	1
Unincorporated County	9	2	2[a]	5
Totals	**10**	**2**	**2**	**6**

a. Information provided not sufficient to locate property

Source: May 1, 2012, FEMA Report of Repetitive Losses

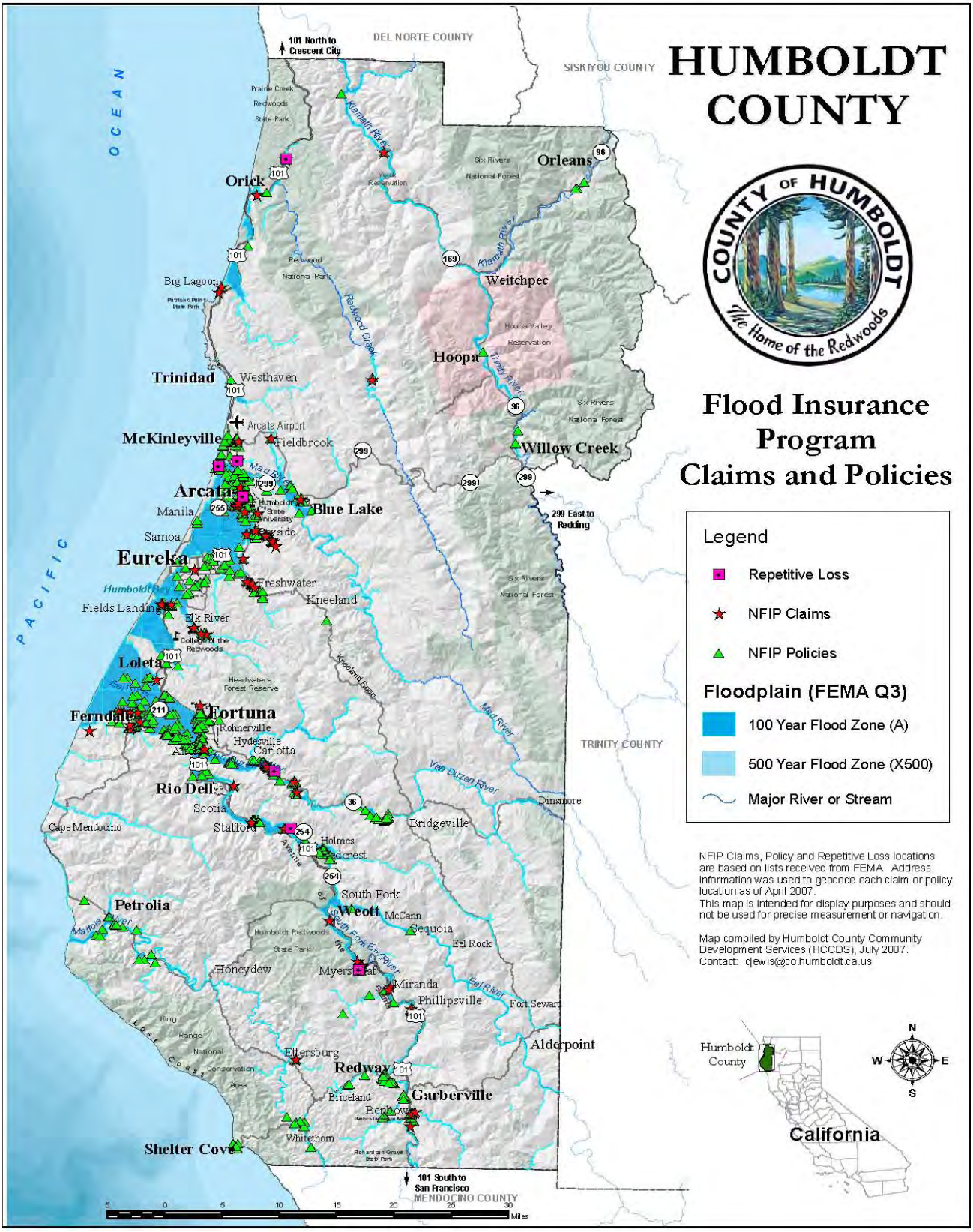


Figure 11-4. Flood Insurance Policies, Claims and Repetitive Losses for Humboldt County

11.6.3 Critical Facilities and Infrastructure

HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves to estimate the percent of damage to the building and contents of critical facilities, HAZUS-MH correlates these estimates into an estimate of functional downtime (the estimated time it will take to restore a facility to 100 percent of its functionality). This helps to gauge how long the planning area could have limited usage of facilities deemed critical to flood response and recovery. The HAZUS critical facility results are as follows:

- **100-year flood event**—On average, critical facilities would receive 11.69 percent damage to the structure and 33.8 percent damage to the contents during a 100-year flood event. The estimated time to restore these facilities to 100 percent of their functionality is 510 days.
- **500-year flood event**—A 500-year flood event would damage the structures an average of 11.71 percent and the contents an average 40.63 percent. The estimated time to restore these facilities to 100 percent of their functionality after a 500-year event is 529 days.

11.6.4 Environment

The environment vulnerable to flood hazard is the same as the environment exposed to the hazard. Loss estimation platforms such as HAZUS-MH are not currently equipped to measure environmental impacts of flood hazards. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

11.7 FUTURE TRENDS

The county has experienced moderate growth over the past 10 years, averaging a 1.25-percent increase in population every year from 2000 through 2009. Very little of this growth occurred in the mapped floodplains of the planning area. However, economic problems in the past three years impacted growth in the county, with some areas experiencing negative growth. Humboldt County and its planning partners are optimistic that marginal, sustained growth will return to the county as the state and national economies strengthen.

The County and its planning partners are equipped to handle future growth within flood hazard areas. All municipal planning partners have general plans that address frequently flooded areas in their safety elements. All partners have committed to linking their general plans to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts flood hazard areas.

11.8 SCENARIO

The major river systems in Humboldt County flood at irregular intervals, but generally in response to a succession of intense winter rainstorms. Storm patterns of warm, moist air usually occur between early November and late March. A series of such storms can cause severe flooding in Humboldt County. The worst-case scenario is a series of storms that flood numerous drainage basins in a short time. This would overwhelm city and county response and floodplain management departments. Major roads would be blocked, preventing critical access for many residents and critical functions. High river flows could cause rivers to scour, possibly washing out roads and creating more isolation problems. In the case of multi-basin flooding, the county would not be able to make repairs quickly enough to restore critical facilities and infrastructure.

Flood control structures such as dams and levees could lose their flood protection levels due to changes in hydrology caused by climate change. This could tax these types of facilities to the point of system failures, which could cause significant flooding in the planning area. The impacts of sea level rise will be felt along the coastal portions of the county, with losses of coastline and increased inundation areas.

11.9 ISSUES

The planning team has identified the following flood-related issues relevant to the planning area:

- The accuracy of the existing flood hazard mapping produced by FEMA in reflecting the true flood risk within the planning area is questionable. This is most prevalent in areas protected by levees not accredited by the FEMA mapping process.
- The extent of the flood-protection currently provided by flood control facilities (dams, dikes and levees) is not known due to the lack of an established national policy on flood protection standards.
- Older levees are subject to failure or do not meet current building practices for flood protection.
- The Redwood Creek levee system was not designed to account for the major sediment loading coming from the upper watershed, associated with historical logging and road-building. The capacity of the system is reduced every year by the deposition of thousands of cubic yards of sediment. The County annually excavates accumulated sediment to the extent feasible, but environmental laws prevent the level of removal needed to restore the design capacity. The County has been working with the National Park Service, the Redwood Creek Watershed Group, and others to request Congressional funding for a reconnaissance study by the Corps of Engineers. The reconnaissance study would provide a vehicle for local, state, and federal stakeholders to identify opportunities for long-term flood control for the community and enhancement of the lower Redwood Creek and estuary, which were severely impacted by construction of the levees. The reconnaissance study would be a Section 905(b) analysis authorized under Section 216 of the River and Harbors Flood Control Act of 1970 (33 USC 426 et. seq.) as amended. Setback levees in some form could help ensure continued flood protection, provide environmental restoration, and allow continued agricultural use of adjacent lands.
- The risk associated with the flood hazard overlaps the risk associated with other hazards such as earthquake, landslide and fish losses. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- There is no degree of consistency in land-use practices and regulatory floodplain management scope within the planning area.
- How will potential climate change impact flood conditions in the planning area?
- Climate change may cause more extensive flood problems due to possible sea level rise and more severe weather patterns. Consequently, the 500-year floodplain inundation area may become a higher probability risk. Coastal flood hazard ratings may also need to be reviewed.
- More information is needed on flood risk to support the concept of risk-based analysis of capital projects.
- There needs to be a sustained effort to gather historical damage data, such as high water marks on structures and damage reports, to measure the cost-effectiveness of future mitigation projects.
- Ongoing flood hazard mitigation will require funding from multiple sources.

- There needs to be a coordinated hazard mitigation effort between jurisdictions affected by flood hazards in the county.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods.
- The concept of residual risk should be considered in the design of future capital flood control projects and should be communicated with residents living in the floodplain.
- The promotion of flood insurance as a means of protecting private property owners from the economic impacts of frequent flood events should continue.
- Existing floodplain-compatible uses such as agricultural and open space need to be maintained. There is constant pressure to convert these existing uses to more intense uses within the planning area during times of moderate to high growth.
- The economy affects a jurisdiction's ability to manage its floodplains. Budget cuts and personnel losses can strain resources needed to support floodplain management.

COUNTY OF HUMBOLDT

Map 11-1. FEMA DFIRM Flood Hazard Areas

Levee

1 Percent Annual Flood Hazard (100 Year)

0.2 Percent Annual Flood Hazard (500 Year)

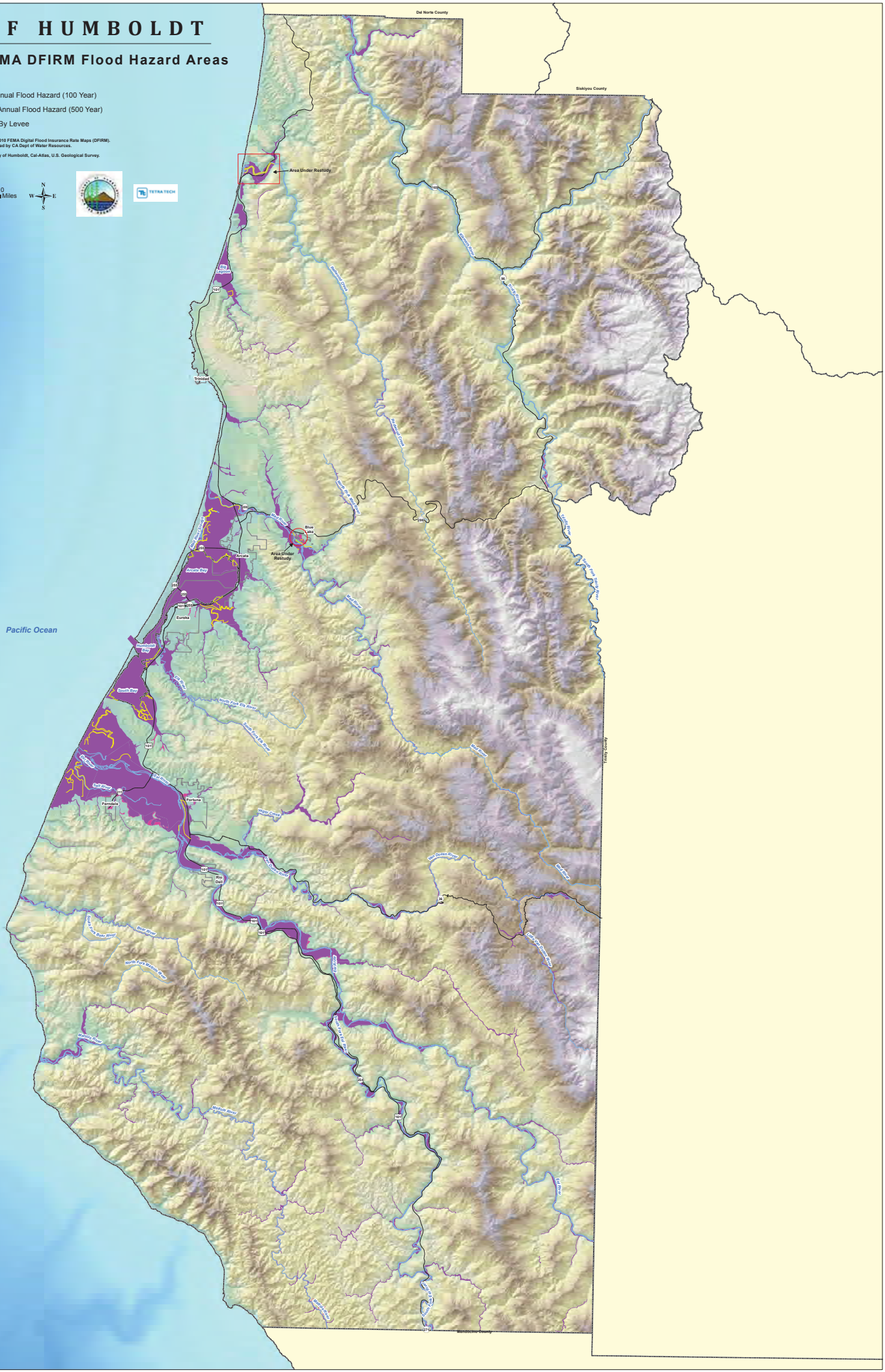
X Protected By Levee

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, U.S. Geological Survey.

0 2.5 5 10 Miles

N W E S



CHAPTER 12.
LANDSLIDE

12.1 GENERAL BACKGROUND

A landslide is a mass of rock, earth or debris moving down a slope. Landslides may be minor or very large, and can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions or human modification of the land.

Mudslides (or mudflows or debris flows) are rivers of rock, earth, organic matter and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt. Water pressure in the pore spaces of the material increases to the point that the internal strength of the soil is drastically weakened. The soil's reduced resistance can then easily be overcome by gravity, changing the earth into a flowing river of mud or "slurry." A debris flow or mudflow can move rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars and anything else in its path. Although these slides behave as fluids, they pack many times the hydraulic force of water due to the mass of material included in them. Locally, they can be some of the most destructive events in nature.

DEFINITIONS

Landslide—The sliding movement of masses of loosened rock and soil down a hillside or slope. Such failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.

Mass Movement—A collective term for landslides, debris flows, falls and sinkholes.

Mudslide (or Mudflow or Debris Flow)—A river of rock, earth, organic matter and other materials saturated with water.

All mass movements are caused by a combination of geological and climate conditions, as well as the encroaching influence of urbanization. Vulnerable natural conditions are affected by human residential, agricultural, commercial and industrial development and the infrastructure that supports it.

12.2 HAZARD PROFILE

Landslides are caused by one or a combination of the following factors: change in slope of the terrain, increased load on the land, shocks and vibrations, change in water content, groundwater movement, frost action, weathering of rocks, and removing or changing the type of vegetation covering slopes. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 33 percent
- A history of landslide activity or movement during the last 10,000 years
- Stream or wave activity, which has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable
- The presence or potential for snow avalanches
- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments

- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel.

Flows and slides are commonly categorized by the form of initial ground failure. Figure 12-1 through Figure 12-4 show common types of slides. The most common is the shallow colluvial slide, occurring particularly in response to intense, short-duration storms. The largest and most destructive are deep-seated slides, although they are less common than other types.

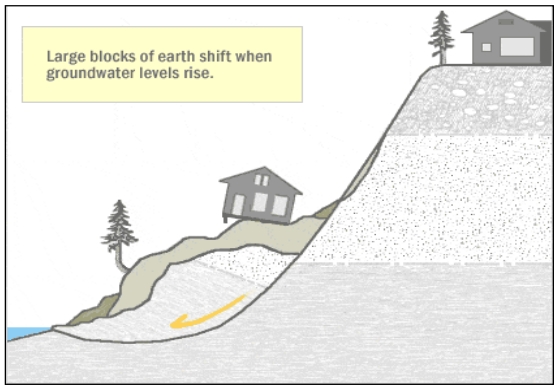


Figure 12-1. Deep Seated Slide

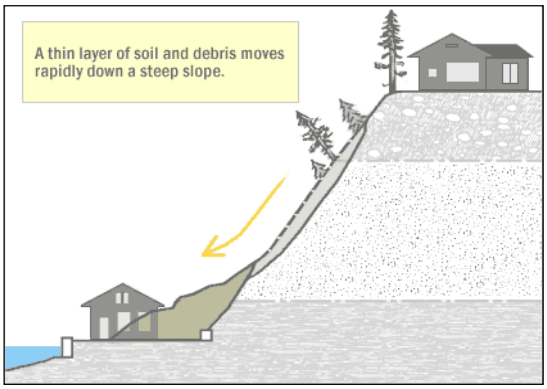


Figure 12-2. Shallow Colluvial Slide

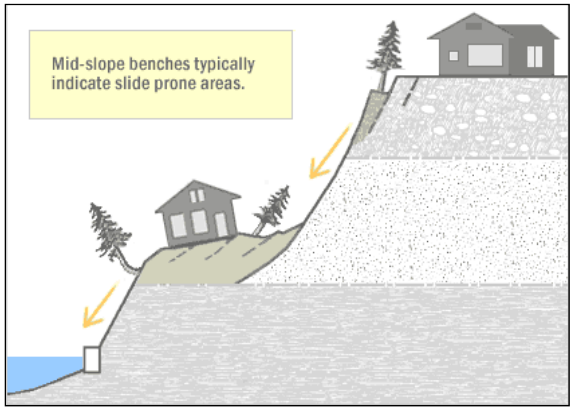


Figure 12-3. Bench Slide

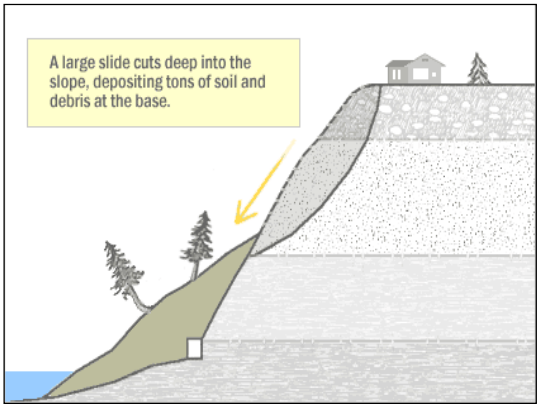


Figure 12-4. Large Slide

Common mass movement types in Humboldt County include the following:

- Translational Slides—A shallow translational sliding feature caused by groundwater pressures within a hillside and slope parallel weaknesses in bedrock near the surface
- Rotational Slides—Deep-seated landslides and slumping with a rotational component caused by natural groundwater pressures within a hillside, removal of the slope toe, and removal of vegetation
- Falls—Block falls of soil from high bluffs, primarily along the near-vertical cliffs of the coastline and edges of river terraces
- Flows—Shallow, rapid, liquid-like flow of the outer surface of a hillside slope, consisting of course, fine-grained soils, or clays materials.

These slide types occur particularly in response to intense, short-duration storms, and/or in combination with larger earthquakes (greater than a 6.0 on the Richter Scale). The largest and most destructive are

deep-seated slides, although they are less common than other types. Most landslides in the county occur from January through March after the water table has risen during the wet months. In addition to the coastal bluffs, land sliding is most prevalent around the slopes of the steep, northwest-trending mountains and hills. Water is involved in nearly all cases; and human influence has been identified in many of the reported slides. The recognition of ancient dormant mass movement sites is important in the identification of areas most susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of ground water flow, these dormant sites are more vulnerable to construction-triggered sliding than adjacent undisturbed material.

12.2.1 Past Events

Landside activity is a frequent event in Humboldt County, with the severity ranging from minor to severe. The most recent severe and widespread landslide damage in the county occurred during the winter storm of 2005-06. Humboldt County was a designated county included in FEMA's "California Severe Storms, Flooding, Mudslides, and Landslides" declaration after this event. Record high rains and winds of the 2005-06 winter storms resulted in thousands of large- and small-scale landslides along every major transportation corridor in the county (U.S. Highways 101, 299, 96 and 36). The result was millions of dollars in damage and much of the county being cut off from the outside world. Drainage systems and catchment basins could not handle the volume of runoff, focusing the water's energy against vulnerable slopes and manmade structures. In some cases, saturated soils became overloaded with the weight of rainwater and collapsed. Private homeowners, particularly in areas where the natural drainage has been paved or otherwise modified, also reported significant damage.

The landslide and mudslide/debris flow activity during the winter storms of 2005-06 caused widespread disruption of surface transportation. The closing of roads in places for almost a week resulted in widespread goods shortages to Eureka and the Humboldt Bay area, where the majority of the county's population resides. Slides cut off not only road transport of goods, but also services and utilities. Wind gusts up to 100 mph blew over tens of thousands of trees, which in turn knocked out power lines. Power could not be serviced until roads were cleared of trees and landslides. Many people were without power for a week or more. Given the shipping volume by road through Humboldt County, some of it involving hazardous materials, it was fortunate that no serious chemical spills occurred.

U.S. Highway 101, the main transportation corridor in northern coastal California and Humboldt County, traverses a landslide-prone area. Landslides along this corridor, especially at Confusion Hill (Figure 12-5 and Figure 12-6), have been an ongoing problem for decades and regularly shut down the highway (10 times in winter of 2003-04). The associated costs are estimated to be over a quarter million dollars per day in travel delay and added vehicle operating costs. Over $14 million in emergency work was conducted in the area to keep the highway open in 2007 alone, and $33 million in the last 10 years. A $65 million highway bridge construction project is currently being constructed by the California Department of Transportation to bypass the Confusion Hill slide area.

Figure 12-5. Confusion Hill Slide, View from Airplane, Winter 2005-06

Figure 12-6. Confusion Hill Slide, View Looking South on U.S. Highway 101, Winter 2005-06

12.2.2 Location

The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges.

The recognition of ancient dormant mass movement sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding.

For this risk assessment, two sets of mapping were used to identify probable extent and location of the landslide hazard:

- Landslide susceptibility mapping produced by California Geological Survey—This mapping provides data layers such as landslide inventory, geology, rock strength and slope in varying scales and formats. The methodology of Wilson and Keefer (1985) was used to combine rock strength and slope data for an assessment of landslide susceptibility. These categories express the generalization that on very low slopes, landslide susceptibility is low even in weak materials and that landslide susceptibility increases with increases in slope angle and decreasing rock strength. Eight categories of landslide susceptibility were mapped for the planning area, as shown in Map 12-1.
- Steep slopes intersected with soft or unstable soils—Landslide risk is tied to steep slopes and soft soils. Intersections were identified for NEHRP Class D and E soil with slopes of 15 to 30 percent and 30 percent and greater. The extent and locations of these risk areas are shown in Map 12-2.

12.2.3 Frequency

Landslides are often triggered by other natural hazards such as earthquakes, heavy rain, floods or wildfires, so landslide frequency is often related to the frequency of these other hazards. In Humboldt County, landslides typically occur during and after major storms, so the potential for landslides largely coincides with the potential for sequential severe storms that saturate steep, vulnerable soils. Landslide events occurred during the winter storms of 2006 and 1997. According to SHELDUS records, the planning area has been impacted by severe storms at least once every other year since 1960. Until better data is generated specifically for landslide hazards, this severe storm frequency is appropriate for the purpose of ranking risk associated with the landslide hazard.

In general, landslides are most likely during periods of higher than average rainfall. The ground must be saturated prior to the onset of a major storm for significant landslides to occur. Most local landslides occur in January after the water table has risen during the wet months of November and December. Water is involved in nearly all cases; and human influence has been identified in more than 80 percent of reported slides.

12.2.4 Severity

Slides and earth flows can pose serious hazards to property in hillside terrain. When they move—in response to such changes as increased water content, earthquake shaking, addition of load, or removal of downslope support—they deform and tilt the ground surface. The result can be destruction of foundations,

offset of roads, breaking of underground pipes, or overriding of downslope property and structures. Slope failures in the United States result in an average of 25 lives lost per year and an annual cost to society of about $1.5 billion. The 2005-06 storms in Humboldt County caused millions of dollars in damage due to falls, slides, and mud and debris flows. This was about half of all damage caused by the storm. The landslides caused by the storm also caused tens of millions of dollars of damage to road infrastructure.

12.2.5 Warning Time

Mass movements can occur suddenly or slowly. The velocity of movement may range from a slow creep of inches per year to many feet per second, depending on slope angle, material and water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to determine what areas are at risk during general time periods. Assessing the geology, vegetation and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis, and respond after the event has occurred. Generally accepted warning signs for landslide activity include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines
- Sunken or down-dropped road beds
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content)
- Sudden decrease in creek water levels though rain is still falling or just recently stopped
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

12.3 SECONDARY HAZARDS

Landslides can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public and private transportation. This could result in economic losses for businesses. Other potential problems resulting from landslides are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They also can damage rivers or streams, potentially harming water quality, fisheries and spawning habitat.

12.4 CLIMATE CHANGE IMPACTS

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability for landslide occurrences.

12.5 EXPOSURE

12.5.1 Population

A GIS analysis of population was performed. Population figures (in census blocks) were cross-referenced with the map of landslide susceptibility (Map 12-1). Table 12-1 summarizes the results. About 29 percent of the county population lives in areas of high slope instability.

TABLE 12-1.
HUMBOLDT COUNTY POPULATION AND SLOPE INSTABILITY

	Population		Houses	
Landslide Risk	Number	% of County Total	Number	% of County Total
High (Susceptibility categories VIII, IX, X)	39,210	29%	16,055	29%
Moderate (Susceptibility categories V, VI, VII)	71,660	53%	29,794	55%
Low (Susceptibility categories O, III)	24,339	18%	8,781	16%
Total	**135,209**	**100%**	**54,630**	**100%**

12.5.2 Property

Table 12-2 shows the number of acres in each landslide susceptibility category by jurisdiction. It is estimated that 63 percent of the area in Humboldt County is within a high landslide susceptibility category. Table 12-3 shows the general land use of parcels exposed to landslides for all unincorporated areas of Humboldt County. Lands used for timber related, rural residential, and single family residential land uses are the most vulnerable; while lands used for schools, gravel mining, industrial, and camping are less vulnerable. The predominant land uses for parcels in the unincorporated County are timber and residential related. This table presents data only for parcels exposed to steep slopes in unincorporated Humboldt County.

TABLE 12-2.
AREA EXPOSED TO LANDSLIDE SUSCEPTIBILITY CATEGORIES

		Susceptibility Categories 0-III		Susceptibility Categories V-VI		Susceptibility Categories VII-VIII		Susceptibility Categories IX-X	
	Total Acres	Acres Exposed	% of Total	Acres Exposed	% of Total	Acres Exposed	% of Total	Acres Exposed	% of Total
Arcata	6,371	4,173	65.50%	119	1.87%	1,080	16.95%	999	15.68%
Blue Lake	416	372	89.26%	1	0.28%	43	10.36%	0	0.10%
Eureka	10,354	7,990	77.17%	29	0.28%	1,326	12.80%	1,009	9.74%
Ferndale	769	530	68.95%	2	0.32%	59	7.72%	177	23.01%
Fortuna	3,126	1,927	61.66%	249	7.98%	524	16.76%	425	13.61%
Rio Dell	1,586	718	45.24%	197	12.44%	389	24.52%	282	17.80%
Trinidad	415	127	30.72%	46	11.04%	135	32.49%	107	25.75%
Unincorporated	2,269,603	158,228	6.97%	217,732	9.59%	439,054	19.34%	1,454,588	64.09%
Total	**2,292,640**	**174,065**	**7.59%**	**218,375**	**9.53%**	**442,610**	**19.31%**	**1,457,587**	**63.58%**

TABLE 12-3.
UNINCORPORATED PARCELS EXPOSED TO HIGH SUSCEPTIBILITY BY LAND USE TYPE

Land Use Type	Number of Parcels in High Landslide Susceptibility Area	Land Use Type	Number of Parcels in High Landslide Susceptibility Area
Agriculture	77	Multi-family residential	44
Camp	1	Multi-family residential - vacant	2
Church	12	Open space/parks	886
Commercial	79	Public	188
Commercial - vacant	154	Rural residential	2,788
Golf course	5	Rural residential - vacant	1,852
Gravel mining	2	School	1
Grazing/timber	1,203	Single family residential	794
Heavy industrial	14	Single family residential – vacant	2,421
Heavy industrial - vacant	15	Timber production	3,152
Light industrial	7	Tribal lands	78
Light industrial - vacant	3	Vacant	9
		Total	**13,787**

12.5.3 Critical Facilities and Infrastructure

Table 12-4 summarizes the critical facilities exposed to the landslide hazard. No loss estimation of these facilities was performed due to the lack of established damage functions for the landslide hazard. A significant amount of infrastructure can be exposed to mass movements:

- **Roads**—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses. It is estimated that 3,500 miles of public roadways intersect areas of high landslide susceptibility.
- **Bridges**—Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- **Power Lines**—Power lines are generally elevated above steep slopes; but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and rip down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.

TABLE 12-4.
CRITICAL FACILITIES AND INFRASTRUCTURE IN HIGH LANDSLIDE SUSCEPTIBILITY AREAS

	Number of Critical Facilities in Landslide Susceptibility Categories VIII, IX and X
Medical and Health Services	6
Government Function	9
Protective Function	42
Schools	10
Hazmat	4
Other Critical Function	33
Bridges	104
Water	61
Wastewater	3
Power	6
Communications	4
Total	**282**

12.5.4 Environment

Environmental problems as a result of mass movements can be numerous. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to landslides.

12.5.5 Other Assets at Risk

Natural Resources

Natural resources are highly valued by residents of Humboldt County for their contribution to the local quality of life, and as an economic development asset that attracts tourist-related expenditures. Landslides are part of the natural environment, but they can destroy natural assets that are highly valued by the community.

Agricultural and Timber Resources

Agricultural resources include rangelands, timberlands, cultivated farmlands and dairy lands. Agricultural lands are an important element of the Humboldt County identity and economy. Landslides can have major consequences to such resources, primarily timberland, due to the large percentage of such land in remote locations on steep slopes. Roads accessing timberlands are often susceptible to slides and frequently are contributing factors to landslides. Landslide activity on these roads can remove them from production.

Cultural Resources

The Humboldt County General Plan Cultural Resources Section provides an overview of culturally sensitive resources in the county (Humboldt County, 1984):

> Before European settlement, the Humboldt County area was one of the most culturally diverse regions of California, being home to nearly a dozen distinct peoples. In large part, Native American tribes occupied distinct areas conforming largely to the natural watershed basins. Culturally sensitive areas are sites and regions of special importance to Native Americans, primarily coastlines and riverbanks with outstanding religious or resource-producing importance. Over 32,000 acres of land in Humboldt County are designated as culturally sensitive, with notable concentrations along the Lower Klamath, the Lower Trinity, lower end and North Fork of the Mad, and the Van Duzen Rivers, and the eastern shore of Humboldt Bay.

Culturally sensitive areas exist on both public and private lands. While some locations are publicly identified, others are held as confidential information by Native American organizations. Many cultural sites are at risk from landslides and mass movements, which can destroy artifacts and structures.

The Northwest Information Center at Sonoma State University maintains records of cultural resource sites, including cemeteries, villages, and lithic scatters (surface-visible concentrations of stone chips, flakes, and tools). Three-quarters of these resources are located along rivers and major tributaries; the remainder are in flat mountainous areas or prairies. High-density sites (villages, cemeteries, and ceremonial and gathering areas) are concentrated in the Hoopa and Yurok reservations, Karuk tribal lands and riverine areas. Ridgelines along rivers and creeks, where traveling between villages likely occurred, and lithic scatters around Trinidad, Humboldt Bay, the Eel delta, and Shelter Cove are considered medium-density resource sites. In addition to these resources, the County is home to a World Heritage Site designated by the United Nations (the World's Tallest Tree at Redwood National Park), 48 structures or locations listed on the National Register of Historic Places, and 13 California Historic Landmarks.

Scenic Resources

Humboldt County features a broad range of scenic resources, including the coastline and Pacific Ocean, mountains, hills, ridgelines, inland water features, forests, agricultural features, and distinctive rural communities. Many of these resources or access routes to them are exposed and vulnerable to landslides.

Coastal Views

Humboldt County's varied and extensive coastline allows for a wide range of scenic vistas from State Highway 101 and from beaches, state parks and coastal access points. The County's Local Coastal Program includes a technical study on visual resources. The study includes a detailed inventory of local visual resources along the coastline and identifies areas as "highly scenic" or "visually degraded areas" (Humboldt County, 1979). A recent discussion of Humboldt County's scenic resources, viewshed evaluation and policy discussion is contained in the *Natural Resources and Hazards Discussion Paper* prepared for the General Plan Update (Dyett and Bhatia, 2002). Landslides could visually impact these views or prevent access to views.

Forests

Forestlands define much of the visual landscape of Humboldt County. Redwood National Park, Six Rivers National Forest, Redwoods State Park, and King Range National Conservation Area are all significant protected forests in the county. Forestland is abundant well beyond these protected areas. The scenic value of these natural resources, viewed from within or from outside, is of great importance. Landslides are a natural part of forest lands and can have an impact.

Scenic Highways

Several highways in Humboldt County have unique scenic qualities because of their natural setting. A scenic road is defined as a roadway that, in addition to its transportation function, provides opportunities for the enjoyment of natural and scenic resources. Scenic roads direct views to areas of exceptional beauty, natural resources or landmarks, or historic and cultural interest. Although no highways in Humboldt County are officially designated as California State scenic highways, several state highways are eligible for such designation:

- Route 36 from Route 101 near Fortuna to Trinity County
- Route 96 from Route 299 at Willow Creek north to Siskiyou County
- Route 101 for its entire length in Humboldt County
- Route 299 from Arcata to Willow Creek.

Local Humboldt County roadways also have significant scenic view values (Dyett and Bhatia, 2002). Because these routes are frequently located in less developed areas, they are frequently susceptible to landslides.

12.6 VULNERABILITY

12.6.1 Population

Due to the nature of census block group data, it is difficult to determine populations vulnerable to mass movements. In general, all persons who are exposed to landslide hazards are also vulnerable. Due to Humboldt County's increasing population density and the fact that many man-made structures are built on view property atop or below bluffs and on steep slopes subject to mass movement, more lives are now endangered by this hazard than ever before. Public education and outreach efforts in this regard will need to focus on the economically disadvantaged and those who are most vulnerable due to age or disability.

12.6.2 Property

The effects of landslide activity during the winter storms of 2005-06 indicate significant vulnerability to such hazards. Countywide, the millions of dollars in damage attributable to mass movement during those storms affected private property and public infrastructure and facilities.

As the population continues to grow, more people are building and living on or otherwise modifying areas with marginal stability. Humboldt County's steep coastal bluffs and riverfront and stream-front properties are the sites of debris flows and other types of landslides, but many landslides there cannot be seen from aerial reconnaissance. These failures are only clearly visible from close quarters on the ground. These are areas of intense development pressure. An accurate picture of where landslides were triggered during previous storms is vital for making intelligent land use planning decisions. Consideration of existing landslide susceptibilities and potential hazards will reduce the risk to people and property both now and with future development. In the past, many mass movement losses may have gone unrecorded because insurance companies do not cover such damages. Transportation network damage has often been repaired under the general category of maintenance.

Loss estimations for the landslide hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. It should be noted that the value of assets exposed was determined by estimating the percentage of each census block intersecting the identified risk area; this is probably a large overstatement of risk, but it is the best available data. Table 12-5 shows estimates for potential general building stock loss for landslide.

TABLE 12-5.
ESTIMATED LOSS POTENTIAL IN LANDSLIDE RISK AREAS

Jurisdiction	% of Total Area at Risk[a]	Assessed Value Exposed	Estimated Loss Potential		
			10% Damage	30% Damage	50% Damage
Arcata	17.25	$94,608,732	$9,460,873	$28,382,620	$47,304,366
Blue Lake	0.23	$61,984	$6,198	$18,595	$30,992
Eureka	9.75	$94,588,560	$9,458,856	$28,376,568	$47,294,280
Ferndale	23.12	$12,484,371	$1,248,437	$3,745,311	$6,242,185
Fortuna	16.83	$53,349,018	$5,334,902	$16,004,705	$26,674,509
Rio Dell	22.93	$16,134,517	$1,613,452	$4,840,355	$8,067,259
Trinidad	32.77	$5,430,190	$543,019	$1,629,057	$2,715,095
Unincorporated	80.24	$301,256,153	$30,125,615	$90,376,846	$150,628,076
Total	**79.58**	**$577,913,525.00**	**$57,791,352.00**	**$173,374,057.00**	**$288,956,762.00**

a. Area at risk is defined as areas in Landslide Susceptibility Categories VIII, IX and X.

12.6.3 Critical Facilities and Infrastructure

It is estimated that 282 critical facilities and pieces of critical infrastructure are exposed to the landslide hazard to some degree. A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from mass movements should be done to determine if they could withstand impacts of a mass movement.

Several types of infrastructure are exposed to mass movements, including transportation, water and sewer and power infrastructure. Highly susceptible areas of the county include mountain and coastal roads and transportation infrastructure. At this time all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available.

12.6.4 Environment

The environment vulnerable to landslide hazard is the same as the environment exposed to the hazard.

12.7 FUTURE TRENDS IN DEVELOPMENT

The county experienced moderate growth during the initial performance period for this plan, averaging a 0.41-percent increase in population every year from 2008 through 2013. However, economic problems in the past three years impacted growth in the county, with some areas experiencing negative growth. Humboldt County and its planning partners are optimistic that marginal, sustained growth will return to the county as the state and national economies strengthen.

The County and its planning partners are equipped to handle future growth within landslide hazard areas. All municipal planning partners have general plans that address landslide risk areas in their safety elements. All partners have committed to linking their general plans to this hazard mitigation plan update. This will create an opportunity for wise land use decisions as future growth impacts landslide hazard areas.

Additionally, the State of California has adopted the International Building Code (IBC) by reference in its California Building Standards Code. The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types considered susceptible to landslide hazards. These provisions assure that new construction is built to standards that reduce the vulnerability to landslide risk.

12.8 SCENARIO

Major mass movements in Humboldt County occur as a result of soil conditions that have been affected by severe storms, groundwater or human development activities on steep unstable slopes. After heavy rains from November to December, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it causes weakness and destabilization in the slope. As rains continue, the groundwater table rises, adding to the weakening of the slope. Gravity, poor drainage, a rising groundwater table and poor soil exacerbate hazardous conditions.

A mass movement event is most likely during late winter when the water table is high. A short intense storm could cause the saturated soil to move, resulting in landslides. These conditions would be significantly accelerated in areas recently impacted by severe wildfires. Most mass movements would likely be isolated events, affecting specific areas. The worst-case scenario for mass movement hazards in Humboldt County generally corresponds with a severe storm with heavy rain and flooding. It is probable that private and public property including infrastructure would be affected.

Road obstructions caused by mass movements would likely occur, creating isolation problems for residents and businesses in populated but sparsely developed areas. Mass movements could affect bridges that pass over landslide prone ravines and knock out road service throughout the county. Property owners exposed to steep slopes likely would suffer damage to property or structures. In addition, landslides carrying vegetation such as shrubs and trees may cause a break in power or communication lines, cutting off power and communication access to residents. Continued heavy rains and flooding would complicate this problem further. As resources in Humboldt County attend to problems with flooding, it is possible they may be unavailable to assist with landslides. This would worsen the problem of isolation for residents and disrupt commerce.

Based on historical events and the prevalence in the County of steep slopes with a potential for instability, it is likely that mass movements would occur anywhere in the county that has been affected by historical landslides and areas that have potential steep slopes.

12.9 ISSUES

Important issues associated with landslides in the planning area include the following:

- More detailed property information is needed from the County Assessor to properly assess the risk from the landslide hazard.
- There are existing homes in landslide risk areas throughout the county. The degree of vulnerability of these structures depends on the codes and standards to which the structures were constructed. Information to this level of detail is not currently available.
- Future development could lead to more homes in landslide risk areas.
- Mapping and assessment of landslide hazards are constantly evolving. As new data and science become available, assessments of landslide risk should be reevaluated.
- The impact of climate change on landslides is uncertain. If climate change impacts atmospheric conditions, then exposure to landslide risks is likely to increase.
- Landslides may cause negative environmental consequences, including water quality degradation.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards such as earthquake, flood and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- There is a risk of isolation of the entire county (worst case) or neighborhoods and communities due to the fact that large portions of the transportation infrastructure are in areas of high and moderate slope instability. This includes food shortages, loss of power, and severely reduced economic productivity.
- Landslides can cause a loss of water quality to the environment and for drinking purposes due to increased sediment delivery into surface waterways.

COUNTY OF HUMBOLDT

Map 12-1. Landslide Susceptibility

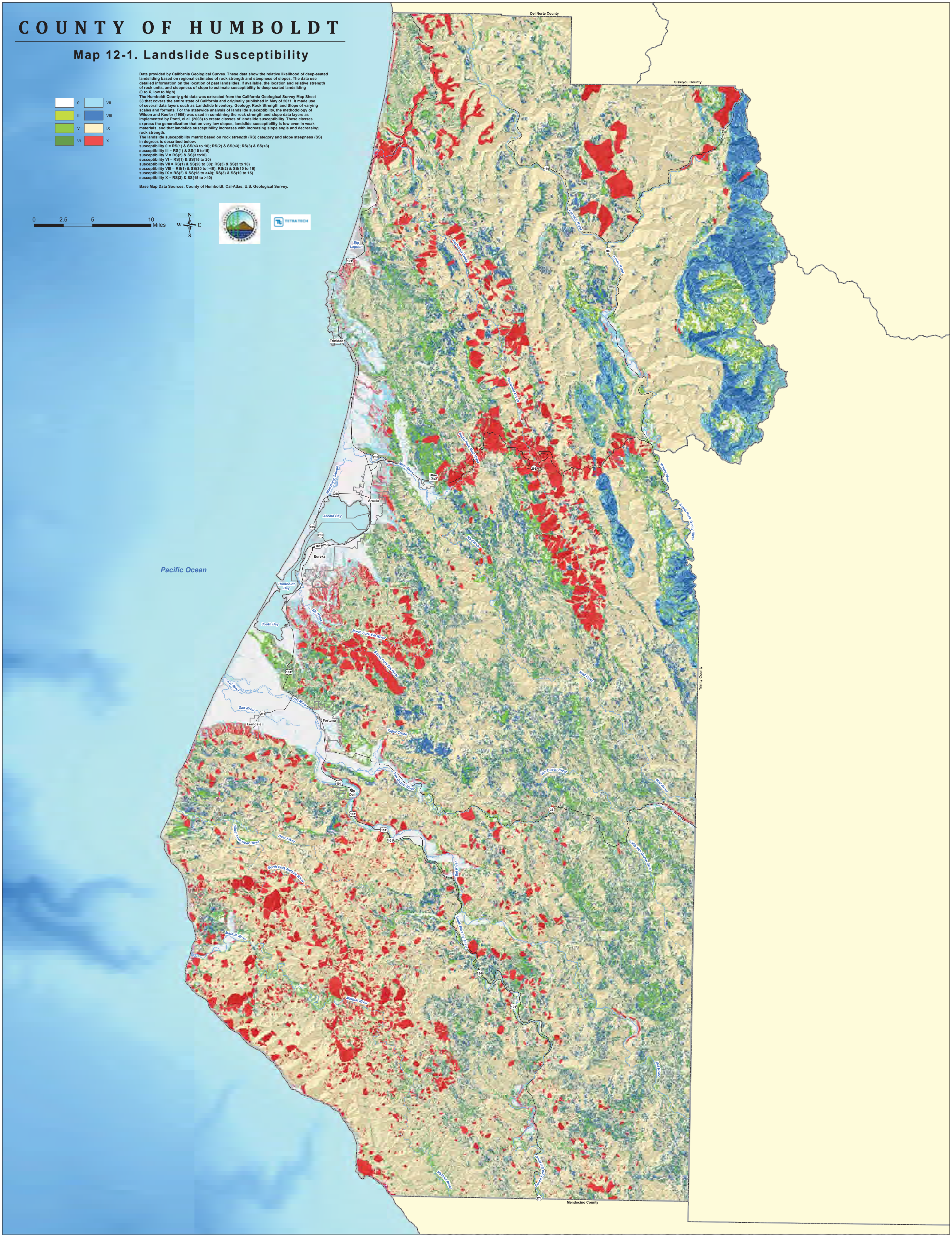
Data provided by California Geological Survey. These data show the relative likelihood of deep-seated landsliding based on regional estimates of rock strength and steepness of slopes. The data use detailed information on the location of past landslides, if available, the location and relative strength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

The Humboldt County grid data was extracted from the California Geological Survey Map Sheet 58 that covers the entire state of California and originally published in May of 2011. It made use of several data layers such as Landslide Inventory, Geology, Rock Strength and Slope of varying scales and formats. For the statewide analysis of landslide susceptibility, the methodology of Wilson and Keefer (1985) was used in combining the rock strength and slope data layers as implemented by Ponti, el al. (2008) to create classes of landslide susceptibility. 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.

The landslide susceptibility matrix based on rock strength (RS) category and slope steepness (SS) in degrees is described below:

susceptibility 0 = RS(1) & SS(<3 to 10); RS(2) & SS(<3); RS(3) & SS(<3)
susceptibility III = RS(1) & SS(10 to15)
susceptibility V = RS(2) & SS(3 to10)
susceptibility VI = RS(1) & SS(15 to 20)
susceptibility VII = RS(1) & SS(20 to 30); RS(3) & SS(3 to 10)
susceptibility VIII = RS(1) & SS(30 to >40); RS(2) & SS(10 to 15)
susceptibility IX = RS(2) & SS(15 to >40); RS(3) & SS(10 to 15)
susceptibility X = RS(3) & SS(15 to >40)

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



COUNTY OF HUMBOLDT

Map 12-2. Landslide Hazard Areas
Steep Slopes, NEHRP Soft Soils

15-30 percent slope, NEHRP D soils

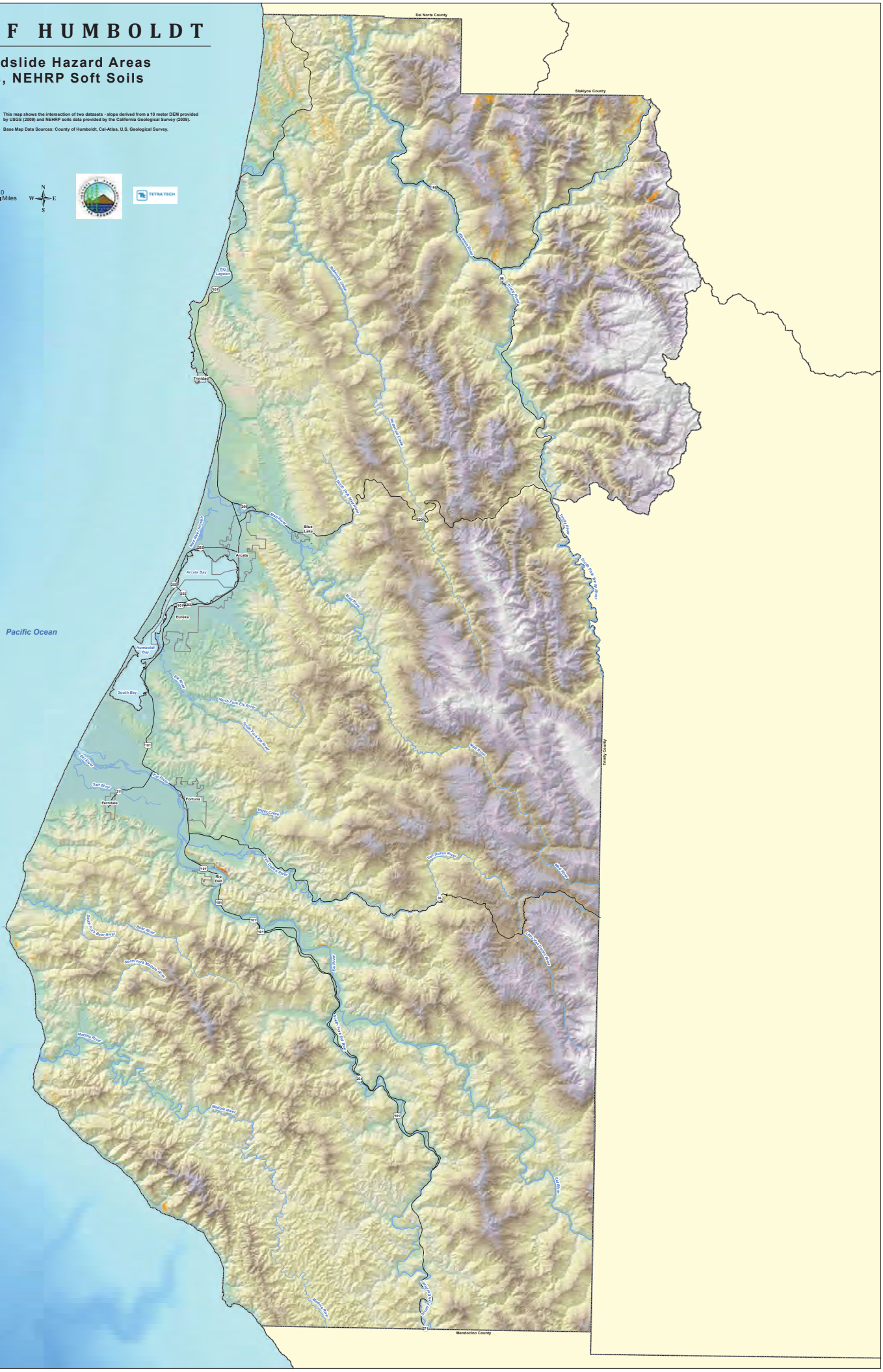
Greater than 30 percent slope, NEHRP D soils

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, U.S. Geological Survey.

0 2.5 5 10 Miles

N W E S



CHAPTER 13.
SEVERE WEATHER

13.1 GENERAL BACKGROUND

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thunderstorms, downbursts, tornadoes, waterspouts, snowstorms, ice storms, and dust storms.

Severe weather events can be categorized into two types: those that form over wide geographic areas are classified as general severe weather; those with a more limited geographic area are classified as localized severe weather. Severe weather, technically, is not the same as extreme weather, which refers to unusual weather events are at the extremes of the historical distribution for a given area.

An overview of Humboldt County's climate is presented in Section 6.4.3. Three types of severe weather events typically impact the planning area: thunderstorms, damaging winds and hail storms. These types of severe weather are described in the following sections. There have been six recorded tornado/funnel cloud events with the County since 1950. However, these were F2-rated or lower events that caused no damage, and tornados are not considered a high risk for the county. Flooding issues associated with severe weather are discussed in Chapter 11.

13.1.1 Thunderstorms

A thunderstorm is a rain event that includes thunder and lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail with a diameter of three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), or tornado.

Three factors cause thunderstorms to form: moisture, rising unstable air (air that keeps rising when disturbed), and a lifting mechanism to provide the disturbance. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise (hills or mountains can cause rising motion, as can the interaction of warm air and cold air or wet air and dry air) it will continue to rise as long as it weighs less and stays warmer than the air around it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of

DEFINITIONS

Freezing Rain—The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to six tons of ice, creating a threat to power and telephone lines and transportation routes.

Severe Local Storm—"Microscale" atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms and snowstorms. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area. Typical impacts are on transportation infrastructure and utilities.

Thunderstorm—A storm featuring heavy rains, strong winds, thunder and lightning, typically about 15 miles in diameter and lasting about 30 minutes. Hail and tornadoes are also dangers associated with thunderstorms. Lightning is a serious threat to human life. Heavy rains over a small area in a short time can lead to flash flooding.

Tornado—Funnel clouds that generate winds up to 500 miles per hour. They can affect an area up to three-quarters of a mile wide, with a path of varying length. Tornadoes can come from lines of cumulonimbus clouds or from a single storm cloud. They are measured using the Fujita Scale, ranging from F0 to F5.

Windstorm—A storm featuring violent winds. Southwesterly winds are associated with strong storms moving onto the coast from the Pacific Ocean. Southern winds parallel to the coastal mountains are the strongest and most destructive winds. Windstorms tend to damage ridgelines that face into the winds.

Winter Storm—A storm having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation.

convection). The water vapor it contains begins to cool and it condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves we hear as thunder. Thunderstorms have three stages (see Figure 13-1):

- The developing stage of a thunderstorm is marked by a cumulus cloud that is being pushed upward by a rising column of air (updraft). The cumulus cloud soon looks like a tower (called towering cumulus) as the updraft continues to develop. There is little to no rain during this stage but occasional lightning. The developing stage lasts about 10 minutes.
- The thunderstorm enters the mature stage when the updraft continues to feed the storm, but precipitation begins to fall out of the storm, and a downdraft begins (a column of air pushing downward). When the downdraft and rain-cooled air spread out along the ground, they form a gust front, or a line of gusty winds. The mature stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes. The storm occasionally has a black or dark green appearance.
- Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the dissipating stage. At the ground, the gust front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. Rainfall decreases in intensity, but lightning remains a danger.

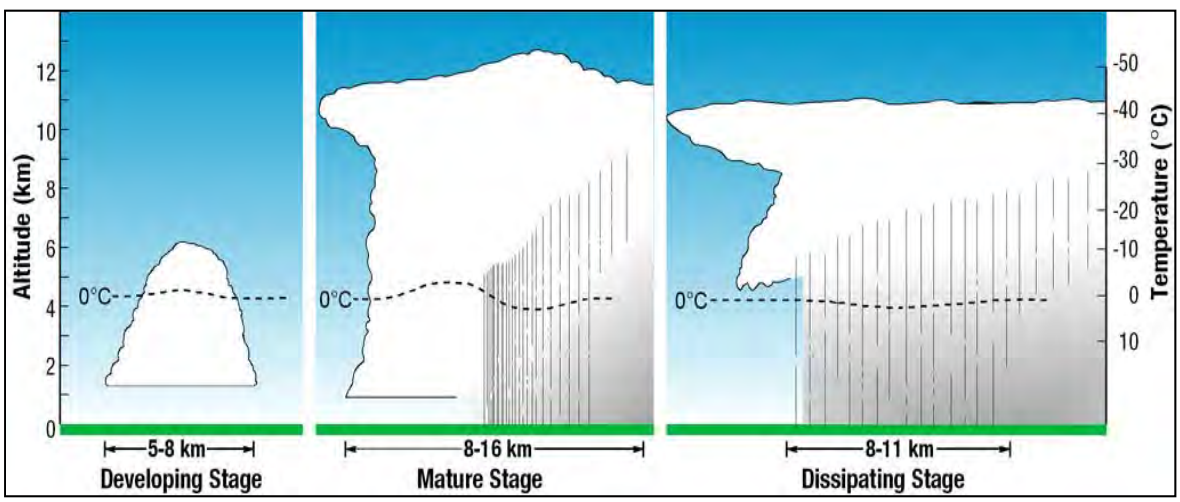


Figure 13-1. The Thunderstorm Life Cycle

There are four types of thunderstorms:

- **Single-Cell Thunderstorms—**Single-cell thunderstorms usually last 20 to 30 minutes. A true single-cell storm is rare, because the gust front of one cell often triggers the growth of another. Most single-cell storms are not usually severe, but a single-cell storm can produce a brief severe weather event. When this happens, it is called a pulse severe storm.
- **Multi-Cell Cluster Storm—**A multi-cell cluster is the most common type of thunderstorm. The multi-cell cluster consists of a group of cells, moving as one unit, with each cell in a different phase of the thunderstorm life cycle. Mature cells are usually found at the center of the cluster and dissipating cells at the downwind edge. Multi-cell cluster storms can produce moderate-size hail, flash floods and weak tornadoes. Each cell in a multi-cell cluster lasts

only about 20 minutes; the multi-cell cluster itself may persist for several hours. This type of storm is usually more intense than a single cell storm.

- Multi-Cell Squall Line—A multi-cell line storm, or squall line, consists of a long line of storms with a continuous well-developed gust front at the leading edge. The line of storms can be solid, or there can be gaps and breaks in the line. Squall lines can produce hail up to golf-ball size, heavy rainfall, and weak tornadoes, but they are best known as the producers of strong downdrafts. Occasionally, a strong downburst will accelerate a portion of the squall line ahead of the rest of the line. This produces what is called a bow echo. Bow echoes can develop with isolated cells as well as squall lines. Bow echoes are easily detected on radar but are difficult to observe visually.
- **Super-Cell Storm—**A super-cell is a highly organized thunderstorm that poses a high threat to life and property. It is similar to a single-cell storm in that it has one main updraft, but the updraft is extremely strong, reaching speeds of 150 to 175 miles per hour. Super-cells are rare. The main characteristic that sets them apart from other thunderstorms is the presence of rotation. The rotating updraft of a super-cell (called a mesocyclone when visible on radar) helps the super-cell to produce extreme weather events, such as giant hail (more than 2 inches in diameter), strong downbursts of 80 miles an hour or more, and strong to violent tornadoes.

13.1.2 Damaging Winds

Damaging winds are classified as those exceeding 60 mph. Damage from such winds accounts for half of all severe weather reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. There are seven types of damaging winds:

- Straight-line winds—Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft.
- Downdrafts—A small-scale column of air that rapidly sinks toward the ground.
- Downbursts—A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- Microbursts—A small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- Gust front—A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- Derecho—A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos

typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.

- Bow Echo—A bow echo is a linear wind front bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

13.1.3 Hail Storms

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Recent studies suggest that super-cooled water may accumulate on frozen particles near the back-side of a storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground.

Hailstones grow two ways: by wet growth or dry growth. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a super-cooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice. Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are “frozen” in place, leaving cloudy ice.

Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are “balanced” in an updraft. One can tell how many times a hailstone traveled to the top of the storm by counting its layers. Hailstones can begin to melt and then re-freeze together, forming large and very irregularly shaped hail.

13.2 HAZARD PROFILE

13.2.1 Past Events

Table 13-1 summarizes severe weather events in the planning area since 1996, as recorded by the National Oceanic and Atmospheric Administration (NOAA).

13.2.2 Location

Severe weather events have the potential to happen anywhere in the planning area. Communities in low-lying areas next to streams or lakes are more susceptible to flooding. Wind events are most damaging to areas that are heavily wooded. Maps 13-1 through 13-4 show the distribution of average weather conditions over the planning area.

13.2.3 Frequency

The severe weather events for Humboldt County shown in Table 13-1 are often related to high winds associated with winter storms and thunderstorms. The planning area can expect to experience exposure to some type of severe weather event at least annually.

TABLE 13-1.
PAST SEVERE WEATHER EVENTS IMPACTING PLANNING AREA

Date	Type	Deaths or Injuries	Property Damage
3/4/1996	Hail	0	None reported
Description: *Widespread convection producing hail, mostly pea-sized.*			
10/25/1996	High Wind	0	None reported
Description: *Two trees were downed, several artichoke plants were ripped out of the ground and a willow tree was damaged by a convective wind gust. Unconfirmed report of a funnel cloud, possible cold air funnel.*			
3/30/1997	Funnel Cloud	0	None Reported
Description: *Funnel cloud was seen by off-duty National Weather Service employee off the coast near Trinidad.*			
4/23/1997	Waterspout	0	None reported
Description: *A waterspout was sighted by the public over the southern part of Humboldt Bay near the College of the Redwoods. It was reported to be picking up water and mud.*			
01/29/1998	Hail	0	None reported
Description: *0.75-inch hail reported in Humboldt County.*			
02/03/1998	Lightning	0	$10,000
Description: *Three cows struck and killed by lightning.*			
11/30/1999	Thunderstorm Wind	0	None Reported
Description: *Thunderstorm activity produced wind gusts up to 57 knots.*			
12/30/2002	Thunderstorm Wind	0	None reported
Description: *Thunderstorm embedded in a strong cold front. Wind speeds in excess of 60 knots reported.*			
08/04/2003	Hail	0	None reported
Description: *Hail up to 1 inch in diameter reported.*			
12/07/2003	Funnel Cloud	0	None reported
Description: *Funnel cloud spotted in Orick*			
2/25/2004	Thunderstorm Wind	0	None reported
Description: *Severe thunderstorms activity near Patrick's Point State park. Wind gusts up to 75 knots reported near Orick.*			
11/28/2005	High Winds	0	$10,000
Description: *High winds downed trees and power poles*			
12/31/2005	High Winds	0	$3.2 million
Description: *Costs refer to all of North Coast, including Del Norte, Humboldt, and Trinity County*			
03/31/2012	Thunderstorm Wind	0	None reported
Description: *A strong line of thunderstorms associated with a post-frontal trough moved across Northwest California. One storm produced severe winds over portions of coastal Del Norte County. Other storms produced sub-severe hail over portions of coastal Mendocino County. Gusty wind conditions that were below severe criteria caused a tree to fall onto highway 36. A car drove into the fallen tree resulting in one fatality. The wind event was preceded by an atmospheric river rain event that saturated soils and therefore exacerbated the vulnerability of trees to wind damage.*			

13.2.4 Severity

The effects on Humboldt County of a strong thunderstorm, tornado, windstorm or ice storm are likely to be similar: fallen trees, downed power lines and interruption of transportation lifelines, damaged homes and public buildings. Fatalities are uncommon, but they can occur.

A tornado is the smallest and potentially most dangerous of local storms, though extremely uncommon in Humboldt County. A tornado is formed by the turbulent mixing of layers of air with contrasting temperature, moisture, density and wind flow. The mixing layers of air account for most of the tornadoes occurring in April, May and June, when cold, dry air meets warm, moister air moving up from the south. If a major tornado were to strike a populated area, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. In the case of extremely high winds, some buildings may be damaged or destroyed. Due to the often short warning period, livestock are commonly the victims of a tornado or windstorm.

Windstorms are a frequent problem in Humboldt County and have been known to cause substantial damage. The predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher. Under most conditions, the County's highest winds come from the southwest.

The effects of an ice storm or snowstorm are downed power lines and trees and a large increase in traffic accidents. These storms can cause death by exposure, heart failure due to strenuous snow removal activity, traffic accidents (over 85 percent of ice storm deaths are caused by traffic accidents), and carbon monoxide poisoning. These storms also have the potential to cause large losses of livestock, primarily due to dehydration.

The most common problems associated with severe storms are immobility and loss of utilities. Roads may become impassable due to flooding, downed trees, ice, snow, or from a secondary hazard such as a landslide. Power lines may be downed due to high winds and other services, such as water or phone, may not be able to operate without power. Lightning can cause severe damage and can be deadly. Two major concerns for snowfall are dangerous roadway conditions and collapse of structures due to heavy snow load on roofs. In addition, ice can create dangerous situations on roadways as well as freeze pipes.

13.2.5 Warning Time

Meteorologists can often predict the likelihood of a severe storm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

13.3 SECONDARY HAZARDS

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails.

13.4 CLIMATE CHANGE IMPACTS

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate (see Figure 13-2). The changing hydrograph caused by climate change could have a significant impact on the intensity, duration and frequency of storm events. All of these impacts could have significant economic consequences.

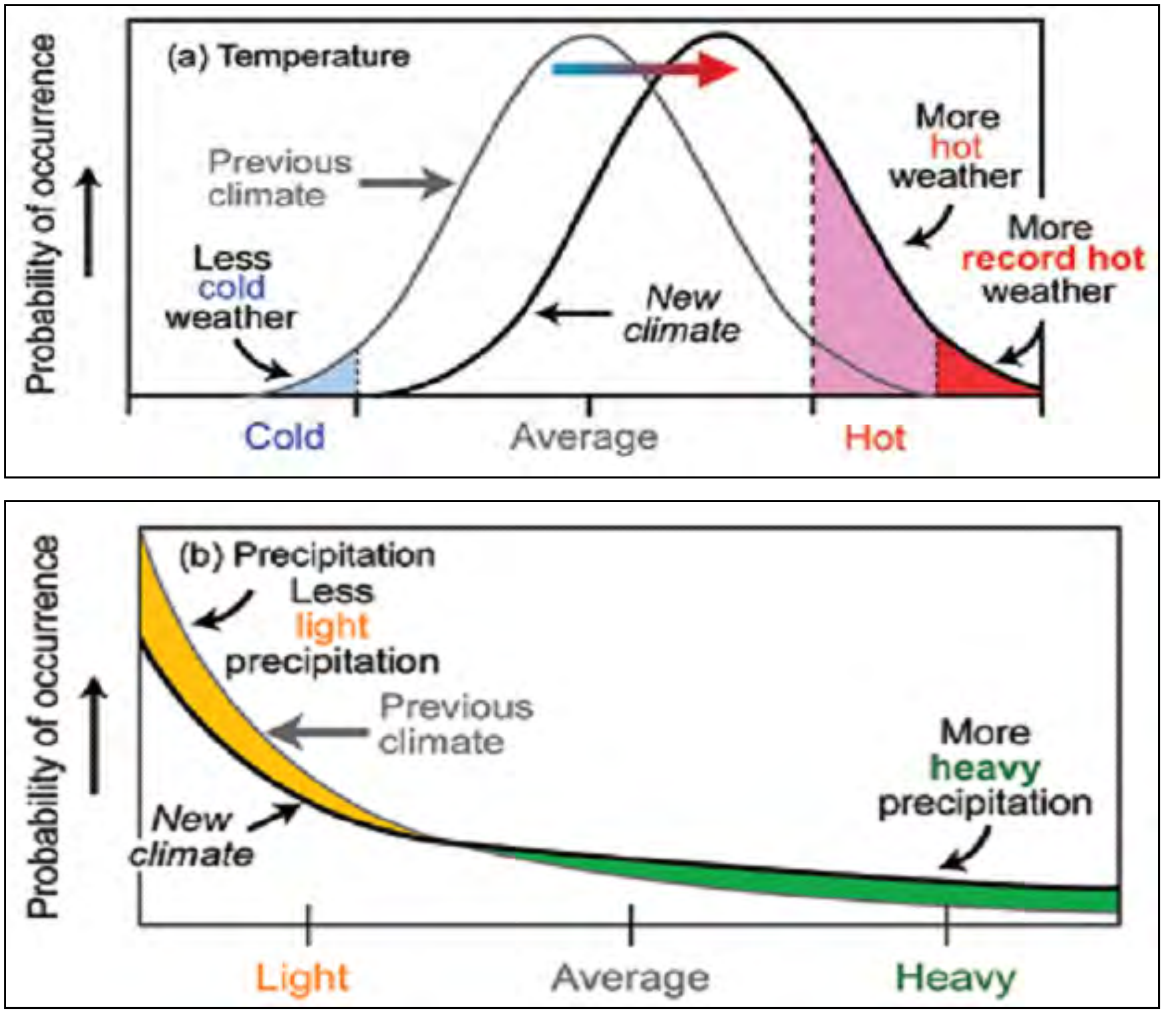


Figure 13-2. Severe Weather Probabilities in Warmer Climates

13.5 EXPOSURE

13.5.1 Population

A lack of data separating severe weather damage from flooding and landslide damage prevented a detailed analysis for exposure and vulnerability. However, it can be assumed that the entire planning area is exposed to some extent to severe weather events. Certain areas are more exposed due to geographic location and local weather patterns. Populations living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and black out, while populations in low-lying areas are at risk for possible flooding.

13.5.2 Property

According to the Humboldt County Assessor, there are 53,137 buildings within the census tracts that define the planning area. Most of these buildings are residential. It is estimated that 20 percent of the residential structures were built without the influence of a structure building code with provisions for wind loads. All of these buildings are considered to be exposed to the severe weather hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

13.5.3 Critical Facilities and Infrastructure

All critical facilities exposed to flooding (Chapter 11) are also likely exposed to severe weather. Additional facilities on higher ground may also be exposed to wind damage or damage from falling trees. The most common problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

13.5.4 Environment

The environment is highly exposed to severe weather events. Natural habitats such as streams and trees are exposed to the elements during a severe storm and risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding events caused by severe weather or snowmelt can produce river channel migration or damage riparian habitat. Storm surges can erode beachfront bluffs and redistribute sediment loads.

13.6 VULNERABILITY

13.6.1 Population

Vulnerable populations are the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.

13.6.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

Loss estimations for the severe weather hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 13-2 lists the loss estimates.

13.6.3 Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Snowstorms in higher elevations can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and to the elderly.

Prolonged obstruction of major routes due to landslides, snow, debris or floodwaters can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

TABLE 13-2.
LOSS ESTIMATES FOR SEVERE WEATHER

		Estimated Loss Potential from Severe Weather		
	Exposed Value	10% Damage	30% Damage	50% Damage
Arcata	$2,193,245,000	$219,324,500	$65,797,350	$109,662,250
Blue Lake	$107,872,000	$10,787,200	$3,236,160	$5,393,600
Eureka	$3,879,919,000	$387,991,900	$116,397,570	$193,995,950
Ferndale	$215,976,000	$21,597,600	$6,479,280	$10,798,800
Fortuna	$1,267,615,000	$126,761,500	$38,028,450	$63,380,750
Rio Dell	$281,495,000	$28,149,500	$8,444,850	$14,074,750
Trinidad	$66,274,000	$6,627,400	$1,988,220	$3,313,700
Unincorporated	$7,508,610,000	$750,861,000	$225,358,300	$375,430,500
Total	**$15,521,006,000**	**$1,552,100,600**	**$465,730,180**	**$776,050,300**

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

13.6.4 Environment

The vulnerability of the environment to severe weather is the same as the exposure.

13.7 FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The planning partners have adopted the International Building Code in response to California mandates. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in general plans within the planning area also address many of the secondary impacts (flood and landslide) of the severe weather hazard. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of severe weather.

13.8 SCENARIO

Severe local storms are frequent with significant impacts, particularly when secondary hazards of flood and landslide occur. A worst-case event would involve prolonged high winds during an extremely wet rain/snowstorm accompanied by freezing temperatures, followed by warmer weather and continued rain. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to flooding, downed tree obstructions, and downed power lines. Power outages would be common throughout the county. Some subdivisions in more rural unincorporated areas could experience limited ingress and egress. Later, as the weather warms and rains continue while snow melts, the sudden run-off could produce flooding, overtopped culverts with ponded water on roads, and landslides on steep slopes. Flooding and landslides could further obstruct roads and bridges, further isolating residents.

13.9 ISSUES

Important issues associated with a severe weather in the planning area include the following:

- Severe local storms will have significant impacts as Humboldt County continues to experience residential growth. In general, every household and resident in the County is likely to be exposed to severe weather, but some are more likely than others to experience isolation as a result. Those residing in higher elevations with limited transportation routes may have the greatest vulnerability to isolation from storms. Another group at risk is the 10 percent of the County population that is over the age of 65.
- Climate change may cause more severe weather patterns that could impact vulnerable populations within the planning area. Increased frequency and intensity of storms may result in greater damage.
- Detailed spatial analysis is needed to locate the most vulnerable populations, followed by focused public education and outreach mitigation activities for these populations.
- The risk associated with the severe weather hazard overlaps the risk associated with other hazards such as earthquake, landslide and flood. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe weather events such as windstorms.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.
- Isolated population centers.

COUNTY OF HUMBOLDT

Map 13-1. Annual Average Precipitation (inches) 1981 - 2010

Precipitation

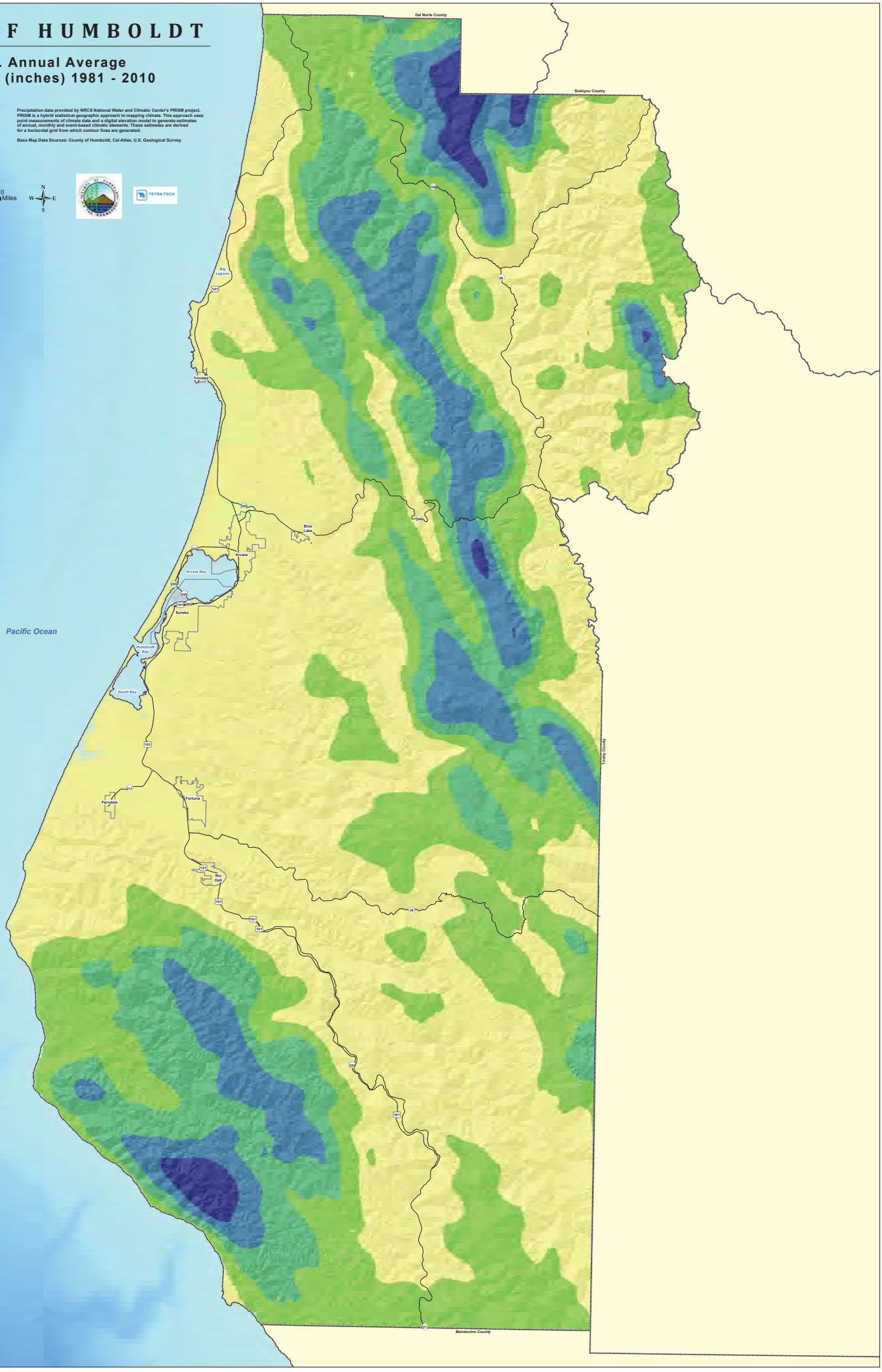
- 41.0 - 65.0
- 65.1 - 83.0
- 83.1 - 103.0
- 103.1 - 129.0
- 129.1 - 171.0

0 2.5 5 10 Miles

N W E S

Precipitation data provided by NRCS National Water and Climatic Center's PRISM project. PRISM is a hybrid statistical–geographic approach to mapping climate. This approach uses point measurements of climate data and a digital elevation model to generate estimates of annual, monthly and event-based climatic elements. These estimates are derived for a horizontal grid from which contour lines are generated.

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



COUNTY OF HUMBOLDT

Map 13-2. Annual Average Maximum Temperature (ºF) 1981 - 2010

Maximum Temperature

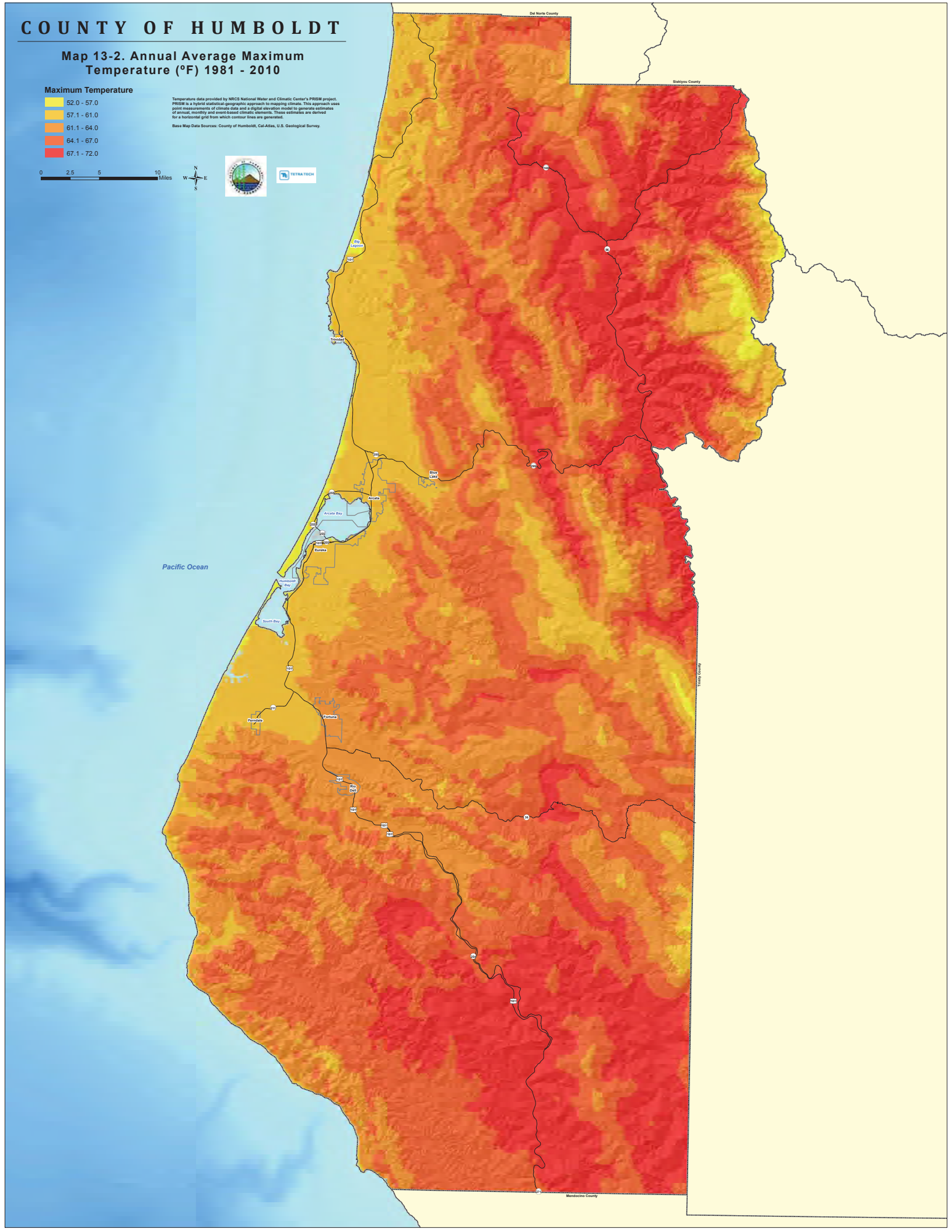
- 52.0 - 57.0
- 57.1 - 61.0
- 61.1 - 64.0
- 64.1 - 67.0
- 67.1 - 72.0

0 2.5 5 10 Miles

N W E S

Temperature data provided by NRCS National Water and Climatic Center's PRISM project. PRISM is a hybrid statistical–geographic approach to mapping climate. This approach uses point measurements of climate data and a digital elevation model to generate estimates of annual, monthly and event-based climatic elements. These estimates are derived for a horizontal grid from which contour lines are generated.

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



COUNTY OF HUMBOLDT

Map 13-3. Annual Average Minimum Temperature (ºF) 1981 - 2010

Minimum Temperature

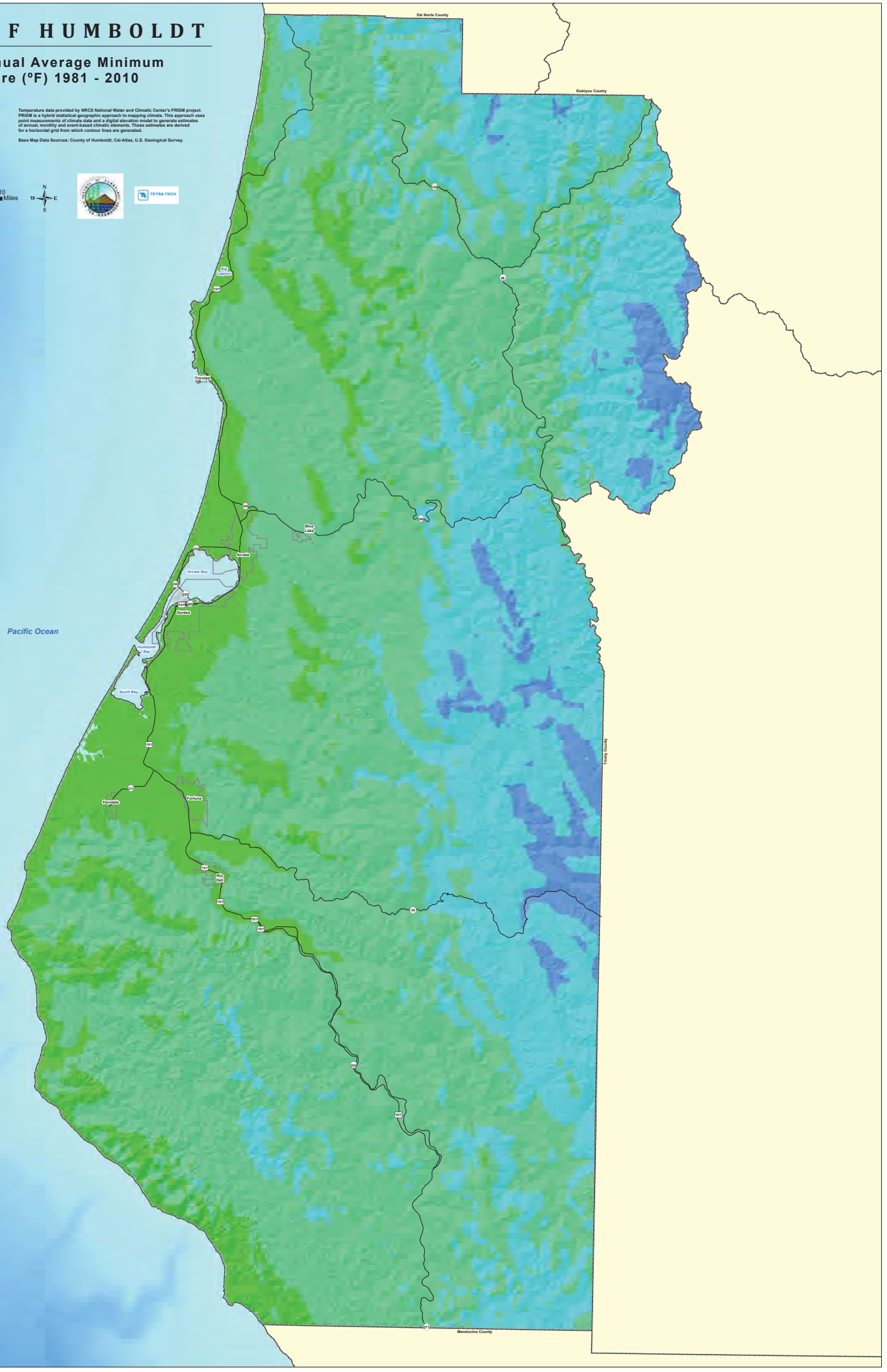
- 36.0
- 36.1 - 39.0
- 39.1 - 42.0
- 42.1 - 44.0
- 44.1 - 49.0

0 2.5 5 10 Miles

N W E S

Temperature data provided by NRCS National Water and Climatic Center's PRISM project. PRISM is a hybrid statistical–geographic approach to mapping climate. This approach uses point measurements of climate data and a digital elevation model to generate estimates of annual, monthly and event-based climatic elements. These estimates are derived for a horizontal grid from which contour lines are generated.

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



COUNTY OF HUMBOLDT

Map 13-4. Wind Power Class at 50m Height

Wind Power Class

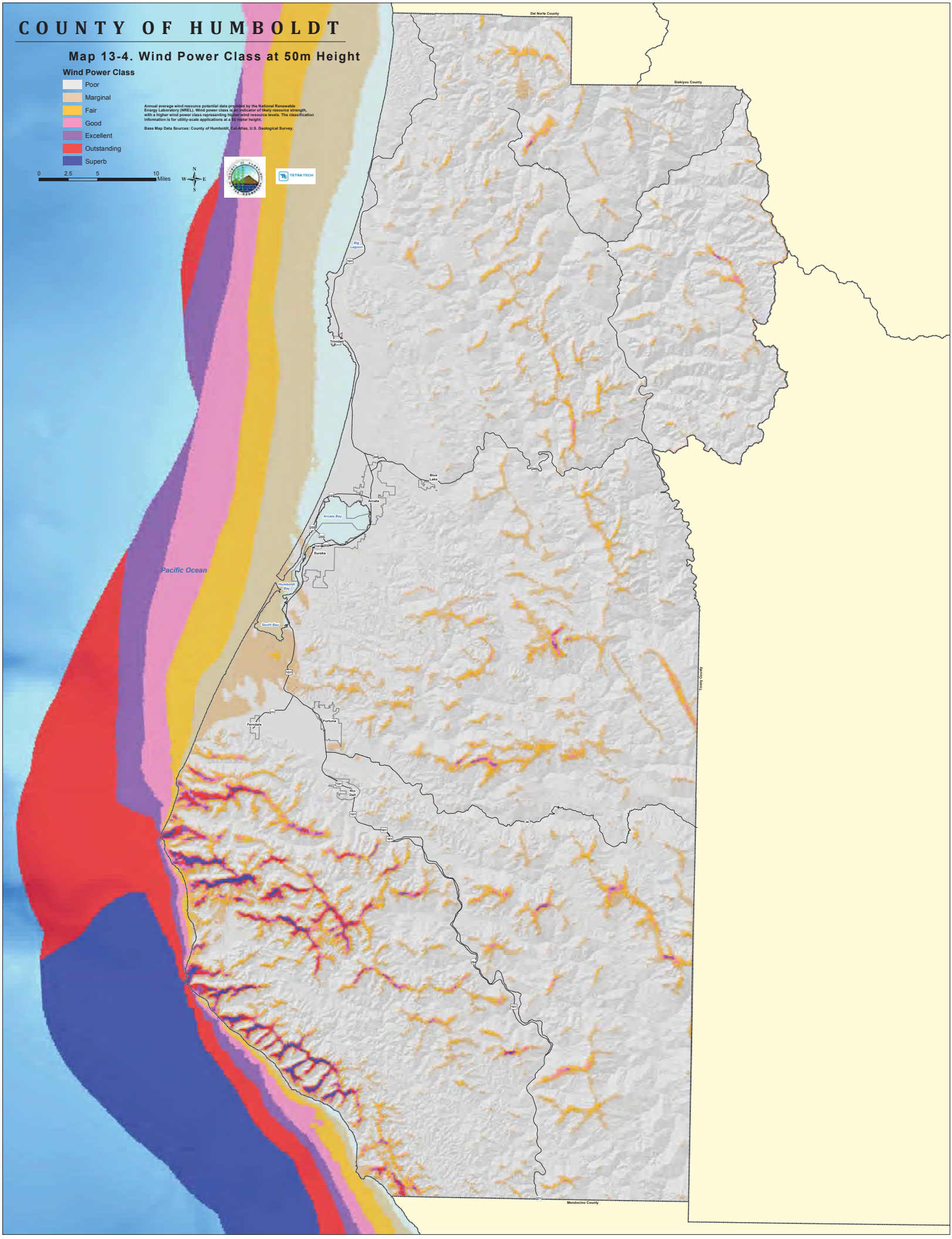
- Poor
- Marginal
- Fair
- Good
- Excellent
- Outstanding
- Superb

0 2.5 5 10 Miles

N W E S

Annual average wind resource potential data provided by the National Renewable Energy Laboratory (NREL). Wind power class is an indicator of likely resource strength, with a higher wind power class representing higher wind resource levels. The classification information is for utility-scale applications at a 80 meter height.

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



CHAPTER 14.
TSUNAMI

14.1 GENERAL BACKGROUND

DEFINITIONS

Tsunami—A series of traveling ocean waves of extremely long wavelength usually caused by displacement of the ocean floor and typically generated by seismic or volcanic activity or by underwater landslides.

A tsunami consists of a series of high-energy waves that radiate outward like pond ripples from an area where a generating event occurs. The waves arrive at shorelines over an extended period. Tsunamis are typically classified as local or distant. Locally generated tsunamis have minimal warning times, leaving few options except to run to high ground. They may be accompanied by damage resulting from the triggering earthquake due to ground shaking, surface faulting, liquefaction or landslides. Distant tsunamis may travel for hours before striking a coastline, giving a community a chance to implement evacuation plans.

In the open ocean, a tsunami may be only a few inches or feet high, but it can travel with speeds approaching 600 miles per hour. As a tsunami enters the shoaling waters near a coastline, its speed diminishes, its wavelength decreases, and its height increases greatly. The first wave usually is not the largest. Several larger and more destructive waves often follow the first one. As tsunamis reach the shoreline, they may take the form of a fast-rising tide, a cresting wave, or a bore (a large, turbulent wall-like wave). The bore phenomenon resembles a step-like change in the water level that advances rapidly (from 10 to 60 miles per hour).

The configuration of the coastline, the shape of the ocean floor, and the characteristics of advancing waves play important roles in the destructiveness of the waves. Offshore canyons can focus tsunami wave energy and islands can filter the energy. The orientation of the coastline determines whether the waves strike head-on or are refracted from other parts of the coastline. A wave may be small at one point on a coast and much larger at other points. Bays, sounds, inlets, rivers, streams, offshore canyons, islands, and flood control channels may cause various effects that alter the level of damage. It has been estimated, for example, that a tsunami wave entering a flood control channel could reach a mile or more inland, especially if it enters at high tide.

The first visible indication of an approaching tsunami may be recession of water (draw down) caused by the trough preceding the advancing, large inbound wave crest. Rapid draw down can create strong currents in harbor inlets and channels that can severely damage coastal structures due to erosive scour around piers and pilings. As the water's surface drops, piers can be damaged by boats or ships straining at or breaking their mooring lines. The vessels can overturn or sink due to strong currents, collisions with other objects, or impact with the harbor bottom.

Conversely, the first indication of a tsunami may be a rise in water level. The advancing tsunami may initially resemble a strong surge increasing the sea level like the rising tide, but the tsunami surge rises faster and does not stop at the shoreline. Even if the wave height appears to be small, 3 to 6 feet for example, the strength of the accompanying surge can be deadly. Waist-high surges can cause strong currents that float cars, small structures, and other debris. Boats and debris are often carried inland by the surge and left stranded when the water recedes.

At some locations, the advancing turbulent wave front will be the most destructive part of the wave. In other situations, the greatest damage will be caused by the outflow of water back to the sea between

crests, sweeping all before it and undermining roads, buildings, bulkheads, and other structures. This outflow action can carry enormous amounts of highly damaging debris with it, resulting in further destruction. Ships and boats, unless moved away from shore, may be dashed against breakwaters, wharves, and other craft, or be washed ashore and left grounded after the withdrawal of the seawater.

14.2 HAZARD PROFILE

14.2.1 Past Events

California is at risk from both local and distant tsunamis. Eighty-two possible or confirmed tsunamis in California have been observed or recorded. Most recently, the March 11, 2011 tsunami caused by an earthquake near Japan resulted in nearly $100 million in damage to the California maritime community. The February 27, 2010 earthquake near Chile also resulted in tsunami inundation in California.

Table 14-1 summarizes the major north coast California tsunami events. Most of these events were small and only detected by tide gages. Eleven events were large enough to cause damage and four caused deaths. At least three of these events had direct measurable impacts on Humboldt County.

Two tsunami events caused major damage on the California coast. The 1960 Chilean earthquake produced a great tsunami that impacted the entire Pacific basin. Damage was reported in California ports and harbors from San Diego to Crescent City and losses exceeded $1 million. The worst event was the 1964 tsunami generated by the Magnitude-9.2 Alaska earthquake, which killed 12 in Northern California and caused over $15 million in damage. The peak wave height was 21 feet in Crescent City and 29 city blocks were inundated. Wave oscillations in San Francisco Bay lasted more than 12 hours, causing nearly $200,000 in damage to boats and harbor structures.

14.2.2 Location

The earth's surface is made up of a number of crustal plates that contain large sections of the continents and ocean basins. These plates may pull apart from, slide past, override, or under-ride (i.e., "subduct") one another. Plate boundaries coincide with faults that produce earthquakes as stress accumulated from the relative movement of the plates is relieved. The earthquakes, in turn, may produce displacements of the sea floor that can set the overlying column of water in motion, initiating a tsunami. However, not all submarine earthquakes produce tsunamis. It depends on the magnitude of the earthquake and type of faulting that has occurred.

The most active plate boundaries rim the Pacific Ocean and the Caribbean Sea. Consequently, this is where most tsunami activity is expected. Most tsunamis originate in the Pacific "Ring of Fire," which is the most active seismic region on earth. An estimated 489 cities in Alaska, California, Hawaii, Oregon, and Washington are susceptible to tsunamis. As many as 900,000 residents of these cities could be inundated by a 50-foot tsunami. In addition, millions of tourist that visit these regions each year could be impacted by tsunami events along the Pacific coast.

History has demonstrated that most tsunamis affecting the Northern California, Oregon, and Washington have originated in the Gulf of Alaska (Aleutian Subduction Zone). There is also geological evidence of significant impacts from tsunamis originating along the Cascadia subduction zone. The Cascadia subduction zone extends from Cape Mendocino in California to the Queen Charlotte Islands, British Columbia, and lies only a short distance off the coast. Historically, the Washington and Oregon coasts have received comparatively minor damage from Alaskan tsunamis. However, Crescent City has experienced damaging tsunamis from Alaska and noticeable effects from a tsunami originating near Chile (see Figure 14-1). A tsunami generated along the nearby Cascadia subduction zone would probably also be very damaging in Northern California.

TABLE 14-1.
TSUNAMIS THAT HAVE AFFECTED NORTH COAST CALIFORNIA

Date	Origin of Tsunami	Impacted Areas	Run-up (meters)	Observations/comments
3/19/1855	N. California	Humboldt Bay	Observed	Water in the bay agitated for 1 hour
4/6/1943	N. Central Chili	Crescent City	Trace	
4/1/1946	E. Aleutian Islands	Crescent City	1.0	3-foot amplitude and a 12-minute period were recorded for this event.
12/20/1946	Nankaido, Japan	Crescent City	0.2	
3/4/1952	SE Hokkaido, Japan	Crescent City	0.2	
11/4/1952	Kamchatka Peninsula, Russia	Crescent City	1.0	In Crescent City, 4 boats were overturned and concrete buoys were moved.
3/91957	Central Aleutian Is.	Crescent City	0.7	
5/22/1960	South/Central Chili	Crescent City	1.7	$30,000 in damages. Two ships were destroyed, others were damaged.
10/13/1963	Kuril Islands, Russia	Crescent City	0.5	
3/28/1964	Gulf of Alaska	Crescent City	6.3	Ten people killed, 35 injured, 52 homes and 172 businesses damaged or destroyed. $15 million in damages
		Klamath River		One person killed $4,000 damages to dock and boats at Requa. Damage reported least 2.6 km from mouth of Klamath River.
		Trinidad		Observed run-up was 5.4 meters above mean lower low water.
2/4/1965	W. Aleutian Islands	Crescent City	0.1	
10/17/1966	Peru	Crescent City	0.1	
5/16/1968	Honshu, Japan	Crescent City	0.6	
7/26/1971	New Ireland	Crescent City	<0.1	
10/3/1974	Peru	Crescent City	<0.1	
5/7/1986	W. Aleutian Islands	Crescent City	0.1	
4/25/1992	Northern CA Cape Mendocino	Humboldt Bay	0.3 Observed	Waves arrived at Humboldt Bay about 20 minutes after ground shaking.
		Clam Beach	0.6	Water level changed several feet
		Crescent City	0.9	Oscillations in harbor, the 4th wave were the highest recorded.
		Trinidad		Cars were struck on the beach.
9/1/1994	Northern CA Cape Mendocino	Crescent City	0.14	Recorded on Crescent City tide gauge 45 minutes after earthquake.
11/15/2006	Kuril Islands	Crescent City Arena Cove Pt. Reyes	1.76 1.18 0.62	Recorded on Marigram
01/13/2007	Kuril Islands	Crescent City Arena Cove Pt. Reyes	0.23 0.25 0.12	Recorded on Marigram
3/11/2011	Honshu Island	Crescent City	2.47	$100 million in damage to the California maritime community

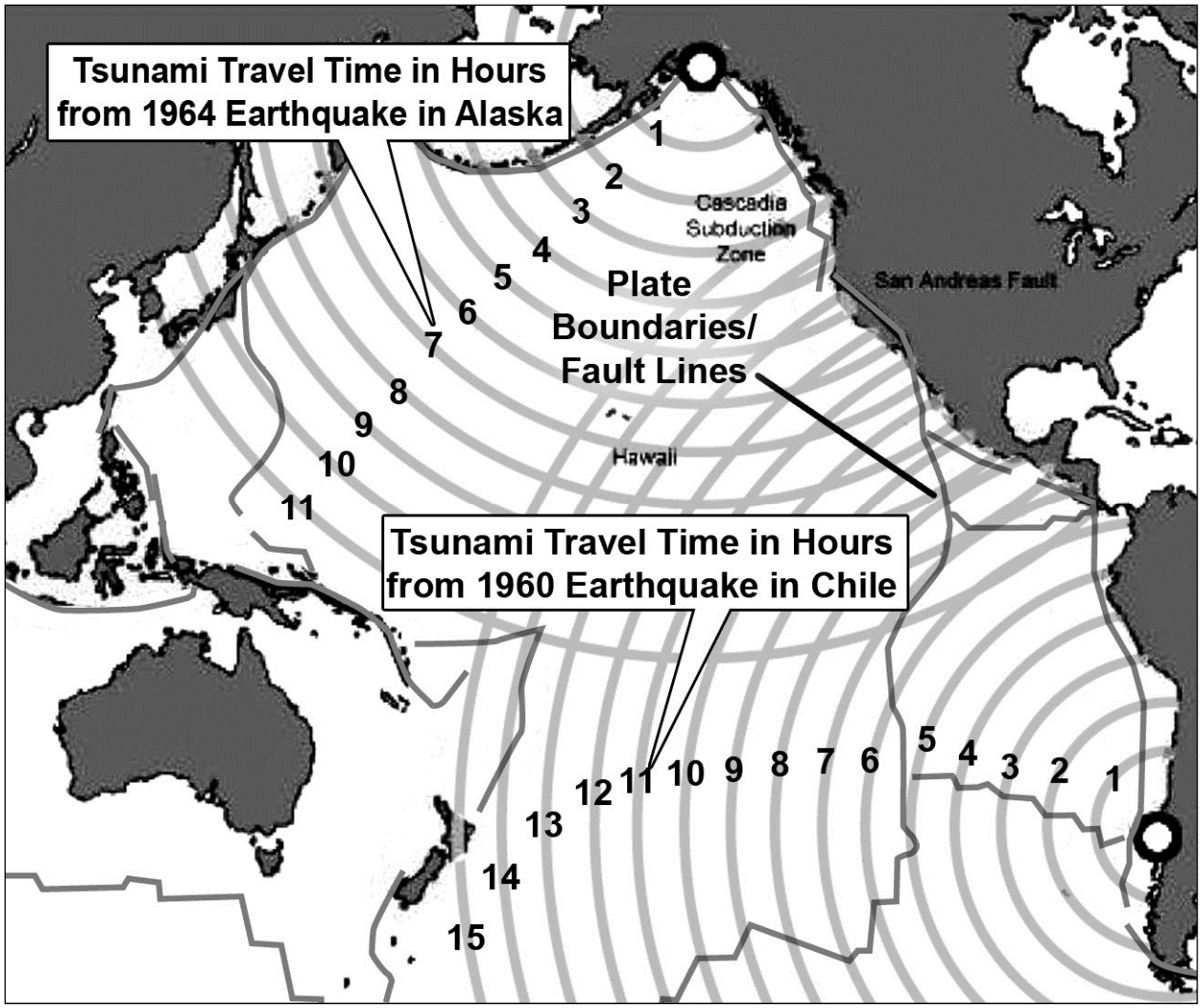


Figure 14-1. Potential Tsunami Travel Times in the Pacific Ocean

Tsunamis that damaged California's coast have come from all around the Pacific basin, including South America and Alaska. Nearly two-thirds of California's tsunami events and all but one damaging event were generated by distant sources. Local tsunamis have the potential to cause locally greater wave heights and pose a threat to the state. The largest historical local-source tsunami on the west coast was caused by the 1927 Point Arguello, California, earthquake (Magnitude 7.1), which produced 7-foot waves in the nearby coastal area.

Map 14-1 illustrates the tsunami inundations areas mapped by CalEMA. The modeling process for this mapping used the MOST (method of splitting tsunamis) computational program, which allows for wave evolution over a variable seabed and accounts for topography in its inundation mapping. 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. A suite of tsunami source events was selected for modeling , representing realistic local and distant earthquakes and hypothetical extreme undersea and nearshore landslides.

14.2.3 Frequency

The frequency of tsunamis is related to the frequency of the events that cause them, so it is similar to the frequency of seismic or volcanic activities or landslides. Generally four or five tsunamis occur every year in the Pacific Basin, and those that are most damaging are generated in the Pacific waters off South America rather than in the northern Pacific.

14.2.4 Severity

Tsunamis are a threat to life and property to anyone living near the ocean. From 1950 to 2007, 478 tsunamis were recorded globally. Fifty-one of these events caused fatalities, to a total of over 308,000 coastal residents. The overwhelming majority of these events occurred in the Pacific basin. Recent tsunamis have struck Nicaragua, Indonesia, and Japan, killing several thousand people. Property damage due to these waves was nearly $1 billion. Historically, tsunamis originating in the northern Pacific and along the west coast of South America have caused more damage on the west coast of the United States than tsunamis originating in Japan and the Southwest Pacific.

The Cascadia subduction zone will produce the state's largest tsunami. The Cascadia subduction zone is similar to the Alaska-Aleutian trench that generated the Magnitude-9.2 1964 Alaska earthquake and the Sunda trench in Indonesia that produced the Magnitude-9.3 December 2004 Sumatra earthquake. Native American accounts of past Cascadia earthquakes suggest tsunami wave heights on the order of 60 feet, comparable to water levels in Aceh Province Indonesia. Water heights in Japan produced by the 1700 Cascadia earthquake were over 15 feet, comparable to tsunami heights observed on the African coast after the Sumatra earthquake. The Cascadia subduction zone last ruptured January 26, 1700, creating a tsunami that left markers in the geologic record from Humboldt County to Vancouver Island, Canada and is noted in written records in Japan. At least seven ruptures of the Cascadia subduction zone have been observed in the geologic record.

14.2.5 Warning Time

Typical signs of a tsunami hazard are earthquakes and/or sudden and unexpected rise or fall in coastal water. The large waves are often preceded by coastal flooding and followed by a quick recession of the water. Tsunamis are difficult to detect in the open ocean; with waves less than 3 feet high. The tsunami's size and speed, as well as the coastal area's form and depth, affect the impact of a tsunami; wave heights of 50 feet are not uncommon. In general, scientists believe it requires an earthquake of at least a magnitude 7 to produce a tsunami.

The Pacific tsunami warning system evolved from a program initiated in 1946. It is a cooperative effort involving 26 countries along with numerous seismic stations, water level stations and information distribution centers. The National Weather Service operates two regional information distribution centers. One is located in Ewa Beach, Hawaii, and the other is in Palmer, Alaska. The Ewa Beach center also serves as an administrative hub for the Pacific warning system.

The warning system only begins to function when a Pacific basin earthquake of magnitude 6.5 or greater triggers an earthquake alarm. When this occurs, the following sequence of actions occurs:

- Data is interpolated to determine epicenter and magnitude of the event.
- If the event is magnitude 7.5 or greater and located at sea, a TSUNAMI WATCH is issued.
- Participating tide stations in the earthquake area are requested to monitor their gages. If unusual tide levels are noted, the tsunami watch is upgraded to a TSUNAMI WARNING.

- Tsunami travel times are calculated, and the warning is transmitted to the disseminating agencies and thus relayed to the public.
- The Ewa Beach center will cancel the watch or warning if reports from the stations indicate that no tsunami was generated or that the tsunami was inconsequential.

This system is not considered to be effective for communities located close to the tsunami because the first wave would arrive before the data were processed and analyzed. In this case, strong ground shaking would provide the first warning of a potential tsunami.

Emerging Tsunami Mitigation and Preparedness Activities in California

After the 2010 and 2011 tsunamis, post-event survey teams and questionnaires were used to gather information about physical effects and emergency response, including the following key findings (Wilson et al., 2012a and 2012b):

- During the 2010 tsunami, a maximum tsunami amplitude of 1.2 m was observed at Pismo Beach, and over $3 million worth of damage occurred to boats and docks in nearly a dozen harbors, most significantly in Santa Cruz, Ventura, Mission Bay, and northern Shelter Island in San Diego Bay.
- During the 2011 tsunami, the maximum amplitude was measured at 2.47 m in Crescent City Harbor, with over $100 million in damage to two dozen harbors. The most affected harbors were Crescent City, Noyo River, Santa Cruz, Moss Landing and southern Shelter Island.
- During both events, people on docks and near the ocean were at risk to injury, and one fatality occurred during the 2011 tsunami, at the mouth of the Klamath River.
- Significant sediment deposition and damage in Crescent City and Santa Cruz harbors during the 2011 event caused long delays in recovery of those harbors because of regulatory and reconstruction issues.

Eye-witness accounts and video information collected after the 2010 and 2011 tsunamis provided a resource for improving tsunami hazard analysis in harbors and bays. Based on the analysis of these recent events and information from the USGS Science Applications for Risk Reduction Project, the state tsunami program is enhancing existing products and developing new products that will improve tsunami preparedness and mitigation statewide. The ultimate goal of these improvements is to save lives and reduce immediate and long-term impact on coastal communities. These products will achieve the following:

- Help the maritime community better understand tsunami hazards at ports and harbors, as well as if and where boats should go offshore to be safe
- Help emergency managers develop evacuation plans for relatively small warning-level events where extensive evacuation is not required
- Help land-use planners better understand the tsunami hazard over the lifetime of construction and development.

Through a cooperative technical partnership developed between the state and FEMA, observed strong tsunami currents and damage are being used to validate and calibrate numerical tsunami models. Using validated modeling, the state tsunami program has initiated a plan to develop three sets of products for maritime communities:

- Detailed maps identifying in-harbor tsunami hazards (strong currents and eddies, peak amplitude surges, large tidal fluctuations, etc.)

- Offshore safety zones where ships can evacuate to and safely gather during a tsunami
- Preparedness, mitigation, and recovery and continuity plans to help maritime communities be more resilient to tsunami hazards.

Harbor-specific guidance will be created to help maritime communities better prepare for, respond to, and recover from future tsunamis. Most of this mapping and guidance work with the maritime communities will be completed by the year 2015.

In the 2011 tsunami in California, the arrival of significant tsunami activity (which was only forecasted to be between 1 m and 2.5 m for areas within a warning area along the coast) coincided with low tide conditions and therefore was not expected to inundate dry land. Considerable differences were noted among communities conducting evacuation and response. Only a few communities in the state called full evacuations; in most cases, no evacuations were initiated. Many emergency managers indicated that secondary evacuation lines for smaller warning-level events would have been useful, reducing the potential for under- or over-evacuation and alleviating the need for an “all or nothing” decision. As a result, scenario-specific, tsunami evacuation “playbook” maps and guidance recommendations are being produced detailing inundation from tsunamis of various sizes and source locations. In addition, a formula that incorporates forecasted tsunami amplitudes (wave heights), tidal conditions, storm activity, and site specific tsunami run-up potential into a “maximum predicted tsunami run-up height” is being developed to determine which evacuation scenario is most appropriate and conservative to use. These products, expected to be available by the end of 2013, will help coastal emergency managers prepare local response plans when minor distant source tsunamis or larger tsunamis from local and regional sources are generated.

Along with improvements to evacuation planning and maritime planning, the state tsunami program has made progress on products for the land-use planning community. Because land-use planning decisions should not be based on the existing state-wide tsunami inundation maps, which represent “worst-case” scenarios, a probabilistic tsunami hazard analysis (PTHA) must be completed. Maps and associated products based on PTHA methods will be similar to other probabilistic flood and seismic hazard maps by representing standard risk levels (average return periods) for tsunami hazards, which can be used not only in land-use planning, but possibly also for implementing building design criteria, producing more consistent inundation maps for evacuation planning, and setting flood insurance rates. The initial phase of PTHA and land-use planning product development includes the following:

- Develop a work group of experts to evaluate existing PTHA methods
- Determine the adequacy of the PTHA methods for land-use planning and other uses
- Accept and make improvements to the PTHA methods
- Determine the appropriate risk levels for PTHA-based map production
- Initiate development of PTHA-based maps for the California coast.

The process and products of this PTHA in California will also form the basis for the National Tsunami Hazard Mitigation Program to implement nation-wide. With this initial work being completed by the fall of 2013, the state tsunami program is collaborating with other entities interested in developing PTHA maps for the entire state.

14.3 SECONDARY HAZARDS

Aside from the tremendous hydraulic force of the tsunami waves themselves, floating debris carried by a tsunami can endanger human lives and batter inland structures. Ships moored at piers and in harbors often

are swamped and sunk or are left battered and stranded high on the shore. Breakwaters and piers collapse, sometimes because of scouring actions that sweep away their foundation material and sometimes because of the sheer impact of the waves. Railroad yards and oil tanks situated near the waterfront are particularly vulnerable. Oil fires frequently result and are spread by the waves.

Port facilities, naval facilities, fishing fleets and public utilities are often the backbone of the economy of the affected areas, and these are the resources that generally receive the most severe damage. Until debris can be cleared, wharves and piers rebuilt, utilities restored, and fishing fleets reconstituted, communities may find themselves without fuel, food and employment. Wherever water transport is a vital means of supply, disruption of coastal systems caused by tsunamis can have far-reaching economic effects.

14.4 CLIMATE CHANGE IMPACTS

The impacts of climate change on the frequency and severity of tsunami events could be significant in regions with vulnerable coastline. Global sea-level rise will affect all coastal societies, especially small island states and densely populated low-lying coastal areas. Based on current science, CalEMA and the California Natural Resources Agency have estimated that the sea level rise for the North Coast region of California may reach 55 inches by 2100. This rise has two effects on low-lying coastal regions: any structures located below the new level of the sea will be flooded; and the rise in sea level may lead to coastal erosion that can further threaten coastal structures. As a rule-of-thumb, a sandy shoreline retreats about 100 feet for every 1-foot rise in sea level.

Scientists have known for some time that climate change affects not just the atmosphere and the oceans but also the Earth’s crust. Melting ice masses change the pressures on the underlying earth, which can lead to earthquakes and tsunamis. Rising seas also change the balance of mass across earth’s surface, putting new strain on old earthquake faults.

14.5 EXPOSURE

14.5.1 Population

The population living in tsunami hazard zones was estimated based on the census blocks that intersect with the estimated tsunami hazard zones. The populations that would be most exposed to this type of hazard are those along beaches, low-lying coastal areas, tidal flats and river deltas that empty into ocean-going waters. The methodology used identified census tract groups whose centers are along the coastline of the planning area. HAZUS-MH estimated the number of buildings in each block that are in the tsunami hazard zone, and then estimated the total population by multiplying the average Humboldt County household size of 2.31 persons per household by the number of structures. Using this approach, it is estimated that exposed population is 9,855 people (7.29 percent of the county total).

14.5.2 Property

The value of exposed buildings in the tsunami hazard zone within the planning area was generated using HAZUS-MH at the user-defined level and is summarized in Table 14-2. The estimates include the value of both the buildings and their contents. This methodology estimates that that there are 3,413 structures exposed to the tsunami hazard within the planning area, with an assessed value of $1.315 billion.

14.5.3 Critical Facilities and Infrastructure

Facilities

Table 14-3 summarizes the identified critical facilities in the tsunami inundation areas.

TABLE 14-2.
EXPOSURE AND VALUE OF STRUCTURES IN TSUNAMI INUNDATION ZONE

	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	351	$109,573,000	$81,641,000	$191,214,000	8.72
Blue Lake	0	$0	$0	$0	0.00
Eureka	1,097	$395,960,000	$332,280,000	$728,240,000	18.77
Ferndale	0	$0	$0	$0	0.00
Fortuna	0	$0	$0	$0	0.00
Rio Dell	0	$0	$0	$0	0.00
Trinidad	59	$9,490,000	$7,056,000	$16,546,000	24.97
Unincorporated	1,906	$230,718,000	$148,366,000	$379,084,000	5.05
Total	**3,413**	**$745,741,000**	**$569,343,000**	**$1,315,084,000**	**8.47**

TABLE 14-3.
CRITICAL FACILITIES IN TSUNAMI INUNDATION ZONE

Jurisdiction	Medical and Health Services	Government Function	Hazardous Materials	Schools	Other	**Total**
Arcata	2	3	10	8	21	**44**
Blue Lake	0	0	0	0	0	**0**
Eureka	1	6	22	2	73	**104**
Ferndale	0	0	0	1	1	**2**
Fortuna	0	0	0	0	0	**0**
Rio Dell	0	0	0	0	0	**0**
Trinidad	0	0	0	1	0	**1**
Unincorporated	0	2	13	9	22	**46**
Total	**3**	**11**	**45**	**21**	**117**	**197**

Infrastructure

Roads or railroads that are blocked or damaged can prevent access throughout the county and can isolate residents and emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by tsunami inundation or debris from flood flows also can cause isolation. Water and sewer systems can be flooded or backed up, causing further health problems. Underground utilities can also be damaged during flood events.

Roads

Roads are an important component in the management of tsunami related emergencies in that they act is the primary resource for evacuation to higher ground before and during the course of a tsunami event.

Roads often act as flood control facilities in low depth, low velocity flood events by acting as levees or berms and diverting or containing flood flows.

Using HAZUS-MH, the planning team identified the following major road facilities that may be impacted by tsunami events by analyzing the bridge inventory exposed to the tsunami hazard areas:

- US Highway 101
- Highway 255
- Highway 211
- Highway 299
- Highway 1
- King Salmon Avenue.

This is a list of major roads that may be impacted by a tsunami, based solely on exposure; it should not be misinterpreted as possible evacuation routes for tsunami events. Evacuation routes are identified in emergency response plans in effect within the planning area.

Bridges

Bridges exposed to tsunami events can be extremely vulnerable due to the forces transmitted by the wave run-up and by the impact of debris carried by the wave action. HAZUS-MH identified 37 bridges within the tsunami inundation areas.

Water, Sewer, Utilities

Water and sewer systems can be affected by the flooding associated with tsunami events. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can also be backed up, causing wastes to spill into homes, neighborhoods, rivers and streams. The forces of tsunami waves can impact above ground utilities by knocking down power lines and radio/cellular communication towers. Power generation facilities can be severely impacted by both the velocity impact of the wave action and the inundation of floodwaters. HAZUS identified 19 utilities within tsunami inundation areas.

14.5.4 Environment

All waterways would be exposed to the effects of a tsunami; inundation of water and introduction of foreign debris could be hazardous to the environment. All wildlife inhabiting the area also is exposed.

14.6 VULNERABILITY

14.6.1 Population

The populations most vulnerable to the tsunami hazard are the elderly, disabled and very young who reside near beaches, low-lying coastal areas, tidal flats and river deltas that empty into ocean-going waters. In the event of a local tsunami generated in or near the planning area, there would be little warning time, so more of the population would be vulnerable. The degree of vulnerability of the population exposed to the tsunami hazard event is based on a number of factors:

- Is there a warning system?
- What is the lead time of the warning?

- What is the method of warning dissemination?
- Will the people evacuate when warned?

For this assessment, the population vulnerable to possible tsunami inundation is considered to be the same as the exposed population.

The HAZUS modeling estimated that as many as 7,000 people would be displaced by the tsunami events depicted by the inundation mapping and an additional 5,900 people would need short-term shelter.

14.6.2 Property

All structures along beaches, low-lying coastal areas, tidal flats and river deltas would be vulnerable to a tsunami, especially in an event with little or no warning time. The impact of the waves and the scouring associated with debris that may be carried in the water could be damaging to structures in the tsunami's path. Those that would be most vulnerable are those located in the front line of tsunami impact and those that are structurally unsound. HAZUS-MH generated loss estimates for the estimated tsunami hazard areas, as reflected in Table 14-4. It is estimated that there would be up to $225.5 million of loss from the tsunami hazard events represented by the inundation mapping.

TABLE 14-4.
LOSS ESTIMATES FOR TSUNAMI

	Acres Inundated	Estimated Loss Associated with Tsunami			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	1,342	$4,559,000	$5,997,000	$10,556,000	0.48
Blue Lake	0	$0	$0	$0	0.00
Eureka	2,459	$45,930,000	$111,111,000	$157,041,000	4.05
Ferndale	0	$0	$0	$0	0.00
Fortuna	0	$0	$0	$0	0.00
Rio Dell	0	$0	$0	$0	0.00
Trinidad	38	$1,059,000	$1,214,000	$2,273,000	3.43
Unincorporated	41,389	$24,181,000	$31,434,000	$55,615,000	0.74
Total	**45,228**	**$75,729,000**	**$149,756,000**	**$225,485,000**	**1.45**

14.6.3 Critical Facilities and Infrastructure

Using damage function curves to estimate the percent of damage to critical buildings and their contents, HAZUS-MH correlates these estimates to estimated functional down-time. Functional down-time is the time it will take to restore a facility to 100 percent of its functionality. HAZUS estimated that on the average, critical facilities would receive 16 percent damage to structures and 44 percent damage to contents during the tsunami events depicted by the inundation mapping. The functional down-time to restore these facilities to 100 percent of their functionality would be approximately 480 days.

14.6.4 Environment

The vulnerability of aquatic habit and associated ecosystems would be highest in low-lying areas close to the coastline. Areas near gas stations, industrial areas and Tier II facilities would be vulnerable due to potential contamination from hazardous materials.

Tsunami waves can carry destructive debris and pollutants that can have devastating impacts on all facets of the environment. Millions of dollars spent on habitat restoration and conservation in the planning area could be wiped out by one significant tsunami. There are currently no tools available to measure these impacts. However, it is conceivable that the potential financial impact of a tsunami event on the environment could equal or exceed the impact on property. Community planners and emergency managers should take this into account when preparing for the tsunami hazard.

The HAZUS modeling for this hazard estimated that as much as 34,190 tons of debris could be generated by the tsunami events depicted in the inundation mapping for the planning area.

14.7 FUTURE TRENDS IN DEVELOPMENT

Humboldt County has experienced moderate growth during the initial performance period for this plan , averaging a 0.41-percent increase in population every year from 2008 through 2013. However, economic problems in the past three years impacted growth in the County, with some areas experiencing negative growth. Humboldt County and its planning partners are optimistic that marginal, sustained growth will return to the county as the state and national economies strengthen.

Humboldt County is subject to state general planning laws and the California Coastal Act. The County and its cities have adopted critical areas and resources lands regulations pursuant to these laws. Maintaining the agricultural heritage of Humboldt County is a high priority for its land use programs and managers. It has been Humboldt County’s policy in the past to not allow for an increase in exposure within its floodplains. The information in this plan provides Humboldt County and its planning partners a tool to ensure that there is no increase in exposure within the floodplains of the planning area.

14.8 SCENARIO

The worst-case scenario for the planning area is a local tsunami event triggered by a seismic event along the Cascadia subduction zone. Historical records suggest that tsunami wave heights on the order of 15 to 60 feet could be generated by a Cascadia subduction event. The Humboldt County planning area possesses some geographical features that may help absorb some of the impacts of tsunami events. However, a major tsunami event in the region would have devastating impacts on the people, property and economy of Humboldt County

14.9 ISSUES

The planning team has identified the following issues related to the tsunami hazard for the planning area:

- The County assessor data on general building stock needs to be enhanced to better support future risk assessments of the tsunami hazard.
- Present building codes and guidelines do not adequately address the impacts of tsunamis on structures, and current tsunami hazard mapping is not appropriate for code enforcement.
- As tsunami warning technologies evolve, the tsunami warning capability within the planning area will need to be enhanced to provide the highest degree of warning to planning partners with tsunami risk exposure.

- With the possibility of climate change, the issue of sea level rise may become an important consideration as probable tsunami inundation areas are identified through future studies.
- To measure and evaluate the probable impacts of tsunamis on planning, new hazard mapping based on probabilistic scenarios likely to occur for Humboldt County needs to be created. The science and technology in this field are emerging. For tsunami hazard mitigation programs to be truly effective, probabilistic tsunami mapping will need to be a key component.
- Resources in the planning area, such as the Redwood Coast Tsunami Work Group and Humboldt State University, have done excellent work in implementing and supporting public information and awareness programs. These programs need to be continued, supported and enhanced to promote the concepts of mitigation and preparedness for the impacts of tsunamis and all hazards addressed by this plan.
- Special attention will need to be focused on the vulnerable communities in the tsunami zone and on hazard mitigation through public education and outreach.

COUNTY OF HUMBOLDT

Map 14-1.
Tsunami Inundation Areas

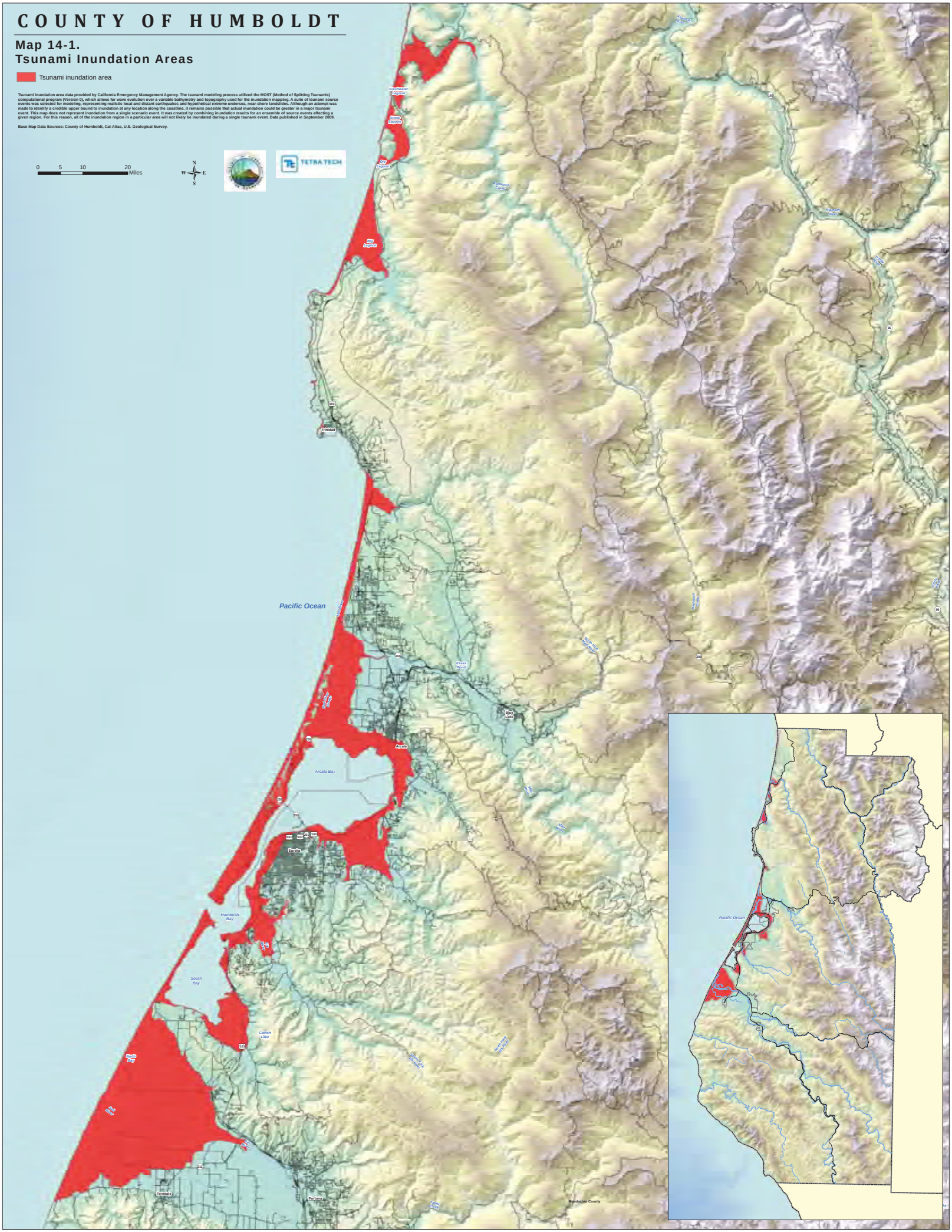
Tsunami inundation area

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, U.S. Geological Survey.

0 5 10 20 Miles

N W E S



CHAPTER 15.
WILDFIRE

15.1 COMMUNITY WILDFIRE PROTECTION PLAN

The Humboldt County Board of Supervisors approved a community wildfire protection plan, pursuant to the federal Healthy Forests Restoration Act, on May 28, 2013. This plan is effectively the wildfire hazard mitigation plan for the Humboldt Operational Area, and is hereby linked to this hazard mitigation plan by reference. Key components of the plan are referenced in this chapter, which provides an overview of the wildfire hazard. The plan can be viewed online at: http://co.humboldt.ca.us/natural-resources/fire_safe_council/

15.2 GENERAL BACKGROUND

A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, and arson. Fire hazards present a considerable risk to vegetation and wildlife habitats. Short-term loss caused by a wildfire can include the destruction of timber, wildlife habitat, scenic vistas, and watersheds. Long-term effects include smaller timber harvests, reduced access to affected recreational areas, and destruction of cultural and economic resources and community infrastructure. Vulnerability to flooding also increases after a wildfire due to the watershed damage. The potential for significant damage to life and property exists in areas designated as "wildland urban interface areas," where development is adjacent to densely vegetated areas.

15.3 HAZARD PROFILE

15.3.1 Past Events

Fire has been a significant factor in Humboldt County's history. Evidence of this can be seen in the fire scars on ancient redwoods, some dating back more than a thousand years. Despite the generally damp climate prevailing in these forests, studies have suggested an historical fire return interval of 50 to 100 years in the northern part of the county and 12 to 50 years in the south. Several of the more destructive historical fires occurred on the coast around the Trinidad area, including the 7,432-acre Luffenholz Fire of 1908, the 17,527-acre A-Line Fire of 1936, and a 15,000-acre unnamed fire near Patrick's Point in 1945. Maps 15-1 and 15-2 show the fire perimeters for the planning area from 1908 through 2012. Table 15-1 lists the fires tracked by CAL FIRE from 2007 through 2012.

DEFINITIONS

Conflagration—A fire that grows beyond its original source area to engulf adjoining regions. Wind, extremely dry or hazardous weather conditions, excessive fuel buildup and explosions are usually the elements behind a wildfire conflagration.

Fires Hazard—The potential for fire in a given area, based on the fuels available to burn and how they would burn. It can be influenced by past disturbances or management activities that alter the hazard for better or worse by changing the overall site moisture. It is also affected by the volume and spatial arrangement of fuels. Fire hazard is distinguished from fire risk, which incorporates the probability of wildfire occurrence—or ignitions—with fire hazard.

Interface Area—An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

Wildfire—Fires that result in uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property in non-urban areas. Because of their distance from firefighting resources, they can be difficult to contain and can cause a great deal of destruction.

TABLE 15-1.
FIRES BY CAUSE—HUMBOLDT COUNTY UNIT, 2007-2012

	2012	2011	2010	2009	2008	2007	**Total**
Arson	15	5	4	1	5	12	**42**
Campfire	13	1	3	1	2	1	**21**
Debris Burning	10	14	5	21	9	14	**73**
Equipment Use	3	3	6	7	6	8	**33**
Lightning	1	0	0	7	47	1	**56**
Miscellaneous	4	17	26	29	38	23	**137**
Power line	9	3	8	0	0	0	**20**
Smoking	0	1	3	2	1	0	**7**
Undetermined	26	32	26	54	32	33	**203**
Vehicle	7	4	0	2	2	1	**16**
Total	**2100**	**2091**	**2091**	**2133**	**2150**	**2100**	**608**

15.3.2 Location

Areas of significant fire hazards are mapped based on factors such as the following:

- **Fuel**—Fuel may include living and dead vegetation on the ground, along the surface as brush and small trees, and above the ground in tree canopies. Lighter fuels such as grasses, leaves and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs and trunks take longer to warm and ignite. Trees killed or defoliated by forest insects and diseases are more susceptible to wildfire.
- **Weather**—Relevant weather conditions include temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount and duration, and the stability of the atmosphere. Of particular importance for wildfire activity are wind and thunderstorms:
  - Strong, dry winds produce extreme fire conditions. Such winds generally reach peak velocities during the night and early morning hours.
  - The thunderstorm season typically begins in June with wet storms, and turns dry with little or no precipitation reaching the ground as the season progresses into July and August.
- **Terrain**—Topography includes slope and elevation. The topography of a region influences the amount and moisture of fuel; the impact of weather conditions such as temperature and wind; potential barriers to fire spread, such as highways and lakes; and elevation and slope of land forms (fire spreads more easily uphill than downhill).

Taking these factors into consideration, a fire hazard severity scale has been devised that characterizes zones by the number of days of moderate, high and extreme fire hazard. These zones, referred to as Fire Hazard Severity Zones (FHSZ), define the application of various mitigation strategies to reduce risk associated with wildfires. Map 15-3 shows the FHSZ map for the planning area. This map is the basis for this wildfire risk assessment.

The FHSZ model is built from existing data and hazard constructs developed by CAL FIRE's Fire and Resource Assessment Program. The model refines the zones to characterize fire exposure mechanisms that cause ignitions to structures. The model characterizes potential fire behavior for vegetation fuels, which are by nature dynamic. Since model results are used to identify permanent engineering mitigations for structures, it is desirable that the model reflect changes in fire behavior over the length of time a structure is likely to be in place. Significant land-use changes need to be accounted for through periodic maintenance routines.

The model output of fire probability also is based on frequency of fire weather, ignition patterns, expected rate-of spread, and past fire history. It also accounts for flying ember production, and hazards based on the area of influence where embers are likely to land and cause ignitions. This is the principal driver of hazard in densely developed areas. A related concern in built-out areas is the relative density of vegetative fuels that can serve as sites for new spot fires within the urban core and spread to adjacent structures.

In Humboldt County, approximately 2.13 million acres are in a high, or very high FHSZ. This represents over 82 percent of the area of the County. The geography, weather patterns and vegetation in the Humboldt County planning area provide ideal conditions for recurring wildfires.

15.3.3 Frequency

Fire Regimes

Fire regime is a description of fire's historical natural occurrence, variability, and influence on vegetation dynamics in the landscape. Fire regimes can provide information for fire planning, as they describe the frequency of fire and the effects a fire is expected to have on a particular area's vegetation. Generally based on fire history reconstructions, fire regime descriptions include the season, frequency, severity, size, and spatial distribution of fires. There is a wide variability in intervals, severities and seasons, but some generalities have been made. Over the years, foresters and plant ecologists have come to use a small number of standardized fire regime classes to make general comparisons about the fire ecology of ecosystems and regions. Five historical fire regimes are defined, based on the average number of years between fires (fire frequency) and fire severity (amount of consumption of the dominant overstory vegetation):

- I: 0 to 35-year frequency and low (surface fires most common) to mixed severity (less than 75 percent of the dominant overstory vegetation replaced)
- II: 0 to 35-year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced)
- III: 35- to 100+-year frequency and mixed severity
- IV: 35- to 100+-year frequency and high severity
- V: 200+-year frequency and high severity.

The CAL FIRE regime data for Humboldt County is shown in Map 15-4. Although the fire regimes in Humboldt have been altered due to fire suppression and other land management activities, there are two pre-settlement fire regimes still found in the county today. According to information collected and analyzed by CAL FIRE, Humboldt County is primarily Fire Regime I, with scattered areas of Fire Regime III (generally on ridge tops, and more often in the eastern parts of the county).

This classification system was used to make one of the first nationwide, coarse-scale maps of fire regimes. CAL FIRE used it to produce somewhat more detailed (but still very coarse-scale) statewide fire regime maps. The LANDFIRE program (also known as Landscape Fire Resource and Management

Planning) has since revised the fire regime class definitions and conducted a national analysis for the National Interagency Fire Coordinating Group. LANDFIRE's more elaborate methodology for regional-scale analyses could be used to produce more local-scale map products for Humboldt County.

Wildfire Seasons

The wildfire season in Humboldt County generally begins in June and ends in mid-October; however, wildfires have occurred in every month of the year. Drought, light snow pack, and local weather conditions can expand or shorten the length of the fire season. The early and late shoulders of the fire season are usually associated with human-caused fires. The peak months of July, August, and September are usually related to thunderstorms and lightning strikes. Typically, the wildfire season is shorter in western Humboldt County's than in the eastern half for a number of reasons:

- The western half receives more rainfall
- The western half has spring seasons that are wetter and cooler
- Summer temperatures are much higher in the eastern portion of the county
- Much of the precipitation in the east falls as snow during the winter.

15.3.4 Severity

Potential losses from wildfire include human life, structures and other improvements, and natural resources. Given the immediate response times to reported fires, the likelihood of injuries and casualties is minimal. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly and those with respiratory and cardiovascular diseases. Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds.

15.3.5 Warning Time

Wildfires are often caused by humans, intentionally or accidentally. There is no way to predict when one might break out. Since fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

15.4 SECONDARY HAZARDS

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations, which

can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding.

15.5 CLIMATE CHANGE IMPACTS

Fire in western ecosystems is determined by climate variability, local topography, and human intervention. Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, forest susceptibility to wildfires changes. Climate change also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

Historically, drought patterns in the West are related to large-scale climate patterns in the Pacific and Atlantic oceans. The El Niño–Southern Oscillation in the Pacific varies on a 5- to 7-year cycle, the Pacific Decadal Oscillation varies on a 20- to 30-year cycle, and the Atlantic Multidecadal Oscillation varies on a 65- to 80-year cycle. As these large-scale ocean climate patterns vary in relation to each other, drought conditions in the U.S. shift from region to region. El Niño years bring drier conditions to the Pacific Northwest and more fires.

Climate scenarios project summer temperature increases between 2ºC and 5°C and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide—the so-called “fertilization effect”—could also contribute to more tree growth and thus more fuel for fires, but the effects of carbon dioxide on mature forests are still largely unknown. High carbon dioxide levels should enhance tree recovery after fire and young forest regrowth, as long as sufficient nutrients and soil moisture are available, although the latter is in question for many parts of the western United States because of climate change.

Lack of sufficient snowpack to provide adequate water flows in summer and into fall, during the times of historical fire season, can substantially increase local fire hazard and fire risk. Climate models diverge with respect to future trends in precipitation over northwestern California, but there is widespread agreement that a trend toward lower snow water equivalent and earlier snowmelt will continue. Current data shows that temperatures, precipitation, and fire frequency and severity are changing in Humboldt County and throughout California. In Humboldt County, that could mean less predictable fire behavior. There may be more frequent and more erratic fires inland, perhaps with a decrease of wildfire along the coastal areas of the county. Such changes in fire behavior make community-based fire safety efforts all the more important

15.6 EXPOSURE

15.6.1 Population

Population could not be examined by Fire Hazard Severity Zone because census block group areas do not coincide with the fire risk areas. However, population was estimated using the structure count of buildings in each Fire Hazard Severity Zone and applying the census value of 2.31 persons per household for Humboldt County. These estimates are shown in Table 15-2.

TABLE 15-2.
POPULATION WITHIN WILDFIRE HAZARD AREAS

	Moderate FHSZ			High FHSZ			Very High FHSZ		
		Population			Population			Population	
	Buildings	Number	% of Total	Buildings	Number	% of Total	Buildings	Number	% of total
Arcata	2,044	4722	26.47	162	374	2.09	0	0	0
Blue Lake	183	423	33.53	0	0	0	0	0	0
Eureka	1,333	3078	11.39	0	0	0	0	0	0
Ferndale	296	683	49.99	46	106	7.77	0	0	0
Fortuna	1,702	3931	33.08	2	5	0.04	0	0	0
Rio Dell	1,116	2577	76.64	79	183	5.44	0	0	0
Trinidad	21	48	13.25	93	215	58.86	22	51	13.9
Unincorporated	11,398	26,329	36.5	9,498	21,940	30.4	3,736	8,630	11.9
Total	**18,093**	**41,791**	**30.9**	**9,880**	**22,823**	**16.9**	**3,758**	**8,681**	**6.4**

15.6.2 Property

Property damage from wildfires can be severe and can significantly alter entire communities. The number of buildings in the various wildfire hazard zones within the planning area is shown in Table 15-3 through Table 15-5, along with their assessed values.

TABLE 15-3.
EXPOSURE AND VALUE OF STRUCTURES IN VERY HIGH WILDFIRE HAZARD AREAS

Jurisdiction	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	0	$0	$0	**$0**	0.00
Blue Lake	0	$0	$0	**$0**	0.00
Eureka	0	$0	$0	**$0**	0.00
Ferndale	0	$0	$0	**$0**	0.00
Fortuna	0	$0	$0	**$0**	0.00
Rio Dell	0	$0	$0	**$0**	0.00
Trinidad	22	$3,506,901	$2,607,449	**$6,114,350**	9.23
Unincorporated	3,736	$438,804,952	$270,007,164	**$708,812,116**	9.44
Total	**3,758**	**$442,311,853**	**$272,614,613**	**$714,926,466**	**4.61**

TABLE 15-4.
EXPOSURE AND VALUE OF STRUCTURES IN HIGH WILDFIRE HAZARD AREAS

Jurisdiction	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	162	$50,060,171	$27,309,433	$77,369,603	3.53
Blue Lake	0	$0	$0	$0	0.00
Eureka	0	$0	$0	$0	0.00
Ferndale	46	$5,625,271	$3,073,489	$8,698,760	4.03
Fortuna	2	$260,931	$147,422	$408,353	0.03
Rio Dell	80	$9,663,264	$5,091,741	$14,755,006	5.24
Trinidad	93	$31,009,782	$20,544,476	$51,554,258	77.79
Unincorporated	9,498	$1,419,260,037	$830,670,798	$2,249,930835	29.96
Total	**9,881**	**$1,515,879,456**	**$886,837,359**	**$2,402,716,815**	**15.48**

TABLE 15-5.
EXPOSURE AND VALUE OF STRUCTURES IN MODERATE WILDFIRE HAZARD AREAS

Jurisdiction	Buildings Exposed	Value Exposed			% of Total Assessed Value
		Structure	Contents	**Total**	
Arcata	2,044	$503,043,922	$323,386,358	$826,430,280	37.68
Blue Lake	183	$21,347,915	$12,180,786	$33,528,701	31.08
Eureka	1,333	$258,290,337	$172,040,572	$430,330,909	11.09
Ferndale	296	$55,857,621	$41,757,747	$97,615,368	45.20
Fortuna	1,702	$292,617,127	$189,680,896	$482,298,023	38.05
Rio Dell	1,116	$125,386,036	$70,518,600	$195,904,635	69.59
Trinidad	21	$2,161,965	$1,375,101	$3,537,066	5.34
Unincorporated	11,398	$1,710,067,028	$993,494,543	**$2,703,561,571**	36.01
Total	**18,093**	**$2,968,771,951**	**$1,804,434,603**	**$4,773,206,553**	**30.75**

Some land uses, such as single-family rural residential, are more vulnerable to wildfire, while others, such as gravel mining, and cemeteries, are less vulnerable. An analysis of Humboldt County Assessor data found that 59 percent of all Humboldt County parcels fall within “High” or “Very High” Fire Hazard Severity Zones (as determined by CAL FIRE) and that just over 85 percent of those are residential dwelling parcels. This indicates that a large majority of parcels in areas with the greatest fire hazard severity zoning contain homes. Based on an evaluation of parcels with development potential in Humboldt County, 62 percent of general plan build-out countywide could be expected to be in high and very high fire hazard severity zones. Therefore, much of the future growth in the county is expected to occur in areas that are most vulnerable to wildfire risk. Table 15-6 presents a breakdown of land use in the fire severity zones.

TABLE 15-6.
LAND USE WITHIN THE WILDFIRE HAZARD AREAS (UNINCORPORATED COUNTY)

	Moderate FHSZ		High FHSZ		Very High FHSZ	
Land Use	Area (acres)	% of total in Risk Area	Area (acres)	% of total in Risk Area	Area (acres)	% of total in Risk area
Unknown	81	1.35%	159	0.42%	6	0.44%
Agriculture	192	3.20%	287	0.77%	0	0.00%
Camp	0	0.00%	4	0.01%	0	0.00%
Cemetery	1	0.02%	2	0.01%	0	0.00%
Church	13	0.22%	45	0.12%	1	0.07%
City	1,435	23.88%	5,687	15.37%	0	0.00%
Commercial	7	0.12%	305	0.82%	0	0.00%
Commercial - vacant	1	0.02%	224	0.61%	0	0.00%
Golf course	0	0.00%	10	0.03%	0	0.00%
Gravel mining	0	0.00%	11	0.03%	0	0.00%
Grazing/timber	676	11.25%	1,538	4.15%	0	0.00%
Heavy industrial	0	0.00%	26	0.07%	0	0.00%
Heavy industrial - vacant	0	0.00%	11	0.03%	0	0.00%
Landfill	0	0.00%	2	0.01%	0	0.00%
Light industrial	0	0.00%	12	0.03%	0	0.00%
Light industrial - vacant	0	0.00%	28	0.08%	0	0.00%
Multifamily residential	53	0.88%	181	0.48%	2	0.15%
Multifamily residential - vacant	1	0.02%	17	0.05%	0	0.00%
Open space/parks	230	3.83%	2,281	6.16%	351	25.68%
Public	45	0.72%	461	1.25%	6	0.44%
Rural residential	924	15.38%	7,056	19.07%	444	32.48%
Rural residential - vacant	440	7.32%	3,972	10.73%	221	16.16%
School	1	0.02%	13	0.04%	0	0.00%
Single family residential	835	13.90%	3,873	10.47%	0	0.00%
Single family residential - vacant	76	1.26%	4,310	11.65%	0	0.00%
Timber production	989	16.46%	5,713	15.44%	143	10.46%
Tribal lands	4	0.07%	754	2.04%	193	14.12%
Vacant	5	0.08%	23	0.06%	0	0.00%
Total	**6,009**	**100.00%**	**37,005**	**100.00%**	**1367**	**100.00%**

15.6.3 Critical Facilities and Infrastructure

Table 15-7 identifies critical facilities exposed to the wildfire hazard in the county. Currently there are four registered Tier II hazardous material containment sites in wildfire risk zones. During a wildfire event, these materials could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition they could leak into surrounding areas, saturating soils and seeping into surface waters, and have a disastrous effect on the environment.

TABLE 15-7.
CRITICAL FACILITIES AND INFRASTRUCTURE IN WILDFIRE HAZARD AREAS

	Number of Critical Facilities in Hazard Zone		
	Moderate	High	Very High
Medical and Health Services	1	9	1
Government Function	5	10	0
Protective Function	4	52	0
Schools	3	40	1
Hazmat	0	4	0
Other Critical Function	10	18	2
Bridges	6	111	16
Water	2	69	1
Wastewater	0	6	0
Power	0	9	0
Communications	1	5	0
Total			

In the event of wildfire, there would likely be little damage to the majority of infrastructure. Most road and railroads would be without damage except in the worst scenarios. Power lines are the most at risk to wildfire because most are supported by wood poles that are susceptible to burning. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion.

15.6.4 Environment

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. However, wildfires can cause severe environmental impacts:

- Damaged Fisheries—Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- Soil Erosion—The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.
- Spread of Invasive Plant Species—Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.

- Disease and Insect Infestations—Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- Destroyed Endangered Species Habitat—Catastrophic fires can have devastating consequences for endangered species.
- Soil Sterilization—Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost. It can take decades or even centuries for ecosystems to recover from a fire. Some fires burn so hot that they can sterilize the soil.

Many ecosystems are adapted to historical patterns of fire occurrence. These patterns, called "fire regimes," include temporal attributes (e.g., frequency and seasonality), spatial attributes (e.g., size and spatial complexity), and magnitude attributes (e.g., intensity and severity), each of which have ranges of natural variability. Ecosystem stability is threatened when any of the attributes for a given fire regime diverge from its range of natural variability.

15.6.5 Other Assets at Risk

Natural Resources

Natural resources are highly valued by residents of Humboldt County for their contribution to the local quality of life, and as an economic development asset that attracts tourist-related expenditures. Fire is part of the natural environment, but it can destroy natural assets that are highly valued by the community.

Agricultural and Timber Resources

Agricultural resources include rangelands, timberlands, cultivated farmlands and dairy lands. Agricultural lands are an important element of the Humboldt County identity and economy. Although fire has been used as a tool in rangeland and timber management, wildfire can have disastrous consequences to such resources, removing them from production and necessitating lengthy restoration programs.

Air Resources

Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor and minerals), gases (carbon monoxide, carbon dioxide and nitrogen oxides) and toxics (formaldehyde and benzene). Emissions from wildfire depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Humboldt County is prone to temperature inversions, which occur when a layer of warm air traps cool air near the surface and creates a lid that inhibits the vertical dispersion of smoke and other pollutants. The Megram Fire (Big Bar Complex Fire) burned 135,000 acres between late August and early November 1999 in eastern Humboldt and Trinity Counties, and resulted in the first air quality related state of emergency in California history. Smoke from the fire was trapped by an inversion layer between late September and early October, causing officials to close schools and encourage residents to leave the area. Those who remained in the affected area were encouraged to remain indoors.

Cultural Resources

The Humboldt County General Plan Cultural Resources Section provides an overview of culturally sensitive resources in the county (Humboldt County, 1984):

> Before European settlement, the Humboldt County area was one of the most culturally diverse regions of California, being home to nearly a dozen distinct peoples. In large part, Native American tribes occupied distinct areas conforming largely to the natural watershed basins. Culturally sensitive areas are sites and regions of special importance to Native Americans, primarily coastlines and riverbanks with outstanding religious or resource-producing importance. Over 32,000 acres of land in Humboldt County are designated as culturally sensitive, with notable concentrations along the Lower Klamath, the Lower Trinity, lower end and North Fork of the Mad, and the Van Duzen Rivers, and the eastern shore of Humboldt Bay.

Culturally sensitive areas exist on both public and private lands. While some locations are publicly identified, others are held as confidential information by local Native American organizations. Many cultural sites are at risk of incidents of wildfire. Fire can destroy artifacts and structures. However, a light fire can clean an area of litter and ground fuel, exposing new cultural sites and artifacts without causing much damage. The discovery of these cultural sites can be a boon to archeologists and Native American groups, but can also present problems of looting and vandalism.

The Northwest Information Center at Sonoma State University maintains records for cultural resource sites, including cemeteries, villages, and lithic scatters (surface-visible concentrations of stone chips, flakes, and tools). Three-quarters of these resources are located along rivers and major tributaries; the remainder are in flat mountainous areas or prairies. High-density sites (villages, cemeteries, and ceremonial and gathering areas) are concentrated in the Hoopa and Yurok reservations, on Karuk tribal lands and riverine areas. Ridgelines along rivers and creeks, where traveling between villages likely occurred, and lithic scatters around Trinidad, Humboldt Bay, the Eel delta, and Shelter Cove are considered medium-density resource sites. In addition to these resources, the County is home to a World Heritage Site designated by the United Nations (the World's Tallest Tree at Redwood National Park), 48 structures or locations listed on the National Register of Historic Places, and 13 California Historic Landmarks.

15.7 VULNERABILITY

Structures, above-ground infrastructure, critical facilities and natural environments are all vulnerable to the wildfire hazard. There is currently no validated damage function available to support wildfire mitigation planning. Except as discussed in this section, vulnerable populations, property, infrastructure and environment are assumed to be the same as described in the section on exposure.

15.7.1 Population

There are no recorded incidents of loss of life from wildfires within the planning area. Given the immediate response times to reported fires, the likelihood of injuries and casualties is minimal; therefore, injuries and casualties were not estimated for the wildfire hazard.

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

15.7.2 Property

Loss estimations for the wildfire hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 15-8 lists the loss estimates for the general building stock for jurisdictions that have an exposure to a fire hazard severity zone.

TABLE 15-8.
LOSS ESTIMATES FOR WILDFIRE IN MODERATE, HIGH OR VERY HIGH FHSZ

		Estimated Loss Potential from Wildfire		
	Exposed Value	10% Damage	30% Damage	50% Damage
Arcata	$903,799,884	$90,379,988	$271,139,965	$451,899,942
Blue Lake	$33,528,701	$3,352,870	$10,058,610	$16,764,351
Eureka	$430,330,909	$43,033,091	$129,099,273	$215,165,454
Ferndale	$106,314,128	$10,631,413	$31,894,239	$53,157,064
Fortuna	$482,706,376	$48,270,638	$144,811,913	$241,353,188
Rio Dell	$210,659,641	$21,065,964	$63,197,892	$105,329,821
Trinidad	$61,205,673	$6,120,567	$18,361,702	$30,602,837
Unincorporated	$5,662,304,522	$566,230,452	$1,698,691,357	$2,831,152,261
Total	**$7,890,849,834**	**$789,084,983**	**$2,367,254,951**	**$3,945,424,918**

15.7.3 Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during wildfire events. In the event of wildfire, there would likely be little damage to most infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

15.8 FUTURE TRENDS IN DEVELOPMENT

The county has experienced moderate growth during the initial performance period for this plan, averaging a 0.41-percent increase in population every year from 2008 through 2013. However, economic problems in the past three years impacted growth in the County, with some areas experiencing negative growth. Humboldt County and its planning partners are optimistic that marginal, sustained growth will return to the county as the state and national economies strengthen.

The highly urbanized portions of the planning area have little or no wildfire risk exposure. Urbanization tends to alter the natural fire regime, and can create the potential for the expansion of urbanized areas into

wildland areas. The expansion of the wildland urban interface can be managed with strong land use and building codes.

New residential construction permitted in Humboldt County's State Responsibility Areas have been built according to the standards of the 2007 California Building Code Chapter 7A, "Materials and Construction Methods for Exterior Wildfire Exposure" (effective January 1, 2008). The planning area is well equipped with these tools, and this planning process has asked each planning partner to assess its capabilities with regards to the tools. As the planning area experiences future growth, it is anticipated that the exposure to this hazard will remain as assessed or even decrease over time due to these capabilities.

15.9 SCENARIO

A major conflagration in the planning area might begin with a wet spring, adding to fuels already present on the forest floor. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials or a tossed lit cigarette, or a sudden lighting storm could trigger a multitude of small isolated fires.

The embers from these smaller fires could be carried miles by hot, dry winds. The deposition zone for these embers would be deep in the forests and interface zones. Fires that start in flat areas move slower, but wind still pushes them. It is not unusual for a wildfire pushed by wind to burn the ground fuel and later climb into the crown and reverse its track. This is one of many ways that fires can escape containment, typically during periods when response capabilities are overwhelmed. These new small fires would most likely merge. Suppression resources would be redirected from protecting the natural resources to saving more remote subdivisions.

The worst-case scenario would include an active fire season throughout the American west, spreading resources thin. Firefighting teams would be exhausted or unavailable. Many federal assets would be responding to other fires that started earlier in the season. While local fire districts would be extremely useful in the urban interface areas, they have limited wildfire capabilities or experience, and they would have a difficult time responding to the ignition zones. Even though the existence and spread of the fire is known, it may not be possible to respond to it adequately, so an initially manageable fire can become out of control before resources are dispatched.

To further complicate the problem, heavy rains could follow, causing flooding and landslides and releasing tons of sediment into rivers, permanently changing floodplains and damaging sensitive habitat and riparian areas. Such a fire followed by rain could release millions of cubic yards of sediment into streams for years, creating new floodplains and changing existing ones. With the forests removed from the watershed, stream flows could easily double. Floods that could be expected every 50 years may occur every couple of years. With the streambeds unable to carry the increased discharge because of increased sediment, the floodplains and floodplain elevations would increase.

15.10 ISSUES

The major issues for wildfire are the following:

- Isolation of neighborhoods and communities. Several vulnerable and isolated populations are in areas of high and extreme risk for wildfire.
- Public education and outreach to people living in the fire hazard zones should include information about and assistance with mitigation activities such as defensible space, and advance identification of evacuation routes and safe zones.

- Conflagration of wooden homes and essential buildings such as fire stations; and isolation due to road and bridge blockage.
- A large number of critical facilities are wood-frame structures in areas of high and extreme risk to wildfire.
- Large clusters of structures are wood-frame structures in areas of high and extreme risk to wildfire.
- Much of the planning area's building stock is of wood-frame construction.
- Wildfires could cause landslides as a secondary natural hazard.
- A high number of critical facilities in the planning area are at risk and could have a significant amount of functional downtime post-event. This creates not only a need for mitigation but also a need for continuity of operations planning to develop procedures for providing services without access to essential facilities.
- Analyses based on the degree of wildfire risk should be updated to match new calculations.
- Regional consistency of higher building code standards such as residential sprinkler requirements and prohibitive combustible roof standards.
- Fire department water supply in high risk wildfire areas.
- Expand certifications and qualifications for fire department personnel. Ensure that all firefighters are trained in basic wildfire behavior, basic fire weather, and that all company officers and chief level officers are trained in the wildland command and strike team leader level.

COUNTY OF HUMBOLDT

Map 15-1. Fire Perimeters - Year of Fire

Year

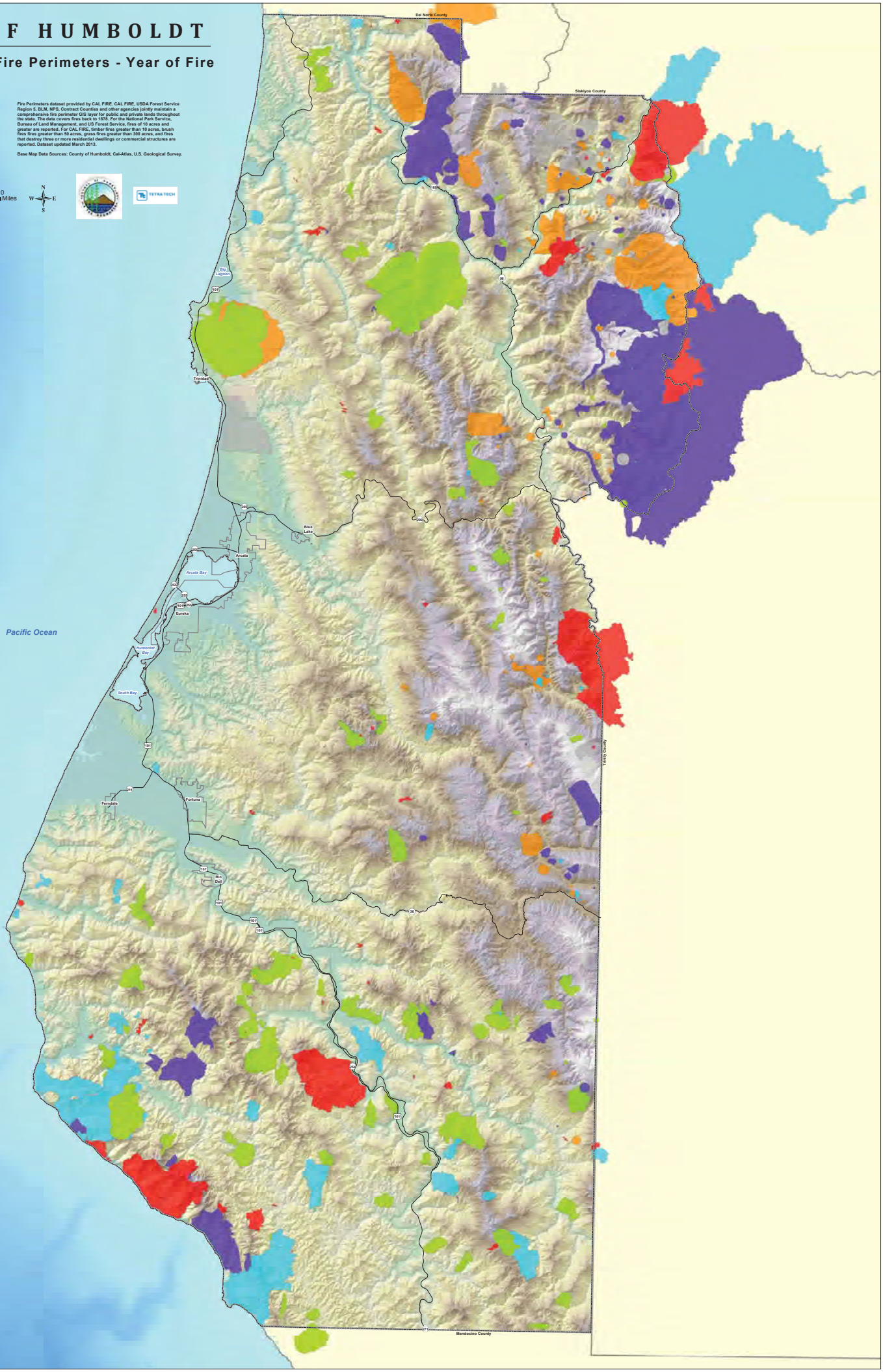
- 1908 - 1920
- 1921 - 1940
- 1941 - 1960
- 1961 - 1980
- 1981 - 2000
- 2001 - 2012

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, U.S. Geological Survey.

0 2.5 5 10 Miles

N W E S



COUNTY OF HUMBOLDT

Map 15-2. Fire Perimeters - Cause of Fire

Cause

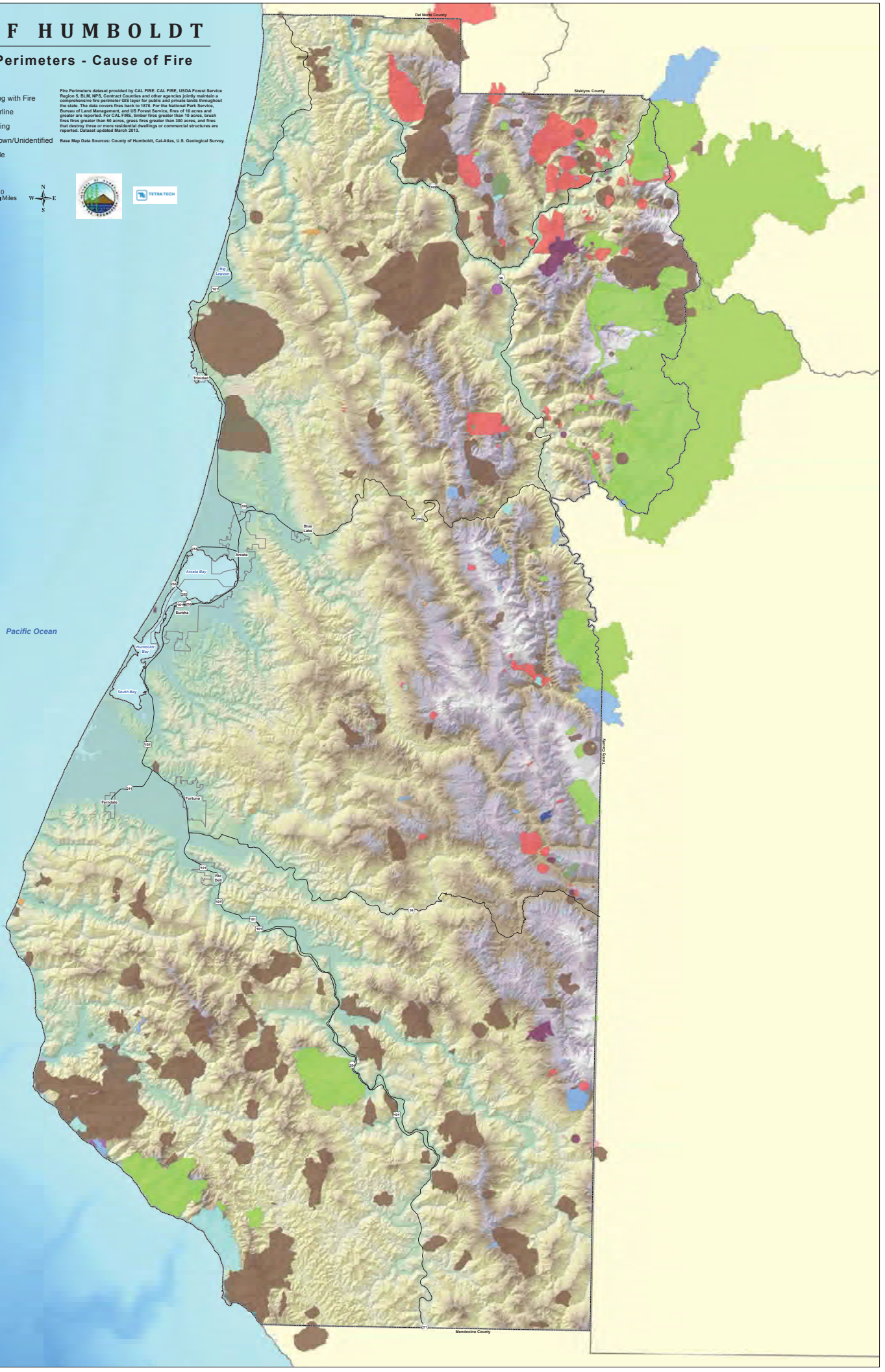
- Arson
- Campfire
- Debris
- Equipment Use
- Escaped Prescribed Burn
- Lightning
- Misc
- Playing with Fire
- Powerline
- Smoking
- Unknown/Unidentified
- Vehicle

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, U.S. Geological Survey.

0 2.5 5 10 Miles

N W E S



COUNTY OF HUMBOLDT

Map 15-3. Fire Hazard Severity Zones

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

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

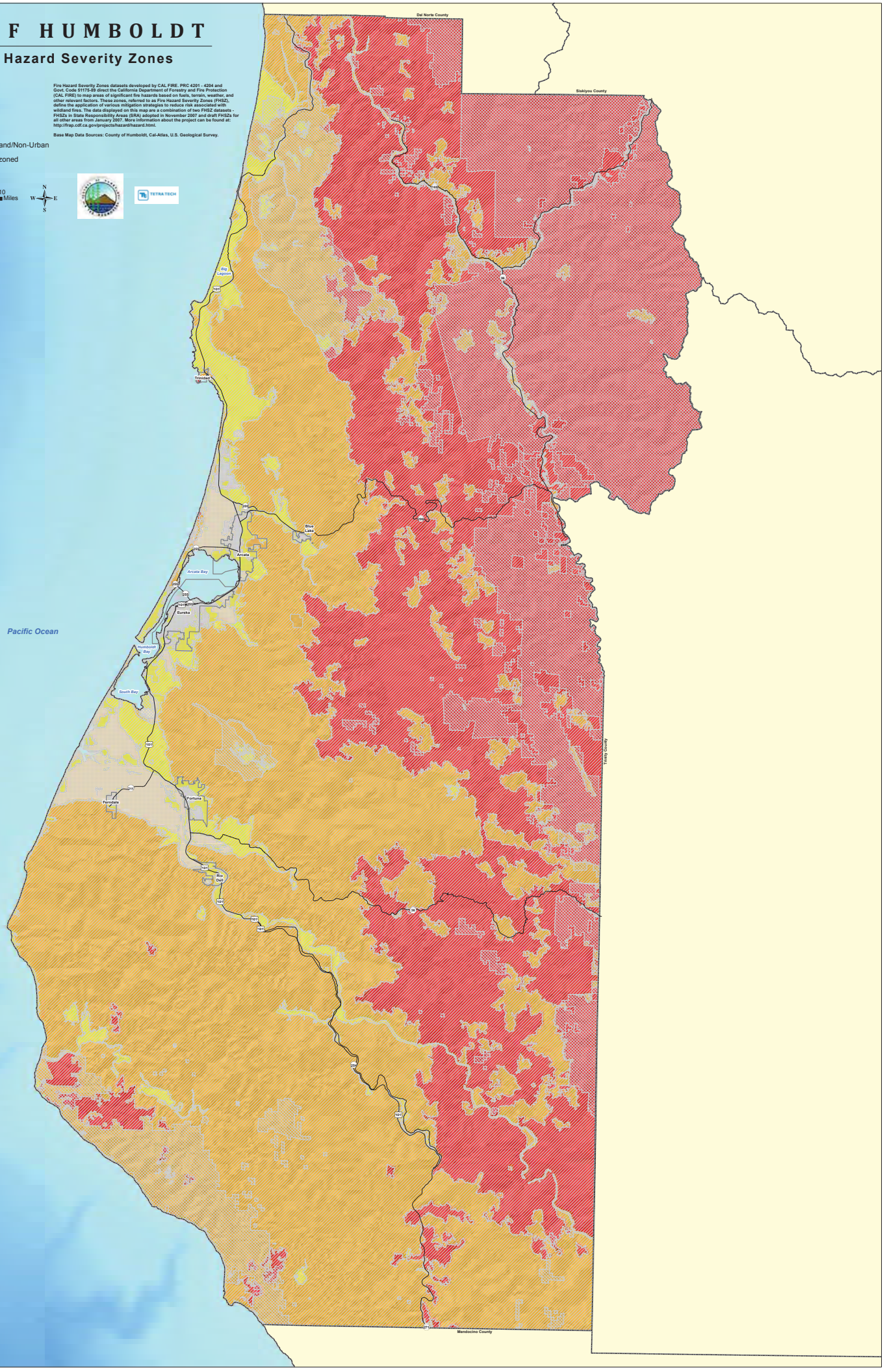
Fire Hazard Severity Zones datasets developed by CAL FIRE. PRC 4201 - 4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to 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. More information about the project can be found at: http://frap.cdf.ca.gov/projects/hazard/hazard.html.

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

0 2.5 5 10 Miles

N W E S

TETRA TECH



COUNTY OF HUMBOLDT

Map 15-4. Natural Fire Regime

Natural Fire 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

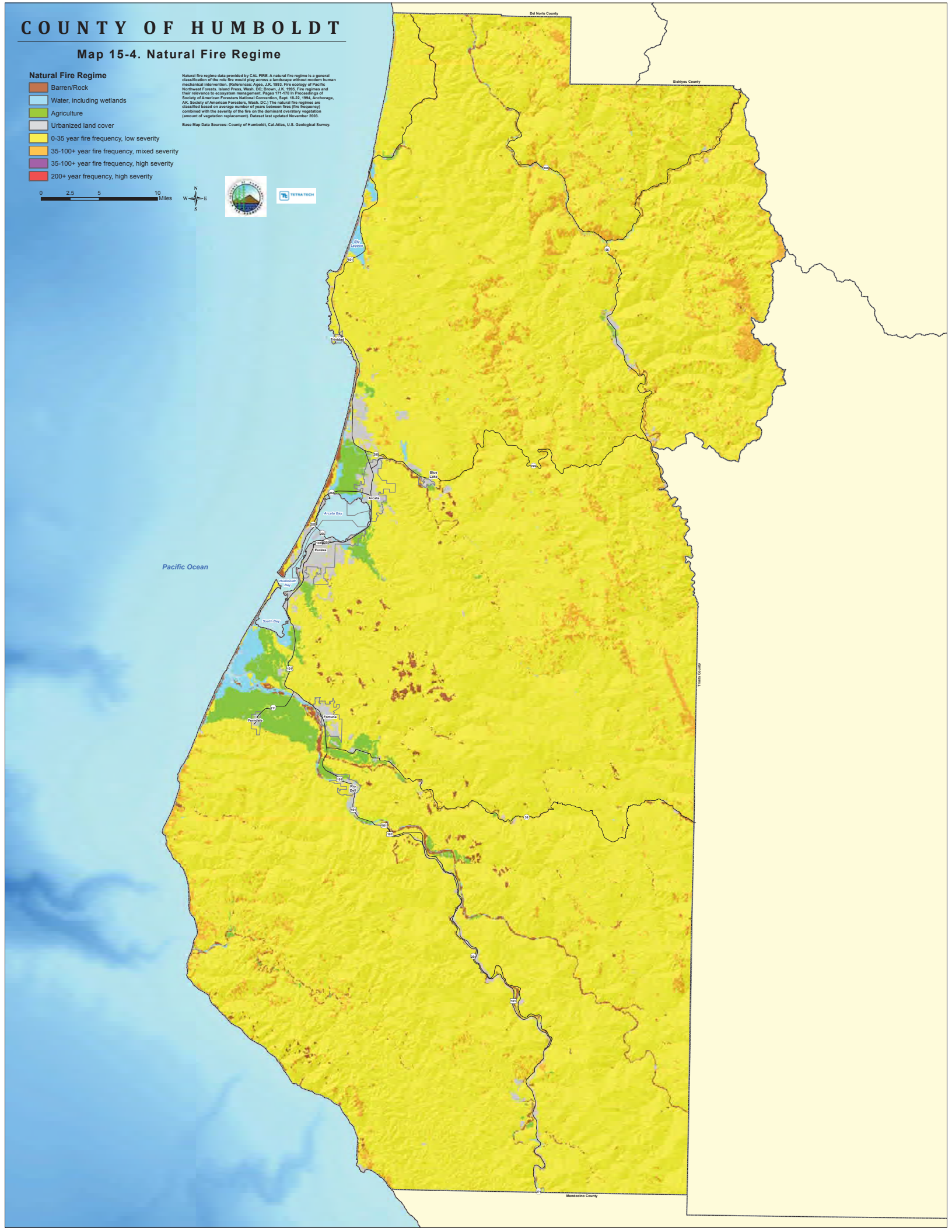
0 2.5 5 10 Miles

N W E S

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, U.S. Geological Survey.

TETRA TECH



CHAPTER 16.
PLANNING AREA RISK RANKING

A risk ranking was performed to measure the probable impact of each hazard of concern on each participating planning partner. The risk ranking allows jurisdictions to compare the impacts of one hazard to another and is a key step in developing a mitigation action plan. The ranking helps to ensure that a mitigation action plan does not overlook any hazards that have significant impact even though they may not present the highest risk to a jurisdiction. The ranking also identifies hazards that have little or no impact and can be eliminated from consideration for actions.

This risk ranking assesses the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of the planning area. Estimates of risk were generated with data from HAZUS-MH using methodologies promoted by FEMA. The risk ranking was conducted via facilitated brainstorming sessions. The process is described in Appendices C, D and E of Volume 2.

The overall ranking for the entire planning area is presented in this chapter; the rankings for individual planning partners are presented in each partner's annex in Volume 2 of this update.

16.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a probability factor based on likelihood of annual occurrence:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor =2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor =1)
- No exposure—There is no probability of occurrence (Probability Factor = 0)

The assessment of hazard frequency is generally based on past hazard events in the area. Table 16-1 summarizes the probability assessment for each hazard of concern for this plan.

TABLE 16-1.
PROBABILITY OF HAZARDS

Hazard Event	Probability (high, medium, low)	Probability Factor
Dam Failure	Low	1
Drought	Medium	2
Earthquake	High	3
Flood	High	3
Landslide	High	3
Severe Weather	High	3
Tsunami	Medium	2
Wildfire	High	3

16.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People** (Table 16-2)—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. It should be noted that planners can use an element of subjectivity when assigning values for impacts on people. Impact factors were assigned as follows:
  - High—50 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—25 percent to 49 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—25 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)
- **Property** (Table 16-3)—Values were assigned based on the percentage of the total ***property value exposed*** to the hazard event:
  - High—30 percent or more of the total assessed property value is exposed to a hazard (Impact Factor = 3)
  - Medium—15 percent to 29 percent of the total assessed property value is exposed to a hazard (Impact Factor = 2)
  - Low—14 percent or less of the total assessed property value is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the total assessed property value is exposed to a hazard (Impact Factor = 0)
- **Economy** (Table 16-4)—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total assessed value of the property exposed to the hazard. For some hazards, such as wildfire, landslide and severe weather, vulnerability was considered to be the same as exposure due to the lack of loss estimation tools specific to those hazards. Loss estimates separate from the exposure estimates were generated for the earthquake and flood hazards using HAZUS-MH.
  - High—Estimated loss from the hazard is 20 percent or more of the total assessed property value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 10 percent to 19 percent of the total assessed property value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 9 percent or less of the total assessed property value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0)

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the economy was given a weighting factor of 1.

TABLE 16-2.
IMPACT ON PEOPLE FROM HAZARDS

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (3)
Dam Failure	Low	1	(3x1) = 3
Drought	Low	1	(3x1) = 3
Earthquake	High	3	(3x3) = 9
Flood	Medium	2	(3x2) = 6
Landslide	Medium	2	(3x2) = 6
Severe Weather	High	3	(3x3) = 9
Tsunami	Low	1	(3x1) = 3
Wildfire	Medium	2	(3x2) = 6

TABLE 16-3.
IMPACT ON PROPERTY FROM HAZARDS

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (2)
Dam Failure	Low	1	(2x1) = 2
Drought	Low	1	(2x1) = 2
Earthquake	High	3	(2x3) = 6
Flood	High	3	(2x3) = 6
Landslide	Medium	2	(2x2) = 4
Severe Weather	High	3	(2x3) = 6
Tsunami	Low	1	(2x1) = 2
Wildfire	Medium	2	(2x2) = 4

TABLE 16-4.
IMPACT ON ECONOMY FROM HAZARDS

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (1)
Dam Failure	Low	1	(1x1) = 1
Drought	Medium	2	(1x2) = 2
Earthquake	High	3	(1x3) = 3
Flood	Low	1	(1x1) = 1
Landslide	Low	1	(1x1) = 1
Severe Weather	Medium	2	(1x2) = 2
Tsunami	Low	1	(1x1) = 1
Wildfire	Medium	2	(1x2) = 2

16.3 RISK RATING AND RANKING

The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors for people, property and operations, as summarized in Table 16-5.

Based on these ratings, a priority of high, medium or low was assigned to each hazard. The hazards ranked as being of highest concern are earthquake and severe weather. Hazards ranked as being of medium concern are landslide, flood and wildfire. The hazards ranked as being of lowest concern are tsunami, drought and dam failure. Table 16-6 shows the hazard risk ranking.

TABLE 16-5.
HAZARD RISK RATING

Hazard Event	Probability Factor	Sum of Weighted Impact Factors	Total (Probability x Impact)
Dam Failure	1	(3+2+1) = 6	(1x6) = 6
Drought	2	(3+2+2) = 7	(2x7) = 14
Earthquake	3	(9+6+3) = 18	(3x18) = 54
Flood	3	(6+6+1) = 13	(3x13) = 39
Landslide	3	(6+4+1) = 11	(3x11) = 33
Severe Weather	3	(9+6+2) = 17	(3x17) = 51
Tsunami	2	(3+2+1) = 6	(2x6) = 12
Wildfire	3	(6+4+2) = 12	(3x12) = 36

TABLE 16-6.
HAZARD RISK RANKING

Hazard Ranking	Hazard Event	Category
1	Earthquake	High
2	Severe Weather	High
3	Flood	Medium
4	Wildfire	Medium
5	Landslide	Medium
6	Drought	Low
7	Tsunami	Low
8	Dam Failure	Low

CHAPTER 17.
HAZARDS OF INTEREST

The hazards of concern assessed in Chapter 8 through Chapter 15 and rated and ranked in Chapter 16 are those that present significant risks in the Humboldt Operational area. Additional hazards, both natural and human-caused, were identified by the Steering Committee as having some potential to impact the planning area, but at a much lower risk level than the hazards of concern. These other hazards are identified as hazards of interest.

The sections below provide short profiles of each hazard of interest, including qualitative discussion of their potential to impact Humboldt County. No formal risk assessment of these hazards was performed, and no mitigation initiatives have been developed to address them. However, all planning partners for this plan should be aware of these hazards and should take steps to reduce the risks they present whenever it is practical to do so.

17.1 FISH LOSS

Humboldt County's wild rivers, Humboldt Bay, and the ocean all support fisheries. Coastal and inland areas are rich in sport and commercial fish. Bays, estuaries and other tidal inlets provide a variety of habitats supporting many species of anadromous and ocean fish. Humboldt Bay is second only to San Francisco Bay in size among California's coastal estuaries. It is an important habitat for many invertebrates, fish, birds and mammals, and is one of the largest producers of commercial oysters in the state. The inland area of the county is home to a wealth of fish due to relatively undeveloped watersheds, ample rainfall and the mild, consistent climate of the region. Nearly 400,000 acres of the County's inland and coastline are in state and national park systems, leaving large tracts of existing habitat undeveloped and relatively pristine.

In the 1970s, more than half the fish produced and consumed in California were landed in the Humboldt Bay Area (Humboldt County, 1979). The bay provides critical habitat to over 100 fish species. The five major fisheries based in Humboldt Bay are ground fish, salmon, shrimp, crab, and albacore. Inland, sport fishing in Humboldt's many wild rivers should be rich and plentiful, but each year fewer and fewer adult fish return from the sea to spawn as a result of habitat damage from logging, water diversions, road building, grazing, and mining, over-fishing, and well-intended but flawed hatcheries.

The fishing communities of the North Coast once represented some of the most productive salmon rivers in the United States, generating more than $1.25 billion for the regional economy. But declining fish numbers and poor water conditions along many of these rivers have forced the federal government to all but shut down commercial fishing along California's north coast. This closure has cost coastal communities nearly 80 percent of the region's job base, or over 7,000 family wage jobs.

In recent years, fishermen, resource agencies and the state legislature implemented programs to reduce the number of vessels participating in each coastal fishery. Harvest limits and other regulations have been put in place to protect sensitive species. In many cases, these strategies have aided in population recovery. Some species, however have not shown any population recovery. The decline in the population of several species of salmon and trout has resulted in them being listed as threatened or endangered under the Endangered Species Act. The following are the federal and state listed species in Humboldt County:

- Tidewater Goby (*Eucyclogobius newberryi*)

- Coho Salmon (*Oncorhynchus kisutch*)
- Northern California Steelhead Trout (*Oncorhynchus mykiss*)
- Chinook Salmon (*Oncorhynchus tshawytscha*)
- Green Sturgeon (*Acipenser medirostris*).

A fishing disaster in Humboldt County has the potential to occur in almost any waterway in the county. Most of the rivers and streams in the county contain fish that are economically and socially important to Humboldt County communities. In 2002 the Klamath fish kill was a tribal and state declared disaster due to its impacts on the cultural and economic viability of the tribes inhabiting the Lower Klamath and its tributaries. The 2002 Klamath Fish kill contributed to the closing of the commercial salmon season in 2006 along the entire northern California coast, which had effects from Del Norte to Santa Cruz County.

The frequency with which fish disasters have occurred is difficult to measure, but with the current decline in all commercial fisheries, an increase in fish related disasters can be expected. A fish related disaster has been declared in Humboldt County in the following years: 1994, 1995, 2000, 2002, and 2006. Changing climate conditions and increased pressure on marine fisheries will lead to further declines in marine fishery production and a greater vulnerability to fluctuations in marine fishery populations.

For coastal communities, a fish disaster can have devastating consequences. The shutdown of the 2006 salmon season resulted in an $80 million dollar aid package for Central and Northern California and affected approximately 8,000 fishermen. Almost $2.5 million in funds were allocated for relief following the declared disaster for the 2000 ground fish season. With so much of the north coast fishery dependent on the productivity of the Dungeness crab season, a collapse of the crab fishery would have a crippling effect on the north coast fishing industry.

The amount of warning time possible to Humboldt County fishermen depends largely on the fishery in question. Crab, salmon, and ground fish all have different seasons and are monitored by different agencies.

17.2 MARINE INVASIVE SPECIES

As humans travel, they transport, intentionally or unintentionally, plants and animals, introducing non-indigenous species. Twentieth-century ships are painted with anti-fouling paints to prevent the settlement of fouling organisms, but the ships use water as ballast. Millions of gallons of water, along with the small organisms living in it, are taken into the ship at one port and released in another. Millions of planktonic organisms, including larvae, can be contained in the ballast water. When the water is taken up, sediment is drawn into the ballast tanks as well, hosting benthic communities that can be transported around the world. Some fouling organisms still travel around the world attached to nooks and crannies of ships.

One marine invasive species impacting Humboldt County is the New Zealand mud snail. This 1/8-inch, brownish black snail reproduces asexually and in vast numbers, reaching densities anywhere from 300,000-800,000 snails per square meter. In such vast numbers, the New Zealand mud snail can out-compete native snails and aquatic insects for food and cause fish populations, which feed on these native snails and insects, to suffer. In 2011, the New Zealand mud snail had been identified in Freshwater Lagoon, Big Lagoon, and the Redwood Creek estuary. Many invasive species negatively impact ecosystems by outcompeting and replacing native species. The Humboldt Bay National Wildlife Refuge has identified several invasive plant species, including European beach grass (*ammophila arenaria)* and dense-flowered cordgrass (*Spartina densiflora)* impacting coastal and estuarial ecosystems in this way.

17.3 OIL SPILLS

An oil spill is a release of liquid petroleum into the environment that results in pollution of land, water and air, due to human activity or through oil seeps on land or under water. Oil spills can result from the release of crude oil from offshore oil platforms, drilling rigs, wells, pipelines, tank trucks and marine tank vessels. Refined petroleum products such as gasoline, diesel and bunker fuel used by cargo ships are also sources of potential oil spills.

Depending on the origin, size, and duration of the release, an oil spill can have serious impacts on air and water quality, public health, plant and animal habitat, and biological resources. Spill clean-up and remediation activities may cost millions of dollars and impacts can last for years. The environmental impacts contribute to short- and long-term impacts on economic activities in areas affected by oil spills. Moratoriums may be temporarily imposed on fisheries, and tourism may decline in beach communities, resulting in economic hardship on people dependent on those industries for their livelihood and on the economic health of the community as well.

As an area that is dependent upon maritime industries, Humboldt county is susceptible to impacts from oil spills from a variety of sources. The following historical events exemplify the potential impacts of oil spills on the planning area:

- On November 5, 1997, the M/V Kure punctured a fuel tank and spilled approximately 4,500 gallons of fuel oil while docked in Humboldt Bay. Studies after the event identified the following injuries to natural resources and recreational services from the spill:
  - Marbled murrelets: 130 estimated dead
  - Common murres, other alcids (the bird family that includes auks, murres and puffins), and procellariidae (the seabird family that includes petrels, prions and shearwaters): 910 estimated dead
  - Pelicans, cormorants, and gulls: 220 estimated dead (including 31 brown pelicans)
  - Loons and grebes: 243 estimated dead
  - Waterfowl: 414 estimated dead
  - Shorebirds: 2,033 estimated dead
  - Shoreline habitat: 6,200 acres of mudflat, wetland, beach and riprap habitat exposed to oil
  - Recreational services—767 estimated lost user days of surfing, camping, and sea kayaking activity
- On September 6, 1999, the dredge M/V Stuyvesant spilled at least 2,100 gallons of fuel oil into the Pacific Ocean near the mouth of Humboldt Bay. Studies after the event identified the following injuries to natural resources and recreational services from the spill:
  - Marbled murrelets: 135 estimated dead
  - Common murres: 1,600 estimated dead
  - Other birds: 670 estimated dead
  - Fish and shrimp: 3,282 kg of shrimp and over 6,000 fish estimated dead
  - Sandy beach habitat: 3,054 acres lightly, moderately or heavily oiled
  - Rocky intertidal habitat: 162 acres lightly, moderately or heavily oiled
  - Recreational services: 9,415 estimated lost user-days, 197 diminished user-days

17.4 VOLCANO (ASH FALL)

California has two major volcanoes in the Cascade Range: Mount Shasta and Lassen Peak. Lassen Peak is the southernmost active volcano in the Cascade Range, located halfway between Lake Tahoe and the Oregon border. Prior to Mount Saint Helens in 1980, Lassen Peak was the last volcano in the continental U.S. to erupt, with a major series of eruptions starting in 1914 and continuing sporadically until 1921. These volcanoes can lie dormant for centuries between eruptions. Hazards related to volcanic eruptions are distinguished by the different ways in which materials are emitted from the volcano:

- High-speed avalanches of hot ash and rock called pyroclastic flows, lava flows, and landslides can devastate areas up to 10 miles away. Lava may flow out as a viscous liquid, or it may explode from the vent as solid or liquid particles.
- Huge mudflows of volcanic ash and debris called lahars can inundate valleys more than 50 miles downstream.
- Falling ash from explosive eruptions, called tephra, can disrupt human activities hundreds of miles downwind, and drifting clouds of fine ash can cause severe damage to the engines of jet aircraft hundreds or thousands of miles away.

Humboldt County could be susceptible to ash fall accumulation from any volcanic activity in the Cascade range, depending on jet stream conditions at the time of eruption. Communities several hundred miles away were impacted by ash accumulation following the 1980 eruption of Mt. St. Helens. Volcanic ash can have significant impacts on machinery and equipment, and can lead to structural roof collapse depending on the amount of accumulations. When tephra gets wet, it can dry like cement, and become very heavy. Considering that volcanic activity can trigger thunderstorm activity, the likely hood of tephra accumulations becoming saturated is high.

17.5 HAZARDOUS MATERIALS

Hazardous materials are present in facilities that produce, store or use them in nearly every city in the United States, and they are transported daily along interstate highways and railways. According to the California State Hazard Mitigation Plan, hazardous materials are substances that are flammable, combustible, explosive, toxic, noxious, corrosive, an oxidizer, an irritant or radioactive. California regulated substances that have the greatest probability of adversely impacting the community are listed in the CCR Title 19. Federal law (49 CFR) lists thousands of hazardous materials, including gasoline, insecticides, household cleaning products and radioactive materials. Even the natural gas used in homes and businesses is a dangerous substance when a leak occurs.

Hazardous material releases can pose a risk to life, public health, air quality, water quality and the environment. They may result in the evacuation of a facility or an entire neighborhood. In addition to the immediate risk, long-term public health and environmental impacts may result from sustained exposure to certain substances. The following are the most common types of hazardous material incidents:

- **Fixed-Facility Hazardous Materials Incident**—This is the uncontrolled release from a fixed site of materials that pose a risk to health, safety and property. It is possible to identify and prepare for fixed-site incidents because federal and state laws require those facilities to notify state and local authorities about materials being used or produced at the site.

  Hazardous Materials Transportation Incident—A hazardous materials transportation incident is any event during transport resulting in uncontrolled release of materials that can pose a risk to health, safety and property. Transportation incidents are difficult to prepare for because there is little if any notice about what materials could be involved should an accident happen. Transported hazardous wastes include thousands of shipments of radiological

materials moved across the United States by ground transportation, mostly medical materials and low-level radioactive waste. Hazardous materials transportation incidents can occur on any transportation corridor, although most occur on interstate highways, other major federal or state highways, or major rail lines. Many incidents occur in sparsely populated areas and affect very few people. Others are in areas with much higher population densities, such as the January 6, 2005 train accident in Graniteville, South Carolina that released chlorine gas killing nine, injuring 500, and causing the evacuation of 5,400 residents.

- **Interstate Pipeline Hazardous Materials Incident**—There are a significant number of interstate natural gas, heating oil, and petroleum pipelines running through the State of California. These are used to provide natural gas to utilities and to transport these materials from production facilities to end-users.

Hazardous materials are likely accidently released or spilled numerous times each day. Eliminating these widespread substances throughout the county would be nearly impossible, but the threat of accidental releases or spills may be reduced by mitigation. The following required mitigation efforts pertaining to hazardous substances are implemented through state and federal regulation:

- Fixed Facilities:
  - Process hazard analysis through the California Division of Occupational Safety and Health
  - Policies and procedures, hazard communication, and training
  - Placarding and labeling of containers
  - Hazard assessment
  - Security
  - Process and equipment maintenance
  - Mitigating techniques (flares, showers, mists, containment vessels, failsafe devices)
  - Use of inherently safer alternative products
  - Emergency plans and coordination
  - Response procedures
- Transported:
  - Placards and labeling of containers
  - Proper container for material type
  - Random inspections of transporters
  - Safe handling policies and procedures
  - Hazard communications
  - Training for handlers
  - Permitting
  - Transportation flow studies, e.g., restricting HAZMAT transportation over certain routes.

Federal laws that regulate hazardous materials include the Superfund Amendments and Reauthorization Act of 1986, the Resource Conservation and Recovery Act of 1976, the October 2007 Hazardous Materials Transportation Act, the Occupational Safety and Health Act, the Toxic Substances Control Act,

and the Clean Air Act. California law established the Unified Program, which consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections and enforcement activities of six environmental and emergency response programs. The programs are regulated and overseen by the California Environmental Protection Agency, however local governments are responsible for implementing and enforcing the standards.

Highway 101 serves as the primary transportation route in the county; it borders Humboldt Bay and the coastline with a north-to-south orientation and intersects the most populous communities. It is a major, interstate transportation corridor that traverses California from Los Angeles in the southern end of the state, up to the Oregon border in the north, where it continues to parallel the coastline through Oregon and Washington, all the way to Port Angeles. Hundreds of trucks transport an array of cargo across the winding corridors of Highway 101 each day, creating the potential for hazardous materials spills that can threaten the safety of people, wildlife, and waterways. Other hazardous materials threats in Humboldt County come from facilities, such as wastewater treatment plants, that store hazardous materials and have not been retrofitted to withstand seismic activity, flood, or other potentially damaging hazard events.

Humboldt communities are served by the Humboldt/Del Norte Hazardous Materials Response Team (HMRT), a multi-agency structured team staffed by personnel from the City of Eureka Fire Department, the Ferndale Volunteer Fire Department, Humboldt Waste Management, and the Yurok Tribe. HMRT activities include response, training and coordination. HMRT achieved CalEMA Type II rating in 2010.

17.6 TERRORISM

Acts of terrorism are intentional, criminal, malicious acts with the following characteristics:

- They involve the use of illegal force.
- They are intended to intimidate or coerce.
- They are committed in support of political or social objectives.

Table 17-1 provides a hazard profile summary for terrorism-related events. For each type of event, the following factors are addressed:

- **Application Mode**—The human acts necessary to cause the event to occur.
- **Hazard Duration**—The length of time the hazard is present. For example, a chemical warfare agent such as mustard gas, if un-remediated, can persist for hours or weeks under the right conditions.
- **Dynamic or Static Characteristics**—An event's tendency to expand, contract, or remain confined in time, magnitude, and space. For example, a cloud of chlorine gas leaking from a storage tank can change location by drifting with the wind and can diminish in danger by dissipating over time.
- **Mitigation and Exacerbating Conditions:**
  - Mitigation Conditions—Characteristics of the target and its physical environment that can reduce the effects of a hazard. For example, earthen berms can provide protection from bombs; exposure to sunlight can render some biological agents ineffective; and effective perimeter lighting and surveillance can minimize the likelihood of someone approaching a target unseen.
  - Exacerbating conditions—Characteristics that can enhance or magnify the effects of a hazard. For example, depressions or low areas in terrain can trap heavy vapors, and a

proliferation of street furniture (trash receptacles, newspaper vending machines, mail boxes, etc.) can provide hiding places for explosive devices.

TABLE 17-1.
EVENT PROFILES FOR TERRORISM

Hazard	Application Mode	Hazard Duration	Static/Dynamic Characteristics	Mitigating and Exacerbating Conditions
Conventional Bomb	Detonation of explosive device on or near target; delivery via person, vehicle, or projectile.	Instantaneous; additional secondary devices, or diversionary activities may be used, lengthening the duration of the hazard until the attack site is determined to be clear.	Extent of damage is determined by type and quantity of explosive. Effects generally static other than cascading consequences, incremental structural failure, etc.	Blast force is inversely proportional to the cube of the distance from the blast; thus, each additional increment of distance provides progressively more protection. Terrain, forestation, structures, etc. can provide shielding by absorbing and/or deflecting energy and debris. Exacerbating conditions include ease of access to target; lack of barriers and shielding; poor construction; and ease of concealment of device.
Chemical Agent	Liquid/aerosol contaminants can be dispersed using sprayers or other aerosol generators; liquids vaporizing from puddles/ containers; or munitions.	Chemical agents may pose viable threats for hours to weeks depending on the agent and the conditions in which it exists.	Contamination can be carried out of the initial target area by persons, vehicles, water, and wind. Chemicals may be corrosive or otherwise damaging over time if not remediated.	Air temperature can affect evaporation of aerosols. Ground temperature affects evaporation of liquids. Humidity can enlarge aerosol particles, reducing inhalation hazard. Precipitation can dilute and disperse agents but can spread contamination. Wind can disperse vapors but also cause target area to be dynamic. The micro-meteorological effects of buildings and terrain can alter travel and duration of agents. Shielding in the form of sheltering in place can protect people and property from harmful effects.
Arson/ Incendiary Attack	Initiation of fire or explosion on or near target via direct contact or remotely via projectile.	Generally minutes to hours.	Extent of damage is determined by type and quantity of device, accelerant, and materials present at or near target. Effects generally static other than cascading consequences, incremental structural failure, etc.	Mitigation factors include built-in fire detection and protection systems and fire-resistive construction techniques. Inadequate security can allow easy access to target, easy concealment of an incendiary device, and undetected initiation of a fire. Non-compliance with fire and building codes, as well as failure to maintain existing fire protection systems, can substantially increase the effectiveness of a fire weapon.
Armed Attack	Tactical assault or sniping from remote location, or random attack based on fear, emotion, or mental instability.	Generally minutes to days.	Varies based on the perpetrators' intent and capabilities.	Inadequate security can allow easy access to target, easy concealment of weapons, and undetected initiation of an attack.

TABLE 17-1.
EVENT PROFILES FOR TERRORISM

Hazard	Application Mode	Hazard Duration	Static/Dynamic Characteristics	Mitigating and Exacerbating Conditions
Biological Agent	Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point or line sources such as munitions, covert deposits, and moving sprayers.	Biological agents may pose viable threats for hours to years depending on the agent and the conditions in which it exists.	Depending on the agent used and the effectiveness with which it is deployed, contamination can be spread via wind and water. Infection can spread via human or animal vectors.	Altitude of release above ground can affect dispersion; sunlight is destructive to many bacteria and viruses; light to moderate wind will disperse agents but higher winds can break up aerosol clouds; the micro-meteorological effects of buildings and terrain can influence aerosolization and travel of agents.
Cyber-terrorism	Electronic attack using one computer system against another.	Minutes to days.	Generally no direct effects on built environment.	Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks.
Agro-terrorism	Direct, generally covert contamination of food supplies or introduction of pests and/or disease agents to crops and livestock.	Days to months.	Varies by type of incident. Food contamination events may be limited to specific distribution sites, whereas pests and diseases may spread widely. Generally no effects on built environment.	Inadequate security can facilitate adulteration of food and introduction of pests and disease agents to crops and livestock.
Radiological Agent	Radioactive contaminants can be dispersed using sprayers/ aerosol generators, or by point or line sources such as munitions.	Contaminants may remain hazardous for seconds to years depending on material used.	Initial effects will be localized to site of attack; depending on meteorological conditions, subsequent behavior of radioactive contaminants may be dynamic.	Duration of exposure, distance from source of radiation, and the amount of shielding between source and target determine exposure to radiation.
Nuclear Bomb	Detonation of nuclear device underground, at the surface, in the air, or at high altitude.	Light/heat flash and blast/shock wave last for seconds; nuclear radiation and fallout hazards can persist for years. Electromagnetic pulse from a high-altitude detonation lasts for seconds and affects only unprotected electronic systems.	Initial light, heat, and blast effects of a subsurface, ground, or air burst are static and determined by the device's characteristics and employment; fallout of radioactive contaminants may be dynamic, depending on meteorological conditions.	Harmful effects of radiation can be reduced by minimizing the time of exposure. Light, heat, and blast energy decrease logarithmically as a function of distance from seat of blast. Terrain, forestation, structures, etc. can provide shielding by absorbing and/or deflecting radiation and radioactive contaminants.

TABLE 17-1.
EVENT PROFILES FOR TERRORISM

Hazard	Application Mode	Hazard Duration	Static/Dynamic Characteristics	Mitigating and Exacerbating Conditions
Intentional Hazardous Material Release (fixed facility or transportation)	Solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers	Hours to days.	Chemicals may be corrosive or otherwise damaging over time. Explosion and/or fire may be subsequent. Contamination may be carried out of the incident area by persons, vehicles, water, and wind.	As with chemical weapons, weather conditions directly affect how the hazard develops. The micro-meteorological effects of buildings and terrain can alter travel and duration of agents. Shielding in the form of sheltering in place can protect people and property from harmful effects. Non-compliance with fire and building codes, as well as failure to maintain existing fire protection and containment features, can substantially increase the damage from a hazardous materials release.

Source: FEMA 386-7

The Federal Bureau of Investigation (FBI) categorizes two types of terrorism in the United States:

- Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction. The bombing of the Alfred P. Murrah federal building in Oklahoma City is an example of domestic terrorism. The FBI is the primary response agency for domestic terrorism. The FBI coordinates domestic preparedness programs and activities of the United States to limit acts posed by terrorists, including the use of weapons of mass destruction.
- International terrorism involves groups or individuals whose terrorist activities are foreign-based or directed by countries or groups outside the United States, or whose activities transcend national boundaries. Examples include the 1993 bombing of the World Trade Center and the attacks of September 11, 2001 at the World Trade Center and the Pentagon.

Most terrorist events in the United States have been bombing attacks, involving detonated or undetonated explosive devices, tear gas, pipe bombs, or firebombs. The effects of terrorism can vary from loss of life and injuries to property damage and disruptions in services such as electricity, water supplies, transportation, or communications. The event may have an immediate effect or a delayed effect. Terrorists often choose targets that offer limited danger to themselves and areas with relatively easy public access. Foreign terrorists look for visible targets where they can avoid detection before and after an attack such as international airports, large cities, major special events, and high-profile landmarks.

Three factors distinguish terrorism hazards from other types of hazards:

- In the case of chemical, biological, and radioactive agents, their presence may not be immediately obvious, making it difficult to determine when and where they may have been released, who has been exposed, and what danger is present for first responders and emergency medical technicians.
- There is limited scientific understanding of how these agents affect the population at large.

- Terrorism evokes strong emotional reactions, ranging from anxiety to fear to anger to despair to depression.

While education, heightened awareness, and early warning of unusual circumstances may deter crime and terrorism, intentional acts that harm people and property are possible at any time. Public safety entities react to the threat, locating, isolating and neutralizing further damage, and investigating potential scenes and suspects to bring criminals to justice. Those involved with terrorism response, including public health and public information staff, are trained to deal swiftly with the public's emotional reaction. The area of the event must be clearly identified in all emergency alert messages to prevent those not affected by the incident from overwhelming local emergency rooms and response resources, which would reduce service to those actually affected. The public must be informed clearly and frequently about what government agencies are doing to mitigate the impacts of the event. The public will also be given clear directions on how to protect the health of individuals and families.

In dealing with terrorism, the unpredictability of human beings must be considered. People with a desire to perform criminal acts may seek out targets of opportunity that may not fall into established lists of critical areas or facilities. First responders train not only to respond to organized terrorism events, but also to respond to random acts by individuals who, for a variety of reasons ranging from fear to emotional trauma to mental instability, may choose to harm others and destroy property.

PART 3 —
MITIGATION STRATEGY

CHAPTER 18.
MITIGATION ALTERNATIVES

To support each planning partner's development of a mitigation action plan, catalogs of hazard mitigation alternatives were developed that present a broad range of alternatives to consider, in compliance with 44 CFR (Section 201.6(c)(3)(ii)). One catalog was developed for each hazard of concern evaluated in this plan. The basis for the catalogs was a facilitated session with the Steering Committee looking at strengths, weaknesses, obstacles and opportunities within the planning area. The catalogs for each hazard are listed in Table 18-1 through Table 18-8. The catalogs present alternatives that are categorized in two ways:

- By what the alternative would do:
  - Manipulate a hazard
  - Reduce exposure to a hazard
  - Reduce vulnerability to a hazard
  - Increase the ability to respond to or be prepared for a hazard
- By who would have responsibility for implementation:
  - Individuals
  - Businesses
  - Government.

Many hazard mitigation initiatives recommended in this plan were selected from among the alternatives presented in the catalogs. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process, are consistent with the planning partners' goals and objectives, and are within the capabilities of the partners to implement. However, not all the alternatives meet all the planning partners' selection criteria. These catalogs represent the comprehensive range of alternatives considered by each planning partner.

TABLE 18-1.
CATALOG OF MITIGATION ALTERNATIVES—DAM FAILURE

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
• None	1. Remove dams 2. Remove levees 3. Harden dams	1. Remove dams 2. Remove levees 3. Harden dams
Reduce Exposure		
• Relocate out of dam failure inundation areas.	• Replace earthen dams with hardened structures	1. Replace earthen dams with hardened structures 2. Relocate critical facilities out of dam failure inundation areas. 3. Consider open space land use in designated dam failure inundation areas.
Reduce Vulnerability		
• Elevate home to appropriate levels.	• Flood-proof facilities within dam failure inundation areas	1. Adopt higher regulatory floodplain standards in mapped dam failure inundation areas. 2. Retrofit critical facilities within dam failure inundation areas.
Increase Preparation or Response Capability		
1. Learn about risk reduction for the dam failure hazard. 2. Learn the evacuation routes for a dam failure event. 3. Educate yourself on early warning systems and the dissemination of warnings.	1. Educate employees on the probable impacts of a dam failure. 2. Develop a continuity of operations plan.	1. Map dam failure inundation areas. 2. Enhance emergency operations plan to include a dam failure component. 3. Institute monthly communications checks with dam operators. 4. Inform the public on risk reduction techniques 5. Adopt real-estate disclosure requirements for the re-sale of property located within dam failure inundation areas. 6. Consider the probable impacts of climate in assessing the risk associated with the dam failure hazard. 7. Establish early warning capability downstream of listed high hazard dams. 8. Consider the residual risk associated with protection provided by dams in future land use decisions.

TABLE 18-2.
CATALOG OF MITIGATION ALTERNATIVES—DROUGHT

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
None	None	Groundwater recharge through stormwater management
Reduce Exposure		
None	None	Identify and create groundwater backup sources
Reduce Vulnerability		
1. Drought-resistant landscapes 2. Reduce water system losses 3. Modify plumbing systems (through water saving kits)	1. Drought-resistant landscapes 2. Reduce private water system losses	1. Water use conflict regulations 2. Reduce water system losses 3. Distribute water saving kits
Increase Preparation or Response Capability		
• Practice active water conservation	• Practice active water conservation	1. Public education on drought resistance 2. Identify alternative water supplies for times of drought; mutual aid agreements with alternative suppliers 3. Develop drought contingency plan 4. Develop criteria “triggers” for drought-related actions 5. Improve accuracy of water supply forecasts 6. Modify rate structure to influence active water conservation techniques

TABLE 18-3.
CATALOG OF MITIGATION ALTERNATIVES—EARTHQUAKE

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
None	None	None
Reduce Exposure		
• Locate outside of hazard area (off soft soils)	• Locate or relocate mission-critical functions outside hazard area where possible	• Locate critical facilities or functions outside hazard area where possible
Reduce Vulnerability		
1. Retrofit structure (anchor house structure to foundation) 2. Secure household items that can cause injury or damage (such as water heaters, bookcases, and other appliances) 3. Build to higher design	1. Build redundancy for critical functions and facilities 2. Retrofit critical buildings and areas housing mission-critical functions	1. Harden infrastructure 2. Provide redundancy for critical functions 3. Adopt higher regulatory standards
Increase Preparation or Response Capability		
1. Practice “drop, cover, and hold” 2. Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 72-hour self-sufficiency during an event 3. Keep cash reserves for reconstruction 4. Become informed on the hazard and risk reduction alternatives available. 5. Develop a post-disaster action plan for your household	1. Adopt higher standard for new construction; consider “performance-based design” when building new structures 2. Keep cash reserves for reconstruction 3. Inform your employees on the possible impacts of earthquake and how to deal with them at your work facility. 4. Develop a continuity of operations plan	1. Provide better hazard maps 2. Provide technical information and guidance 3. Enact tools to help manage development in hazard areas (e.g., tax incentives, information) 4. Include retrofitting and replacement of critical system elements in capital improvement plan 5. Develop strategy to take advantage of post-disaster opportunities 6. Warehouse critical infrastructure components such as pipe, power line, and road repair materials 7. Develop and adopt a continuity of operations plan 8. Initiate triggers guiding improvements (such as <50% substantial damage or improvements) 9. Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities. 10. Develop a post-disaster action plan that includes grant funding and debris removal components.

TABLE 18-4.
CATALOG OF MITIGATION ALTERNATIVES—FLOOD

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
1. Clear stormwater drains and culverts 2. Institute low-impact development techniques on property	1. Clear stormwater drains and culverts 2. Institute low-impact development techniques on property	1. Maintain drainage system 2. Institute low-impact development techniques on property 3. Dredging, levee construction, and providing regional retention areas 4. Structural flood control, levees, channelization, or revetments. 5. Stormwater management regulations and master planning 6. Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff
Reduce Exposure		
1. Locate outside of hazard area 2. Elevate utilities above base flood elevation 3. Institute low impact development techniques on property	1. Locate business critical facilities or functions outside hazard area 2. Institute low impact development techniques on property	1. Locate or relocate critical facilities outside of hazard area 2. Acquire or relocate identified repetitive loss properties 3. Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. 4. Adopt land development criteria such as planned unit developments, density transfers, clustering 5. Institute low impact development techniques on property 6. Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff
Reduce Vulnerability		
1. Retrofit structures (elevate structures above base flood elevation) 2. Elevate items within house above base flood elevation 3. Build new homes above base flood elevation 4. Flood-proof existing structures	1. Build redundancy for critical functions or retrofit critical buildings 2. Provide flood-proofing measures when new critical infrastructure must be located in floodplains	1. Harden infrastructure, bridge replacement program 2. Provide redundancy for critical functions and infrastructure 3 Adopt appropriate regulatory standards, such as: increased freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. 4. Stormwater management regulations and master planning. 5. Adopt “no-adverse impact” floodplain management policies that strive to not increase the flood risk on downstream communities.

TABLE 18-4.
CATALOG OF MITIGATION ALTERNATIVES—FLOOD

Personal Scale	Corporate Scale	Government Scale
Increase Preparation or Response Capability		
1. Buy flood insurance 2. Develop household mitigation plan, such as retrofit savings, communication capability with outside, 72-hour self-sufficiency during and after an event	1. Keep cash reserves for reconstruction 2. Support and implement hazard disclosure for the sale/re-sale of property in identified risk zones. 3. Solicit cost-sharing through partnerships with other stakeholders on projects with multiple benefits.	1. Produce better hazard maps 2. Provide technical information and guidance 3. Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) 4. Incorporate retrofitting or replacement of critical system elements in capital improvement plan 5. Develop strategy to take advantage of post-disaster opportunities 6. Warehouse critical infrastructure components 7. Develop and adopt a continuity of operations plan 8. Consider participation in the Community Rating System 9. Maintain existing data and gather new data needed to define risks and vulnerability 10. Train emergency responders 11. Create a building and elevation inventory of structures in the floodplain 12. Develop and implement a public information strategy 13. Charge a hazard mitigation fee 14. Integrate floodplain management policies into other planning mechanisms within the planning area. 15. Consider the probable impacts of climate change on the risk associated with the flood hazard 16. Consider the residual risk associated with structural flood control in future land use decisions 17. Enforce National Flood Insurance Program 18. Adopt a Stormwater Management Master Plan

TABLE 18-5.
CATALOG OF MITIGATION ALTERNATIVES—LANDSLIDE

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
1. Stabilize slope (dewater, armor toe) 2. Reduce weight on top of slope 3. Minimize vegetation removal and the addition of impervious surfaces.	1. Stabilize slope (dewater, armor toe) 2. Reduce weight on top of slope	1. Stabilize slope (dewater, armor toe) 2. Reduce weight on top of slope
Reduce Exposure		
• Locate structures outside of hazard area (off unstable land and away from slide-run out area)	• Locate structures outside of hazard area (off unstable land and away from slide-run out area)	1. Acquire properties in high-risk landslide areas. 2. Adopt land use policies that prohibit the placement of habitable structures in high-risk landslide areas.
Reduce Vulnerability		
• Retrofit home.	• Retrofit at-risk facilities.	1. Adopt higher regulatory standards for new development within unstable slope areas. 2. Armor/retrofit critical infrastructure against the impact of landslides.
Increase Preparation or Response Capability		
1. Institute warning system, and develop evacuation plan 2. Keep cash reserves for reconstruction 3. Educate yourself on risk reduction techniques for landslide hazards.	1. Institute warning system, and develop evacuation plan 2. Keep cash reserves for reconstruction 3. Develop a continuity of operations plan 4. Educate employees on the potential exposure to landslide hazards and emergency response protocol.	1. Produce better hazard maps 2. Provide technical information and guidance 3. Enact tools to help manage development in hazard areas: better land controls, tax incentives, information 4. Develop strategy to take advantage of post-disaster opportunities 5. Warehouse critical infrastructure components 6. Develop and adopt a continuity of operations plan 7. Educate the public on the landslide hazard and appropriate risk reduction alternatives.

TABLE 18-6.
CATALOG OF MITIGATION ALTERNATIVES—SEVERE WEATHER

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
None	None	None
Reduce Exposure		
None	None	None
Reduce Vulnerability		
1. Insulate house 2. Provide redundant heat and power 3. Insulate structure 4. Plant appropriate trees near home and power lines (“Right tree, right place” National Arbor Day Foundation Program)	1. Relocate critical infrastructure (such as power lines) underground 2. Reinforce or relocate critical infrastructure such as power lines to meet performance expectations 3. Install tree wire	1. Harden infrastructure such as locating utilities underground 2. Trim trees back from power lines 3. Designate snow routes and strengthen critical road sections and bridges
Increase Preparation or Response Capability		
1. Trim or remove trees that could affect power lines 2. Promote 72-hour self-sufficiency 3. Obtain a NOAA weather radio. 4. Obtain an emergency generator.	1. Trim or remove trees that could affect power lines 2. Create redundancy 3. Equip facilities with a NOAA weather radio 4. Equip vital facilities with emergency power sources.	1. Support programs such as “Tree Watch” that proactively manage problem areas through use of selective removal of hazardous trees, tree replacement, etc. 2. Establish and enforce building codes that require all roofs to withstand snow loads 3. Increase communication alternatives 4. Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors. 5. Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines 6. Provide NOAA weather radios to the public

TABLE 18-7.
CATALOG OF MITIGATION ALTERNATIVES—TSUNAMI

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
• None	• None	• Build wave abatement structures (e.g. the "Jacks" looking structure designed by the Japanese)
Reduce Exposure		
• Locate outside of hazard area	• Locate structure or mission critical functions outside of hazard area whenever possible.	1. Locate structure or functions outside of hazard area whenever possible. 2. Harden infrastructure for tsunami impacts. 3. Relocate identified critical facilities located in tsunami high hazard areas.
Reduce Vulnerability		
• Apply personal property mitigation techniques to your home such as anchoring your foundation and foundation openings to allow flow though.	• Mitigate personal property for the impacts of tsunami	1. Adopt higher regulatory standards that will provide higher levels of protection to structures built in a tsunami inundation area. 2. Utilize tsunami mapping once available, to guide development away from high risk areas through land use planning.
Increase Preparation or Response Capability		
1. Develop and practice a household evacuation plan. 2. Support/participate in the Redwood Coast Tsunami Working Group. 3. Educate yourself on the risk exposure from the tsunami hazard and ways to minimize that risk.	1. Develop and practice a corporate evacuation plan. 2. Support/participate in the Redwood Coast Tsunami Working Group. 3. Educate employees on the risk exposure from the tsunami hazard and ways to minimize that risk.	1. Create a probabilistic tsunami map for the planning area. 2. Provide incentives to guide development away from hazard areas. 3. Develop a tsunami warning and response system. 4. Provide residents with tsunami inundation maps 5. Join NOAA's Tsunami Ready program 6. Develop and communicate evacuation routes 7. Enhance the public information program to include risk reduction options for the tsunami hazard

TABLE 18-8.
CATALOG OF MITIGATION ALTERNATIVES—WILDFIRE

Personal Scale	Corporate Scale	Government Scale
Manipulate Hazard		
• Clear potential fuels on property such as dry overgrown underbrush and diseased trees	• Clear potential fuels on property such as dry underbrush and diseased trees	1. Clear potential fuels on property such as dry underbrush and diseased trees 2. Implement best management practices on public lands.
Reduce Exposure		
1. Create and maintain defensible space around structures 2. Locate outside of hazard area 3. Mow regularly	1. Create and maintain defensible space around structures and infrastructure 2. Locate outside of hazard area	1. Create and maintain defensible space around structures and infrastructure 2. Locate outside of hazard area 3. Enhance building code to include use of fire resistant materials in high hazard area.
Reduce Vulnerability		
1. Create and maintain defensible space around structures and provide water on site 2. Use fire-retardant building materials 3. Create defensible spaces around home	1. Create and maintain defensible space around structures and infrastructure and provide water on site 2. Use fire-retardant building materials 3. Use fire-resistant plantings in buffer areas of high wildfire threat.	1. Create and maintain defensible space around structures and infrastructure 2. Use fire-retardant building materials 3. Use fire-resistant plantings in buffer areas of high wildfire threat. 4. Consider higher regulatory standards (such as Class A roofing) 5. Establish biomass reclamation initiatives
Increase Preparation or Response Capability		
1. Employ techniques from the National Fire Protection Association's Firewise Communities program to safeguard home 2. Identify alternative water supplies for fire fighting 3. Install/replace roofing material with non-combustible roofing materials.	1. Support Firewise community initiatives. 2. Create /establish stored water supplies to be utilized for firefighting.	1. More public outreach and education efforts, including an active Firewise program 2. Possible weapons of mass destruction funds available to enhance fire capability in high-risk areas 3. Identify fire response and alternative evacuation routes 4. Seek alternative water supplies 5. Become a Firewise community 6. Use academia to study impacts/solutions to wildfire risk 7. Establish/maintain mutual aid agreements between fire service agencies. 8. Create/implement fire plans 9. Consider the probable impacts of climate change on the risk associated with the wildfire hazard in future land use decisions

CHAPTER 19.
AREA-WIDE MITIGATION INITIATIVES AND IMPLEMENTATION

19.1 SELECTED COUNTY-WIDE MITIGATION INITIATIVES

The planning partners and the Steering Committee determined that some initiatives from the mitigation catalogs could be implemented to provide hazard mitigation benefits countywide. Table 19-1 lists the recommended countywide initiatives, the lead agency for each, and the proposed timeline. The parameters for the timeline are as follows:

- Short Term = to be completed in 1 to 5 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded and implemented under existing programs.

19.2 BENEFIT/COST REVIEW

The action plan must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Therefore, a review of the apparent benefits versus the apparent cost of each project was performed. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

Cost ratings were defined as follows:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High—**Project will provide an immediate reduction of risk exposure for life and property.
- **Medium—**Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low—**Long-term benefits of the project are difficult to quantify in the short term.

TABLE 19-1.
ACTION PLAN—COUNTYWIDE MITIGATION INITIATIVES

Hazards Addressed	Lead Agency	Possible Funding Sources or Resources	Time Line[a]	Objectives
CW-1—Continue to participate in the planning partnership and, to the extent possible based on available resources, provide coordination and technical assistance in applications for grant funding that include assistance in cost vs. benefit analysis.				
All Hazards	Planning Partners	Grant Funding	Short term, Ongoing	6, 8, 12
CW-2—Encourage the development and implementation of an operational area-wide hazard mitigation public-information strategy that meets the needs of all planning partners.				
All Hazards	Humboldt County, Planning Partners	Cost sharing from the Partnership General fund allocations Cost sharing with stakeholders	Short term, Ongoing	6, 7, 8, 12
CW-3—Coordinate updates to land use and building regulations as they pertain to reducing the impacts of natural hazards, to seek a regulatory cohesiveness within the planning area. This can be accomplished via a commitment from all planning partners to involve each other in their adoption processes, by seeking input and comment during the course of regulatory updates or general planning.				
All Hazards	Governing body of each eligible planning partner.	General funds	Short term, Ongoing	1, 3, 11, 12
CW-4—Sponsor and maintain a natural hazards informational website to include the following types of information: • Hazard-specific information such as GIS layers, private property mitigation alternatives, important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • Links to Planning Partners' pages, FEMA, Red Cross, NOAA, USGS and the National Weather Service. • Hazard mitigation plan information such as progress reports, mitigation success stories, update strategies, Steering Committee meetings.				
All Hazards	Humboldt County	General fund	Short term, Ongoing	6, 7, 8, 12
CW-5—Maintain the Hazard Mitigation Plan Steering Committee as a viable body over time to monitor progress of the plan, provide technical assistance to Planning Partners and oversee the update of the plan according to schedule. This body will continue to operate under the ground rules established at its inception.				
All Hazards	Humboldt County	Existing, ongoing programs	Short term, Ongoing	All
CW-6—Amend or enhance the Humboldt County Operational Area Hazard Mitigation Plan as well as the general Plans for each municipality as needed to comply with state or federal mandates (i.e., CA. Assembly Bill # 2140) as guidance for compliance with these programs become available.				
All Hazards	Humboldt County, each municipal planning partner	General funds	Short term, Ongoing	All
CW-7—Work with the Humboldt County Assessor to begin the capture of general building stock information such as area, date of construction and foundation type, to better support future risk assessments.				
All Hazards	Humboldt County	General fund	Long term, depending on funding	6, 7, 8

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly.

For many of the strategies identified in this action plan, the partners may seek financial assistance under the HMGP or PDM programs, both of which require detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, the partners reserve the right to define "benefits" according to parameters that meet the goals and objectives of this plan.

19.3 COUNTY-WIDE ACTION PLAN PRIORITIZATION

Table 19-2 lists the priority of each countywide initiative, using the same parameters used by each of the planning partners in selecting their initiatives. A qualitative benefit-cost review was performed for each of these initiatives. The priorities are defined as follows:

- **High Priority**—A project that meets multiple objectives (i.e., multiple hazards), has benefits that exceed cost, has funding secured or is an ongoing project and meets eligibility requirements for the HMGP or PDM grant program. High priority projects can be completed in the short term (1 to 5 years).
- **Medium Priority**—A project that meets goals and objectives, that has benefits that exceed costs, and for which funding has not been secured but that is grant eligible under HMGP, PDM or other grant programs. Project can be completed in the short term, once funding is secured. Medium priority projects will become high priority projects once funding is secured.
- **Low Priority**—A project that will mitigate the risk of a hazard, that has benefits that do not exceed the costs or are difficult to quantify, for which funding has not been secured, that is not eligible for HMGP or PDM grant funding, and for which the time line for completion is long term (1 to 10 years). Low priority projects may be eligible for other sources of grant funding from other programs.

TABLE 19-2.
PRIORITIZATION OF COUNTYWIDE MITIGATION INITIATIVES

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 (High, Med., Low)
CW-1	3	Medium	Low	Yes	Yes	Yes	High
CW-2	4	Low	Low	Yes	Yes	Yes	High
CW-3	4	Low	Low	Yes	No	Yes	High
CW-4	4	Medium	Medium	Yes	Yes	No	Medium
CW-5	12	Low	Low	Yes	No	Yes	High
CW-6	12	Low	Low	Yes	No	Yes	High
CW-7	3	Medium	Low	Yes	Yes	No	Medium

19.4 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). For multi-jurisdictional

plans, each jurisdiction requesting approval must document that is has been formally adopted. This plan will be submitted for a pre-adoption review to CalEMA prior to adoption. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan. All partners understand that DMA compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners can be found in Appendix E of this volume.

19.5 PLAN MAINTENANCE STRATEGY

A hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan over a 5-year cycle
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as general or capital improvement plans, when appropriate
- A discussion on how the community will continue public participation in the plan maintenance process.

This chapter details the formal process that will ensure that the Humboldt Operation Area Hazard Mitigation Plan remains an active and relevant document and that the planning partners maintain their eligibility for applicable funding sources. The plan maintenance process includes a process for monitoring and evaluating the plan and producing an updated plan every five years. This chapter also describes how public participation will be integrated throughout the plan maintenance and implementation process. It also explains how the mitigation strategies outlined in this plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, capital improvement planning, and building code enforcement and implementation. The Plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant.

19.5.1 Plan Maintenance Oversight

Oversight of this plan maintenance strategy will be led by the Humboldt County Department of Public works with support from Humboldt County Office of Emergency Services. The principle point of contact is:

Cybelle Immitt, Senior Planner
County of Humboldt Public Works
1106 Second Street
Eureka, CA 95501
Phone: (707) 445-7652
FAX: (707) 443-7388
Email: CImmitt@co.humboldt.ca.us

19.5.2 Plan Implementation

The effectiveness of the hazard mitigation plan depends on its implementation and incorporation of its action items into partner jurisdictions' existing plans, policies and programs. Together, the action items in the plan provide a framework for activities that the Partnership can implement over the next 5 years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies, and programs.

Humboldt County will have lead responsibility for overseeing the plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all planning partnership members and agencies identified as lead agencies in the mitigation action plans (see planning partner annexes in Volume 2 of this plan).

19.5.3 Steering Committee

The Steering Committee is a total volunteer body that oversaw the development of the plan and made recommendations on key elements of the plan, including the maintenance strategy. It was the Steering Committee's position that an oversight committee with representation similar to the initial Steering Committee should have an active role in the plan maintenance strategy. Therefore, it is recommended that a steering committee remain a viable body involved in key elements of the plan maintenance strategy. The new steering committee should strive to include representation from the planning partners, as well as other stakeholders in the planning area.

The principal role of the steering committee in this plan maintenance strategy will be as a resource available to consult on implementing mitigation measures, coordinating grants among planning partners and other aspects of plan implementation and maintenance. Future plan updates will be overseen by a steering committee similar to the one that participated in this plan update process, so keeping an interim steering committee intact will provide a head start on future updates. Completion of the performance period progress report is the responsibility of each planning partner, not the responsibility of the steering committee. The steering committee will review the progress report to identify issues needing to be addressed in future plan updates.

19.5.4 Performance Period Progress Report

During this plan update process, the Steering Committee determined that completion of an annual progress report as prescribed under the initial plan was not feasible for the Humboldt Operational Area planning partnership. The 5-year performance period progress report completed for this plan update was an effective tool in the plan update process. The Steering Committee directed that the plan maintenance strategy be revised to replace annual progress reporting with performance-period progress reporting. Any trigger of a comprehensive update to the Humboldt Operational Area Hazard Mitigation Plan, as described in Section 20.5.4, will require completion of a performance period progress report. The minimum task of each planning partner will be to evaluate the progress of its individual action plan during the 5-year performance period. This review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new projects
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or initiatives that involve hazard mitigation.

The progress report conducted for this plan update is included in Appendix D and may be used as a template to guide the planning partners in preparing future performance period progress reports. The plan

maintenance steering committee will provide feedback to the planning team on items to be included in the progress report. The planning team will then prepare a formal report on the progress of the plan. This report should be used as follows:

- Posted on the Humboldt Operational Area hazard mitigation home page dedicated to the hazard mitigation plan
- Provided to the local media through a press release
- Presented to planning partner governing bodies to inform them of the progress of actions implemented during the reporting period

Uses of the progress report will be at the discretion of each planning partner. Progress reporting is not a requirement specified under 44 CFR. However, it may enhance the planning partnership's opportunities for funding. While failure to implement this component of the plan maintenance strategy will not jeopardize a planning partner's compliance under the DMA, it may jeopardize its opportunity to partner and leverage funding opportunities with the other partners. Each planning partner was informed of these protocols at the beginning of this planning process (in the "Planning Partner Expectations" package provided at the start of the process), and each partner acknowledged these expectations with submittal of a letter of intent to participate in this process.

Although annual progress reporting has been removed from this plan maintenance strategy, the larger jurisdictional partners (Humboldt County and larger cities and special service districts) will continue to coordinate as needed with planning partners and the Steering Committee. These planning partners are fully committed to coordinating grant opportunities and leveraging available resources within the operational area to support implementation and maintenance of this plan. At a minimum, the County will communicate with the partnership on an annual basis to review the plan and its availability on the County web site; provide updates on plan implementation; discuss potential collaboration opportunities; and confirm contact information.

19.5.5 Plan Update

Local hazard mitigation plans must be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6(d)(3)). The Humboldt County partnership intends to update the hazard mitigation plan on a 5-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than 5 years based on the following triggers:

- A presidential disaster declaration that impacts the planning area
- A hazard event that causes loss of life
- A comprehensive update of the County or participating city's general plan

It will not be the intent of future updates to develop a complete new hazard mitigation plan for the planning area. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plans will be reviewed and revised to account for any initiatives completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms (such as the general plan).
- The draft update will be sent to appropriate agencies and organizations for comment.

- The public will be given an opportunity to comment on the update prior to adoption.
- The partnership governing bodies will adopt their respective portions of the updated plan.

19.5.6 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through the Humboldt Operational Area Hazard Mitigation website and by copies of performance period progress reports provided to the media. Each planning partner has agreed to provide links to the County hazard mitigation plan website on their individual jurisdictional websites to increase avenues of public access to the plan. The Humboldt County Natural Resources Planning Division has agreed to maintain the hazard mitigation plan website. This site will not only house the final plan, it will become the one-stop shop for information regarding the plan, the partnership and plan implementation. Copies of the plan will be distributed to the Humboldt County Library system. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

As planning partners apply for grants, components of those grant applications will require outreach to the public. These grant applications will provide an opportunity to inform the public about this plan and provide them the opportunity to provide feedback to the partnership.

19.5.7 Incorporation Into Other Planning Mechanisms

The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time this plan was prepared. The Humboldt County General Plan and the general plans of the partner cities are considered to be integral parts of this plan. The County and partner cities, through adoption of general plans and zoning ordinances, have planned for the impact of natural hazards. All municipal planning partners have committed to creating linkage between their general plans and this hazard mitigation plan as prescribed under CA Assembly Bill 2140. The plan development process provided the County and the cities with the opportunity to review and expand on policies contained within these planning mechanisms. The planning partners used their general plans and the hazard mitigation plan as complementary documents that work together to achieve the goal of reducing risk exposure to the citizens of the planning area. An update to a general plan may trigger an update to the hazard mitigation plan.

All municipal planning partners are committed to creating a linkage between the hazard mitigation plan and their individual general plans by identifying a mitigation initiative as such and giving that initiative a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan include the following:

- Partners' emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Integrated regional watershed management plans pursuant to Proposition 84
- Water system vulnerability assessments

- Master fire protection plans (Community Wildfire Protection Plans)
- Energy assurance plans.

Some action items do not need to be implemented through regulation. Instead, these items can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

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APPENDIX A.
ACRONYMS AND DEFINITIONS

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ACRONYMS

CaLEAP—California Local Energy Assurance Plan

CalEMA—California Emergency Management Agency

CCR—California Code of Regulations

CEQA—California Environmental Quality Act

CFR—Code of Federal Regulations

CIP—Capital Improvement Plan

CRS—Community Rating System

DFIRM—Digital Flood Insurance Rate Maps

DHS—Department of Homeland Security

DMA —Disaster Mitigation Act

DWR—California Department of Water Resources

EPA—U.S. Environmental Protection Agency

ESA—Endangered Species Act

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

FHSZ—Fire hazard severity zone

FIRM—Flood Insurance Rate Map

GIS—Geographic Information System

GWh—Gigawatt-hour

HAZUS-MH—Hazards, United States-Multi Hazard

HMGP—Hazard Mitigation Grant Program

IBC—International Building Code

IRC—International Residential Code

MM—Modified Mercalli Scale

MWh—Megawatt-hour

NEHRP—National Earthquake Hazards Reduction Program

NFIP—National Flood Insurance Program

NOAA—National Oceanic and Atmospheric Administration

PDM—Pre-Disaster Mitigation Grant Program

PDI—Palmer Drought Index

PGA—Peak Ground Acceleration

PHDI—Palmer Hydrological Drought Index

SHELDUS—Special Hazard Events and Losses Database for the U.S.

SPI—Standardized Precipitation Index

USGS—U.S. Geological Survey

DEFINITIONS

100-Year Flood: The term "100-year flood" can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1 percent chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1 percent annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program.

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1-percent chance of being equaled or exceeded in any given year, also known as the "100-year" or "1-percent-annual-chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program are protected to the same degree against flooding.

Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds" and "drainage basins."

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment: A capability assessment provides a description and analysis of a community's current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified. The following capabilities were reviewed under this assessment:

- Legal and regulatory capability
- Administrative and technical capability
- Fiscal capability

Community Rating System (CRS): The CRS is a voluntary program under the National Flood Insurance Program that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Critical Facility: Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs. For the purposes of this plan, critical facilities include:

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

Dam: Any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of water.

Dam Failure: Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

Debris Avalanche: Volcanoes are prone to debris and mountain rock avalanches that can approach speeds of 100 mph.

Debris Flow: Dense mixtures of water-saturated debris that move down-valley; looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated,

become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

Debris Slide: Debris slides consist of unconsolidated rock or soil that has moved rapidly down slope. They occur on slopes greater than 65 percent.

Disaster Mitigation Act of 2000 (DMA); The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. Under the DMA, a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program were established.

Drainage Basin: A basin is the area within which all surface water- whether from rainfall, snowmelt, springs or other sources- flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Drought: Drought is a period of time without substantial rainfall or snowfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages for some activity, group, or environmental function. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Earthquake: An earthquake is defined as a sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy. Earthquakes can last from a few seconds to over 5 minutes, and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Fire Behavior: Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency: Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area.

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A flood insurance rate map identifies most, but not necessarily all, of a community's floodplain as the Special Flood Hazard Area.

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Fog: Fog refers to a cloud (or condensed water droplets) near the ground. Fog forms when air close to the ground can no longer hold all the moisture it contains. Fog occurs either when air is cooled to its dew point or the amount of moisture in the air increases. Heavy fog is particularly hazardous because it can restrict surface visibility. Severe fog incidents can close roads, cause vehicle accidents, cause airport delays, and impair the effectiveness of emergency response. Financial losses associated with transportation delays caused by fog have not been calculated in the United States but are known to be substantial.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour (mph)) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazards U.S. Multi-Hazard (HAZUS-MH) Loss Estimation Program: HAZUS-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The HAZUS-MH software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. HAZUS-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. HAZUS-MH has also been used to assess vulnerability (exposure) for other hazards.

Hydraulics: Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide: Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting upon them.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt," usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000ºF. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see http://www.fema.gov/hazard/thunderstorms/thunder.shtm).

Liquefaction: Liquefaction is the complete failure of soils, occurring when soils lose shear strength and flow horizontally. It is most likely to occur in fine grain sands and silts, which behave like viscous fluids when liquefaction occurs. This situation is extremely hazardous to development on the soils that liquefy, and generally results in extreme property damage and threats to life and safety.

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Magnitude: Magnitude is the measure of the strength of an earthquake, and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Mass movement: A collective term for landslides, mudflows, debris flows, sinkholes and lahars.

Mitigation: A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

Mitigation Actions: Mitigation actions are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

Peak Ground Acceleration: Peak Ground Acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Preparedness: Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A presidential disaster declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid flood losses in excess of $1000.00; or
- Two paid flood losses in excess of $1000.00 within any 10-year period since 1978 or
- Three or more paid losses that equal or exceed the current value of the insured property.

Return Period (or Mean Return Period): This term refers to the average period of time in years between occurrences of a particular hazard (equal to the inverse of the annual frequency of occurrence).

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of

hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Risk Ranking: This ranking serves two purposes, first to describe the probability that a hazard will occur, and second to describe the impact a hazard will have on people, property, and the economy. Risk estimates for the City are based on the methodology that the City used to prepare the risk assessment for this plan. The following equation shows the risk ranking calculation:

Risk Ranking = Probability + Impact (people + property + economy)

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Sinkhole: A collapse depression in the ground with no visible outlet. Its drainage is subterranean. It is commonly vertical-sided or funnel-shaped.

Special Flood Hazard Area: The base floodplain delineated on a Flood Insurance Rate Map. The Special Flood Hazard Area is mapped as a Zone A in riverine situations and zone V in coastal situations. The Special Flood Hazard Area may or may not encompass all of a community's flood problems

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Stream Bank Erosion: Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. However, it is important to remember that a stream is a dynamic and constantly changing system. It is natural for a stream to want to meander, so not all eroding banks are "bad" and in need of repair. Generally, stream bank erosion becomes a problem where development has limited the meandering nature of streams, where streams have been channelized, or where stream bank structures (like bridges, culverts, etc.) are located in places where they can actually cause damage to downstream areas. Stabilizing these areas can help protect watercourses from continued sedimentation, damage to adjacent land uses, control unwanted meander, and improvement of habitat for fish and wildlife.

Steep Slope: Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25 percent. For this study, steep slope is defined as slopes greater than 33 percent.

Sustainable Hazard Mitigation: This concept includes the sound management of natural resources, local economic and social resiliency, and the recognition that hazards and mitigation must be understood in the largest possible social and economic context.

Thunderstorm: A thunderstorm is a storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry seasons.

Tornado: A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. On a local scale, tornadoes are the most intense of all atmospheric circulations, and winds can reach destructive speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains downgradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire: These terms refer to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Windstorm: Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

APPENDIX B.
MITIGATION INITIATIVES FROM 2008 HUMBOLDT COUNTY OPERATIONAL AREA PLAN

APPENDIX B.
MITIGATION INITIATIVES FROM 2008
HUMBOLDT COUNTY OPERATIONAL AREA PLAN

OPERATIONAL AREA-WIDE MITIGATION INITIATIVES/ACTION PLAN					
Mitigation Initiative	Hazards Initiative Addresses	Administrating Agency	Possible Funding Sources or Resources	Timeline[a]	Objectives
CW-1. To the extent possible based on available resources provide coordination and technical assistance in the application for grant funding that includes assistance in cost vs. benefit analysis for grant eligible projects	All	OES and CDS jointly	Existing programs for the two lead agencies Grant funding	Short term Ongoing	6, 8, 12
CW-2: Encourage the development and implementation of an Operational Area-wide hazard mitigation public-information strategy that meets the needs of all planning partners.	All	Overseen by OES and CDS jointly, with participation of all planning partners	Cost sharing from the Partnership General Fund Allocations Cost sharing with Stakeholders	Short Term Depends on funding	6, 7, 8, 12
CW-3: Coordinate updates to land use and building regulations as they pertain to reducing the impacts of natural hazards, to seek a regulatory cohesiveness within the planning area. This can be accomplished via a commitment from all planning partners to involve each other in their adoption processes, by seeking input and comment during the course of regulatory updates or general planning.	All	Governing body of each eligible planning partner.	General funds	Short Term Ongoing	1, 3, 11, 12
CW-4: Sponsor and maintain a natural hazards informational website to include the following types of information: • Hazard-specific information such as GIS layers, private property mitigation alternatives, important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • CRS creditable information • Links to Coalition Partners' pages, FEMA, Red Cross, NOAA, USGS and the National Weather Service. • Hazard mitigation plan information such as progress reports, mitigation success stories, update strategies, Steering Committee meetings.	All	CDS with support from OES and all planning partners	County General Fund through existing programs Grant Funding	Short Term/ Ongoing	6, 7, 8, 12

OPERATIONAL AREA-WIDE MITIGATION INITIATIVES/ACTION PLAN

Mitigation Initiative	Hazards Initiative Addresses	Administrating Agency	Possible Funding Sources or Resources	Timeline[a]	Objectives
CW-5: The Hazard Mitigation Plan Steering Committee will remain as a viable body over time to monitor progress of the plan, provide technical assistance to Planning Partners and oversee the update of the plan according to schedule. This body will continue to operate under the ground rules established at its inception.	All	OES to be lead coordinating agency with support from CDS and the planning partnership.	Funded through existing, on-going programs	Short	All
CW-6: Amend or enhance the Hazard Mitigation Plan on an "as needed" basis to seek compliance with state or federal mandates (i.e. CA. Assembly Bill # 2140) as guidance for compliance with these programs become available.	All	CDS, OES Each planning partner	Ongoing programs. Grant funding depending on the mandate.	Long term Ongoing	All Objectives

a. Short term = 1 to 5 years; Long Term= 5 years or greater

Abbreviations: CDS = Humboldt County Department of Community Development Services, FEMA = Federal Emergency Management Agency; NOAA = National Oceanic and Atmospheric Administration; OES = Humboldt County Office of Emergency Services; USGS = U.S. Geological Survey

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-1	FEMA training in Benefit/Cost Analysis	All Hazards	1, 3, 4, 5, 6 8, 12	To be initiated by OES, made availabl e to all depart-ments.	Med	A request will be submitted to CAOES and FEMA. Funded under FEMA's HMTAP program	Short Term
HC-2	Join CRS program	Flood/Tsuna mi	6, 7, 9, 10, 11	CDS-Building	Med	PDM Grant, HMGP, General Fund	Short Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-3	Obtain Firewise Certification	Wildfire	2, 3, 5, 6, 8, 9	OES	Med	National Fire Plan Grant Program, PDM Grant, HMGP, General Fund	Short Term
HC-4	Draft and adopt a Post-Disaster Action Plan	All Hazards	1, 3, 4 , 5, 8, 9, 12	OES, CDS	Med	PDM Grant, HMGP, General Fund	Short Term
HC-5	Develop, map, and communicate evacuation routes for all applicable hazards	All Hazards	1, 3, 5, 6, 12	CDS, OES	Med	PDM Grant, HMGP, General Fund, CAOES	Long Term Depends on funding
HC-6	Identify priority locations for landslide mitigation projects and 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)	Landslide, Wildfire, Fish Loss, Severe Weather, Earthquake	1, 2, 3, 6, 7, 8, 9, 10, 11	PW	Med	PDM Grant, HMGP, General Fund, Road Funds	Short Term Depends on funding
HC-7	Update Post-Disaster Recovery Ordinance	All Hazards	1, 3, 4, 5, 9, 10, 12	CDS-Building , PW	Med	PDM Grant, HMGP, General Fund	Short Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-8	Implement priority recommendations from the Humboldt County Master Fire Protection Plan	Wildfire, Landslide, Fish Loss	12, 3, 4, 5, 6, 7, 9, 10, 11, 12	HCFSC and CDS	High	Grant Funding (National Fire Plan Grant Program, FEMA Grant Program, County Payments Title III, other programs)	Short Term
HC-9	Evaluate flood zones for the establishment of Base Flood Elevations	Flood/ Tsunami,	3, 7	CDS-Building, OES	Med	Grant funding, General Fund	Long Term Depends on funding
HC-10	Adopt International Building Code pursuant to state mandate as soon as it is adopted by the State.	Earthquake, Wildfire, Flood, Severe Weather, Dam Failure, Landslide	2, 3, 11	CDS	Med	General Fund, Building Funds	Short Term
HC-11	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.	Earthquake, Tsunami, Flood	1, 2, 3, 7, 8, 9	PW, CDS	Med	General Fund, Grants	Short Term
HC-12	Engineering or retrofitting new and existing roads and bridges to withstand hazards.	Dam Failure, Earthquake, Landslide, Severe Weather, Tsunami, Wildfire	1, 2, 3, 4, 5, 8, 9, 11	PW	High	General Fund, PDM Grant, HMGP, Other State Grants, STIP	Ongoing Short Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-13	Complete a comprehensive inventory of unreinforced masonry buildings within the unincorporated area of Humboldt County and include a Cost/Benefit Analysis of each URM structure to determine if the benefits of reinforcement outweigh the costs.	Earthquake	2, 4, 8, 9	CDS-Building and Planning	Med	General Fund, PDM Grant, HMGP	Ongoing Short Term
HC-14	Adopt an ordinance to require strengthening and/or reinforcement of unreinforced masonry buildings (per the requirements of the 1986 Government Code 8875 et seq.), except residential structures and warehouses. This will require a strong public education program coupled with financial incentives to achieve community support. Based on the Cost/Benefit Analysis in 14 above, provide funding options and assistance to reduce owner expense and accomplish this initiative.	Earthquake	2, 4, 6, 11	CDS-Building, OES	Med	General Fund, PDM	Short Term
HC-15	Join the NOAA Tsunami Ready Program (includes Storm Ready)	Tsunami, Flood Severe Weather	3, 4, 5, 6, 7, 8, 9	OES	Med	NOAA funding/support, Grants	Ongoing Short Term
HC-16	Develop probabilistic tsunami hazard maps or other methodology suitable for flood insurance risk use and make available to the public	Tsunami	2, 3, 5, 6, 7, 9	OES/ CDS	Med	PDM Grant, HMGP, Other State Grants	Ongoing Long Term Depends on funding

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-17	Develop and implement a tsunami signage program	Tsunami	1, 3, 5, 8, 10, 12	OES, NOAA, PW	Med	General Fund, other partner agency funding & Grants	Ongoing Short Term
HC-18	Support the State of California in its effort to develop criteria, with guidance from an expert panel, for addressing the Tsunami hazard in local land use planning	Tsunami	1, 3, 5, 8, 10, 12	BOS	Low	General Fund	Short Term
HC-19	Develop a tsunami warning and response system	Tsunami	1, 3, 5, 8, 10, 12	OES/NOAA	High	Donations, NOAA Grants, and one time Development Fees	Ongoing Long Term Depends on funding
HC-20	Provide training for appropriate staff within the County on the use of HAZUS-MH software	All Hazards	1, 5, 7, 9, 10	CDS	Med	General Fund, PDM, HMGP, ESRI grants	Short Term
HC-21	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 preparedness via county website and other media sources.	All Hazards	3, 6, 7	OES	Med	General Fund, grants & Partnership funding	Ongoing Short Term
HC-22	Design, post to the web and publicize the availability of a web GIS mapping tool providing detailed maps of natural hazard overlays with site address and/or parcel locations	Al Hazards	1, 3, 5, 6, 8	CDS	Med	General Fund, PDM, ESRI grants	Short Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-23	Seek funding and authorization to include seismic upgrades to planned major repairs of county buildings to increase resistance to earthquake damage, especially buildings critical to emergency response and recovery (including designs and feasibility studies associated with the construction project) These include, but shall not be limited to, the buildings proposed for remodeling in the Capital Project Plan.	Earthquake	1, 2, 3, 7, 11	PW	Med	General Fund, PDM, HMGP	Ongoing Long Term Depends on funding
HC-24	Design and distribute building guides to help citizens comply with hazard mitigation code requirements.	All Hazards	3, 6, 7, 8, 11	CDS-Building	Med	General Fund, PDM, HMGP & Building Finds	Short Term
HC-25	Upgrade landslide hazard mapping by producing a complete uniform dataset following the CDMG North Coast Watersheds Mapping project methodology, or similar acceptable mapping approach and make easily accessible to public.	Landslide	2, 3, 6, 7, 10, 12	CDS - GIS	Med	General Fund & Grant Funding	Long Term Depends on funding
HC-26	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.	All Hazards	1, 3, 4, 5, 8, 12	EH, PW, CAO	Low	General Fund, Federal and State post disaster grants	Short Term
HC-27	Identify and develop adequate locations for the temporary storage of post disaster event debris.	All Hazards	1, 3, 4, 5, 8, 12	PW supported by EH	Med	Grants	Short Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-28	Secure funding for additional GIS staffing capacity to provide interagency coordination and consolidated, integrated GIS capabilities including all county departments and other applicable agencies	All Hazards	1, 3, 5, 7, 8	All applicable County Departments	Low	General Fund, PDM Grants, ESRI grants, Department of Homeland Security & all applicable County departmental funding sources.	Short Term Depends on funding
HC-29	Hardening and reinforcement of repeater sites (retrofit)	All Hazards	1, 2, 3, 4, 5	CAO/Communications, OES, PW	Med	Homeland Security, HERSA/CDC Grant,	Short Term
HC-30	Public education for identified isolated islands of humanity. This could include the development of CERTS.	All Hazards	3, 5, 6, 7	PH and OES	High	Homeland Security, PDM Grant, HERSA/CDC Grant, Volunteers	Short Term
HC-31	Retrofit airport runways to be able to receive larger aircrafts-Rohnerville, Arcata/McKinleyville, Murray	All Hazards	1, 2, 4, 5, 12	PW-Aviation	Low	PDM Grants, HMGP, other grants	Long Term Depends on funding
HC-32	Update County Operations Plan for better integration and training coordination	All Hazards	1, 3, 5, 8, 12	OES	High	HERSA/CDC, CAOES, General Fund	Short Term
HC-33	Develop County COOP	All Hazards	1, 3, 8, 12	CDS/OES	Med	Homeland Security, HERSA/CDC, General Fund, CAOES, PDM Grant, HMGP	Short Term
HC-34	Relocate and/or develop a mobilization plan for PW maintenance yards.	All Hazards	1, 2, 3, 5, 8	PW	Med	Grants	Short Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-35	Relocation/digitize stored County Records	Flood, Earthquake, Tsunami, Severe Weather	1, 3, 8	CAO	High	All applicable County Department funding sources & Grants	Short Term
HC-36	Establish alternate OES Emergency Operations Center	All Hazards	1, 2, 4, 5	CAO/ OES	Med	General Fund, State Funds, Grants	Short Term Long Term
HC-37	Retrofit/upgrade Redwood Acres and Humboldt County Fairgrounds for use as critical infrastructure for response and recovery activities	All Hazards	1, 3, 4, 5	PW	Med	General Fund, State Funds, Grants	Long Term
HC-38	Upgrade/develop redundant interoperable communication systems (fiber optic, wireless,, radio, other)	All Hazards	1, 2, 3, 4, 5, 12	CAO	Med	State Funding, Homeland Security & Partnership funding	Short Term
HC-39	Include in Capital Improvements Plan --back-up emergency energy sources	All Hazards	1, 2, 3, 10	PW/OES	High	General Fund, PDM Grant, CAOES, Homeland Security	Short Term
HC-40	Support an EH program to Provide funding to Process Hazard Analysis for local businesses, such as what if checklists, Hazard and Operability Study, Failure Mode and Effects Analysis.	All Hazards	1, 2, 3, 5, 6, 7, 10	EH	High	PDM Grant, HMGP , CUPA (Certified Unified Program Agency funding)	Long Term Depends on funding
HC-41	Support an EH program to fund hazard assessment for local businesses in accordance with CalARP requirements.	Dam or Levee Failure, Earthquake, Landslide, Severe Weather, Tsunami, Wildfire	1, 7, 10	EH	Med	PDM Grant, HMGP, CUPA	Long Term Depends on funding

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-42	Support fisheries enhancement, maintenance, restoration programs, and native stock replenishment programs	Fish Losses	3, 7, 8, 9	CDS	Med	Prop 50, other grants	Short Term Ongoing
HC-43	Support conservation easement programs intended to preserve or restore healthy fish species habitat	Fish losses	3, 7, 8, 9	CDS	Low	Title III, Grants	Ongoing
HC-44	Support wetland/riparian protection, restoration, enhancement and maintenance programs	Fish losses	3, 7, 8, 9	PW, CDS	Low	General Fund	Ongoing
HC-45	Support studies to evaluate fish populations as well as disease impact studies	Fish losses	3, 7, 9	PW, CDS	Low	General Fund	Long Term
HC-46	Perform "risk-based" analysis of non-accredited levees within the planning area (Redwood Creek) to identify the most cost-beneficial remediation of those facilities. Implement recommendation of the analysis	Fish losses and Flood	3, 6, 7, 8, 9, 10	CDS, Public Works	High	General Fund, Grants (FEMA, U.S. Army Corps of Engineers)	Long Term Depends on funding
HC-47	Support studies to evaluate the effect of the major dams operating procedures on resident fish.	Fish losses	3, 7, 8, 9, 10	CDS	Med	General Fund	Long Term
HC-48	Develop a Habitat Conservation Plan.	Fish losses	3, 7, 8, 9, 10	CDS-Planning	Low	General Fund, Grants	Long Term
HC-49	Dam and levee reinforcement and new construction.	Flood	1, 2, 3, 4, 5, 9, 11	PW	Med	HMGP	Long Term

UNINCORPORATED HUMBOLDT COUNTY HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
HC-50	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 become available.	All	All	CDS, OES	Med	Ongoing programs; grant funding depending on mandate	Long Term Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CalAPR = California Accidental Release Program; CAOES = California Office of Emergency Services; CDMG = California Department of Mines and Geology; CDS = Community Development Services; CERTS = Community Emergency Response Teams; COOP = Continuity of Operations Plan; CRS = Community Rating System; CUPA = Certified Unified Program Agency Funding; EH = Humboldt County Environmental Health; ESRI = Environmental System Research Institute; HAZUS-MH= Hazards U.S. Multi-Hazard; HCFSC = Humboldt County Fire Safe Council; HMGP = Hazard Mitigation Grant Program; MFPP = Master Fire Protection Plan; NOAA = National Oceanic and Atmospheric Administration's; OES = Humboldt County Office of Emergency Services; PDM = Pre-Disaster Mitigation Grant Program; PH = Humboldt County Public Health; PW = Humboldt County Public Works; STIP = State Transportation Improvement Program

CITY OF ARCATA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
A-1	Designate, prepare and announce Emergency Assembly Points throughout the City.	All Hazards Except Fish Loss	1,4,5,12	City Manager's Office	Medium	General Fund	Short-term
A-2	Adopt a Long-term Capital Improvement Plan.	All Hazards Except Fish Loss	1-6,9	Department of Public Works	Low	General Fund	Short-term
A-3	Improve hillside stability in landslide-prone areas utilizing feasible approaches that provide the highest degree of benefit, for the least cost.	Landslide	2,3	Department of Public Works	Medium	Hazard mitigation Grant funding, General Fund	Long-term (pending funding)
A-4	Conduct an updated Dam Failure Flood Routing Analysis for City of Arcata Dam #2	Dam Failure	3,9	Department of Public Works Environmental Services department	Medium	General Fund, Forest Fund, Storm water Fund	Short-term
A-5	Prepare a Post Disaster Recovery Plan	All Hazards	1,3,12	Community Development Department Police department	Low	General Fund	Short-term
A-6	Install Emergency water inter-ties between neighboring jurisdictions	Earthquake, Severe weather, Drought	2,3,8,9, 12	Environmental Services Department	High	Enterprise Fund	Long-term
A-7	Develop ring levees around at risk critical facilities	Tsunami, Flood, Severe Weather	1,2,3	Department of Public Works Environmental Services Department	High	General Fund, PDM, Enterprise Fund	Long-term
A-8	Perform seismic retrofits of critical facilities	Earthquake	1,2,3	Department of Public Works	High	General Fund, Capital Improvement Fund, Enterprise Fund, PDM	Long-term

CITY OF ARCATA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
A-9	Work with the NOAA to attain the certifications of Storm Ready and Tsunami Ready.	Tsunami, Severe Weather	3,6,8	City Manager's Office	Medium	General Fund,	Short-term
A-10	Perform preventive maintenance of Jane's Creek and other drainage ways.	Landslide, Dam Failure, Flood, Severe Weather,	2,9	Department of Public Works Environmental Services Department	Low	General Fund, Drainage Fund, Department of Water Resources	Ongoing, Short-Term
A-11	Adopt International Building Code.	Earthquake, Flood	11	Community Development Department	Low	Building Fees	Short-term
A-12	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.	All Hazards	1,4,5,12	Police Department	Medium	General Fund	Ongoing, Short-Term
A-13	Adopt an updated Emergency Response Plan	All Hazards	1,4,5,12	Police Department	Low	General Fund	Short-term
A-14	Establish a warning system for Dam Failure	Dam Failure	3,9	Department of Public Works	Medium	General Fund, Drainage Fund	Long-Term
A-15	Update City land use code for seismic setbacks/structural requirements and hillside development standards	Earthquake, Landslide	10	Community Development Department	Low	General Fund	Short-Term

CITY OF ARCATA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
A-16	Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Arcata	All Hazards	3,5,8,12	Police Department	Mediu m	General Fund	Short-Term
A-17	Update floodplain mapping throughout the City, including continued participation with the National Flood Insurance Program.	Flood, Severe Weather	7,8,	Department of Public Works	Mediu m	General Fund, Drainage Fund	Ongoing, Long-Term
A-18	Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.	All Hazards	1,4,5,12	Department of Public Works	Low	General Fund,	Ongoing, Short-Term
A-19	Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.	All Hazards	7,8	Department of Public Works Environmenta l Services Department	Low	General Fund,	Ongoing Short-Term
A-20	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.	All Hazards	6,7	Police Department City Manager's Office	Low	General Fund,	Ongoing, Short-Term

CITY OF ARCATA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
A-21	Raise flood prone areas adjacent to West End Rd. to an elevation that will not be inundated during flooding events.	Flood, Severe Weather	2, 9	Department of Public Works Environmental Services Department	Medium	Enterprise Fund, Drainage Fund, PDM, CDBG	Short-Term
A-22	For emergency preparedness, implement offsite parking for corporation yard equipment.	All Hazards	1,2,4,5	Department of Public Works	Low	General Fund	Short-Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CITY OF BLUE LAKE HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
BL-1	Adopt a Long-term Capital Improvements Plan	All Hazard Except Fish Loss	1-5	City Manager's Office	Low	General Fund	Short-term
BL-2	Prepare a Post Disaster Recovery Plan	All Hazard Except Fish Loss	1-5	City Manager Office	Low	General Fund	Short-term
BL-3	Adopt International Building Code 2008	Earthquake and Flood	1,3	City Manager Office	Low	General Fund	Short-term
BL-4	Install Emergency water inter-ties between neighboring jurisdictions	Earthquake, Sever weather, Drought, Dam Failure	1-6	Public Works	High	Enterprise Fund. Possible Hazard Mitigation Grant funding	Long-term Depends on funding
BL-5	Support county-wide initiatives in the Humboldt Operational Area Hazard mitigation Plan	All Hazards	All	City Manager Office	Low	Funded through existing/ ongoing programs	Short-term Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CITY OF EUREKA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
E1.	Replace/retrofit Eureka Fire Main Station and Emergency Operations Center (same location) to provide seismic strengthening to maintain essential emergency services.	All Hazards	O-1, O-2, O-3, O-4, O-5	Dept. of Public Works	$9,715,000	General Fund, OES, FEMA HMGP, PDM	Short term
E2.	Reconstruct Dock B to provide seismic strengthening to reduce risk of structural failure and sustain needed economic infrastructure.	Earthquake, severe weather, tsunami	O-2, O-12	Dept. of Public Works	$10,265,000	Harbor District, Redevelop-ment, EDA Grants, HMGP, PDM	Short term
E3.	Construct Corporation Yard improvements to reduce risk of structural failure and increase efficiency and operations during natural disaster.	Earthquake, floods, tsunami	O-1, O-2, O-3, O-4	Dept. of Public Works	$675,000	General Fund, Redevelopment. City Water and Sewer Fund, HMGP, PDM	Short term
E4.	Construct Eureka Municipal Airport improvements to provide for increased use, safety and security of airport during a natural disaster.	Earthquake, severe weather, tsunami,	O-4, O-5, O-12	Dept. of Public Works	$940,000	Hangar rental revenues, EDA Grants, CalTrans Aeronautics.	Long term
E5.	Construct a Fire Manipulative Training Facility in a central location to train emergency responders.	All Hazards	O-4, O-5, O-8,	Dept. of Public Works	$1,105,000	General Fund, FEMA grants, other Fire Districts.	Short term
E6.	Construct Fire Station 3 and 4 improvements to increase capacity for emergency apparatus and equipment and personnel.	Earthquake, severe weather,	O-1, O-2, O-3, O-4, O-5,	Dept. of Public Works	$1,125,000	General Fund, OES, FEMA, HMGP, PDM.	Short term
E7.	Replace/retrofit/upgrade and cleanup fuel terminal facility to improve safety, minimize environmental impacts, and provide a more reliable fuel system.	Earthquake, severe weather	O-1, O-2, O-3, O-4, O-5, O-12	Dept. of Public Works	$887,500	General Fund, Bay revenues, HMGP, PDM.	Short term

CITY OF EUREKA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
E8.	Construct Martin Slough Enhancement Project to reduce property and environmental damage caused by flooding.	Earthquake, flooding, severe weather	O-1, O-2, O-3, O-4, O-5, O-12	Dept. of Public Works	$525,000	CA DWR, CA Coastal Conservancy, CA RWQCB, HMGP, PDM.	Short term
E9.	Construct Police Station Modifications to improve security and efficiency.	All Hazards	O-1, O-2, O-3, O-4, O-5,	Dept. of Public Works	$245,000	General Fund, Drug asset forfeitures.	Long term
E10.	Install, replace and repair or relocate Storm Drainage facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding.	Earthquake, flooding, severe weather	O-1, O-2, O-3, O-4, O-5, O-12	Dept. of Public Works	$50,000	General Fund, Gas tax, Assess. District, Grants.	Short term
E11.	Repair and replace Sewer Lift Station facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding.	Earthquake, severe weather	O-1, O-2, O-3, O-4, O-5	Dept. of Public Works	$765,000	Sewer revenues.	Short term
E12.	Construct Martin Slough Sewer Interceptor to protect and improve efficiency, safety and reliability of wastewater collection and transport system.	Earthquake, flooding	O-1, O-2, O-3, O-4, O-5, O-12	Dept. of Public Works	$31,700,000	Wastewater revenues, User fees, EPA grants, CA Prop 50 Grant.	Short term
E13.	Construct Standby Emergency Power Generator to ensure wastewater treatment plant is operational during critical emergencies and disasters.	Earthquake, severe weather	O-1, O-2, O-3, O-4, O-5, O-12	Dept. of Public Works	$750,000	Wastewater revenues.	Long term
E14.	Construct Extended Fuel Storage Facilities to provide adequate fuel storage at additional locations during periods of extended power outage.	Earthquake, severe weather, flooding	O-1, O-2, O-3, O-4, O-5, O-12	Dept. of Public Works	$210,000	Water and sewer revenues.	Long term

CITY OF EUREKA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
E15.	Construct Mad River Water Pipeline project to strengthen system and ensure safe and reliable provision of public water to citizens and emergency service agencies.	Earthquake, tsunami	O-1, O-2, O-3, O-4, O-5	Dept. of Public Works	$7,365,000	Water Bond Proceeds	Short term
E16.	Construct Water Reservoir Maintenance and Security Improvement Project for seismic strengthening and to improve security and safety for Eureka's emergency water supply	Earthquake, severe weather, drought	O-1, O-2, O-3, O-4, O-5	Dept. of Public Works	$620,000	Water Bonds, Fund 501, HMGP, PDM	Short term
E17.	Implement Storm Water Management Plan to educate public about controlling/improving flooding events and water quality in the City.	Flooding, severe weather, drought	O-6, O-7, O-9, O-10	Dept. of Public Works	$50,000	General Fund	Short term
E18.	Create and maintain a hazard mitigation informational web page on the City's website.	All Hazards	O-6, O-7	Office of City Manager	$3,000	General Fund	Short term
E19.	Support County wide 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.	All Hazards	O-6, O-7, O-8, O-10	Office of City Manager	$10,000	General Fund	Short term
E20.	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.	All Hazards	O-6, O-7, O-8, O-10	Office of City Manager	$10,000	General Fund	Short term

CITY OF EUREKA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
E21.	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.	All Hazards	O-11	Dept. of Public Works	$10,000	General Fund, HMGP.	Short term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CITY OF FERNDALE HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
F-1	Designate, prepare and announce Emergency Assembly Points throughout the City.	All Hazards Except Fish Loss	1, 3, 5, 7, 8, 10	CMO	Low	General Fund	Short-Term
F-2	Adopt a long-term Capital Improvement Plan	All Hazards Except Fish Loss	1-3, 5, 7	PW	Medium	General Fund	Long Term
F-3	Improve hillside stability in landslide-prone by improving drainage and planting plants that protect soil and retaining walls where needed.	areas, Landslide	2, 3, 10	PW	Medium	PW	Long Term
F-4	Prepare a Post Disaster Recovery Plan	All Hazards	1, 3	CMO	Low	General Fund	Short Term
F-5	Develop ring levees around at risk facilities	Tsunami, Flood, Severe weather,	1-3	PW/WTF	High	WWF	Short-Term
F-6	Perform Seismic retrofits of critical facilities, such as the public works facility and the Wastewater facility	Earthquake	1-3	PW/WTF	High	General Fund/PW/SF	Short Term
F-7	Work with NOAA to attain the certificates of Storm Ready and Tsunami Ready	Tsunami, Severe Weather	3, 5-8	CMO	Medium	General Fund	Short Term
F-8	Perform Preventative Maintenance for Francis Creek	Landslide, flood, severe weather	1, 2, 9, 10	PW	Low	PW	Short Term
F-9	Adopt International Building Code on January 1, 2008	Earthquake, Flood	11	CMO	Low	Building Fees	Short Term
F-10	Establish redundant communication capabilities throughout the city.	All Hazards	1, 5	PD	Medium	General Fund	Short Term
F-11	Adopt an updated Emergency Response Plan	All Hazards	1, 5, 10	PD	Low	General Fund	Short Term

CITY OF FERNDALE HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
F-12	Update City Land Use Code for seismic setbacks/structural requirements and hillside development standards	Earthquake, Landslides	10	CMO	Low	General Fund	Short Term
F-13	Update floodplain mapping throughout the City, including continued participation with a national flood insurance program	Flood, Severe weather	7, 8, 10	CMO/PW	Low	PW	Short Term
F-14	Maintain National Incident Management System and Incident Command System training for City staff	All Hazards	1, 4, 5, 10	PW	Low	General Fund	Ongoing/Short Term
F-15	Obtain and distribute current information about local natural hazards risk and emergency preparedness including creating and maintaining current website information	All Hazards	3, 8, 10	WTF	Low	General Fund	Ongoing/Short Term

Key: CMO=City Manager's Office, PW=Public Works, WTF=Waste Treatment Facility, SF=Sewer Fund, PD=Police Department

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CITY OF FORTUNA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
FO-1	Protect City's major water supply storage from landslides and earthquake damage. CIP Project #s 9124 & 9327.	Landslides / Earthquakes / Wildfire	3, 4, 5	City	$2,100 k + $1,800 k	Bond financing leveraged with PDM grant funding.	Short Term
FO-2	Localized Detention Basin @ Strongs Creek headwaters. CIP Project #9603	Severe Storms / Flooding	1, 2	City	$151k	Bond financing and development impact fees leveraged with PDM grant funding.	Short Term
FO-3	Localized Detention Basin @ Rohner Creek headwaters. CIP Project #9602	Severe Storms / Flooding	1, 2	City	$302k	Bond financing, development impact fees leveraged with PDM grant funding.	Short Term
FO-4	Construct flap gate valves at various locations throughout City to prevent backwater inundation from major creek channel high water conditions.	Severe Storms / Flooding	1, 2	City	$150k	Bond financing leveraged with PDM grant funding.	Short Term
FO-5	Increase channel capacity through bank elevation improvements at localized regions of repetitive flooding incidents. CIP Project #9704	Severe Storms / Flooding	1, 2	City	$92k	Bond financing and development impact fees leveraged with PDM grant funding.	Short Term
FO-6	Vegetation clearing of existing drainage courses including ditches and creek channels. CIP Project 9709.	Severe Storms / Flooding / Wildfire	1, 2, 4	City	$150k	Bond financing leveraged with PDM grant funding.	Short Term
FO-7	Stabilize hillsides from mass landslide movements at or adjacent to street right-of-ways.	Severe Storms / Landslides	1, 5	City	$120k	Street CIP funds leveraged with PDM grant funding	Short Term
FO-8	Rohner Creek by-pass. CIP Project #9601	Severe Storms / Flooding	1, 2	City	$3,700 k	Bond financing leveraged with PDM grant funding.	Short Term

CITY OF FORTUNA HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
FO-9	Rohner Creek widening. CIP Project #9600	Severe Storms / Flooding	1, 2	City	$362k	Bond financing leveraged with PDM grant funding.	Short Term
FO-10	New 48" storm drain at Third St. @ Stockyard. CIP Project #9702.	Severe Storms / Flooding	1, 2	City	$92k	Bond financing leveraged with PDM grant funding.	Short Term
FO-11	Detention Basin on Mill Creek. CIP Project #9804.	Severe Storms / Flooding	1, 2	City	$140k	Bond financing leveraged with PDM grant funding.	Short Term
FO-12	Detention basin cleaning. CIP Project #9601.	Severe Storms / Flooding	1, 2	City	$40k	Bond financing leveraged with PDM grant funding.	Short Term Ongoing
FO-13	Dinsmore Drive flood control. CIP Project #9502.	Severe Storms / Flooding	1, 2	City	$26k	Bond financing leveraged with PDM grant funding.	Short Term
FO-14	Elevate emergency generator @ water supply/treatment facility above 100 year flood elev.	Severe Storms / Flooding	1, 2	City	$5k	Bond financing leveraged with PDM grant funding.	Short Term
FO-15	Strong's Creek by-pass @ US 101 box culvert to Riverwalk Detention Basin.	Severe Storms / Flooding	1, 2	City	$1,500 k	Bond financing leveraged with PDM grant funding.	Long term Pending Funding
FO-16	Circle levee @ water supply/treatment facility above 100 year flood elev.	Severe Storms / Flooding	1, 2	City	$100k	Bond financing leveraged with PDM grant funding.	Short Term
FO-17	Seismic retrofit of at-grade water storage tanks (250k & 1 million gallons).	Earthquake / Wildfire	3, 4	City	$250k	Bond financing leveraged with PDM grant funding.	Short Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CITY OF RIO DELL HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
RD-1	Chlorine Generation Equipment Replacement and Seismic Retrofit	Earthquake, Severe Weather, Flood	1, 2	DPW	Med	General Fund, CDBG Grants, DMA Grants	Long Term
RD-2	Upgrade Pumps at Headworks	Earthquake, Severe Weather, Flood	1, 2	DPW	Med	General Fund, CDBG Grants, DMA Grants	Short Term
RD-3	Improvements to Wastewater Collection System Mains, Laterals, and Manholes	Earthquake, Flood, Severe Weather	1, 2	DPW	High	General Fund, CDBG and DHS Grants	Long Term
RD-4	Wastewater Lift Stations Maintenance and Upgrades	Flood, Earthquake	1, 2	DPW	Med	General Fund, CDBG and DHS Grants	Long Term
RD-5	Install Stormproof Fuel Storage Tanks	Earthquake, Severe Weather, Flood	1, 2	DPW	Low	General Fund, DMA Grants	Long Term
RD-6	Belleview Creek Crossing Repair	Severe Weather, Floods	1, 2, 24	DPW	Med	General Fund, CDBG and DHS Grants	Long Term
RD-7	Painter Street to Highway 101 Drainage Ditch Repair	Severe Weather, Floods	1, 2, 24	DPW	Med	General Fund, CDBG and DHS Grants	Long Term
RD-8	Center Street to Painter Street Culvert Improvements	Severe Weather, Floods	1, 2, 24	DPW	Med	General Fund, CDBG and DHS Grants	Long Term
RD-9	City Hall Seismic Retrofit	Earthquakes	1, 2, 5, 32	DPW	High	General Fund, CDBG and DHS Grants	Long Term
RD-10	Fireman's Hall Seismic Retrofit	Earthquakes	1, 2, 5, 32	DPW	High	General Fund, DMA Grants	Long Term
RD-11	City Standby Power Generation Capabilities	All Hazards except Fish Loss	1, 2, 4, 32	DPW	Low	General Fund	Long Term
RD-12	Fire Sprinkler Installation at City Hall and Fireman's Hall	Wild Fire, Earthquake	1, 2, 5, 32	DPW	Med	General Fund, DMA Grants	Long Term

CITY OF RIO DELL HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
RD-13	Construct Retaining Wall on Road to Dinsmore	Earthquake, Severe Weather, Landslide	1, 2, 3	DPW	Med	General Fund, DMA Grant	Long Term
RD-14	Elevating Wastewater Plant	Flood, Severe Weather	1, 2, 3	DPW	High	General Fund, DHS, DMA CDBG Grants	Long Term
RD-15	Designate, prepare and announce Emergency Assembly Points throughout the City.	All Hazards Except Fish Loss	1, 4, 5, 12	DPW	Medium	General Fund, DMA	Short-term
RD-16	Adopt a Long-term Capital Improvement Plan	All Hazards Except Fish Loss	1-6, 9	DPW	Low	General Fund	Short-term
RD-17	Improve hillside stability in landslide-prone areas	Landslide	2, 3	DPW	Medium	General Fund, PDM	Long-term
RD-18	Prepare a Post Disaster Recovery Plan	All Hazards	1, 3, 12	DPW	Low	General Fund, DMA Grants	Short-term
RD-19	Install Emergency water interties between neighboring jurisdictions	Earthquake, Severe weather, Drought	2, 3, 8, 9, 12	DPW	High	General Fund, DHS, CBG, DMA, Grants	Long-term
RD-20	Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.	Tsunami, Severe Weather	3, 6, 8	DPW	Medium	General Fund, DMA Grants	Short-term
RD-21	Adopt International Building Code on January 1st, 2008	Earthquake, Flood	11	DPW	Low	Building Fees	Short-term
RD-22	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.	All Hazards	1, 4, 5, 12	DPW	Medium	General Fund	Ongoing/ Short-Term

CITY OF RIO DELL HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
RD-23	Adopt an updated Emergency Response Plan	All Hazards	1, 4, 5, 12	DPW	Low	General Fund	Short-term
RD-24	Update City land use code for seismic setbacks/structural requirements and hillside development standards	Earthquake, Landslide	10	DPW	Low	General Fund, DMA Grants	Short-Term
RD-25	Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Rio Dell	All Hazards	3, 5, 8, 12	DPW	Medium	General Fund	Short-Term
RD-26	Update floodplain mapping throughout the City, including continued participation with the National Flood Insurance Program.	Flood, Severe Weather	7, 8,	DPW	Medium	General Fund, Drainage Fund	Ongoing/ Short-Term
RD-27	Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.	All Hazards	1, 4, 5, 12	DPW	Low	General Fund, DMA Grants	Ongoing/ Short-Term
RD-28	Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.	All Hazards	7, 8	DPW	Low	General Fund,	Ongoing/ Short-Term
RD-29	Develop Focused Storm Drainage Facility Plan	Severe Weather, Flood	1-6, 9	DPW	Med	General Fund	Long Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

CITY OF TRINIDAD HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
T-1	Designate, prepare and announce Emergency Assembly Points throughout the City.	All Hazards Except Fish Loss	1, 4, 5, 12	PD	Medium	General Fund	Short-term
T-2	Adopt a Long-term Capital Improvement Plan	All Hazards Except Fish Loss	1-6	PW, CP	Low	General Fund	Short-term
T-3	Improve hillside stability in landslide-prone areas	Landslide	1, 2	CP	Medium	General Fund	Long-term
T-4	Prepare a Post Disaster Recovery Plan	All Hazards	1, 3, 12	PD	Low	General Fund	Short-term
T-5	Obtain emergency water supplies	Earthquake, Severe weather, Drought	1, 2, 5, 12	PW	High	Enterprise Fund	Long-term
T-6	Perform seismic retrofits of critical facilities	Earthquake	1, 2, 3	PW	High	General Fund, Capital Improvement Fund, Enterprise Fund	Long-term
T-7	Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.	Tsunami, Severe Weather	3, 6	CP, CE	Medium	General Fund,	Short-term
T-8	Adopt International Building Code on January 1st, 2008	Earthquake, Flood	11	CP, CE	Low	Building Fees	Short-term
T-9	Improve alternative communication capabilities throughout the City, including acquisition of emergency transceivers, satellite telephones, and/or other communication devices.	All Hazards	1, 4, 5, 12	PD	Medium	General Fund	Ongoing/ Short-Term
T-10	Adopt an updated Emergency Response Plan	All Hazards	1, 4, 5	PD	Low	General Fund	Short-term

CITY OF TRINIDAD HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
T-11	Update City land use code for seismic setbacks/structural requirements and hillside development standards	Earthquake , Landslide	10	CP, CE	Low	General Fund	Short-Term
T-12	Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Trinidad	All Hazards	3, 5, 8, 12	PD	Medium	General Fund	Short-Term
T-13	Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.	All Hazards	1, 4, 5, 12	PD	Low	General Fund,	Ongoing/ Short-Term
T-14	Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.	All Hazards	7, 8	PD/PW	Low	General Fund,	Ongoing/ Short-Term
T-15	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.	All Hazards	6, 7	PD/CC	Low	General Fund,	Ongoing/ Short-Term
T-16	For emergency preparedness, implement offsite parking/storage for City equipment.	All Hazards	1, 2, 4, 5	PW	Low	General Fund	Short-Term

a. “Short term” = 1 to 5 years; “Long Term”= 5 years or greater

ORLEANS COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
OCSD-1	Retrofit existing water storage tank for the impacts of earthquake and landslides, while increasing the storage capacity for fire protection capability.	EQ, LS, WF	1, 2	OCSD Board	High	OCSD general fund, FEMA Hazard Mitigation Grant	Long Term, Depends on funding
OCSD-2	Retrofit existing water distribution system for the impacts of earthquake, flood and landslide. Retrofit to include where feasible, extension of existing system to non-serviced areas to provide fire hydrant protection.	EQ, Fld, LS, WF	1, 2, 3, 8	OCSD / Humboldt County	High	Potential partnering opportunity with Humboldt County. OCSD general fund, FEMA hazard Mitigation grant funding	Long Term, Depends on funding
OCSD-3	Structural/nonstructural seismic retrofit of OFPD fire house.	EQ	1, 2, 3	OVFD	High	OCSD general fund, FEMA Hazard Mitigation Grant	Long term, Depends on funding
OCSD-4	Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan	All Hazards	All Objectives	OCSD Board	Low	Funded through existing/ongoing programs	Short term Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

ORICK COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
O-1	Provide public outreach for tsunami awareness	Tsunami	3, 6, 7, 8, 10	Orick tsunami ready	$500	NOAA, NPS	Short Term/Ongoing
O-2	Seismic retro fit of water supply system	EQ, Wildfire	1, 2, 4, 9	OCSD	$10 mil	OCSD District funding, Hazard Mitigation Grant	Long term, Depends on funding
O-3	Upgrade levees to 250 years flood Protection Level	Flood	1, 2, 3, 9	Humboldt County	High	Benefit assessment, U.S. Army Corps of Engineers 205 funding, Hazard Mitigation Grant Funding	Long term, Depends on funding

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

HUMBOLDT COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
HCSD-1	Retrofit Tanks, Ridgewood, Walnut, and Freshwater among others.	Earthquake	1, 2, 3, 4	HCSD	600 K	CIP	Short Term
HCSD-2	Enhance water supply system for fire prevention, in areas rated high by Cal Fire	Wildfire	1, 3, 4, 5	HCSD	1.5 M	Grant and General Funds	Short Term Depends on funding
HCSD-3	Acquire support equipment such as: backup generators and water pumps	All Hazards	1, 2, 3, 5, 8	HCSD	500 K	DHS Grant, and General Funds	Short Term Depends on funding
HCSD-4	Engineering feasibility study of Critical Facilities for structural and non-structural mitigation.	Flood and Earthquake	1, 2, 4, 5	HCSD	350 K	District funds	Short Term
HCSD-5	Promote public awareness of the risk associated with natural hazards to HCSD rate payers via public information means available to HCSD (is there a problem with this one?)	All Hazards	1, 2.4	HCSD	15 K	District Funds trough ongoing programs	Short Term/Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

WILLOW CREEK COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
WCCSD-1	Retrofit existing water storage tank for the impacts of earthquake and landslides, while increasing the storage capacity for fire protection capability.	EQ, LS, WF	1,2	WCCSD	$1,000,000 High	District funds leveraged with Hazard Mitigation Grant funding	Long Term Depends on funding
WCCSD-2	Retrofit existing water distribution system for the impacts of earthquake, flood and landslide. Retrofit to include where feasible, extension of existing system to non-serviced areas to provide fire hydrant protection.	EQ, Fld, LS, WF	1,2,3,8	WCCSD	$2,000,000 High	District funds leveraged with Hazard Mitigation Grant funding	Long Term Depends on funding
WCCSD-3	Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan	All Hazards	All Objectives	WCCSD	Low	Funded through existing/ongoing programs	Short term Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

WILLOW CREEK FIRE PROTECTION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
WCFPD-1	Seismic retrofit fire hall	EQ	1, 2, 3	WCFPD	Medium	Tax apportionment and fire assessment fee schedule. FEMA Hazard Mitigation Grant Funding	Long Term Depends on funding
WCFPD-2	Multi-Agency Emergency Management Facility	All Hazards	All	WCFPD	Medium	Tax apportionment and fire assessment fee schedule	Long Term Depends on funding
WCFPD-3	Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan	All Hazards	All	WCFPD	Low	Funded through existing/ongoing programs	Short Term Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

WEOTT COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
WCSD-1	Install Water Meters	Drought	1,2,3	WCSD	$100,000	Cal Dept Health Svcs Prop 50	Long Term
WCSD-2	Retrofit/Upgrade Transmission Lines for possible impacts from earthquake and landslides	EQ/LS	1,2,3	WCSD	$1,000,000	Prop 50, District funds, possible FEMA hazard mitigation grant	Long Term Depends on funding
WCSD-3	Develop redundancy to water supply by establishing a Back-Up Well Facility	EQ, LS and Drought	1,2,3	WCSD	$50,000	Self-Funded	Short Term
WCSD-4	Retrofit the community hall for the probable impacts of earthquake, flooding and severe weather	EQ, Fld, SW	1,2	WCSD	High	District Funds, possible FEMA Hazard mitigation Grant	Long Term Depends on funding
WCSD-5	Establish "defensible" spaces around identified critical facilities and infrastructure by clearing accumulated brush around facilities	WF, SW, Drought	1,2,3	WCSD	$20,000	Self-Funded	Short Term Ongoing
WCSD-6	Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan	All Hazards	All Objectives	WCSD	Low	Funded through existing/ongoing programs	Short term Ongoing

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

MCKINLEYVILLE COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
MCSD- 1	Earthquake :Mitigate for loss of water transmission line under the Mad River	EQ	1, 2	McKCSD	$800,000 (High)	Capital Reserves	Short Term
MCSD- 2	Flooding: River bank stabilization of Mad River west of the Ocean Avenue area	FL	1, 2, 4, 5	Hum. County	$1.5 M (High)	NRCS	Short Term
MCSD- 3	Water Well for backup system supply	All Hazards	1, 2, 4, 5	McKCSD	$500,000 (Medium)	Capital Reserves	Short Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

REDWAY COMMUNITY SERVICE DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
RW-1	Reinforce Riverbank at Water treatment plant to mitigate the impacts of stream bank erosion	Flood	1,2,9	RCSD	250 to 750K	Grant	Long term Depends on funding
RW-2	Enhance stormwater management capability within the district, with an emphasis on upgrades to existing stormwater conveyance system	SW, Flood	1,2,3,8	RCSD and Humboldt County	High	Bonds, Benefit assessments, Capital Improvement funds, Hazard Mitigation Grant	Long term Depends on funding
RW-3	Community outreach/Education Disaster Preparedness	All Hazards	All Objectives	RCSD	Low	District Funds Partnering with Stakeholders	Short term Ongoing
RW-4	Add Alternate/Redundant aerial crossing for effluent from Wastewater Plant	EQ, Flood, LS	1,2,9	RCSD	750K	District Funds, Grant	Long term, Depends on funding

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

HUMBOLDT #1 FIRE PROTECTION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
HFD-1	Seismic Retrofit Station 12	Earthquake	1, 2, 4	HFD#1	1,000,000	Grant/Loan/Bond	Short Term
HFD-2	Private Bridge Safety Program	All Hazards	1, 2, 3, 4, 5, 11	HFD#1	160,000	Grant/Loan/Bond	Short Term
HFD-3	Training Facilities - multi-agency	All Hazards	3, 5, 7, 8, 12	City of Eureka	280,000	Reserves/ Operational Budget	Short Term
HFD-4	Support the District's CPR education program	All Hazards	6, 7, 9, 10	HFD#1	1,000/yr	Operational Budget	Ongoing
HFD-5	Employee Disaster Response Plan	All hazards	1, 4, 5, 6, 7	HFD#1	750/yr	Operational Budget	Ongoing
HFD-6	Seismic Retrofit Station 11	Earthquake	1, 2, 4	HFD#1	1,700,000	Grant/Loan/Bond	Short Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

ARCATA FIRE PROTECTION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline[a]
AFPD-1	Continue/enhance ongoing public education programs to include components on hazard awareness and mitigation.	All Hazards	6, 7, 8	Arcata Fire Protection District	Low	District Budget	Ongoing
AFPD-2	Update District sponsored website to include preparedness, warning and mitigation information on the Earthquake, Tsunami and Wildfire Initiatives.	Earthquake, Tsunami, Wild Fire	6, 7, 8	Arcata Fire Protection District	Low	District Budget	Ongoing
AFPD-3	Retrofit all fire stations with non-combustible roofing material.	Wild Fire, Severe Weather	1, 2, 4	Arcata Fire Protection District	Medium	District Budget	Short-Term
AFPD-4	Provide/update new radios for all "First responders".	All Hazards	1, 2, 4, 5, 6	Arcata Fire Protection District	Medium	District Budget Fire Service -DHS grant	Short-Term
AFPD-5	Outfit/equip 2 apparatus to meet USAR capabilities.	All hazards	1, 2, 3, 4, 5, 8, 12	Arcata Fire Protection District	High	District Budget	Short-Term
AFPD-6	Acquire transmitter for thermal imager.	All Hazards	2, 3, 4, 5	Arcata Fire Protection District	Medium	District Budget	Short-Term
AFPD-7	Support/adopt county-wide Fire apparatus program	All Hazards	2, 4, 8, 10, 12	Arcata Fire Protection District	Low	District Budget	Short-Term
AFPD-8	Support/implement county-wide initiatives of the Humboldt Operational Area Hazard Mitigation Plan.	All Hazards	2, 4, 8, 10, 12	Arcata Fire Protection District	Low	District Budget	Short-Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

RIO DELL FIRE PROTECTION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
RDFD-1	Develop a post disaster action plan	All Hazards	1, 4, 5, 8	RDFPD	Medium	RDFPD City of Rio Dell	Short Term
RDFD-2	Initiate Public outreach and education efforts, including an active Firewise program.	Wildfire	6, 7, 8	RDFPD	Medium	City of Rio Dell, Humboldt County, Cal-Fire, RDFPD	Short Term
RDFD-3	Clear fuels on land that can trigger or maintain wildfires.	Wildfire	2, 3, 9	RDFPD	Medium	Cal-Fire, Private land owners	Long Term, Depends on funding
RDFD-4	Establish and maintain mutual aid agreements between fire service agencies.	All Hazards	1, 4, 5, 8, 12	RDFPD	Low	RDFPD	Short Term, Ongoing
RDFD-5	Identify and create emergency vehicle access in high hazard areas.	All Hazards	1, 4, 5, 8	RDFPD	Medium	City of Rio Dell, Humboldt County, Private land owners	Long Term, Depends on funding
RDFD-6	Install fire suppression sprinkler system throughout fire station at 50 West Center St.	Wildfire	1, 2, 4	RDFPD	Medium	RDFPD	Long Term, Depends on funding

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

SAMOA PENINSULA FIRE PROTECTION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
SP-1	Seismic and Tsunami Retrofit Fairhaven Station	EQ/ Tsunami	1, 2, 4	Samoa Fire	High ($200,00)	grant/loan/bond	Long Term, Depends on funding
SP-2	Achieve Tsunami Ready Status for Fairhaven	Flood/ Tsunami	6, 10	Samoa Fire	Low (up to $30,000)	Funded via ongoing district programs. Possible NOAA grant	Short Term, Depends on funding
SP-3	Build vertical evacuation site for Fairhaven	Tsunami	3	Hum County	High ($250,000)	grant/loan/bond	Long Term, Depends on funding
SP-4	Achieve Tsunami Ready Status for Samoa	Flood/ Tsunami	6, 10	Samoa Fire	Low (up to $30,000)	Funded via ongoing district programs. Possible NOAA grant	Short Term, Depends on funding

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

SHELTER COVE RESORT IMPROVEMENT DISTRICT NO. 1 HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
RID-1	Development and initial implementation of vegetative management program on greenbelt and other RID property.	WF	1,2,9	RID	100,000	Property taxes	Short Term Ongoing
RID-2	Annual power line tree trimming	SW	1,2,3,8	RID	50,000	Electric utility revenue	Short Term Ongoing
RID-3	Building extra water storage capacity to counteract drought and fight fires	WF	1,2,9	RID	5 million	Hookup fees/Future bonds?	Short Term
RID-4	Seismic retrofit or replacement of 11 water tanks.	EQ/WF	1,2,9	RID	1 million	Hookup fees/Future bonds? Grant	Long term Depends on funding
RID-5	Automation of the existing tsunami siren	TS	1,2,3,4	RID	25,000	Property taxes	Short Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

GARBERVILLE SANITARY DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
GSD-1	Map out the water and wastewater system	All exposed hazards	1,2,3,4	GSD BOD	$23,000	Operating funds	Short Term
GSD-2	Consider store water/captured water techniques	All exposed hazards	1,3	GSD BOD	$750,000	SRF/Prop 50	Short Term
GSD-3	Educate the public in awareness, preparation, mitigation response, and recovery alternatives	All exposed hazards	3,5,6	GSD BOD	$15,000	Operating funds	Short Term
GSD-4	Purchase generator for back up power	All exposed hazards	1,3,4	GSD BOD	$45,000	Operating funds	Short Term
GSD-5	Prepare an update to the Hazard Mitigation Plan for the District	All exposed hazards	3,5,6,9	GSD BOD	$1,000	Operating funds	Short Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

HUMBOLDT BAY MUNICIPAL WATER DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
HBMWD-1	Retrofit emergency water supply interties for the communities of McKinleyville, Blue Lake, Fieldbrook-Glendale and possibly Arcata and Eureka	EQ, Fld, SW	1,2,3,4, 9	HBMWD	$1,750, 000	HMGP, District Funds, Other Funding	Short-term
HBMWD-2	Acquire Emergency Response Equipment – Yellowmine Pipe, K-Rails, traffic plates, portable fencing, gravel/sand	All Hazards	1,4,5	HBMWD	$50,000	District Funds	Short-term
HBMWD-3	Acquire Support Equipment for Emergency Operations Centers at Essex, Korblex and Eureka	All Hazards	1,4,5	HBMWD	$12,000	District Funds	Short-term
HBMWD-4	Conduct public awareness education regarding hazards affecting water supply	All Hazards	6,7	Humboldt County	$10,000	District Funds	Short-term
HBMWD-5	Conduct design and feasibility studies for construction of critical infrastructure/facilitie s	EQ, Fld, SW, Ts	1,2,3,4, 9	HBMWD	$50,000	HMGP, District Funds	Short-term
HBMWD-6	Retrofit Techite domestic waterline on Samoa Peninsula	EQ, Fld, Ts	1,2,3,4, 9	HBMWD	$12,000 ,000	HMGP, District Funds, Other Funding	Short-term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

HUMBOLDT BAY HARBOR, RECREATION AND CONSERVATION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
HB-1	Assess and enhance the Harbor District's storm and tsunami warning capability by joining NOAA "Storm Ready" and "Tsunami Ready" programs	Severe Storm, Tsunami, Flooding	O-8,O-9,O-10,,O-21,O-25	NOAA/ HBHR CD Board	$30K	NOAA; Harbor District; Humboldt County	Short Term
HB-2	Rebuild/retrofit warehousing at Redwood Marine Terminal	Earthquake Severe Storm	O-2,O-14,O-16	Harbor District	$25 Mil	Harbor District; CA Maritime Infrastructure Bank; Private Investment; HMGP/PDM	Long Term Depends on funding
HB-3	Rebuild breakwater at Woodley Island Marina	Severe Storm	O-2 O-16	Harbor District	$400K	Harbor District; HMGP/PDM	Short Term
HB-4	Rebuild work dock at Woodley Island Marina	Earthquake Severe Storm	O-2 O-16	Harbor District	$1 Mil	Harbor District, CA Department of Boating and Waterways HMGP/PDM	Short Term
HB-5	Rebuild breakwater at Shelter Cove	Severe Storm	O-2 O-16	Harbor District	$1.7 Mil	Harbor District; CA Department of Boating and Waterways; HMGP/PDM	Short Term
HB-6	Install floating breakwater on east end of Woodley Island Marina	Severe Storm Flooding	O-2	Harbor District	$1 Mil	Harbor District; CA Department of Boating and Waterways; HMGP/PDM	Long Term Depends on funding
HB-7	Develop standard specifications for levee repair/rehabilitation to minimize breaching and overtopping	Flooding Severe Storm	O-2, O-16, O-20, O-40	Harbor District	$100K	Harbor District;	Short Term

HUMBOLDT BAY HARBOR, RECREATION AND CONSERVATION DISTRICT HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
HB-8	Develop Dredge Material Management Program in order to ensure adequate water depths necessary for safe navigation and emergency access	Severe Storm Tsunami Flooding	O-1 O-5 O-20	Harbor District	$300K	Harbor District	Short Term
HB-9	Rebuild Redwood Marine Terminal and Fields Landing Terminal Berths	Severe Storm Earthquake	O-2 O-14 O-16	Harbor District	$125 Mil	Harbor District; Prop 1B; HMGP/PDM; Private Investment	Long Term Depends on funding

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

RECLAMATION DISTRICT #768 HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
RD-1	Ongoing Levee Maintenance and Flood Gate upkeep	EQ, Flood, SW, Tsunami	1, 2, 8, 9	District	Medium	District Funds	Short-term, Ongoing
RD-2	Levee Raising / Tsunami Ready Certification	EQ, Flood, SW, Tsunami	1, 2, 9	District	High	District Funds	Long-Term
RD-3	Levee Improvements for Storm Ready Certification	EQ, Flood, SW, Tsunami	1, 2, 9	District	High	District Funds	Long-Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

ST. JOSEPH HEALTH SYSTEM, HUMBOLDT COUNTY (REDWOOD MEMORIAL HOSPITAL, ST. JOSEPH HOSPITAL) HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
SJ-1	Structural seismic retrofit of hospital facility according to Hospital Campus Master Plan. Construction of new facility to meet seismic standards.	Earthquake	2, 4, 5	OSHPD	High ($.110 M)	Hospital revenues; Health System Support; Grant Funding; Community Donations	Short Term
SJ-2	Non-structural seismic retrofit of hospital facilities according to Hospital Campus Master Plan.	Earthquake	2, 4, 5	OSHPD	High ($3 M)	Hospital revenues; Health System Support; Grant Funding; Community Donations	Short Term
SJ-3	Support County Wide Initiatives that promote the education of the public on the impacts of natural hazards within Humboldt County, and the preparedness for and the mitigation of those impacts. This support will be in the form dissemination of appropriate information to the residents of Humboldt and continuing support/participation in the Humboldt Operational Area Hazards Mitigation Planning Partnership.	All Hazards	4, 6, 7	SJHS-HC	Low	General Revenues; Grant Funding	Ongoing /Short Term
SJ-4	Utilize information provided in the Humboldt County risk assessment to consider emergency management provisions that will reduce the vulnerability to, and enhance the preparedness for the impacts of natural hazards that SJHS-HC has exposure.	All Hazards	2, 4	SJHS-HC	Low	General Revenue; Grant Funding	Long Term

ST. JOSEPH HEALTH SYSTEM, HUMBOLDT COUNTY (REDWOOD MEMORIAL HOSPITAL, ST. JOSEPH HOSPITAL) HAZARD MITIGATION ACTION PLAN MATRIX

Initiative	Mitigation Initiative	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Possible Funding Sources or Resources	Timeline [a]
SJ-5	Continue to coordinate and work with Humboldt County Emergency Management in disaster response and preparedness. This level of coordination should include: updates to the Emergency response plan, development of a post disaster action plan, training and support.	All Hazards	2, 4, 5, 12	SJHS-HC	Low	General Revenue; Grant Funding	Ongoing /Short Term

a. "Short term" = 1 to 5 years; "Long Term"= 5 years or greater

Humboldt Operational Area
Hazard Mitigation Plan Update

APPENDIX C.
PUBLIC OUTREACH

Humboldt County Survey: Hazard Mitigation Planning

1. Where in Humboldt County do you live?

	Response Percent	Response Count
ALDERPOINT/BLOCKSBURG	0.6%	6
ARCATA	10.5%	106
AVENUE OF THE GIANTS (FRUITLAND RIDGE, HOLMES, MIRANDA, MYERS FLAT, PEPPERWOOD, PHILLIPSVILLE, REDCREST, SHIVELY, WEOTT)	1.0%	10
BAYSIDE	2.3%	23
BIG LAGOON	0.1%	1
BLUE LAKE	1.6%	16
BRICELAND	0.4%	4
BRIDGEVILLE/DINSMORE	0.4%	4
CARLOTTA/HYDESVILLE/ALTON/ROHNERVILLE	1.1%	11
CUTTEN	3.6%	36
EUREKA	**33.7%**	**340**
FORT SEWARD/MCCANN/EEL ROCK	0.1%	1
FERNBRIDGE	0.0%	0

FERNDALE	2.4%	24
FIELDBROOK/GLENDALE	1.2%	12
FIELDS LANDING/KING SALMON	0.2%	2
FORTUNA	8.7%	88
FRESHWATER	1.3%	13
GARBERVILLE/REDWAY/BENBOW	2.1%	21
HARRIS/PALO VERDE	0.2%	2
KNEELAND	0.5%	5
KORBEL	0.0%	0
LOLETA/TABLE BLUFF	1.1%	11
MANILA/SAMOA/FAIRHAVEN	1.4%	14
MAPLE CREEK	0.0%	0
MCKINLEYVILLE	11.0%	111
ORICK	0.2%	2
ORLEANS	1.1%	11
PETROLIA/HONEYDEW	0.3%	3
RIO DELL	1.2%	12
SCOTIA/STAFFORD	0.2%	2
SHELTER COVE	4.0%	40

TRINIDAD	0.9%	9
WEITCHPEC	0.1%	1
WESTHAVEN	0.5%	5
WHITETHORN/ETTERSBURG	0.2%	2
WILLOW CREEK	0.6%	6
HOOPA RESERVATION	0.2%	2
YUROK RESERVATION	0.1%	1
Other (please specify)	5.1%	51
	answered question	**1,008**
	skipped question	**0**

2. Do you work in Humboldt County?

	Response Percent	Response Count
Yes	**90.9%**	**884**
No	9.1%	89
	answered question	**973**
	skipped question	**35**

3. Which of the following hazard events have you or has anyone in your household experienced in the past 20 years within Humboldt County? (Check all that apply)

	Response Percent	Response Count
Avalanche	1.0%	10
Dam/Levee Failure	0.3%	3
Drought	8.7%	87
Earthquake	**88.0%**	**882**
Flood	26.3%	264
Hazardous Materials	5.9%	59
Household Fire	7.0%	70
Landslide	15.0%	150
Severe Weather (wind, lightning, winter storm, etc.)	63.4%	635
Tsunami	24.1%	241
Wildfire	17.5%	175
None	5.1%	51
Other (please specify)	4.2%	42
	answered question	**1,002**
	skipped question	**6**

4. How prepared is your household to deal with a natural hazard event?

	Not at all prepared	Somewhat prepared	Adequately prepared	Well prepared	Very well prepared	Not sure	Rating Average	Rating Count
Check one:	8.3% (76)	**50.4% (464)**	22.2% (204)	11.4% (105)	6.8% (63)	0.9% (8)	2.61	920
							answered question	**920**
							skipped question	**88**

5. Which of the following have provided you with useful information to help you be prepared for a hazard event? (Check all that apply)

	Response Percent	Response Count
Emergency preparedness information from a government source (e.g., federal, state, or local emergency management)	60.6%	554
"Living on Shaky Ground/Living on the fault line" courses	38.8%	355
Personal experience with one or more natural hazards/disasters	**65.3%**	**597**
Locally provided news or other media information	49.6%	453
Schools and other academic institutions	18.2%	166
Attended meetings that have dealt with disaster preparedness	32.1%	293
Community Emergency Response Training (CERT)	11.8%	108
Earthquake/Tsunami Exhibit at the County Fair	21.4%	196
Church	2.7%	25
None	3.6%	33

Other (please specify)		13.2%	121
		answered question	**914**
		skipped question	**94**

6. How concerned are you about the following hazards in Humboldt County? (Check one response for each hazard)

	Not Concerned	Somewhat Concerned	Concerned	Very Concerned	Extremely Concerned	Rating Average	Rating Count
Avalanche	**89.6% (790)**	7.9% (70)	2.0% (18)	0.1% (1)	0.3% (3)	1.14	882
Climate Change	**30.5% (273)**	27.5% (246)	19.2% (172)	14.0% (125)	8.7% (78)	2.43	894
Civil Disturbance	**34.8% (308)**	33.2% (294)	20.5% (182)	8.5% (75)	3.0% (27)	2.12	886
Dam/Levee Failure	**62.4% (550)**	24.3% (214)	9.3% (82)	3.4% (30)	0.6% (5)	1.55	881
Disease/Epidemic	25.5% (226)	**38.5% (341)**	25.8% (228)	8.1% (72)	2.0% (18)	2.23	885
Drought	**39.6% (352)**	29.8% (265)	20.0% (178)	8.3% (74)	2.1% (19)	2.03	888
Earthquake	1.5% (14)	8.9% (81)	26.5% (242)	**36.0% (328)**	27.1% (247)	3.78	912
Flood	14.5% (129)	27.6% (246)	**34.7% (309)**	17.2% (153)	6.1% (54)	2.73	891
Hazardous Materials	21.7% (191)	**37.6% (332)**	27.0% (238)	9.6% (85)	4.1% (36)	2.37	882
Household Fire	12.0% (107)	33.3% (297)	**37.5% (334)**	10.9% (97)	6.3% (56)	2.66	891
Landslide	**34.6% (308)**	33.5% (298)	21.1% (188)	8.8% (78)	2.0% (18)	2.10	890
Severe Weather	11.6% (104)	26.9% (242)	**34.7% (312)**	20.6% (185)	6.3% (57)	2.83	900
Tsunami	11.7% (105)	25.1% (226)	**29.9% (269)**	21.7% (195)	11.6% (104)	2.96	899

Wildfire	19.6% (173)	**29.8% (263)**	26.1% (230)	15.5% (137)	9.0% (79)	2.64	882
Other	**78.9% (150)**	4.7% (9)	8.9% (17)	3.7% (7)	3.7% (7)	1.48	190
						(Please specify other natural hazard)	37
						answered question	**920**
						skipped question	**88**

7. Which of the following steps has your household taken to prepare for a hazard event? (Check all that apply)

	Response Percent	Response Count
Received first aid/CPR training	66.9%	614
Made a fire escape plan	43.8%	402
Designated a meeting place	40.0%	367
Identified utility shutoffs	65.8%	604
Stored sand bags	2.5%	23
Prepared a disaster supply kit	44.4%	408
Installed smoke detectors on each level of the house	**83.2%**	**764**
Stored food and water	62.5%	574
Stored flashlights and batteries	76.0%	698
Purchased and learned how to program a NOAA Weather Radio	20.8%	191
Stored a battery-powered radio	44.7%	410
Stored a fire extinguisher	70.6%	648
Stored medical supplies (first aid kit, medications)	63.6%	584
Purchased natural hazard insurance (Flood, Earthquake, Wildfire)	17.1%	157

Established a "defensible space" around your home	28.6%	263
Use of fire resistive landscapes	12.2%	112
Have anchored service utilities to my home (water heater, furnace, wood stove, etc.)	52.8%	485
None	2.2%	20
Other (please specify)	4.4%	40
	answered question	**918**
	skipped question	**90**

8. Of the steps identified in question # 7, do you plan on taking any of these within the next 6 months?

	Response Percent	Response Count
Yes	49.5%	417
No	**50.5%**	**425**
	(please specify)	302
	answered question	**842**
	skipped question	**166**

9. Which of the following methods do you think are most effective for providing hazard and disaster information? (Check all that apply)

	Response Percent	Response Count
Newspaper	49.2%	453
Telephone Book	14.7%	135
Informational Brochures	37.2%	342
City Newsletters	15.7%	144
Public Meetings	32.8%	302
Workshops	33.0%	304
Schools	36.3%	334
TV News	51.3%	472
TV Ads	33.3%	306
Radio News	61.0%	561
Radio Ads	46.3%	426
Internet	**66.2%**	**609**
Outdoor Advertisements	17.9%	165
Fire Department/Rescue	33.7%	310
Law Enforcement	19.7%	181
Church (faith-based institutions)	11.4%	105

CERT Classes	21.0%	193
Public Awareness Campaign (e.g., Flood Awareness Week, Winter Storm Preparedness Month)	48.0%	442
Books	6.8%	63
Chamber of Commerce	6.6%	61
Academic Institutions	18.9%	174
Public Library	20.1%	185
Red Cross Information	36.8%	339
Community Safety Events	37.4%	344
Fair Booths	32.7%	301
Word of Mouth	38.5%	354
Social Media (Twitter, facebook, Linkdin)	41.3%	380
Auto-dial information from "911" center	25.7%	236
Other (please specify)	5.1%	47
	answered question	**920**
	skipped question	**88**

10. Is your property located in or near a FEMA designated floodplain?

	Response Percent	Response Count
Yes	10.9%	100
No	**67.1%**	**617**
Not Sure	22.1%	203
	answered question	**920**
	skipped question	**88**

11. Is your property located within a Tsunami Evacuation Zone?

	Response Percent	Response Count
Yes	14.5%	133
No	**79.3%**	**730**
Not Sure	6.2%	57
	answered question	**920**
	skipped question	**88**

12. Do you have flood insurance?

	Response Percent	Response Count
Yes	6.8%	63
No	**85.9%**	**790**
Not Sure	7.3%	67
	answered question	**920**
	skipped question	**88**

13. Is your property located near an earthquake fault?

	Response Percent	Response Count
Yes	**56.1%**	**516**
No	15.7%	144
Not Sure	28.3%	260
	answered question	**920**
	skipped question	**88**

14. Do you have earthquake insurance?

	Response Percent	Response Count
Yes	15.8%	145
No	**75.7%**	**696**
Not Sure	8.6%	79
	answered question	**920**
	skipped question	**88**

15. Is your property located in an area at risk for wildfires?

	Response Percent	Response Count
Yes	22.6%	208
No	**67.8%**	**624**
Not Sure	9.6%	88
	answered question	**920**
	skipped question	**88**

16. If you own your home, do you carry homeowners insurance on your property?

	Response Percent	Response Count
Yes	**71.6%**	**649**
No	5.2%	47
Not Applicable	23.2%	210
	answered question	**906**
	skipped question	**102**

17. To the best of your knowledge, does your homeowners insurance policy provide coverage for damage from wildfires?

	Response Percent	Response Count
Yes	18.3%	164
No	7.3%	65
Not Sure	**46.9%**	**419**
Not Applicable	27.5%	246
	answered question	**894**
	skipped question	**114**

18. Have you ever had problems getting home owner's or renter's insurance due to risks from natural hazards?

	Response Percent	Response Count
Yes	7.6%	69
No	**79.6%**	**720**
Not Sure	12.7%	115
If "yes," which natural hazard was involved?		62
answered question		**904**
skipped question		**104**

19. Do you have any special access or functional needs within your household that would require early warning or specialized response during disasters?

	Response Percent	Response Count
Yes	5.4%	49
No	**94.6%**	**862**
answered question		**911**
skipped question		**97**

20. If the answer to Question #19 is yes, are you receiving support from such groups as Hospice, the Redwood Regional Agency, Making Headway, or the County Dept. of Health and Human Services, etc.?

	Response Percent	Response Count
Yes	1.1%	8
No	13.8%	103
Not Applicable	**85.2%**	**638**
	answered question	**749**
	skipped question	**259**

21. When you moved into your home, did you consider the impact a natural disaster could have on your home?

	Response Percent	Response Count
Yes	**58.0%**	**517**
No	39.8%	355
Not Sure	2.2%	20
	answered question	**892**
	skipped question	**116**

22. Was the presence of a hazard risk zone (e.g., dam failure zone, flood zone, tsunami evacuation zone, landslide hazard area, high fire risk area) disclosed to you by a real estate agent, seller, or landlord before you purchased or moved into your home?

	Response Percent	Response Count
Yes	25.8%	230
No	**59.0%**	**526**
Not Sure	15.2%	136
	answered question	**892**
	skipped question	**116**

23. Would the disclosure of this type of hazard risk information influence your decision to buy or rent a home?

	Response Percent	Response Count
Yes	**62.1%**	**554**
No	23.9%	213
Not Sure	14.0%	125
	answered question	**892**
	skipped question	**116**

24. If you own a home, how much money would you be willing to spend to retrofit your home to reduce risks associated with disasters? (for example, by elevating a home above the flood level, performing seismic upgrades, or replacing a combustible roof with non-combustible roofing)

	Response Percent	Response Count
$10,000 or above	8.7%	77
$5,000 to $9,999	9.6%	85
$1,000 to $4,999	11.9%	105
Less than $1,000	6.0%	53
Nothing	5.6%	50
Not Sure	26.1%	231
Not Applicable	**32.2%**	**285**
	answered question	**886**
	skipped question	**122**

25. If you own your home, which of the following incentives would encourage you to spend money to retrofit your home to protect against disasters? (Check all that apply)

	Response Percent	Response Count
Insurance premium discount	52.8%	465
Mortgage discount	37.1%	327
Low interest rate loan	31.6%	278
Grant funding	**54.3%**	**478**
"Rebate" program	52.3%	461
None	3.0%	26
Not Applicable	26.2%	231
Other (please specify)	3.6%	32
	answered question	**881**
	skipped question	**127**

26. If your property were located in a designated “high hazard” area or had received repetitive damages from a hazard event, would you consider a "buyout" (the purchase of your home) offered by a public agency?

	Response Percent	Response Count
Yes	**55.8%**	**483**
No	14.6%	126
Not Sure	29.6%	256
	answered question	**865**
	skipped question	**143**

27. How supportive are you of the regulation of land uses within known high hazard areas?

	Response Percent	Response Count
Very supportive	**33.7%**	**298**
Somewhat supportive	27.8%	246
noncommittal	24.5%	217
Not very supportive	9.2%	81
Adamantly oppose	4.8%	42
	answered question	**884**
	skipped question	**124**

28. Who do you think has the primary responsibility for helping people during the first 12 hours after a strong earthquake or other disaster?

	Response Percent	Response Count
Federal Government (FEMA/DHS)	3.8%	33
State Government (CalEMA, CA National Guard)	4.0%	35
Local Government (City/County)	33.5%	292
The people in the area affected (myself, my neighbors)	**58.7%**	**511**
	Other (please specify)	50
	answered question	**871**
	skipped question	**137**

29. What types of projects do you believe the County, State or Federal agencies should be doing in order to reduce damage and disruption from hazard events within Humboldt County? Please rank each option as a high, medium or low priority.

	High	Medium	Low	Rating Average	Rating Count
Retrofit and strengthen essential facilities such as police, fire, schools and hospitals.	**76.0% (663)**	20.2% (176)	3.8% (33)	1.28	872
Retrofit infrastructure such as roads, bridges, drainage facilities, levees, water supply, waste water and power supply facilities.	**83.7% (731)**	14.1% (123)	2.2% (19)	1.18	873
Fund capital projects such as dams, levees, flood walls, drainage improvements and bank stabilization projects.	38.3% (332)	**48.6% (421)**	13.1% (114)	1.75	867
Strengthen codes and regulations to include higher regulatory standards in hazard areas.	32.5% (283)	**45.6% (397)**	21.8% (190)	1.89	870
Acquire vulnerable properties and maintain as open space.	19.5% (168)	38.1% (328)	**42.4% (365)**	2.23	861
Assist vulnerable property owners with securing funding for mitigation.	19.0% (164)	**48.4% (417)**	32.6% (281)	2.14	862
Provide better public information about risk, and the exposure to hazards within the operational area.	**53.0% (456)**	37.9% (326)	9.2% (79)	1.56	861
Implement projects that restore the natural environments capacity to absorb the impacts from natural hazards.	**49.9% (433)**	34.1% (296)	15.9% (138)	1.66	867

Implement projects that mitigate the potential impacts from climate change.	**37.3% (320)**	35.2% (302)	27.4% (235)	1.90	857
				answered question	**878**
				skipped question	**130**

30. Please indicate how you feel about the following statement: It is the responsibility of government (local, state and federal) to provide education and programs that promote citizen actions that will reduce exposure to the risks associated with hazards.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Rating Average	Rating Count
Choose one:	7.0% (62)	7.6% (67)	13.6% (120)	**40.8% (359)**	30.9% (272)	3.81	880
						answered question	**880**
						skipped question	**128**

31. Please indicate how you feel about the following statement: It is my responsibility to educate myself and take actions that will reduce my exposure to the risks associated with natural hazards.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Rating Average	Rating Count
Choose one:	4.3% (38)	0.9% (8)	1.9% (17)	19.3% (171)	**73.5% (650)**	4.57	884
						answered question	**884**
						skipped question	**124**

32. Please indicate how you feel about the following statement: Information about the risks associated with natural hazards is readily available and easy to locate.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree	Rating Average	Rating Count
Choose one:	3.2% (28)	12.7% (112)	15.4% (136)	**46.9% (414)**	21.9% (193)	3.72	883
						answered question	**883**
						skipped question	**125**

33. Please indicate your age range:

		Response Percent	Response Count
Under 18		0.2%	2
18 to 30		9.2%	81
31 to 40		20.1%	176
41 to 50		22.3%	196
51 to 60		**29.1%**	**255**
61 or older		19.0%	167
		answered question	**877**
		skipped question	**131**

34. How many people currently live in your household?

	Response Percent	Response Count
1	15.3%	134
2	**42.5%**	**373**
3	20.2%	177
4	15.0%	132
5	4.4%	39
6	1.5%	13
7 or more	1.1%	10
	answered question	**878**
	skipped question	**130**

35. Please indicate the primary language spoken in your household.

	Response Percent	Response Count
English	**99.3%**	**870**
Spanish	0.3%	3
Other Indo-European Languages	0.0%	0
Asian and Pacific Island Languages	0.0%	0
Other (please specify)	0.3%	3
	answered question	**876**
	skipped question	**132**

36. Please indicate your gender:

	Response Percent	Response Count
Male	40.3%	349
Female	**59.7%**	**518**
	answered question	**867**
	skipped question	**141**

37. Please indicate your highest level of education.

	Response Percent	Response Count
Grade school/No schooling	0.1%	1
Some high school	0.3%	3
High school graduate/GED	5.5%	48
Some college/Trade school	27.1%	238
College degree	**45.7%**	**402**
Graduate degree	20.5%	180
Other (please specify)	0.8%	7
	answered question	**879**
	skipped question	**129**

38. How long have you lived in Humboldt County?

	Response Percent	Response Count
Less than 1 year	2.2%	19
1 to 5 years	8.3%	73
6 to 10 years	11.9%	105
11 to 20 years	24.6%	216
More than 20 years	**53.0%**	**466**
	answered question	**879**
	skipped question	**129**

39. Do you own or rent your place of residence?

	Response Percent	Response Count
Own	**73.0%**	**636**
Rent	27.0%	235
	answered question	**871**
	skipped question	**137**

40. How much is your gross household income?

	Response Percent	Response Count
$20,000 or less	2.8%	24
$20,001 to $49,999	**30.0%**	**257**
$50,000 to $74,999	27.7%	237
$75,000 to $99,999	18.0%	154
$100,000 or more	16.8%	144
Not Sure	4.7%	40
	answered question	**856**
	skipped question	**152**

41. Do you have regular access to the Internet?

	Response Percent	Response Count
Yes	**96.4%**	**840**
No	3.3%	29
Not Sure	0.2%	2
	answered question	**871**
	skipped question	**137**

42. Comments

	Response Count
	163
answered question	**163**
skipped question	**845**

Humboldt Operational Area
Hazard Mitigation Plan Update

APPENDIX D.
2008 TO 2013, 5-YEAR PROGRESS REPORT

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2008 TO 2013, 5-YEAR PROGRESS REPORT

SUMMARY OVERVIEW OF PROGRESS

The performance period for the *Humboldt Operational Area Hazard Mitigation Plan* began on January 25, 2008, with final approval of the plan by Region IX of the Federal Emergency Management Agency (FEMA). The performance period was 5 years, through January 2013, with an anticipated update to the plan to occur in 2013. The Hazard Mitigation Plan targeted 272 hazard mitigation initiatives to be pursued by participating planning partners during the performance period. As of the end of the period, the following overall progress can be reported:

- 39 out of 272 initiatives (14 percent) were reported as being complete.
- 147 out of 272 initiatives (54 percent) were reported as having ongoing action toward completion.
- 86 out of 272 initiatives (32 percent) were reported as having no action taken.
- The overall plan is considered to be 68 percent complete.

This progress report covers the full 5-year performance period. It was prepared by the Hazard Mitigation Planning Team. In accordance with Section 7.1 of the Hazard Mitigation Plan, the Hazard Mitigation Steering Committee reviewed and approved the report on May 1, 2013.

BACKGROUND

Humboldt County and its planning partners developed the *Humboldt Operational Area Hazard Mitigation Plan* to identify resources, information and strategies for reducing risk from natural hazards. The plan was developed in response to the federal Disaster Mitigation Act of 2000, which required state and local governments to develop hazard mitigation plans in order to be eligible for federal grant assistance. From July 2006 to October 2007, the planning partners organized resources, assessed risks from natural hazards, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address the probable impacts of natural hazards in the Humboldt Operational Area. By completing this process, the planning partners maintained their compliance with the Disaster Mitigation Act and thus remained eligible for hazard mitigation grant funding under the Robert T. Stafford Act. Copies of the plan are available to the public throughout the Humboldt County Public Library system. The plan can be viewed on-line at http://co.humboldt.ca.us/natural-resources/hazardmitigation/

Purpose of the Progress Report

The purpose of this progress report is to provide the governing bodies of the planning partners, stakeholders, and the citizens of the Humboldt Operational Area a report on implementation of the action plan identified in the Hazard Mitigation Plan. The objective of this evaluation is to ensure a continuing planning process that will keep the Hazard Mitigation Plan dynamic and responsive to the needs and capabilities of the planning partners as well as providing the Steering Committee information on needs for improvements through the plan update process. This report discusses the following:

- Hazard events that occurred within the performance period
- Changes in risk exposure within the planning area
- Changes in capability within the planning area that could impact plan implementation

- Mitigation success stories
- Review of the action plan
- Recommendations for changes or enhancements.

The Steering Committee

A steering committee made up of planning partners and stakeholders in the planning area oversaw development of the Hazard Mitigation Plan, and it was decided that a steering committee would remain in place to oversee maintenance of the plan, as established in Chapter 7. This body is organized according to established ground rules, but its membership is dynamic. Membership turnover is monitored via the progress reporting mechanism. The Steering Committee's role in overall plan implementation is also dynamic, based on the planning area's hazard mitigation needs. At a minimum, the Steering Committee provides technical review and oversight on the development of a progress report. Table 1 lists the current Steering Committee membership.

TABLE 1.
STEERING COMMITTEE MEMBERS

Name	Jurisdiction/Agency	Title
Jay Parrish[a]	City of Ferndale	City Manager
Hank Seeman[b]	Humboldt County	Director of Public Works
Bill Gillespie	City of Eureka	Assistant Fire Chief
Karen Diemer	City of Arcata	Deputy Director of Environmental Services
Lou Iglesias	Weott Community Services District	District Board Member
John Friedenbach	Humboldt Bay Municipal Water District	Business Manager
Daniel Larkin	Humboldt County Office of Emergency Services	Emergency Services Coordinator
Jody Brundin	Blue Lake Rancheria Office of Emergency Services	Emergency Manager
Chris Jones Koczera	Red Cross Humboldt County Chapter	Disaster Chair
Stephen Underwood	Fortuna Fire Protection District	
Desmond Cowan	Arcata Fire Protection District	Assistant Fire Chief
Judith A. Warren	Humboldt State University, Regional Training Institute; Community Disaster Preparedness	Regional Coordinator
Tom Nix	Cal Fire	Battalion Chief
Allison Talbott	Pacific Gas and Electric	Government Relations

a. Steering Committee Chairperson b. Steering Committee Vice Chairperson

HAZARD EVENTS DURING THE PERFORMANCE PERIOD

The following hazard events occurred within the planning area during the performance period:

- Declared Emergencies:

- **December 6, 2007 – October 28, 2008:** The Martins Ferry Bridge was closed due to structural instability, causing some residents of the Weitchpec area to be virtually isolated. An extensive effort to open a detour route on Dowd Road commenced and lasted through April 2008. Bridge repairs continued through the end of 2008. The County received a Gubernatorial Proclamation.
- **June 20, 2008 – October 21, 2008:** A lightning storm produced many hundreds of wildfires throughout Northwestern California. In Humboldt County, an initial significant fire near Shelter Cove (Paradise Fire) resulted in partial evacuations and a concerted firefighting response. A later significant fire south of Willow Creek (Hells Half Fire) also resulted in evacuations and firefighting efforts. Due to the many large fires burning in and near Humboldt County, a significant health hazard to the public due to smoke was recognized and addressed. The smoke issue was most acute in the Hoopa, Karuk, and Yurok tribal areas or northeastern Humboldt County. The County received a Gubernatorial Proclamation.
- **July 21, 2009 – November 10, 2009:** The County Emergency Operation Center (EOC) partially activated to support the Board of Supervisors' proclamation of a local emergency in the Redway Community Services District. Extended drought conditions and river water channel movement diminished the District's ability to supply adequate water to Redway-area residents. State resources were leveraged to support the District's water collection improvements.
- **January 9, 2010:** A Magnitude-6.5 earthquake occurred offshore from central Humboldt County. Approximately 30 people visited hospitals for minor injuries, and one major injury was reported. Damage to homes and commercial buildings was greatest in Eureka (foundation damage, cracked walls and driveways, toppled chimneys). Total damage to county roads was $3.3 million. The County received a Gubernatorial Proclamation as a state-declared disaster.
- **March 11, 2011:** The EOC activated in response to a tsunami warning issued for the coastal areas of California. The tsunami was a result of the Magnitude-9.0 great Tohuku earthquake that occurred off the east coast of the Japanese island of Honshu. Some residents of low-lying areas voluntarily evacuated. Many significant water fluctuation cycles were recorded, but there were no reports of damage or injuries in Humboldt County. The County received a Gubernatorial Proclamation as a state-declared disaster.
- **March 30, 2011:** March 2011 storms were a state-declared disaster, after the monthly rainfall total (11.88 inches in Eureka) was the third highest for the month of March in recorded history. The storms caused extensive damage to public roads and impacted agricultural and dairy lands and other public and private property. Total damage to county roads was $18 million. A massive landslide south of Blocksburg created a debris dam of earth and trees in Dobbyn Creek that diverted water onto Alderpoint Road and required major flood control efforts. A large landslide in the headwaters of Francis Creek south of Ferndale caused a major discharge of sediment and contributed to severe downstream flooding. A large landslide north of Redway near Dean Creek closed Highway 101 for several days and required over $8 million in clean up and repair.

- Non-Declared Emergencies:
  - **January 12, 2007:** A Magnitude-8.2 earthquake in the Kuril Islands resulted in a small tsunami striking the Humboldt County coastline. There was no damage reported in Humboldt County.

- **September 29, 2009:** A Magnitude-8.0 earthquake off the coast of American Samoa resulted in a small tsunami striking the Humboldt County coastline. There was no damage reported in Humboldt County.
- **February 27, 2010:** A Magnitude-8.8 off the coast of southern Chile resulted in a small tsunami striking the Humboldt County coastline. There was no damage reported in Humboldt County.

CHANGES IN RISK EXPOSURE IN THE PLANNING AREA

The Hazard Mitigation Plan addressed the probable impacts of the following natural hazard events in the planning area:

- Dam failure
- Drought
- Earthquake
- Fish losses
- Flood
- Landslide and other mass movements
- Severe weather
- Tsunami
- Wildland fire.

No natural hazard event occurred in the planning area during the performance period that would alter or change the probability of occurrence or ranking of risk for the natural hazards addressed by the Hazard Mitigation Plan.

CAPABILITY CHANGES IN THE PLANNING AREA

During the performance period, there were no significant capability changes of jurisdictions in the planning area that would have a profound impact on implementation of the plan. All technical, regulatory and financial capabilities identified by the planning partners during the plan's development remain in place.

MITIGATION SUCCESS STORIES

Firewise Communities

The National Fire Protection Association's Firewise Communities program teaches people how to adapt to living with wildfire and encourages neighbors to work together and take action to prevent losses. The program provides many tools and resources to communities. While Humboldt County is not an eligible entity for recognition as a Firewise Community it has assisted local communities in the recognition process. County staff coordinates with Cal Fire staff to provide technical and education support for local communities working to become recognized Firewise Communities. Six communities in Humboldt County have successfully achieved and maintained Firewise recognition: Bridgeville, Honeydew, Orleans, Petrolia, Upper Jacoby Creek, and Willow Creek.

Firewise assessments and action plans serve as excellent tools for communities to collaboratively learn about and identify actions to address local wildfire hazards. Firewise provides an opportunity for

communities to raise awareness about wildfire risks and to showcase what they are doing to mitigate those risks. Community Firewise events have been used in Humboldt County to share the results of successful projects such as a new or updated local fire plan, educational brochures or videos, or mechanical treatments and prescribed burns to manage hazardous vegetation and improve health.

Managing Wildfire Fuels

Humboldt County has received $495,000 in grant funds from the U.S. Forest Service to support the Fire-Adapted Landscapes and Safe Homes (FLASH) program. The program encourages property owners to mitigate wildfire hazards through vegetation management by awarding a rebate for the creation of defensible space around homes and strategic fuel breaks along escape routes and high-risk areas.

Thus far, hazardous vegetation on slightly over 350 acres of land has been treated to reduce the wildfire risk for homesteads and access routes. Nearly 200 landowners completed work on their properties or are currently enrolled in the program. By the end of the year, 150 additional acres are slated for treatment. This program has significantly mitigated wildfire hazards for participating property-owners and has provided a lasting education that will result in continued vegetation management. There have also been indirect mitigation benefits as participants learn about and implement other fire-safe actions, such as hardening their home ignition zone with fire-resistant building materials, fire-safe landscaping, and improved firefighting water systems. These actions are all recommended as part of a home risk assessment associated with the FLASH program.

Tsunami and Earthquake Hazard Mitigation

The Redwood Coast Tsunami Work Group (RCTWG), formed in 1996, is an organization of local, state, tribal and federal agencies, nongovernmental organizations, and businesses from Del Norte, Humboldt and Mendocino Counties that works to mitigate the regional earthquake and tsunami hazard. RCTWG efforts include multi-agency coordination to develop clear, consistent messaging and community preparedness and education outreach programs. The Western States Seismic Policy Council recognized the RCTWG for its mitigation efforts in 2009 with an award in Excellence for Innovation.

RCTWG has developed educational materials and programs, including the Living on Shaky Ground preparedness magazine and class, regionally specific tsunami brochures in English and Spanish, and community outreach at fairs and workshops. RCTWG member entities have achieved Tsunami Ready status for five communities in Humboldt County and have assisted communities in organizing and conducting evacuation drills to prepare for a tsunami emergency. They have also taken a leadership role in the annual execution of the largest and most comprehensive test of the tsunami warning system in the nation for the past five years. The RCTWG, working closely with the California Geological Survey, has contributed to mapping of the tsunami risk for Humboldt County, developing evacuation maps. The group has provided technical support for the installation of over 400 tsunami signs to educate the public about the tsunami zone.

Seismic Retrofits

In response to significant earthquake hazards, many jurisdictions in Humboldt County have taken action in the past five years to mitigate their risk of damage. Ten jurisdictions have taken steps toward seismic retrofitting critical facilities, such as water storage areas, fire stations, emergency operation centers, and wastewater treatment facilities. This is important work for Humboldt County which is subject to seismic activity. The intersection of three tectonic plates—the North American Plate, the Pacific Plate, and the Gorda Plate—takes place just off the shore of Cape Mendocino. This tectonic intersection, known as the Mendocino Triple Junction, has the highest concentration of earthquake events anywhere in the continental United States. The local seismic setting has the potential to cause significant ground shaking,

which can lead to liquefaction and subsidence hazards, near-shore tsunamis, landslide hazards, and surface fault ruptures.

Improvements in Emergency Services

A Type 2 urban search and rescue (USAR) team has been established within the Humboldt Operational Area after years of planning, supported by significant training efforts, grant funding, and the placement locally of a California Emergency Management Agency (CalEMA) medium-cache USAR trailer. This is an important capacity for this earthquake-prone area that has the potential for being cut off from larger population centers after a large event. Citizens will need to depend on their own resources, and post-earthquake search and rescue in urban areas will be very important.

Also, two technical rescue teams are operating in the planning area, which is a related capability improvement. Another emergency-services improvement is the establishment of a regional fire training facility in Eureka. In 2012, the regional fire training facility received state accreditation as a Rescue Systems 2 training site, making it one of the only sites in Northern California certified to teach these upper-level USAR and technical rescue courses. Over the course of 2012, training workshops were successfully conducted in the planning area to improve incident and interoperability communication between entities and to improve incident management and emergency operation center function. In November 2012, a large-scale training simulation partially coordinated by CalEMA was held in Eureka and Samoa, depicting a major near-shore earthquake. Local resources from across Humboldt County participated, as did CalEMA engines from Mendocino and Sonoma counties, the Marin USAR team, and the Marin Incident Management Team. All efforts have improved emergency services within the county.

Hazard Mitigation Grants

Humboldt Bay Municipal Water District

The Humboldt Bay Municipal Water District (HBMWD) was successful in obtaining one Hazard Mitigation Grant and is in the process of finalizing the National Environmental Protection Act analysis for a second Hazard Mitigation Grant. Funding in the amount of $2.85 million was obtained to replace approximately 10,000 feet of HBMWD's 18-inch Techite pipeline from the Terminal Reservoir on Samoa to the Humboldt Bay Crossing, just before the pipe goes under the bay to the Humboldt Community Services District's (HCSD) Truesdale Pump Station. The existing Techite pipeline provides domestic water to approximately 7,400 people, including residents of the Samoa Peninsula and approximately 60 percent of the total domestic water used by the HCSD. The pipeline also provides an emergency intertie for the City of Eureka, which helps maintain Eureka's water supply in the event that an earthquake or other event damaged Eureka's primary water transmission lines. Techite is a fiberglass-wound pipe that has been found to fail catastrophically, leading to several lawsuits and the discontinuation of its production. This was one of the most important capital improvement projects identified by HBMWD, due to the pipeline's likelihood of failure, particularly during a large earthquake, and the potential resulting catastrophic and wide-ranging impact. The Hazard Mitigation Grant helps ensure project implementation and helps offset rate increase impacts on the community.

HBMWD is in the final processes of obtaining a Hazard Mitigation Grant to replace the Mad River crossing of the domestic water transmission main that feeds the City of Blue Lake and the Fieldbrook-Glendale Community Services District. The water supply pipeline to these communities currently crosses the Mad River as a 14-inch ductile iron pipe attached to a 1930s-era North Coast Railroad Authority bridge, which was not built to modern seismic standards. The bridge has not been used or maintained for many years, and if it fails, it will damage the HBMWD's pipeline and interrupt the sole domestic water service to Fieldbrook and Blue Lake. Inspections found the railroad bridge to be in substandard condition and near the end of its functional life. This project will replace the bridge with an aerial overcrossing

designed to meet current seismic codes. The $2.27 million in Hazard Mitigation Grant funds will help ensure the replacement of this critical piece of Infrastructure.

City of Fortuna

The City of Fortuna is in the process of finalizing paperwork for a $453,000 Hazard Mitigation Grant for the City's Wastewater Treatment Plant Flood Protection Project. The City's treatment plant is located on the banks of the Eel River, and portions of the plant are constructed within the FEMA 100-year floodplain. In addition, the City's gravity effluent outfall to Strongs Creek is below the 100-year flood elevation, which prevents discharge of treated effluent during some flood events. The City is proposing a flood protection project that includes a berm around the plant and construction of a treated effluent pump station. The pumps would be designed to supply pressure to the existing Strongs Creek effluent pipeline to allow the treatment plant to discharge during flood events.

Mad River Streambank Protection Project

Humboldt County completed a streambank stabilization project in 2008 along the right bank of the lower Mad River west of McKinleyville with funding from the USDA Natural Resources Conservation Service, the Governor's Office of Emergency Services, and adjacent landowners. Approximately 1,300 feet of streambank was damaged in December 2005 and January 2006 by high flows caused by severe storms, which were a federal- and state-declared disaster. The top of the bluff eroded to within 15 feet of a residence and was close to several other residences as well as public infrastructure (roads and water utilities). The project incorporated rock slope protection along with bioengineered components (live willow plantings) to enhance erosion resistance and stability for the damaged streambank while providing fish habitat and water quality benefits. Total project cost was $1.6 million.

Arcata-Eureka Airport Bluff Stabilization Project

Humboldt County completed a bluff stabilization project in 2012 near the end of one of the primary runways at the Arcata-Eureka Airport to remediate cumulative losses of the runway safety area due to erosion and landsliding. Work included mechanically stabilized earth walls up to 70 feet high.

Emergency Water, Power and Communication Capabilities

Due to the remoteness of Humboldt County and limited accessibility through surrounding terrain, there is a strong possibility that communities could become cut off from outside aid and isolated from one another in the event of a catastrophic disaster. This possibility emphasizes the need for communities to be prepared for self-reliance for some time following a major disaster. Seven jurisdictions in Humboldt County have made such preparations within the last five years, prioritizing the acquisition of standby emergency power generators and building extra water storage supplies to ensure that critical facilities remain functional in such an event. Five jurisdictions have improved their alternative communication capabilities, including emergency transceivers, satellite telephones, and ham radios. This redundancy enhances the likelihood of being able to coordinate resources and assistance during a disaster, within the County and beyond.

REVIEW OF THE ACTION PLAN

Table 2 reviews the action plan for each planning partner, listing the status of each initiative. Part 4 of the plan provides more detailed descriptions of each initiative and the prioritization process. The table indicates the following for each initiative:

- Was any element of the initiative carried out during the performance period?

- If no action was completed, why?
- Is the timeline for implementation of the initiative still appropriate?
- If the initiative was completed, does it need to be changed or removed from the action plan?

RECOMMENDATIONS FOR CHANGES OR ENHANCEMENTS

The Hazard Mitigation Steering Committee has used this progress report as the basis for revising the Hazard Mitigation Plan during the plan update process in 2013. The changes are chronicled in Volume 1, Chapter 2 of the updated plan.

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
CITY OF ARCATA (A)				
A-1: Designate, prepare and announce emergency assembly points throughout the City.				
Yes	Short Term	No		Ongoing
A-2: Adopt a long-term capital improvement plan.				
Yes	Long Term	No		Ongoing
A-3: Improve hillside stability in landslide-prone areas utilizing feasible approaches that provide the highest degree of benefit for the least cost.				
No	Long Term	No		No Progress
A-4: Conduct an updated dam failure flood routing analysis for City of Arcata Dam #2.				
Yes	Long Term	Yes		Ongoing
A-5: Prepare a post-disaster recovery plan.				
Yes	Short Term	No		Ongoing
A-6: Install emergency water inter-ties between neighboring jurisdictions.				
Yes	Short Term	No		Ongoing
A-7: Develop ring levees around at-risk critical facilities.				
Yes	Long Term	No		Ongoing
A-8: Perform seismic retrofits of critical facilities.				
Yes	Long Term	No		Ongoing
A-9: Work with the NOAA to attain the certifications of Storm Ready and Tsunami Ready.				
Yes	Short Term	No		Ongoing
A-10: Perform preventive maintenance of Jane's Creek and other drainage ways.				
Yes	Short Term	Yes		Ongoing
A-11: Adopt International Building Code.				
Yes	Short Term	No		Complete
A-12: 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.				
Yes	Short Term	Yes		Ongoing
A-13: Adopt an updated emergency response plan				
Yes	Short Term	Yes		Ongoing
A-14: Establish a warning system for dam failure				
Yes	Short Term	No		Ongoing
A-15: Update City land use code for seismic setbacks/structural requirements and hillside development standards				
Yes	Short Term	No		Complete
A-16: Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTs and BESTs) throughout Arcata				
Yes	Short Term	Yes		Ongoing

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
A-17: Update floodplain mapping throughout the City, including continued participation with the National Flood Insurance Program				
Yes	Short Term	No		Ongoing
A-18: Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.				
Yes	Short Term	Yes		Ongoing
A-19: Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.				
Yes	Short Term	No		Ongoing
A-20: 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.				
Yes	Short Term	Yes		Complete
A-21: Raise flood-prone areas adjacent to West End Road to an elevation that will not be inundated during flood events.				
Yes	Long Term	No		Ongoing
A-22: For emergency preparedness, implement offsite parking for corporation yard equipment.				
Yes	Short Term	No		Ongoing
A-23: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing
CITY OF BLUE LAKE (BL)				
BL-1: Adopt a long-term capital improvements plan				
Yes	Short Term	No		Ongoing
BL-2: Prepare a post-disaster recovery plan				
Yes	Short Term	No		Ongoing
BL-3: Adopt International Building Code 2008				
Yes	Short Term	No		Complete
BL-4: Install emergency water inter-ties between neighboring jurisdictions				
Yes	Short Term	Yes		Ongoing
BL-5: Support county-wide initiatives in the Humboldt Operational Area Hazard Mitigation Plan				
Yes	Short Term	No		Ongoing
BL-6: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing
CITY OF EUREKA (E)				
E-1: Replace/retrofit Eureka Fire Main Station and Emergency Operations Center (same location) to provide seismic strengthening to maintain essential emergency services.				
Yes	Short Term	No		Ongoing
E-2: Reconstruct Dock B to provide seismic strengthening to reduce risk of structural failure and sustain needed economic infrastructure.				
No	Short Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
E-3: Construct Corporation Yard improvements to reduce risk of structural failure and increase efficiency and operations during natural disaster.				
Yes	Short Term	No		Ongoing
E-4: Construct Eureka Municipal Airport improvements to provide for increased use, safety and security of airport during a natural disaster.				
Yes	Long Term	No		Ongoing
E-5: Construct a fire manipulative training facility in a central location to train emergency responders.				
Yes	Short Term	No		Ongoing
E-6: Construct Fire Station 3 and 4 improvements to increase capacity for emergency apparatus and equipment and personnel.				
Yes	Short Term	No		Ongoing
E-7: Replace/retrofit/upgrade and clean up fuel terminal facility to improve safety, minimize environmental impacts, and provide a more reliable fuel system.				
Yes	Short Term	No		Complete
E-8: Construct Martin Slough Enhancement Project to reduce property and environmental damage caused by flooding.				
Yes	Short Term	No		Ongoing
E-9: Construct Police Station Modifications to improve security and efficiency.				
Yes	Long Term	No		Ongoing
E-10: Install, replace and repair or relocate storm drainage facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding.				
Yes	Short Term	No		Ongoing
E-11: Repair and replace sewer lift station facilities to improve environmental protection of Humboldt Bay during severe weather events and flooding.				
Yes	Short Term	No		Ongoing
E-12: Construct Martin Slough Sewer Interceptor to protect and improve efficiency, safety and reliability of wastewater collection and transport system.				
Yes	Short Term	No		Ongoing
E-13: Construct standby emergency power generator to ensure wastewater treatment plant is operational during critical emergencies and disasters.				
Yes	Long Term	No		Ongoing
E-14: Construct extended fuel storage facilities to provide adequate fuel storage at additional locations during periods of extended power outage.				
No	Long Term	No		No Progress
E-15: Construct Mad River Water Pipeline project to strengthen system and ensure safe and reliable provision of public water to citizens and emergency service agencies.				
Yes	Short Term	No		Ongoing
E-16: Construct Water Reservoir Maintenance and Security Improvement Project for seismic strengthening and to improve security and safety for Eureka's emergency water supply				
Yes	Short Term	No		Ongoing

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
E-17: Implement storm water management plan to educate public about controlling/improving flooding events and water quality in the City.				
Yes	Short Term	No		Ongoing
E-18: Create and maintain a hazard mitigation informational web page on the City's website.				
Yes	Short Term	No		Ongoing
E-19: 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.				
Yes	Short Term	No		Ongoing
E-20: 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.				
Yes	Short Term	No		Ongoing
E-21: 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.				
Yes	Short Term	No		Ongoing
E-22: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing
CITY OF FERNDALE (F)				
F-1: Designate, prepare and announce emergency assembly points throughout the City.				
Yes	Short Term	No		Ongoing
F-2: Adopt a long-term capital improvement plan				
Yes	Long Term	No		Ongoing
F-3: Improve hillside stability in landslide-prone by improving drainage and planting plants that protect soil and retaining walls where needed.				
Yes	Long Term	No		Ongoing
F-4: Prepare a post-disaster recovery plan				
Yes	Short Term	No		Ongoing
F-5: Develop ring levees around at risk facilities				
Yes	Short Term	No		Ongoing
F-6: Perform seismic retrofits of critical facilities, such as the public works facility and the wastewater facility				
Yes	Short Term	No		Ongoing
F-7: Work with NOAA to attain the certificates of Storm Ready and Tsunami Ready				
Yes	Short Term	No		Ongoing
F-8: Perform preventive maintenance for Francis Creek				
Yes	Short Term	No		Ongoing
F-10: Establish redundant communication capabilities throughout the city.				
Yes	Short Term	No		Ongoing
F-11: Adopt an updated emergency response plan				
Yes	Short Term	No		Ongoing

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
F-12: Update City Land Use Code for seismic setbacks/structural requirements and hillside development standards				
Yes	Short Term	No		Ongoing
F-13: Update floodplain mapping throughout the City, including continued participation with National Flood Insurance Program				
Yes	Short Term	No		Ongoing
F-14: Maintain National Incident Management System and Incident Command System training for City staff				
Yes	Short Term	No		Ongoing
F-15: Obtain and distribute current information about local natural hazards risk and emergency preparedness, including creating and maintaining current website information				
Yes	Short Term	No		Ongoing
F-16: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing
CITY OF FORTUNA (FO)				
FO-1: Protect City's major water supply storage from landslides and earthquake damage. CIP Project #s 9124 & 9327.				
Yes	Short Term	No		Complete
FO-2: Localized detention basin at Strongs Creek headwaters. CIP Project #9603				
No	Long Term	No		No Progress
FO-3: Localized detention basin at Rohner Creek headwaters. CIP Project #9602				
Yes	Short Term	No		Complete
FO-4: Construct flap gate valves at various locations throughout City to prevent backwater inundation from major creek channel high water conditions.				
No	Short Term	No		No Progress
FO-5: Increase channel capacity through bank elevation improvements at localized regions of repetitive flooding incidents. CIP Project #9704				
No	Long Term	No		No Progress
FO-6: Vegetation clearing of existing drainage courses including ditches and creek channels. CIP Project 9709.				
Yes	Short Term	No		Ongoing
FO-7: Stabilize hillsides from mass landslide movements at or adjacent to street right-of-ways.				
Yes	Long Term	No		Ongoing
FO-8: Rohner Creek bypass. CIP Project #9601				
Yes	Short Term	Yes		Ongoing
FO-9: Rohner Creek widening. CIP Project #9600				
Yes	Short Term	No		Ongoing
FO-10: New 48" storm drain at Third Street at Stockyard. CIP Project #9702.				
No	Short Term	No		No Progress
FO-11: Detention Basin on Mill Creek. CIP Project #9804.				
No	Long Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
FO-12: Detention basin cleaning. CIP Project #9601.				
Yes	Short Term	No		Ongoing
FO-13: Dinsmore Drive flood control. CIP Project #9502.				
No	Long Term	No		No Progress
FO-14: Elevate emergency generator at water supply/treatment facility above 100-year flood elevation.				
Yes	Short Term	No		Complete
FO-15: Strong's Creek bypass at US 101 box culvert to Riverwalk Detention Basin.				
No	Long Term	No		No Progress
FO-16: Circle levee at water supply/treatment facility above 100-year flood elevation				
Yes	Short Term	No		Ongoing
FO-17: Seismic retrofit of at-grade water storage tanks (250,000 & 1 million gallons).				
No	Long Term	No		No Progress
FO-18: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Long Term	No		Ongoing
CITY OF RIO DELL (RD)				
RD-1: Chlorine generation equipment replacement and seismic retrofit				
Yes	Short Term	No		Complete
RD-2: Upgrade pumps at headworks				
Yes	Short Term	No		Complete
RD-3: Improvements to wastewater collection system mains, laterals, and manholes				
Yes	Long Term	No		Ongoing
RD-4: Wastewater lift stations maintenance and upgrades				
Yes	Short Term	Yes		Ongoing
RD-5: Install stormproof fuel storage tanks				
Yes	Short Term	No		Complete
RD-6: Belleview Creek crossing repair				
Yes	Short Term	No		Complete
RD-7: Painter Street to Highway 101 drainage ditch repair				
Yes	Long Term	No		Ongoing
RD-8: Center Street to Painter Street culvert improvements				
No	Long Term	No		No Progress
RD-9: City Hall seismic retrofit				
No	Long Term	No		No Progress
RD-10: Fireman's Hall seismic retrofit				
No	Long Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
RD-11: City standby power generation capabilities				
Yes	Short Term	Yes		Ongoing
RD-12: Fire sprinkler installation at City Hall and Fireman's Hall				
No	Long Term	No		No Progress
RD-13: Construct retaining wall on road to Dinsmore				
No	Long Term	No		No Progress
RD-14: Elevate wastewater plant				
Yes	Short Term	No		Complete
RD-15: Designate, prepare and announce emergency assembly points throughout the City.				
Yes	Short Term	No		Ongoing
RD-16: Adopt a long-term capital improvement plan				
Yes	Short Term	No		Ongoing
RD-17: Improve hillside stability in landslide-prone areas				
No	Long Term	No		No Progress
RD-18: Prepare a post-disaster recovery plan				
No	Short Term	No		No Progress
RD-19: Install emergency water interties between neighboring jurisdictions				
Yes	Long Term	No		Ongoing
RD-20: Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.				
No	Short Term	No		Ongoing
RD-21: Adopt International Building Code of January 1, 2008				
Yes	Short Term	No		Complete
RD-22: 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.				
Yes	Short Term	No		Ongoing
RD-23: Adopt an updated emergency response plan				
Yes	Short Term	No		Ongoing
RD-24: Update City land use code for seismic setbacks/structural requirements and hillside development standards				
Yes	Short Term	No		Ongoing
RD-25: Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Rio Dell				
Yes	Short Term	No		Ongoing
RD-26: Update floodplain mapping throughout the City, including continued participation with the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
RD-27: Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.				
Yes	Short Term	No		Ongoing
RD-28: Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.				
No	Short Term	Yes		No Progress
RD-29: Develop focused storm drainage facility plans and implement drainage improvements.				
Yes	Short Term	No		Ongoing
RD-30: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing
CITY OF TRINIDAD (T)				
T-1: Designate, prepare and announce emergency assembly points throughout the City.				
No	Short Term	No		No Progress
T-2: Adopt a long-term capital improvement plan				
Yes	Long Term	No		Ongoing
T-3: Improve hillside stability in landslide-prone areas				
No	Long Term	No		No Progress
T-4: Prepare a post-disaster recovery plan				
Yes	Short Term	Yes		Complete
T-5: Obtain emergency water supplies				
No	Long Term	No		No Progress
T-6: Perform seismic retrofits of critical facilities				
No	Long Term	No		No Progress
T-7: Work with the National Oceanic and Atmospheric Association to attain the certifications of Storm Ready and Tsunami Ready.				
No	Long Term	No		No Progress
T-8: Adopt International Building Code of January 1, 2008				
Yes	Long Term	Yes		Complete
T-9: Improve alternative communication capabilities throughout the City, including acquisition of emergency transceivers, satellite telephones, and/or other communication devices.				
Yes	Short Term	No		Ongoing
T-10: Adopt an updated emergency response plan				
Yes	Short Term	No		Complete
T-11: Update City land use code for seismic setbacks/structural requirements and hillside development standards				
No	Long Term	No		Ongoing
T-12: Promote the formation of Community Emergency Response Teams (CERTs) and Neighborhood and Business Emergency Services Teams (NESTS and BESTs) throughout Trinidad				
No	Long Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
T-13: Maintain National Incident Management System, State Emergency Management System, and Incident Command System training for City staff.				
No	Long Term	No		No Progress
T-14: Support and participate in the Redwood Coast Tsunami Work Group and other hazard mitigation groups in the region.				
No	Long Term	No		No Progress
T-15: 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.				
No	Long Term	No		No Progress
T-16: For emergency preparedness, implement offsite parking/storage for City equipment.				
No	Long Term	No		No Progress
T-17: Consider participation in the National Flood Insurance program when/if special flood hazard areas are designated by FEMA for the City of Trinidad.				
No	Long Term	No		No Progress
HUMBOLDT COUNTY (HC)				
HC-1: FEMA training in benefit/cost analysis				
Yes	Short Term	No		Ongoing
HC-2: Join CRS program				
No	Long Term	Yes		No Progress
HC-3: Obtain Firewise certification				
Yes	Short Term	No		Ongoing
HC-4: Draft and adopt a post-disaster action plan				
No	Long Term	Yes		No Progress
HC-5: Develop, map, and communicate evacuation routes for all applicable hazards				
No	Long Term	Yes		No Progress
HC-6: Identify priority locations for landslide mitigation projects and 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)				
No	Short Term	No		No Progress
HC-7: Update post-disaster recovery ordinance				
No	Short Term	Yes		No Progress
HC-8: Implement priority recommendations from the Humboldt County Master Fire Protection Plan				
Yes	Short Term	No		Ongoing
HC-9: Evaluate flood zones for the establishment of base flood elevations				
Yes	Long Term	No		Ongoing
HC-10: Adopt International Building Code pursuant to state mandate as soon as it is adopted by the state.				
Yes	Short Term	No		Complete

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
HC-11: 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.				
Yes	Short Term	No		Ongoing
HC-12: Engineering or retrofitting new and existing roads and bridges to withstand hazards.				
Yes	Short Term	No		Ongoing
HC-13: Complete a comprehensive inventory of unreinforced masonry buildings within the unincorporated area of Humboldt County and include a cost/benefit analysis of each unreinforced masonry structure to determine if the benefits of reinforcement outweigh the costs.				
No	Short Term	No		No Progress
HC-14: Adopt an ordinance to require strengthening and/or reinforcement of unreinforced masonry buildings (per the requirements of the 1986 Government Code 8875 et seq.), except residential structures and warehouses. This will require a strong public education program coupled with financial incentives to achieve community support. Based on the cost/benefit analysis in HC-13, provide funding options and assistance to reduce owner expense and accomplish this initiative				
Yes	Short Term	No		Ongoing
HC-15: Join the NOAA Tsunami Ready Program (includes Storm Ready)				
Yes	Short Term	No		Complete
HC-16: Develop probabilistic tsunami hazard maps or other methodology suitable for flood insurance risk use and make available to the public				
Yes	Long Term	No		Ongoing
HC-17: Develop and implement a tsunami signage program				
Yes	Short Term	No		Ongoing
HC-18: Support the State of California in its effort to develop criteria, with guidance from an expert panel, for addressing the tsunami hazard in local land use planning				
Yes	Short Term	No		Ongoing
HC-19: Develop a tsunami warning and response system				
Yes	Long Term	Yes		Ongoing
HC-20: Provide training for appropriate staff within the County on the use of HAZUS-MH software				
No	Short Term	No		No Progress
HC-21: 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 preparedness via county website and other media sources.				
Yes	Short Term	No		Ongoing
HC-22: Design, post to the web and publicize the availability of a web GIS mapping tool providing detailed maps of natural hazard overlays with site address and/or parcel locations				
Yes	Short Term	No		Complete
HC-23: Secure property interests (fee title or easements) for sediment detention facilities and/or develop these facilities in areas where excessive sediment is a primary cause of flooding				
No	Short Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
HC-24: Seek funding and authorization to include seismic upgrades to planned major repairs of county buildings to increase resistance to earthquake damage, especially buildings critical to emergency response and recovery (including designs and feasibility studies associated with the construction project) These include, but shall not be limited to, the buildings proposed for remodeling in the Capital Project Plan.				
No	Long Term	No		No Progress
HC-25: Design and distribute building guides to help citizens comply with hazard mitigation code requirements.				
No	Short Term	No		No Progress
HC-26: Upgrade landslide hazard mapping by producing a complete uniform dataset following the California Geological Survey's North Coast Watersheds Mapping project methodology, or similar acceptable mapping approach and make easily accessible to public.				
No	Long Term	No		No Progress
HC-27: 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.				
No	Short Term	No		No Progress
HC-28: Identify and develop adequate locations for the temporary storage of post-disaster event debris.				
No	Short Term	No		No Progress
HC-29: Secure funding for additional GIS staffing capacity to provide interagency coordination and consolidated, integrated GIS capabilities including all county departments and other applicable agencies				
Yes	Short Term	No		Ongoing
HC-30: Hardening and reinforcement of repeater sites (retrofit)				
Yes	Short Term	No		Ongoing
HC-31: Public education for identified "isolated islands of humanity." This could include the development of CERT.				
Yes	Short Term	No		Ongoing
HC-32: Retrofit airport runways to be able to receive larger aircraft: Rohnerville, Arcata/McKinleyville, Murray				
No	Long Term	No		No Progress
HC-33: Update County Operations Plan for better integration and training coordination				
Yes	Short Term	No		Ongoing
HC-34: Develop County Continuity of Operations Plan				
Yes	Short Term	No		Ongoing
HC-35: Relocate and/or develop a mobilization plan for PW maintenance yards.				
No	Short Term	No		No Progress
HC-36: Relocation/digitize stored County Records				
Yes	Short Term	No		Ongoing
HC-37: Establish alternate Emergency Operations Center for the Office of Emergency Services (OES)				
No	Long Term	No		No Progress
HC-38: Retrofit/upgrade Redwood Acres and Humboldt County Fairgrounds for use as critical infrastructure for response and recovery activities				
No	Long Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
HC-39: Upgrade/develop redundant interoperable communication systems (fiber optic, wireless,, radio, other)				
Yes	Long Term	No		Ongoing
HC-40: Include backup emergency energy sources in Capital Improvement Plan				
Yes	Short Term	No		Ongoing
HC-41: Current EH program provides regulatory oversight of high hazard facilities, which includes process hazard analysis, what-if checklists, hazard and operability studies, failure mode and effects analysis				
Yes	Short Term	No		Ongoing
HC-42: Current EH program provides regulatory oversight of high hazard facilities, which includes a hazard assessment in accordance with Cal ARP requirements.				
Yes	Short Term	No		Ongoing
HC-43: Support fisheries enhancement, maintenance, restoration programs, and native stock replenishment programs				
No	Short Term	Yes		No Progress
HC-44: Support conservation easement programs intended to preserve or restore healthy fish species habitat				
Yes	Short Term	No		Ongoing
HC-45: Support wetland/riparian protection, restoration, enhancement and maintenance programs				
Yes	Short Term	No		Ongoing
HC-46: Support studies to evaluate fish populations as well as disease impact studies				
Yes	Long Term	No		Ongoing
HC-47: Perform "risk-based" analysis of non-accredited levees within the planning area (Redwood Creek) to identify the most cost-beneficial remediation of those facilities. Implement recommendation of the analysis.				
Yes	Long Term	No		Ongoing
HC-48: Support studies to evaluate the effect of the major dams' operating procedures on resident fish.				
No	Long Term	Yes		No Progress
HC-49: Develop a Habitat Conservation Plan.				
Yes	Long Term	Yes		Ongoing
HC-50: Dam and levee reinforcement and new construction.				
No	Long Term	No		No Progress
HC-51: 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 become available.				
Yes	Long Term	No		Ongoing
HC-52: Continue participation and maintain good standing in the National Flood Insurance Program.				
Yes	Short Term	No		Ongoing
ORLEANS COMMUNITY SERVICES DISTRICT (OCSD)				
OCSD-1: Retrofit existing water storage tank for the impacts of earthquake and landslides, while increasing the storage capacity for fire protection capability.				
No	Long Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
OCSD-2: Retrofit existing water distribution system for the impacts of earthquake, flood and landslide. Retrofit to include where feasible, extension of existing system to non-serviced areas to provide fire hydrant protection.				
No	Long Term	No		No Progress
OCSD-3: Structural/nonstructural seismic retrofit of OFPD fire house.				
No	Long Term	No		No Progress
OCSD-4: Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan				
No	Short Term	No		No Progress
ORICK COMMUNITY SERVICES DISTRICT (O)				
O-1: Provide public outreach for tsunami awareness				
Yes	Long Term	No		Ongoing
O-2: Seismic retrofit of water supply system				
Yes	Long Term	No		No Progress
O-3: Upgrade levees to 250-year flood protection level				
Yes	Long Term	No		Ongoing
HUMBOLDT COMMUNITY SERVICES DISTRICT (HCSD)				
HCSD-1: Retrofit Tanks, Ridgewood, Walnut, and Freshwater among others.				
Yes	Short Term	Yes		Complete
HCSD-2: Enhance water supply system for fire prevention, in areas rated high by Cal Fire				
Yes	Long Term	No		Ongoing
HCSD-3: Acquire support equipment such as: backup generators and water pumps				
Yes	Short Term	No		Ongoing
HCSD-4: Engineering feasibility study of critical facilities for structural and non-structural mitigation.				
No	Long Term	No		No Progress
HCSD-5: Promote public awareness of the risk associated with natural hazards to HCSD rate payers via public information means available to HCSD (is there a problem with this one?)				
No	Long Term	Yes		No Progress
WILLOW CREEK COMMUNITY SERVICES DISTRICT (WCCSD)				
WCCSD-1: Retrofit existing water storage tank for the impacts of earthquake and landslides, while increasing the storage capacity for fire protection capability.				
Yes	Long Term	No		Complete
WCCSD-2: Retrofit existing water distribution system for the impacts of earthquake, flood and landslide. Retrofit to include where feasible, extension of existing system to non-serviced areas to provide fire hydrant protection.				
Yes	Long Term	No		Ongoing
WCCSD-3: Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan				
Yes	Long Term	No		Ongoing

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
WILLOW CREEK FIRE PROTECTION DISTRICT (WCFPD)				
WCFPD-1: Seismic retrofit fire hall				
No	Long Term	No		No Progress
WCFPD-2: Multi-Agency Emergency Management Facility				
No	Long Term	No		No Progress
WCFPD-3: Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan				
No	Short Term	No		No Progress
WEOTT COMMUNITY SERVICES DISTRICT (WCSD)				
WCSD-1: Install Water Meters				
No	Short Term	No		No Progress
WCSD-2: Retrofit/Upgrade Transmission Lines for possible impacts from earthquake and landslides				
No	Long Term	No		No Progress
WCSD-3: Develop redundancy to water supply by establishing a Back-Up Well Facility				
No	Long Term	No		No Progress
WCSD-4: Retrofit the community hall for the probable impacts of earthquake, flooding and severe weather				
No	Long Term	No		No Progress
WCSD-5: Establish "defensible" spaces around identified critical facilities and infrastructure by clearing accumulated brush around facilities				
No	Short Term	No		No Progress
WCSD-6: Support county-wide initiatives identified in the Humboldt Operational Area Hazard Mitigation Plan				
No	Short Term	No		No Progress
MCKINLEYVILLE COMMUNITY SERVICES DISTRICT (MCSD)				
MCSD-1: Earthquake :Mitigate for loss of water transmission line under the Mad River				
Yes	Long Term	Yes		Ongoing
MCSD-2: Flooding: River bank stabilization of Mad River west of the Ocean Avenue area				
Yes	Short Term	No		Complete
MCSD-3: Water Well for backup system supply				
Yes	Long Term	Yes		Ongoing
REDWAY COMMUNITY SERVICES DISTRICT (RW)				
RW-1: Reinforce Riverbank at Water treatment plant to mitigate the impacts of stream bank erosion				
No	Long Term	No		No Progress
RW-2: Enhance stormwater management capability within the district, with an emphasis on upgrades to existing stormwater conveyance system				
No	Long Term	No		No Progress
RW-3: Community outreach/Education Disaster Preparedness				
No	Short Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
RW-4: Add Alternate/Redundant aerial crossing for effluent from Wastewater Plant				
No	Long Term	No		No Progress
HUMBOLDT #1, FIRE PROTECTION DISTRICT (HFD)				
HFD-1: Seismic Retrofit Station 12				
Yes	Short Term	Yes		Complete
HFD-2: Private Bridge Safety Program				
Yes	Short Term	No		Ongoing
HFD-3: Training Facilities, multi-agency				
Yes	Short Term	No		Ongoing
HFD-4: Support the District's CPR education program				
Yes	Short Term	No		Ongoing
HFD-5: Employee Disaster Response Plan				
Yes	Short Term	No		Ongoing
HFD-6: Seismic Retrofit Station 11				
Yes	Short Term	Yes		Complete
ARCATA FIRE PROTECTION DISTRICT (AFPD)				
AFPD-1: Continue/enhance ongoing public education programs to include components on hazard awareness and mitigation.				
Yes	Long Term	No		Ongoing
AFPD-2: Update District sponsored website to include preparedness, warning and mitigation information on the earthquake, tsunami and wildfire initiatives.				
Yes	Long Term	Yes		Complete
AFPD-3: Retrofit all fire stations with non-combustible roofing material.				
Yes	Short Term	No		Complete
AFPD-4: Provide/update new radios for all "first responders."				
Yes	Short Term	Yes		Complete
AFPD-5: Outfit/equip 2 apparatus to meet USAR capabilities.				
Yes	Short Term	Yes		Complete
AFPD-6: Acquire transmitter for thermal imager.				
No	Short Term	Yes		No Progress
AFPD-7: Support/adopt county-wide fire apparatus program				
Yes	Short Term	Yes		Complete
AFPD-8: Support/implement countywide initiatives of the Humboldt Operational Area Hazard Mitigation Plan.				
Yes	Long Term	Yes		Ongoing
RIO DELL FIRE PROTECTION DISTRICT (RDFD)				
RDFD-1: Develop a post-disaster action plan				
No	Short Term	No		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
RDFD-2: Initiate Public outreach and education efforts, including an active Firewise program.				
No	Short Term	No		No Progress
RDFD-3: Clear fuels on land that can trigger or maintain wildfires.				
No	Short Term	No		No Progress
RDFD-4: Establish and maintain mutual aid agreements between fire service agencies.				
No	Short Term	No		No Progress
RDFD-5: Identify and create emergency vehicle access in high hazard areas.				
No	Short Term	No		No Progress
RDFD-6: Install fire suppression sprinkler system throughout fire station at 50 West Center St.				
No	Long Term	No		No Progress
SAMOA PENINSULA FIRE PROTECTION DISTRICT (SP)				
SP-1: Seismic and tsunami retrofit Fairhaven Station				
No	Long Term	Yes		No Progress
SP-2: Achieve Tsunami Ready STATUS for Fairhaven				
Yes	Long Term	No		Ongoing
SP-3: Build vertical evacuation site for Fairhaven				
Yes	Long Term	No		Ongoing
SP-4: Achieve Tsunami Ready Status for Samoa				
Yes	Long Term	No		Complete
(SHELTER COVE) RESORT IMPROVEMENT DISTRICT NO. 1 (RID)				
RID-1: Development and initial implementation of vegetative management program on greenbelt and other RID property.				
Yes	Short Term	No		Complete
RID-2: Annual power line tree trimming				
Yes	Short Term	No		Ongoing
RID-3: Building extra water storage capacity to counteract drought and fight fires				
Yes	Long Term	No		Ongoing
RID-4: Seismic retrofit or replacement of 11 water tanks.				
Yes	Short Term	No		Ongoing
RID-5: Automation of the existing tsunami siren				
Yes	Short Term	No		Complete
GARBERVILLE SANITARY DISTRICT (GSD)				
GSD-1: Map out the water and wastewater system				
Yes	Long Term	No		Ongoing
GSD-2: Consider store water/captured water techniques				
No	Long Term	Yes		No Progress

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
GSD-3: Educate the public in awareness, preparation, mitigation response, and recovery alternatives				
No	Long Term	No		No Progress
GSD-4: Purchase generator for backup power				
Yes	Long Term	No		Ongoing
GSD-5: Prepare an update to the Hazard Mitigation Plan for the District				
No	Long Term	No		No Progress
HUMBOLDT BAY MUNICIPAL WATER DISTRICT (HBMWD)				
HBMWD-1: Retrofit emergency water supply interties for the communities of McKinleyville, Blue Lake, Fieldbrook-Glendale and possibly Arcata and Eureka				
Yes	Long Term	No		Ongoing
HBMWD-2: Acquire emergency response equipment: Yellowmine pipe, K-Rails, traffic plates, portable fencing, gravel/sand				
Yes	Long Term	No		Ongoing
HBMWD-3: Acquire Support Equipment for Emergency Operations Centers at Essex, Korblex and Eureka				
Yes	Short Term	No		Ongoing
HBMWD-4: Conduct public awareness education regarding hazards affecting water supply				
Yes	Short Term	No		Complete
HBMWD-5: Conduct design and feasibility studies for construction of critical infrastructure/facilities				
Yes	Long Term	No		Ongoing
HBMWD-6: Retrofit Techite domestic waterline on Samoa Peninsula				
Yes	Long Term	No		Ongoing
HUMBOLDT BAY HARBOR, RECREATION, AND CONSERVATION DISTRICT (HB)				
HB-1: Assess and enhance the Harbor District's storm and tsunami warning capability by joining NOAA Storm Ready and Tsunami Ready programs				
Yes	Long Term	No		Ongoing
HB-2: Rebuild/retrofit warehousing at Redwood Marine Terminal				
Yes	Long Term	No		Ongoing
HB-3: Rebuild breakwater at Woodley Island Marina				
Yes	Short Term	Yes		Complete
HB-4: Rebuild work dock at Woodley Island Marina				
Yes	Short Term	Yes		Complete
HB-5: Rebuild breakwater at Shelter Cove				
Yes	Short Term	Yes		Complete
HB-6: Install floating breakwater on east end of Woodley Island Marina				
Yes	Long Term	No		Ongoing
HB-7: Develop standard specifications for levee repair/rehabilitation to minimize breaching and overtopping				
Yes	Long Term	No		Ongoing

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
HB-8: Develop Dredge Material Management Program in order to ensure adequate water depths necessary for safe navigation and emergency access				
Yes	Long Term	No		Ongoing
HB-9: Rebuild Redwood Marine Terminal and Fields Landing Terminal Berths				
Yes	Long Term	No		Ongoing
RECLAMATION DISTRICT #768 (RD)				
RD-1: Ongoing levee maintenance and flood gate upkeep				
Yes	Long Term	No		Ongoing
RD-2: Levee raising / Tsunami Ready certification				
No	Short Term	No		No Progress
RD-3: Levee improvements for Storm Ready certification				
No	Short Term	Yes		No Progress
ST. JOSEPH HEALTH SYSTEM, HUMBOLDT COUNTY (REDWOOD MEMORIAL HOSPITAL, ST. JOSEPH HOSPITAL) (SJ)				
SJ-1: Structural seismic retrofit of hospital facility according to Hospital Campus Master Plan. Construction of new facility to meet seismic standards.				
No	Long Term	No		No Progress
SJ-2: Non-structural seismic retrofit of hospital facilities according to Hospital Campus Master Plan.				
No	Long Term	No		No Progress
SJ-3: Support County Wide Initiatives that promote the education of the public on the impacts of natural hazards within Humboldt County, and the preparedness for and the mitigation of those impacts. This support will be in the form dissemination of appropriate information to the residents of Humboldt and continuing support/participation as a Humboldt Operational Area hazard mitigation planning partner.				
No	Short Term	No		No Progress
SJ-4: Utilize information provided in the Humboldt County risk assessment to consider emergency management provisions that will reduce the vulnerability to, and enhance the preparedness for the impacts of natural hazards that SJHS-HC has exposure.				
No	Short Term	No		No Progress
SJ-5: Continue to coordinate and work with Humboldt County Emergency Management in disaster response and preparedness. This level of coordination should include updates to the Emergency response plan, development of a post-disaster action plan, training and support.				
No	Short Term	No		No Progress
MANILA COMMUNITY SERVICES DISTRICT (M)				
M-1: Achieve Storm / Tsunami Ready status for Manila				
Yes	Short Term	No		Ongoing
M-2: Educate/train community regarding evacuation/preparedness				
Yes	Short Term	No		Ongoing
M-3: Designate evacuation routes				
Yes	Short Term	No		Complete

TABLE 2.
ACTION PLAN MATRIX

Action Taken?	Time Line	Priority Changed?	Comment (Describe progress or changed priority)	Status
M-4: Train staff, management, board of directors and community leaders in National Incident Management System and Incident Command System				
No	Long Term	No		No Progress
M-5: Seismic and tsunami retrofit the Community Center				
No	Long Term	No		No Progress
M-6: Work with PGE to protect community from transmission lines; either automatically throw power to them or bury them				
Yes	Short Term	No		Complete

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing bodies of all planning partners and local media outlets and posted on the Humboldt Operational Area Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

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APPENDIX E.
PLAN ADOPTION RESOLUTIONS FROM PLANNING PARTNERS

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To Be Provided With Final Release

Humboldt Operational Area

Hazard Mitigation Plan Update

Volume 2: Planning Partner Annexes

February 2014

TETRA TECH

Humboldt Operational Area
Hazard Mitigation Plan Update;
Volume 2—Planning Partner Annexes

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PART 1—
INTRODUCTION

CHAPTER 1.
PLANNING PARTNER PARTICIPATION

1.1 BACKGROUND

The Federal Emergency Management Agency (FEMA) encourages multi-jurisdictional planning for hazard mitigation. Such planning efforts require all participating jurisdictions to fully participate in the process and formally adopt the resulting planning document. Chapter 44 of the Code of Federal Regulations (44 CFR) states:

> "Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan." (Section 201.6.a(4))

In the preparation of the Humboldt Operational Area Hazard Mitigation Plan Update, a Planning Partnership was formed to leverage resources and to meet requirements of the federal Disaster Mitigation Act of 2000 (DMA) for as many eligible local governments in Humboldt County as possible. The DMA defines a local government as follows:

> "Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity."

There are two types of Planning Partners in this process, with distinct needs and capabilities:

- Incorporated municipalities (cities and the County)
- Special purpose districts

Municipal governments have permit authority and can adopt rules and regulations governing land use. Special purpose districts do not possess this power, and therefore have no ability to implement actions that impact future land uses. Districts are service providers and owners and operators of critical facilities and infrastructure. The differences in capability and function between municipalities and districts dictate the types of mitigation actions selected by each category of planning partner. Jurisdictional annex templates were created to capture relevant data for each planning partner.

1.2 THE PLANNING PARTNERSHIP

1.2.1 Initial Solicitation and Letters of Intent

The planning team solicited the participation of the County and all County-recognized special purpose districts at the outset of this project. A meeting was held on December 3, 2012 to engage potential stakeholders for this process. The purpose of the meeting was to introduce the planning process to jurisdictions in the County that could have a stake in the outcome of the planning effort. All eligible local governments within the planning area were invited to attend. Various agency and citizen stakeholders were also invited to this meeting. The goals of the meeting were as follows:

- Provide an overview of the Disaster Mitigation Act.

- Provide an update on the planning grant.
- Outline the Humboldt Operational Area plan update work plan.
- Describe the benefits of multi-jurisdictional planning.
- Solicit planning partners.
- Select a Steering Committee.

All interested local governments were provided with a list of planning partner expectations developed by the planning team and were informed of the obligations required for participation. Local governments wishing to join the planning effort were asked to provide the planning team with a "notice of intent to participate" that agreed to the planning partner expectations (see Appendix A) and designated a point of contact for their jurisdiction. In all, formal commitment was received from 34 planning partners by the planning team, and the Humboldt County Planning Partnership was formed.

Maps for each participating city are provided in the individual annex for that city. These maps will be updated periodically as changes to the partnership occur, either through linkage or by a partner dropping out due to a failure to participate.

1.2.2 Planning Partner Expectations

The planning team developed the following list of planning partner expectations, which were confirmed at the kickoff meeting held on December 3, 2012:

- Each partner will provide a "Letter of Intent to Participate."
- Each partner will support and participate in the selection and function of the Steering Committee overseeing the development of the update. Support includes allowing this body to make decisions regarding plan development and scope on behalf of the partnership.
- Each partner will provide support for the public involvement strategy developed by the Steering Committee in the form of mailing lists, possible meeting space, and media outreach such as newsletters, newspapers or direct-mailed brochures.
- Each partner will participate in plan update development activities such as:
  - Steering Committee meetings
  - Public meetings or open houses
  - Workshops and planning partner training sessions
  - Public review and comment periods prior to adoption.

  Attendance will be tracked at such activities, and attendance records will be used to track and document participation for each planning partner. No minimum level of participation will be established, but each planning partner should attempt to attend all such activities.
- Each partner will be expected to perform a "consistency review" of all technical studies, plans, and ordinances specific to hazards identified within the planning area to determine the existence of plans, studies or ordinances not consistent with the equivalent documents reviewed in preparation of the Operational Area plan. For example: if a planning partner has a floodplain management plan that makes recommendations that are not consistent with any of the County's basin plans, that plan will need to be reviewed for probable incorporation into the plan for the partner's area.

- Each partner will be expected to review the risk assessment and identify hazards and vulnerabilities specific to its jurisdiction. Contract resources will provide jurisdiction-specific mapping and technical consultation to aid in this task, but the determination of risk and vulnerability will be up to each partner.
- Each partner will be expected to review the mitigation recommendations chosen for the overall county and determine if they will meet the needs of its jurisdiction. Projects within each jurisdiction consistent with the overall plan recommendations will need to be identified, prioritized and reviewed to determine their benefits and costs.
- Each partner will be required to create its own action plan that identifies each project, who will oversee the task, how it will be financed and when it is estimated to occur.
- Each partner will be required to sponsor at least one public meeting to present the draft plan at least two weeks prior to adoption.
- Each partner will be required to formally adopt the plan.

It should be noted that by adopting this plan, each planning partner also agrees to the plan implementation and maintenance protocol established in Volume 1. Failure to meet these criteria may result in a partner being dropped from the partnership by the Steering Committee, and thus losing eligibility under the scope of this plan.

1.2.3 Linkage Procedures

Eligible local jurisdictions that did not participate in development of this hazard mitigation plan update may comply with DMA requirements by linking to this plan following the procedures outlined in Appendix B.

1.3 ANNEX-PREPARATION PROCESS

1.3.1 Templates

Templates were created to help the Planning Partners prepare their jurisdiction-specific annexes. Since special purpose districts operate differently from incorporated municipalities, separate templates were created for the two types of jurisdictions. The templates were created so that all criteria of Section 201.6 of 44 CFR would be met, based on the partners' capabilities and mode of operation. Each partner was asked to participate in a technical assistance workshop during which key elements of the template were completed by a designated point of contact for each partner and a member of the planning team. The templates were set up to lead each partner through a series of steps that would generate the DMA-required elements that are specific for each partner. The templates and their instructions can be found in Appendices C, D and E to this volume of the Hazard Mitigation Plan Update.

1.3.2 Workshop

Workshops were held for Planning Partners to learn about the templates and the overall planning process. Topics included the following:

- DMA
- Humboldt Operational Area plan background
- The templates
- Risk ranking
- Developing your action plan

- Cost/benefit review.

Separate sessions were held for special purpose districts and municipalities, in order to better address each type of partner's needs. The sessions provided technical assistance and an overview of the template completion process. There was 94-percent attendance of the partnership at these sessions.

In the risk-ranking exercise, each planning partner was asked to rank each risk specifically for its jurisdiction, based on the impact on its population or facilities. Cities were asked to base this ranking on probability of occurrence and the potential impact on people, property and the economy. Special purpose districts were asked to base this ranking on probability of occurrence and the potential impact on their constituency, their vital facilities and the facilities' functionality after an event. A principal objective of this exercise was to familiarize the partnership with how to use the risk assessment as a tool to support other planning and hazard mitigation processes. Tools utilized during these sessions included the following:

- The risk assessment results developed for this plan
- Hazard maps for all hazards of concern
- Hazard mitigation catalogs
- Federal funding and technical assistance catalogs
- Copies of partners' prior annexes, if applicable.

1.3.3 Prioritization

44 CFR requires actions identified in the action plan to be prioritized (Section 201.c.3.iii). The planning team and steering committee developed a methodology for prioritizing the action plans that meets both the needs of the partnership and the requirements of 44 CFR. The actions were prioritized according to the following criteria:

- **High Priority**—Project meets multiple plan objectives, benefits exceed cost, funding is secured under existing programs, or is grant eligible, and project can be completed in 1 to 5 years (i.e., short term project) once funded.
- **Medium Priority**—Project meets at least 1 plan objective, benefits meet or exceed costs, requires special funding authorization under existing programs, grant eligibility is questionable, and project can be completed in 1 to 5 years once funded.
- **Low Priority**—Project will mitigate the risk of a hazard, benefits meet or exceed costs, funding has not been secured, project is not grant eligible, and time line for completion is long term (5 to 10 years).

These priority definitions are dynamic and can change from one category to another based on changes to a parameter such as availability of funding. For example, a project might be assigned a medium priority because of the uncertainty of a funding source, but be changed to high once a funding source has been identified. The prioritization schedule for this plan will be reviewed and updated as needed through the plan maintenance strategy.

1.3.4 Benefit/Cost Review

44 CFR requires the prioritization of the action plan to emphasize a benefit/cost analysis of the proposed actions. Because some actions may not be implemented for up to 10 years, benefit/cost analysis was qualitative and not of the detail required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A review of the apparent benefits

versus the apparent cost of each project was performed. Parameters were established for assigning subjective ratings (high, medium, and low) to costs and benefits as follows:

- Cost ratings:
  - **High—**Existing funding levels are not adequate to cover the costs of the proposed action; implementation would require an increase in revenue through an alternative source (for example, bonds, grants, and fee increases).
  - **Medium—**The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - **Low—**The action could be funded under the existing budget. The action is part of or can be part of an existing, ongoing program.
- Benefit ratings:
  - **High—**The action will have an immediate impact on the reduction of risk exposure to life and property.
  - **Medium**—The action will have a long-term impact on the reduction of risk exposure to life and property or will provide an immediate reduction in the risk exposure to property.
  - **Low—**Long-term benefits of the action are difficult to quantify in the short term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly.

It should be noted that for many of the strategies identified in this action plan, funding might be sought under FEMA's HMGP or PDM programs. Both of these programs require detailed benefit/cost analysis as part of the application process. These analyses will be performed on projects at the time of application preparation. The FEMA benefit-cost model will be used to perform this review. For projects not seeking financial assistance from grant programs that require this sort of analysis, the Partners reserve the right to define "benefits" according to parameters that meet their needs and the goals and objectives of this plan.

1.3.5 Analysis of Mitigation Initiatives

Each planning partner reviewed its recommended initiatives to classify each initiative based on the hazard it addresses and the type of mitigation it involves. Mitigation types used for this categorization are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration,

watershed management, forest and vegetation management, and wetland restoration and preservation.

- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.

The analysis of initiatives in each jurisdiction's annex documents the comprehensive range of alternatives selected by each planning partner, as required under section 201.6 (c)(3)(ii) 44 CFR.

1.4 COMPATIBILITY WITH PREVIOUS REGIONAL HAZARD PLAN

The jurisdictions listed in Table 1-1 participated in the initial Humboldt Operational Area Hazard mitigation Plan. The table lists the dates that each of these jurisdictions adopted the previous hazard mitigation plan.

The initial plan identified 272 jurisdiction-specific strategies and six countywide strategies to address natural hazards of concern. For those participating in the plan update, initial plan participants reviewed the strategies previously included in their annexes to determine which remain relevant for the plan update. Each strategy was identified with one of the following implementation status findings:

- The strategy has been completed (identified in the implementation status table of each jurisdiction's annex).
- The strategy has been removed or is no longer feasible (identified in the implementation status table of each jurisdiction's annex).
- The strategy has been carried over to the current hazard mitigation plan in one of the following ways:
  - Incorporated in the current plan's action plan matrix exactly as presented in the initial plan (identified in the implementation table of each jurisdiction's annex and indicated in the action plan matrix)
  - Addressed by one or more actions in the current plan's action plan matrix, but not incorporated in this plan exactly as presented in the previous plan (identified in the implementation status table of each jurisdiction's annex).

A progress report summarizing the findings of this review was prepared by the planning team and has been included as an appendix to this plan (Appendix B of Volume 1).

1.5 FINAL COVERAGE UNDER THE PLAN

Table 1-2 lists the jurisdictions that submitted letters of intent and their ultimate status in this plan. Of the 34 planning partners who submitted letters of intent, 31 fully met the participation requirements specified by the Steering Committee and prepared annexes included in this volume. Another partner, County Service Area #4, is part of the unincorporated Humboldt County planning area and is covered under the Humboldt County annex; so 32 partners in all will seek DMA compliance under this plan.

One partner was unable to attend a workshop and did not complete an annex; another partner attended a workshop but was unable to complete an annex. The remaining jurisdictions will need to follow the linkage procedures described in Appendix B of this volume to achieve DMA compliance.

TABLE 1-1.
JURISDICTIONS THAT PARTICIPATED IN PREVIOUS HAZARD PLAN

Jurisdiction	Previous Annex Adoption Date
Humboldt County	December 11, 2007
City of Arcata	December 19, 2007
City of Blue Lake	November 18, 2008
City of Eureka	February 5, 2008
City of Ferndale	December 11, 2007
City of Fortuna	March 8, 2008
City of Rio Dell	December 18, 2007
City of Trinidad	February 13,2008
Orleans Community Services District	July 15, 2008
Orick Community Services District	May 14, 2008
Humboldt Community Services District	January 8, 2008
Willow Creek Community Services District	February 7, 2008
Willow Creek Fire Protection District	December 13, 2007
Weott Community Services District	January 27, 2008
McKinleyville Community Services District	December 19, 2007
Redway Community Services District	February 21, 2008
Humboldt #1, Fire Protection District	December 18, 2007
Arcata Fire Protection District	March 25, 2008
Rio Dell Fire Protection District	April 10, 2008
Samoa Peninsula Fire Protection District	December 19, 2007
(Shelter Cover) Resort Improvement District #1	January 17, 2008
Garberville Sanitary District	January 22, 2008
Humboldt Bay Municipal Water District	December 13, 2007
Humboldt Bay Harbor, Recreation, and Conservation District	February 13, 2008
Reclamation District #768	June 5, 2008
St. Joseph Health System, Humboldt County (Redwood Memorial Hospital, St. Joseph Hospital)	December 23, 2008

TABLE 1-2.
PLANNING PARTNER STATUS

Jurisdiction	Submitted Letter of Intent?	Attended Workshop?	Completed Template?	Will Be Covered by Plan?
Humboldt County	Yes	Yes	Yes	Yes
City of Arcata	Yes	Yes	Yes	Yes
City of Blue Lake	Yes	Yes	Yes	Yes
City of Eureka	Yes	Yes	Yes	Yes
City of Ferndale	Yes	Yes	Yes	Yes
City of Fortuna	Yes	Yes	Yes	Yes
City of Rio Dell	Yes	Yes	Yes	Yes
City of Trinidad	Yes	Yes	Yes	Yes
Briceland Community Service District	Yes	No	No	No
Humboldt Community Service District	Yes	Yes	Yes	Yes
Manila Community Service District	Yes	Yes	Yes	Yes
McKinleyville Community Service District	Yes	Yes	Yes	Yes
Orick Community Service District	Yes	Yes	Yes	Yes
Orleans Community Service District	Yes	Yes	No	No
Redway Community Service District	Yes	Yes	Yes	Yes
Weott Community Service District	Yes	Yes	Yes	Yes
Westhaven Community Service District	Yes	Yes	Yes	Yes
Willow Creek Community Service District	Yes	Yes	Yes	Yes
Arcata Fire Protection District	Yes	Yes	Yes	Yes
Briceland Fire Protection District	Yes	Yes	Yes	Yes
Fortuna Fire Protection District	Yes	Yes	Yes	Yes
Humboldt Fire Protection District No. 1	Yes	Yes	Yes	Yes
Loleta Fire Protection District	Yes	Yes	Yes	Yes
Petrolia Fire Protection District	Yes	Yes	Yes	Yes
Rio Dell Fire Protection District	Yes	Yes	Yes	Yes
Samoa Peninsula Fire Protection District	Yes	Yes	Yes	Yes
Willow Creek Fire Protection District	Yes	Yes	Yes	Yes
County Service Area #4	Yes	No	No	Yes[a]
Garberville Sanitary District	Yes	Yes	Yes	Yes
Humboldt Bay Harbor, Recreation and Conservation District	Yes	Yes	Yes	Yes
Humboldt Bay Municipal Water District	Yes	Yes	Yes	Yes
Reclamation District #768	Yes	Yes	Yes	Yes
Shelter Cove Resort Improvement District No. 1	Yes	Yes	Yes	Yes
Southern Humboldt Community Healthcare District	Yes	Yes	Yes	Yes

a. County Service Area #4 is part of the unincorporated Humboldt County planning area and is covered under the Humboldt County annex.

CHAPTER 2.
HUMBOLDT COUNTY TRIBAL STAKEHOLDERS

2.1 BACKGROUND

A significant portion of California's Native American population resides in Humboldt County. Prior to European settlement, the Humboldt County area was populated by peoples of four language families in 14 tribal groups: the Karuk, Yurok, Hupa, Tsnungwe, Chilula, Chimariko, Wiyot, Sinkyone, Mattole, Walaki, Lassik, Nogatl, Wintun, and Whilkut Tribes. Many Tribes and Tribal members did not survive the contact period with Western settlers. The majority of those that did survive banded together into eight distinct Tribal governments, including the following:

- The Big Lagoon Rancheria
- The Blue Lake Rancheria
- The Hoopa Valley Indian Tribe
- The Karuk Tribe of California
- The Bear River Band of the Rohnerville Rancheria
- The Table Bluff Tribe of Wiyot Indians
- The Cher-Ae Heights Indian Community of the Trinidad Rancheria
- The Yurok Tribe

Together, these eight Tribal governments constitute over 8,346 individuals. Each operating under its own independent Tribal Council, these eight sovereign tribal governments were federally recognized between 1864 and 1979. The Tsnungwe Tribe, which has a fully functional Tribal government and may soon be federally recognized, also has a traditional territory that extends slightly into the eastern portion of Humboldt County. Federal recognition of this tribe in the coming years is highly likely.

Given their multi-millennial history of living in the area, the region's Native American peoples are proven experts in successfully mitigating every possible natural hazard faced in Humboldt County. Collectively, the County's tribal oral traditions tell of a long legacy of surviving natural hazards. For instance, Yurok and Wiyot oral histories tell of a massive tsunami over 300 years ago. This tsunami has recently been positively correlated with sediment tests in Humboldt Bay as well as with written history in Japan. These histories indicate that the Tribes are well-versed in the necessities of hazard mitigation.

The Humboldt Operational Area Hazard Mitigation Plan Update was prepared by and for a group of 32 Planning Partners. The tribes are independent sovereign nations, many of whom have their own federally approved hazard mitigation plans, and are therefore not official Planning Partners. However, given the importance of the local tribes, the Humboldt Operational Area planning partnership chose to make an effort to consult with each of the eight Tribal governments in preparing this plan. The results of those inquiries are the following tribal summaries that were developed by the planning team based on a review of readily available documents and resources.

2.2 HUMBOLDT COUNTY TRIBAL PROFILES

The following profiles provide a summary of the tribes' history, organization, geographical location in Humboldt County, land area and population, and whether they have an approved state level hazard mitigation plan. Since the development of the initial Humboldt Operational Area Hazard Mitigation Plan, FEMA has released new guidance for tribal hazard mitigation plans. This Tribal Multi-Hazard Mitigation Planning Guidance assists Indian Tribal governments and other tribal entities to identify and assess their risk to natural

hazards through the Federal Emergency Management Agency's (FEMA's) multi-hazard mitigation planning process. Based on the requirements of 44 CFR 201.7, this guidance helps:

- Indian Tribal governments identify their risks from natural hazards and protect their members and other resources;
- Indian Tribal governments develop and adopt new mitigation plans, or revise or update existing mitigation plans, to meet the requirements of 44 CFR 201.7;
- Plan reviewers evaluate mitigation plans from different Indian Tribal governments in a fair and consistent manner;
- Indian Tribal governments exercise flexibility and apply for assistance as either a grantee or sub-grantee under FEMA grant programs with a single plan type; and
- Provide guidance and culturally relevant examples to other tribal entities that comply with similar planning requirements under 44 CFR 201.6 as a local government.

Indian Tribal governments with an approved Tribal Mitigation Plan in accordance with 44 CFR 201.7 may apply for assistance from FEMA as a grantee. If the Indian Tribal government coordinates with the State for review of their Tribal Mitigation Plan, then the Indian Tribal government also has the option to apply as a sub-grantee through a State or another tribe. A grantee is an entity such as a State, territory, or Indian Tribal government to which a grant is awarded and that is accountable for the funds provided. A sub-grantee is an entity, such as a community, local, or Indian Tribal government; State-recognized tribe; or a private nonprofit (PNP) organization to which a sub-grant is awarded and that is accountable to the grantee for use of the funds provided.

If the Indian Tribal government is eligible as a grantee or sub-grantee because it has an approved Tribal Mitigation Plan and has coordinated with the State for review, it can decide which option it wants to take on a case-by-case basis with respect to each Presidential Disaster Declaration, and for each grant program under a Declaration, but not on a project-by-project basis within a grant program. For example, an Indian Tribal government can participate as a sub-grantee for Public Assistance (PA), but as a grantee for the Hazard Mitigation Grant Program (HMGP) under the same Declaration. However, the Indian Tribal government would not be able to request grantee status under HMGP for one HMGP project, then request sub-grantee status for another HMGP project under the same Declaration.

By acknowledging the tribes as stakeholders, the Humboldt Operational Area planning partnership recognizes the tribal level plans as existing mechanisms that could support or enhance hazard mitigation within the operational area. This is a requirement of section 201.6.b.3, of 44 CFR. These tribal plans offer an opportunity to partner and share information between planning efforts that can leverage resources within the operational area. The Humboldt Operational Area planning effort and those of the tribal governments are separate and autonomous efforts. However, these efforts may provide opportunities to work together as partners in the pre-disaster and post-disaster mitigation of hazards within the Humboldt Operational Area.

2.2.1 The Big Lagoon Rancheria

Tribal Profile

The Big Lagoon Rancheria consists of members belonging to both the Yurok and Tolowa Tribes. Before the arrival of white settlers, both Tribes used a large portion of northern Humboldt County and coastal Del Norte County for fishing, hunting, gathering, ceremonial purposes, and for their villages. The original Big Lagoon Rancheria land was purchased in 1918 and members of the Rancheria expanded the Rancheria in 1985 by purchasing additional property adjacent to the Rancheria. During 2005 and 2006, the Rancheria purchased additional properties totaling 21 acres within a half-mile of the Rancheria. In 2004, the Rancheria purchased

2.2 acres of commercial property in McKinleyville. The Rancheria's Constitution was approved on May 5, 1985.

Location

The Big Lagoon Rancheria is located north of the City of Trinidad, on the southern end of Big Lagoon, and adjacent to the Pacific Ocean.

Land Area

The Big Lagoon Rancheria lands include 22 acres of trust land and 21 acres of tribal fee property within the Big Lagoon area. The trust land is on the southern edge of Big Lagoon and nearly adjacent to the Pacific Ocean. A 5-acre tribal fee parcel is located adjacent to Highway 101, with another 16-acre tribal fee parcel adjacent to the Big Lagoon County Park and Big Lagoon. The developed area of the Rancheria is low-density residential, and the neighboring community of Big Lagoon is also low-density residential with one school. The land surrounding the Rancheria has been used for forestry and sawmills operations during the last 150 years and currently has 126 homes. There is a small but popular County Park that provides public access for boating on Big Lagoon near the Big Lagoon Rancheria. Highway 101 is the primary route from the Rancheria to the more urban portions of Humboldt County that have stores and medical services.

Hazard Overview

The primary hazards for the Big Lagoon Rancheria and surrounding area are winter storms and earthquakes, and there is a potential for damage from tsunamis. In the event of a large earthquake and tsunami, the Tribe would become isolated from medical services by the closure of Highway 101 south of Trinidad and Westhaven. Highway 101 is vulnerable to both flooding and tsunamis as it passes over the Little River and behind Clam Beach. This area has been mapped by the Humboldt County Tsunami Working Group and was identified as being subject to high-velocity wave hazards. The tsunami danger has not been mapped for the Big Lagoon Rancheria but much of the developed portion of the Rancheria is below 35 feet in elevation and is therefore at risk of flooding. Further evaluation of the risk of a destructive wave hitting the community should be evaluated.

Winter storms bring large amounts of rain, large surf, and heavy winds. In the recent past homes in the non-Indian Community Development Corporation community of Big Lagoon were moved inland because of the erosion of the coastal bluffs during winter storms. The erosion caused by winter storms is likely to continue. Although this does often pose an immediate threat to property, it has the potential to pose a long-term threat to property and the environment in the area. Winter storms also cause power outages, and because Big Lagoon is relatively isolated, it can take several days before power is restored.

Population

The total population of the Big Lagoon Rancheria is 17, according to the 2010 U.S. Census.

Approved Plan

The Big Lagoon Rancheria does not have a FEMA-approved, state-level, multi-hazard mitigation plan.

2.2.2 The Blue Lake Rancheria

Tribal Profile

Blue Lake Rancheria (BLR) is a Sovereign Indian Nation located 7 miles east of the City of Arcata and 12 miles northeast of Eureka. The Rancheria is dedicated to the education, self-confidence, and upward mobility of its members. Blue Lake Rancheria is a Wiyot Tribe located in historical Wiyot territory, but the Tribe

includes members who are Wiyot, Tolowa, Hupa, Kuruk, Yurok, and Cherokee Indians. The Tribal Business Committee and the General Council have set as a priority the provision of education, social services, and community safety for tribal members, as well as for the Blue Lake Community as a whole. For decades, the Rancheria has worked hard in the areas of education, entrepreneurship, and philanthropy to become one of the most respected and prosperous tribes in Northern California.

Blue Lake Rancheria was established as a 30-acre reservation for homeless Native Americans through an Executive Order on December 24, 1908. The Executive Order was designed to aid Native Americans displaced by the immigration of Europeans. On August 18, 1958, the U.S. Congress terminated the Blue Lake Rancheria pursuant to Public Law 85-671—later determined to be an illegal and unjust act. After a lawsuit spanning decades (Tillie Hardwick v. United States of America), the Blue Lake Rancheria was reinstated as a federally recognized tribe on December 15, 1983, with an approved constitution granted by the Secretary of the Interior on March 22, 1989.

Wiyot territory historically extended from Little River, north of McKinleyville along the coast, south to Bear River Ridge, and inland 25 miles. Within this territory, there existed many hundreds of historic and prehistoric villages, ceremonial, burial, and summer sites of the Wiyot Tribe. Of the three principal groups of Wiyot, the Mad River Wiyot were known as the Batawat, the Wiki on the Humboldt Bay, and Wiyat. Wiyat is a native name for the Eel River Delta; later the name was applied to all who spoke the language, whether living on the Eel River, Humboldt Bay or Mad River. Wiyot is used in preference to the old name of "Whishosk."

Hazard Overview

Both the seismic and hydrologic settings of the Rancheria are very active. Hence, earthquakes and floods constitute the greatest level of threat to the Rancheria from natural hazards. BLR is less than 1,000 feet away from the Blue Lake Thrust Fault, 3,000 feet away from the primary trace of the Mad River Fault, and subject to the influences of the regional Mendocino Triple Junction, the Coast Range thrust Fault, and the Cascadia Subduction Zone. Earthquakes with a Richter magnitude of 6.0 or higher have occurred nine times in the last fifteen years and larger earthquakes between 6.9 and up to 9.1 Richter magnitude are forecast. Peak ground acceleration (PGA) at BLR is anticipated up to 0.8 g (the acceleration due to gravity - Pacific Watershed Associates, 2006) while FEMA loss models only calculate losses for earthquakes generating 0.55 g PGA. Estimates of losses to structures, contents, and functions, including displacement costs, for an earthquake generating 0.55 g PGA at BLR are approximately $23.3 million. For earthquakes with 0.8 g PGA, losses are estimated to approach 100% and are valued at approximately $71.5 million.

Earthquake events, along with many of the other hazard events, also have the potential to close down the Highway 299 transportation corridor and isolate BLR and the City of Blue Lake from critical municipal and county emergency services, hospitals, shelter, food, as well as from gaming industry patrons. Moreover, frequent closures of Highways 299 and 101 have effectively removed or sharply limited ground access to Humboldt County for state and federal emergency services to the county several times in the last decade. It is estimated that Humboldt County would not receive substantial state or federal aid in a regional or statewide seismic disaster for a minimum of one week and possibly up to three weeks.

BLR is situated within the 100-year floodplain of both the Mad River and Dave Powers Creek (Powers Creek) and contains lands designated as Zone A2, B, and C per the 1999 Flood Insurance Rate Map (FIRM). Each zone has varying degrees of susceptibility to flooding. Flood events much smaller than the 100-year flood but resulting in localized water depths from 9 to 18 inches have occurred three times in the last 15 years (e.g., 1992, 1994, and 2003). The loss estimate methods provided in the How-To Manual (Sheets 3a, 3b, and 4) indicate that the Rancheria could sustain structural, content, and functional losses of up to $24.2 million in

a flood event with water surface elevations two or more feet above grade. Using FEMA's HAZUS-MH model results in loss estimates for a two-foot flood event at an even greater value of $38.4 million.

After floods and earthquakes, wildfire is the hazard to which the Rancheria is most vulnerable and could generate the next greatest losses, up to $15.3 million. The last wildland fire at BLR occurred in the summer of 2003 when grasslands north of the Casino burned. The source of the fire remains unknown.

The Rancheria is surrounded on all but one side by wildlands or former agricultural lands consisting of infrequently maintained grasslands and heavily wooded riparian corridors, beyond which are heavily forested slopes. To the north and east, the Rancheria is bounded by roads from which burning cigarettes thrown from cars or traffic accidents could ignite wildfires. To the south and west, BLR interfaces with vegetation rooted along the Mad River and Powers Creek to which emergency vehicles have very limited access. Once a wildland fire enters the Rancheria, there is a high probability that the fire would ignite residential areas comprised of wooden houses, wooden outbuildings, manufactured homes, trailers—most with combustible siding and decks and non-rated roofing materials—and combustible trees. There are also forty-four above-ground propane tanks immediately adjacent to individual residences that could explode in a single or multi-structure conflagration. Insufficient ingress and egress for emergency vehicles, less than 70% defensible space, and limited fire hydrants make portions of the Rancheria particularly vulnerable. The Tribal Office and gaming facilities, on the other hand, have large defensible spaces, sufficient fire hydrants, and more than one access road to reach them. The Sapphire Palace gaming facility is housed in a plastics-based, tented building that is ignition resistant but is susceptible to melting from contact with hot embers.

Severe winter storms with attendant saturated soils and wind gusts of up to 70 mph are responsible for annual nuisance damages and chronic power outages. Falling trees are a constant threat, particularly to residents of manufactured homes or trailers with less structural strength. Severe storms in the winter of 2006 resulted in blown-off roofing materials in several older buildings, a toppled communications tower on the Casino roof, and three power outages. The power outage of January 2006 lasted six days. Long power outages are of particular concern to BLR as a high percentage of the population are aging, elderly, or infirm, and many are dependent on properly-functioning medical devices and are particularly vulnerable when domestic heating, lighting, cooking, refrigeration, and media access are not accessible. Loss estimates from severe storms, including repairs and displacement, are $985,000.

Other natural hazards, including tsunamis, technological hazards such as chemical spills, poor air quality, and dam failure are also identified in the risk assessment. A failure of Matthews Dam would cause a high-velocity debris torrent at a depth roughly ten feet above the roof elevation of the Casino complex. This event would result in a devastating 100% loss of all BLR structures. If a properly executed, an approximately sixteen-hour warning period between the time of dam failure and arrival of the debris torrent at BLR would allow sufficient time to avert loss of life, and a small percentage of personal effects could be saved. The remaining hazards, such as tsunamis and hazardous spills would result primarily in indirect, mostly economic effects from associated road closures.

Vulnerabilities

In general, most vulnerable at BLR are the residential structures and inhabitants of the Rancheria. The greatest economic losses to residents result from the sum of structural replacement costs and displacement costs during reconstruction. Loss of contents in the residential structures is less substantial. Conversely, the gaming enterprises and Tribal government buildings, while the least structurally vulnerable, would suffer the most economic damage due to losses to high-value contents and, more importantly, the loss of functions. The gaming enterprise is the largest economic asset of the Tribe, and functional downtime equates with substantial economic losses. Downtime is particularly problematic for the gaming business because it cannot be temporarily relocated elsewhere—like most other businesses—due to permitting restrictions.

The greatest vulnerability for non-residents and patrons of the gaming enterprise are their automobiles during a large flood or earthquake. With an average of 750 patrons with 500 vehicles on site at any given time, potential economic losses could be as high as $10 million dollars in vehicle damage alone.

General Mitigation Activities

For most of the hazard event types, under personal mitigation before the event hazard, the CPC decided it was important to have an evacuation plan and have an emergency kit. The CPC emphasized the importance of an emergency kit for every family in the community. This kit will contain information on personal mitigations that individuals should be aware of, as well as lists of resources for additional information. The CPC also ranked a high priority to the establishment of a buddy system with neighbors especially for those members of the community who need more help like the elderly and the sick.

The workplace questionnaires described previously asked not only what staff found unsafe in their workplaces but also what mitigation activities they would suggest to mitigate the vulnerabilities. After reviewing these suggestions, the recommended mitigation activities for the Rancheria workplaces include (in order of priority):

- Assemble and install earthquake kits in the office buildings.
- Become a primary contact for the County Office of Emergency Services for any nearby hazard events.
- Install a backup generator for the Tribal office.
- Perform regular emergency/evacuation drills and first responder/ICS refresher courses.
- Perform CPR training.
- Highlight the natural gas shutoff valve, and turn it off during/after an emergency.
- Develop written procedures for emergency response.
- Develop a central gathering location and a procedure for head counts after an emergency.

These activities are all feasible and generally cost-effective.

Population

The Tribe has 51 enrolled members.

Approved Plan

Blue Lake Rancheria completed a state-level, multi-hazard mitigation plan in 2008 and that plan was updated in 2012. For more information about this plan, contact Jody Brundin at the BLR Office of Emergency Services by calling 707-668-5101

2.2.3 The Hoopa Valley Tribe

Tribal Profile

The People of Hoopa Valley are one of California’s first cultures. The first American trappers and gold miners entered Hoopa in 1828. They came up the Trinity River into the rich valley which has always been the center of the Hupa World, the place where the trails return. Legends say this is where the people came into being. The Tribe’s treaty was signed providing the whole Hoopa Valley as a reservation. In 1876, an executive order was signed acknowledging this treaty. Since first European contact, the culture and traditions remain to this day.

In 1864, a Peace and Friendship Treaty was negotiated with the United States. In 1896, the Department of the Interior began preparing a land allotment list. In 1909, a Proclamation was handed down by President Theodore Roosevelt. This list was not completed and approved until 1923. The Hupa People successfully avoided the physical destruction of their valley homeland, and in modern times created one of the first successful Self-Governance Tribal structures in the nation.

The Tribe's traditional language belongs to the Athabascan Language family, which relates the Tribe to other peoples in the region and, more remotely, to the Athabascans from the interior of Alaska and northern Canada, as well as to the Navajos and Apaches Tribes of the Southwest. The Tribe's traditional way of life was based on the semiannual king salmon runs that still occur on the Trinity River, which flows through the center of the Hoopa Valley Reservation. In addition, the Tribe made use of other indigenous foods, especially acorns. Both these resources remain important as ceremonial foods. Today some 2,500 Hupa people live on the Hoopa Valley Reservation, in the heart of the Tribe's traditional territory.

The Hupa people traditionally occupied lands in the far northwestern corner of California. The boundaries of the reservation were established by Executive Order on June 23, 1876 pursuant to the Congressional Act of April 3, 1864. The boundaries were expanded by Executive Order in 1891 to connect the old Klamath River (Yurok) Reservation to the Hoopa Valley Reservation. Further confirmation of the ownership by the Hupa Tribe of the Hoopa Valley Reservation came on October 31, 1988 with President Ronald Regan's signature on Public Law 100-580, the Hoopa/Yurok Settlement Act.

The Hupa People have occupied their lands since time immemorial, and the past century has really been the shortest in the Tribe's history. However, up until the late 1800s, there is little-to-no written record on the rich history and culture that is now the Hoopa Valley Tribe. Much of the tradition and lore that still exists today has been passed along between generations via an extensive oral tradition. The ceremonies and traditions continue in the similar manners as they have since the beginning, and will continue in this custom.

Location

The Reservation is located in the northeastern corner of Humboldt County in Northern California. It lies approximately 50 miles inland from the Pacific Ocean and is bisected by the Trinity River as the river travels between the community of Willow Creek and its confluence with the Klamath.

Land Area

The Hoopa Valley Indian Reservation is the largest reservation in California. According to the Executive Order issued by President U.S. Grant on June 23, 1876, the Reservation encompasses 89,572 acres. As currently surveyed, the Reservation is nearly square with sides 12 miles in length or approximately 144 square miles. This area encompasses roughly 50% of the Hupa aboriginal territory.

The reservation consists of rugged, mountainous terrain and a broad valley that is bisected by the Trinity River and its many tributaries. The area is characterized by relatively wet, cool winters and dry summers. The primary hazards are earthquakes, flooding from winter storms, and wild land fire during the dry summer and fall.

Hazard Overview

Winter storms can bring large amounts of rain, damaging winds, and occasionally some snow. Rain can cause landslides that block Highway 96 and cause flooding on the Trinity River. The most significant flooding is caused during the late winter and early spring if a warm storm brings a large amount of rain that melts snow in the surrounding mountains. These rain-on-snow events can cause rapid increase in flows and flooding.

Earthquakes are possible at any time in northern California. Aside from damage to property and the potential for injuries, the largest problem associated with an earthquake is the loss of access to emergency medical care and the disruption of power. A clinic on the reservation can address many issues; but if Highway 96 or 299 is blocked, all acute patients would need to be transported by air to Eureka or Redding.

During the summer months, there is a consistent danger of wildland fire. The reservation has its own wild land fire department which responds to over 200 incidents a year. Fire has the potential to destroy homes, block roads, and cause respiratory problems for residents of the Reservation. Fire protection services are bolstered by mutual aid agreements with other fire services in the area.

Insufficient water in the Klamath and Trinity Rivers should also be considered when planning for hazards. As with all natural disasters, low water levels in the rivers are not entirely the consequence of natural weather patterns, such as drought, but the result of management decisions. Both rivers are controlled by upstream reservoirs and decisions as how much water is released are political decisions. Nevertheless, these political decisions can have dramatic impacts on the ability of the rivers to support salmon. Fish kills have occurred in the past and caused harm to Tribes that rely on the Salmon for subsistence and ceremonial purposes.

Population

The 2010 census states the reservation population is 3,041. By utilizing the 2005 BIA Report and the 2010 census population statistics, the population on the reservation was determined to include 1,893 Hoopa, 752 other Native Americans, and 396 non-Indians. New members are added to the Hoopa Tribal role following an application process and final approval by the Tribal Council.

Approved Plan

The Hoopa Tribe does not have a FEMA-approved, state-level, multi-hazard mitigation plan.

2.2.4 The Karuk Tribe

Tribal Profile

The Karuk áraaraha, the Upriver People, are from the middle course of the Klamath and lower course of the Salmon Rivers. Karuk villages once extended from Seiad Valley to 15 kilometers below Bluff Creek along the Klamath River and in vicinities along the middle and lower Salmon River. The Karuk have lived in this region since the beginning of time and retain millennial ties to the land. Today, the Karuk Tribe sustains its traditions and sovereignty as a federally-recognized Tribe. The Karuk Tribe upholds the right of self-governance through many programs that help ensure autonomy as a self-leading community.

The Karuk Tribe provides a variety of programs and services, including social, educational, environmental, cultural, health, general assistance, self-governance, housing, transportation, and land use planning for tribal members and others residing in the communities. The Karuk Tribal Health Program operates health clinics in Orleans, Happy Camp, and Yreka, serving all patients regardless of their ability to pay.

Location

The Karuk Tribe of California's present-day service area is northeastern Humboldt County and all of Siskiyou County. The *Federal Register* describes the area as "[t]he counties of Siskiyou, northeastern Humboldt from State Highway 96 milepost HUM 28.61 north to the Siskiyou County Line in the State of California."

Land Area

Karuk lands include approximately 650 acres of trust land and 800 acres of fee land (land owned by the Tribe but not yet in trust). These lands are mostly isolated parcels dispersed across central and western Siskiyou

County and northeastern Humboldt County. They are generally located in small communities surrounded by National Forest lands. The Karuk Tribe's "near reservation" service area is described above.

In Humboldt County, the Tribe serves the community of Orleans and those residing in the surrounding area. This area covers 214 square miles and is extremely rural. The population density for the Tribe's service area is 6.87 per square mile, which the U.S. Census Bureau labels as a "frontier." Community members served include tribal members, members of other tribes, and non-Indians.

Hazard Overview

The Tribe's service area consists of rugged, mountainous terrain that is bisected by the Klamath River and its many tributaries. It receives abundant sun from May through September. Winter weather consists of heavy rains (most of the region's annual rainfall is received between October and April); rock slides precipitated by rain; rain-on-snow events that cause severe landslides; and high winds. Travel through the service area is confined to Highway 96, a narrow two-lane road that winds along the Klamath River corridor. Highway 96 is built into steep mountains, making it subject to falling rocks year-round and landslides that cause the road to close during winter storm events. High winds and landslides during winter storms frequently destroy power lines, which may be unreachable by electrical utility workers until Highway 96 can be cleared and reopened.

A February 2007 storm closed Highway 96 or restricted travel to one-way controlled traffic at two locations (one near Orleans) for nearly two weeks; the accompanying power outage in Orleans lasted nine days. In August 2013, fast-moving wildfire burned through the community of Orleans, disrupting power for a number of days and causing severe resource damage to tribal lands and housing. The fire resulted in an evacuation of many Tribal and community members, with the Tribe facilitating an evacuation center until the evacuation order was lifted. Events such as these further isolate the Tribe's already rural communities and prohibit residents from accessing services outside the immediate area due to long distances and transportation barriers.

The Karuk Hazard Mitigation Plan identified risk from the following hazards:

- Flood Events
- Wildfire
- Air Quality
- Landslides
- Dams and Dam Failure
- Road & Bridge Failure
- Water Quality
- Volcanic Eruptions
- Earthquakes
- Drought
- Other Events

Population

The total population in the Humboldt County portion of the Tribe's Service Area, according to the 2010 U.S. Census, is 506, with 319 of these residents as Karuk tribal members or descendants.

Approved Plan

The Karuk Tribe of California has a FEMA-approved, state-level, Multi-Hazard Mitigation Plan. The plan was approved in August 2006. The plan may be viewed at: http://www.karuk.us. Information is available by contacting Russell Attebery, Karuk Tribal Chairman, at battebery@karuk.us or (530) 493-1600, ext. 2019.

2.2.5 The Bear River Band of the Rohnerville Rancheria

Tribal Profile

The Bear River Band of the Rohnerville Rancheria currently occupy only a small portion of their ancestral lands which previously encompassed much of the Eel River delta. The original Rohnerville Rancheria was purchased by the United States in 1910 and consisted of 15.187 acres located just outside the city limits of Fortuna. This Rancheria was terminated on July 16, 1966, and the 15.187 acres were divided into individual parcels and given to individual members of the Tribe.

On March 4, 1986, the United States signed a Stipulation to Restoration of Indian Country which established that the original boundaries of the Rohnerville Rancheria, among others, be as they existed immediately prior to the Rancheria Act. By the time the boundaries were re-established only a small portion of the land remained in Indian ownership. Since the land base on the original Rohnerville Rancheria was too small for providing housing and social services for Tribal members, it was necessary for the Tribe to acquire additional property. The Tribe acquired additional property on Singley Hill road. On July 12, 1991, the Tribe entered a grant deed transferring the 65-acre parcel to the United States in trust for the Tribe. The Secretary of Interior accepted this property in Trust on January 20, 1994.

As a modern Tribal government, the Bear River Band provides a variety of social, educational, environmental, linguistic, cultural, general assistance, self-governance, housing, transportation, and land use planning services for Tribal Members residing on and off of the Rancheria.

Location

The Rohnerville Rancheria is located north of the City of Fortuna and east of the community of Loleta. The Bear River Band has ownership or governmental control of four parcels of land within their aboriginal territory. The four parcels include the original Rohnerville Rancheria east of the city of Fortuna, the Singley Hill and the Fearrian Road parcels in Loleta, and the Basayo Subdivision in Fortuna.

Land Area

The Bear River Band lands include approximately 185 acres. The Old Rancheria lands are east of the City of Fortuna and the current Rancheria land is north of Fortuna off of Singley Hill Road. The Tribe owns an additional parcel within the city of Fortuna on which it has constructed housing for Tribal members.

The land is primarily rural residential with the exception of the property within the City of Fortuna. The Rancheria has a casino and housing and is surrounded by pasture and open space lands. The Tribe is planning to construct additional housing on its property off of Singly Hill Road which will also be surrounding by ranch lands and open space.

Hazard Overview

Earthquakes and the possibility of wildland fire are the primary hazards in the area. Although the Rancheria is in a relatively coastal and moist area, the Rancheria is surrounded by grass-lands which have burned in the past. Very little sunshine is needed to dry the fuels sufficiently and increase the risk of wildland fire. The current roads are adequate for emergency access/egress to the Rancheria during dry weather, but may not be adequate for wet weather. In the event an evacuation is necessary, residents of the Rancheria and visitors to the Casino can drive either north or south on Singley Hill Road, which connects with Highway 101 traveling in either direction. The Loleta Volunteer Fire Department provides fire protection services to the Rancheria and is partially funded by the Rancheria.

Storms with strong damaging winds and heavy rain are possible during the winter months. Tribal Officials have commented that it is difficult to drive on Bear River Road during many of the winter storms. The road was constructed without proper drainage and residents on the downhill side of the road often have to put sandbags across their driveways during winter rain events.

Population

The current enrollment of the Tribe is 291 members. Many of these members live in the surrounding communities of Loleta, Fortuna, Rio-Dell and Eureka.

Approved Plan

The Rohnerville Rancheria does not have a FEMA-approved, state-level, Multi-Hazard Mitigation Plan.

2.2.6 The Table Bluff Rancheria

Tribal Profile

The Wiyot people have inhabited California's northern shores for thousands of years. Before the coming of white settlers, Wiyot people around Humboldt Bay and on Indian Island hunted the area's wildlife, fished for salmon, and gathered roots for medicine, food and basketry. Before 1850, there were approximately 1500 to 2000 Wiyot people living within this area. After 1860 there was an estimated population of 200 people left. By 1910 there was an estimate of less than 100 full blood Wiyot people living within the Wiyot territory. This rapid decline in population was due to disease, slavery, target practice, 'protection,' being herded from place to place, and of course, massacres.

After the massacres of 1860 nearly all Wiyot people were removed from their homelands, but some returned. In the early 1900s, a church group purchased 20 acres, in the Eel River estuary, for homeless Wiyot people. The Federal Government later transferred this land into trust status in 1908. This land became known as the Table Bluff Rancheria of Wiyot Indians, now referred to as "The Old Reservation."

In 1958, the Federal Government passed the California Rancheria Act that terminated the Tribe in 1961. In 1975, the Tribe filed suit against the Federal Government for unlawful termination, and in 1981, in Table Bluff Band of Indians v. Lujan (United States), it was determined the Tribe's termination was unlawful and trust status was reinstated. In 1991, during another lawsuit regarding drinking water contamination and other sanitation issues on the Old Reservation, the court mandated new land be purchased and the Tribe moved to another location. This location was approximately 1-mile away up on the bluff, and serves as the present Table Bluff Reservation. The original 20 acres were put into fee simple under the individual families, but deemed to be under the Tribe's jurisdiction as long as held in Indian hands. Some Wiyot people reside on 88 acres of land called the Table Bluff Reservation, 16 miles south of the City of Eureka.

Location

Wiyot territory starts at Little River and continues down the coast to Bear River, then inland to the first set of mountains. Towns that are within the traditional Wiyot territory are McKinleyville, Blue Lake, Arcata, Eureka, Kneeland, Loleta, Fortuna, Ferndale, and Rohnerville. Rivers within this territory are Mad River (Batwat), Elk River, Eel River and the Van Duzen River.

Currently the Wiyot Tribal lands consist of an 88-acre parcel on the southern edge of Humboldt Bay and a 20-acre parcel known as the Old Rancheria. They also recently acquired 1.5 acres of Indian Island which is the center of the Wiyot people's world.

Land Area

The Table Bluff Reservation is located 16 miles south of Eureka in the Eel River Bottom on the southern edge of Humboldt Bay. This property ranges in elevation from about 40 feet above sea level at the edge of Humboldt Bay to near 130 feet above sea level on the southern edge of the property near residential areas.

Hazard Overview

According to the hazard mapping conducted by Humboldt State University, the residential portions of the Table Bluff Reservation are not at risk from a tsunami. However, the re-acquired property on Indian Island is at risk of flooding in the event of a tsunami. The Table Bluff Reservation, however, may be cut off from Eureka in the event of a Tsunami as Highway 101 North may be inundated by flood waters between College of the Redwoods and Eureka. Members of the Tribe would still have access to emergency medical services in Fortuna.

Other hazards include high winds and heavy rain from strong winter storms and earthquakes. Strong winter storms along with increased rates of runoff from bare slopes have caused flooding of the Eel River. Historically floods have covered much of the Eel River bottom. However, the Reservation is located on a bluff which may protect it from any flooding of the Eel River.

Earthquakes have the potential to isolate members of the Wiyot Tribe who live on the Table Bluff reservation from other members of the Tribe who live in the communities of Fortuna and Eureka. Earthquakes may damage area roads and may it impossible to get emergency medical care and to access goods and services.

Population

Currently there are over 526 enrolled members.

Approved Plan

The Table Bluff Rancheria does not have a FEMA-approved, stage-level, Multi-Hazard Mitigation Plan.

2.2.7 The Cher-Ae Heights Indian Community of the Trinidad Rancheria

Tribal Profile

The Trinidad Rancheria was established in 1917. Descendants of three tribes of California presently occupy the Rancheria including the Yurok, Weott, and Tolowa peoples. All three tribes share a similar cultural heritage. Traditionally these groups lived throughout the coastal region of what is now northern California, residing on lands from the Humboldt Bay area to the Oregon coast.

Since the mid-1970s the tribe has accomplished an enormous revitalization, including the development of housing facilities and the provision of health and welfare benefits for its tribal members. A community council that is made up of the entire adult voting tribal membership governs the Trinidad Rancheria. A five member tribal council is elected from the Rancheria community.

Location

The Tribe owns property at two separate sites in Trinidad; 46.5 acres on the west side of Highway 101 along the Pacific Coast and 9 acres on the eastern side of Highway 101 approximately one-mile from the City of Trinidad. Highway 101 bisects the Rancheria on the northeast corner of the Rancheria in Trinidad. The Tribe also owns the Trinidad Pier and Seascape Restaurant in the City of Trinidad. The pier is the northernmost oceanfront pier in the state and sits in one of the state’s most beautiful settings at Trinidad Harbor. It is

accessible from Main Street in central Trinidad. A third parcel of 27.5 acres is located two miles north of McKinleyville east of the Eureka/Arcata Airport.

Land Area

The Trinidad Rancheria comprises of 83 acres on three parcels in Humboldt County. The land uses on the property include commercial, low density residential and sections of coastal beach and bluff. Land uses on surrounding the tribe include, both low and medium density residential, commercial, and state park. The potential hazards include: earthquakes, landslides, tsunami, winter storms, flooding, wildland fire, and toxic chemical/biological spills on Highway 101 (which bisects the Rancheria and is within very close proximity to Tribal homes).

Hazard Overview

Strong winter storms bring large surf which frequently damages portions of Scenic Drive. Scenic Drive is the only access road to portions of the Rancheria including the Casino. Northern parts of Scenic Drive near Trinidad are less susceptible to landslides and failure of the coastal bluff. The southern portion of scenic drive has been closed for up to a year at a time because of erosion of the coastal bluff supporting the road base.

A tsunami has the potential to damage additional portions of Scenic Drive and inundate the Trinidad Pier and Seascape Restaurant in the City of Trinidad. Both the pier and the accompanying restaurant are close to sea-level and would likely feel the impact of any change in sea-level, particularly a large rapid rise in sea level or a wave. If a large earthquake occurs patrons of the restaurant and restaurant staff would need to evacuate before any official tsunami warning is issued. In the event of a large earthquake and Tsunami the Tribe would also become isolated from medical services by the closure of Highway 101 south of Trinidad Westhaven. Highway 101 is vulnerable to both flooding and Tsunamis as it passes over the Little River and behind Clam Beach. This area has been mapped by the Humboldt County Tsunami Working Group and was identified as being subject to ‘High velocity wave hazard.

Earthquakes have the potential to damage property and injure people at any time. If an earthquake occurs while an event is in progress at the Casino the Tribe may need to provide food, water, and shelter for a large number of people. Highway 101 may be closed until bridges are inspected or repaired. If a tsunami accompanies the earthquake it may be several weeks before large portions of 101 are reconstructed.

The risk from wild land fire is relatively small. Fire in stands of Redwoods along the coast is infrequent although based on the fire history in other stands of Redwoods it does occur. Adequate defensible space as well as sufficient access/egress would help mitigate this risk.

Population

According to the 2010 U.S. Census, the total population of the Rancheria is 132. These numbers are for the Trinidad Rancheria and Off-Reservation Trust Land. There are 52 members on the Rancheria and 21 members on Off-Reservation Trust Land. However, Trinidad Rancheria has its own population records as recent as 2006, showing Reservation population at 102 Tribal members, an estimated 31 non-Tribal members, and 52 children living within the Rancheria boundaries. The 2005 BIA report states there are 171 members enrolled.

Approved Plan

The Trinidad Rancheria has a FEMA-approved, state-level, Multi-Hazard Mitigation Plan. The plan was approved in April of 2006. The plan is kept on file with FEMA and on file in the Tribe’s Operations building. Questions can be directed to Jonas Savage, EPA Technician and Emergency Planner for the Rancheria.

2.2.8 The Yurok Tribe

Tribal Profile

The Yurok Tribe is California's largest Indian Tribe with over 6,500 enrolled members. The Yurok Tribe's people are also known historically as the Pohlik-la, Ner-er-er, Petch-ik-lah and Klamath River Indians. For millennia, traditional Yurok religion and sovereignty was pervasive and practiced throughout all of the Tribe's historic villages along the Pacific Coast and inland on the Klamath River. The Yurok people carried on extensive trade and social relations through this region and beyond. Yurok commerce traditionally included a monetary system based on the use of dentalium shells, and other items as currency. The Yurok traditional ceremonies include the Deerskin Dance, Doctor Dance, Jump Dance, Brush Dance, Kick Dance, Flower Dance, Boat Dance, and others, that have drawn Yurok people and neighboring Tribes together for renewal, healing and prayer. This whole land, this Yurok country, stayed in balance and was kept that way by the Tribe's good stewardship, hard work, wise laws and constant prayers to the Creator.

The Yurok social and ecological balance, thousands of years old, was shattered by the invasion of the non-Indians beginning in the 17th century. As white explorers, gold-miners and settlers came to this region, the Yurok people lost more than three-fourths of its population through fatal contact with European diseases and unprovoked massacres by vigilantes. The Yurok people agreed to sign a "Treaty of Peace and Friendship" with representatives of the President of the United States in 1851, however, the US Senate failed to ratify the treaty. In 1855, the US Government ordered the Tribe's people to be confined on the Klamath River Reserve which was created by Executive Order. The relocation of Yurok families to unfamiliar lands caused great hardships. The forced removal of children to US Government boarding schools where they were denied the right to practice their cultural traditions caused the disruption of the Tribe's heritage. Throughout the past history of Yurok contacts with the US Government and State of California, the Tribe has fought to protect and maintain access to its Ancestral Lands. These struggles were legally complicated by the fact that the Yurok people had never established a formal structure with a written form of government. After the land-based natural resources and fisheries of the Tribe's aboriginal lands had been decimated, and the traditional stewardship of the people ignored, the Yurok people knew it was time to establish a federally recognized Tribal Sovereignty and Authority to protect and preserve both the traditions of the Tribe's people and the land and river of its ancestors.

On November 24, 1993, the Constitution of the Yurok Tribe was certified and approved, after having passed a Ratification Election by a majority of the Yurok Tribal members. The Constitution defines the territory, jurisdiction and authority of its Tribal Government. The Yurok Tribe's main offices are located in Klamath, California and the Tribal government employs nearly 200 individuals. Enrolled and registered to vote Tribal members elect nine of its members to the Tribal Council. The Tribal Chairperson and Vice Chairperson are elected at-large. Seven council members represent the seven Tribal Districts. Each Council member serves a term of three years and regularly meets at least monthly. Individual council members have District meetings at least quarterly. All regular and special meetings of the Council are open to members of the Yurok Tribe. All votes of the Council are a matter of public record.

Location

The Yurok Tribe's Territory consists of all Ancestral Lands, specifically including, but not limited to, the Yurok Reservation's lands, which currently extend from one mile on each side from the mouth of the Klamath River and upriver for a distance of 44 miles.

Land Area

The Yurok Reservation is 63,035 acres. Only a small portion of the Yurok Reservation has been developed for residential housing, and much of that lacks basic services such as electricity and telephone.

Hazard Overview

The Yurok Hazard Mitigation Plan identified that there was a medium or high risk of the following hazards:

- Bridge Failure
- Dam Failure
- Drought
- Earthquake
- Extreme Heat
- Fish Kill
- Flood
- Hailstorm
- Landslide
- Road Failure
- Winter Storms
- Structural Fires
- Tsunami
- Water Contamination
- Wildfire
- Windstorm

The Hazard Mitigation Plan examines each hazard and outlines potential mitigation measures which are intended to lessen the impact of each hazard. The Yurok Hazard Mitigation Plan available from the Tribe should be consulted for an in-depth discussion of how hazards affect the Yurok.

Population

The 2005 BIA report states there are 4,912 members enrolled.

Approved Plan

The Yurok Tribe of California has a FEMA-approved, state-level, Multi-Hazard Mitigation Plan. The plan was originally approved in May 2006 but was recently updated to reflect changes from the regions 2008 wildfires. The Tribe is currently waiting for FEMA's review and approval on the updated Hazard Mitigation Plan. The plan may be viewed at: http://www.yuroktribe.org and questions can be directed to Nicole Wright, planner for the Tribe.

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
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Arcata, CA 95521
Phone: 707-822-5957
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Alternate Point of Contact
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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

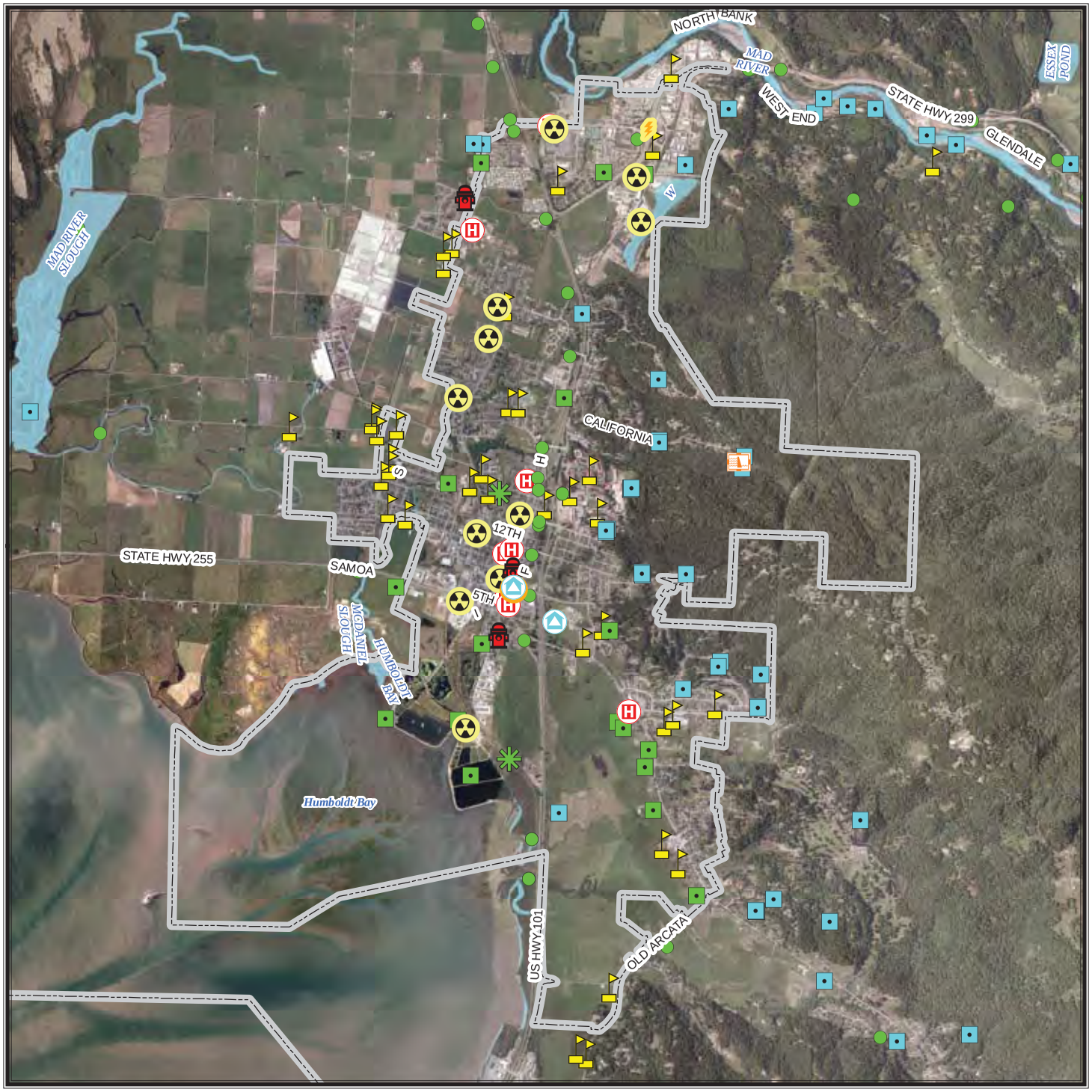
Table 4-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

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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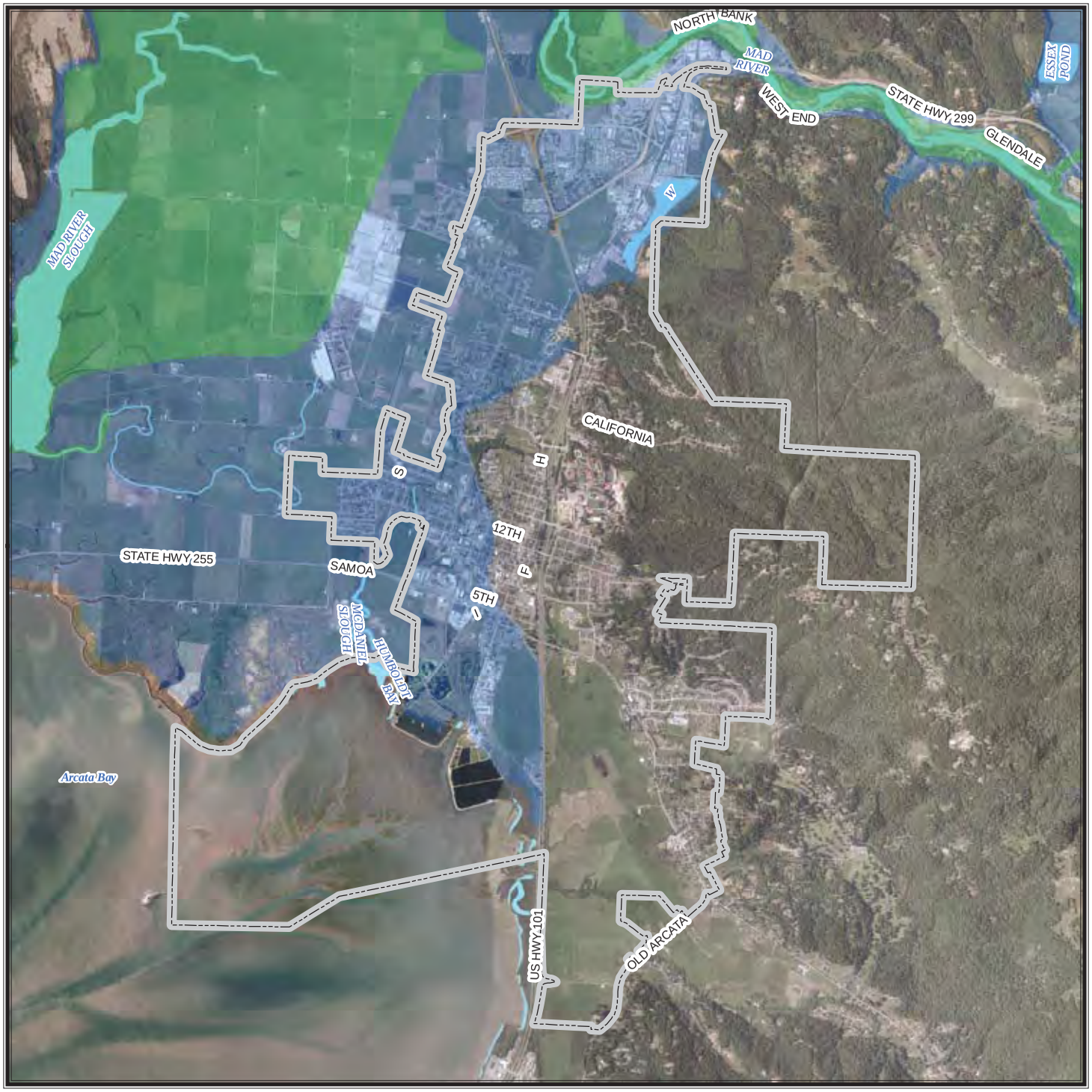


CITY OF ARCATA

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.

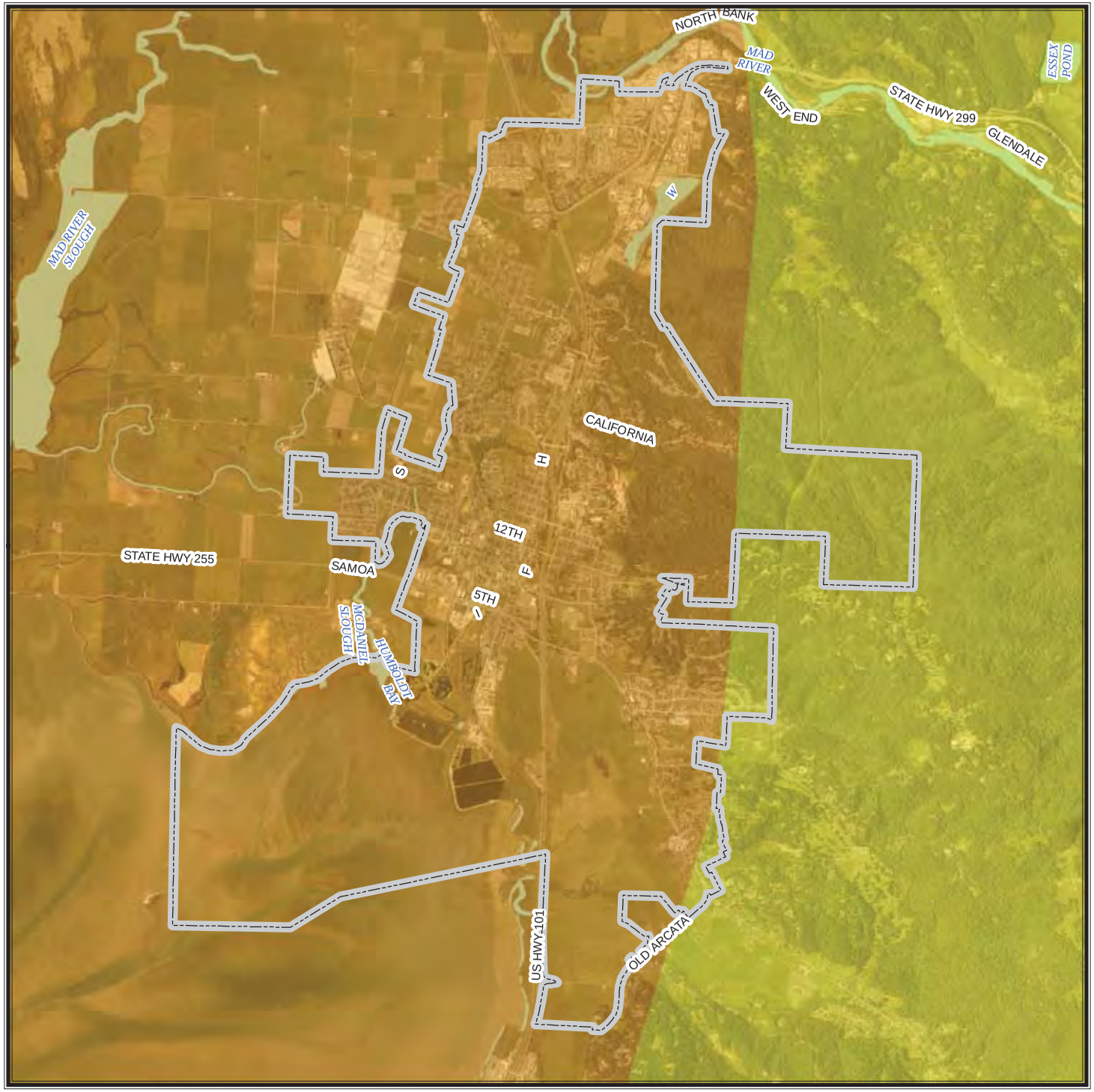
These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow 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

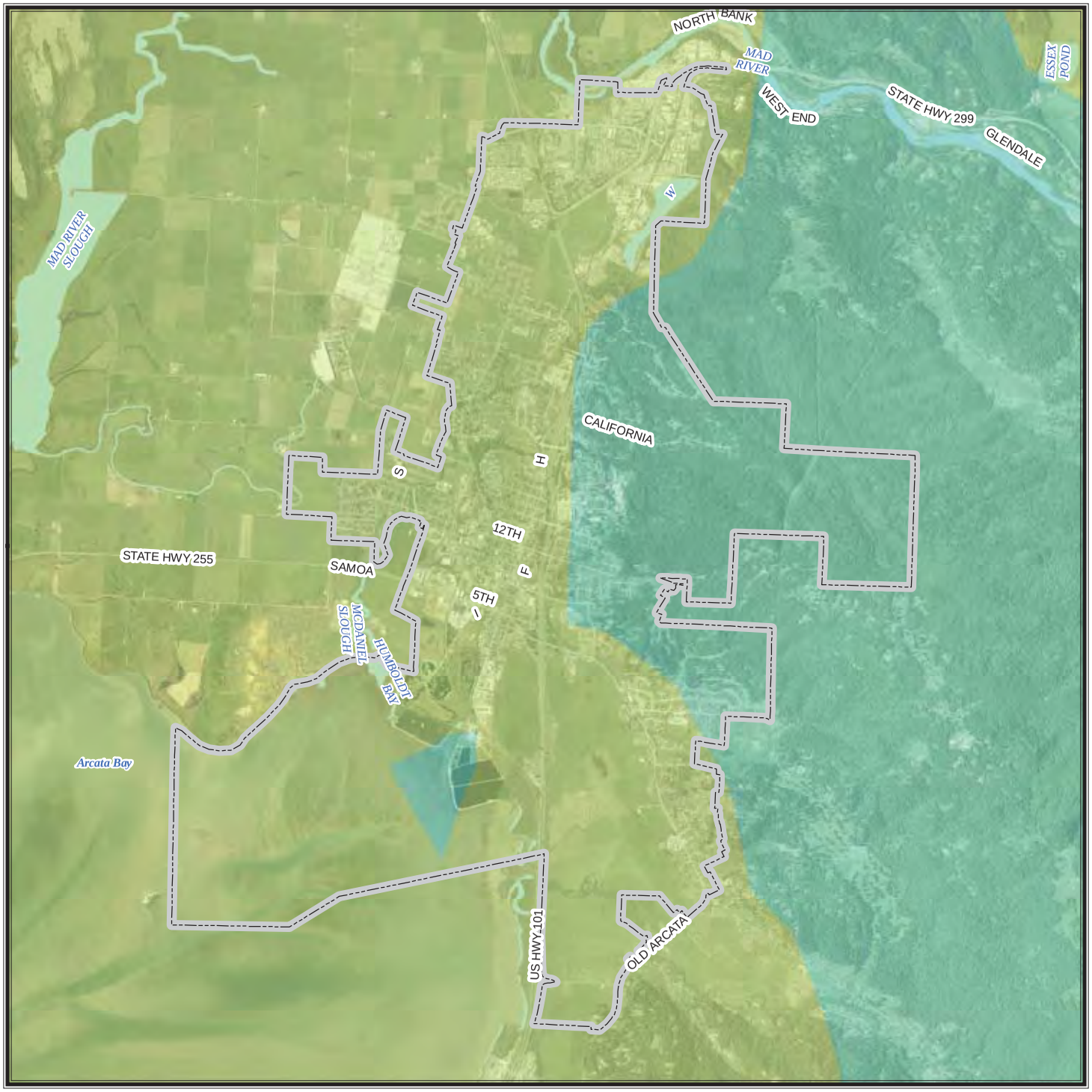
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

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

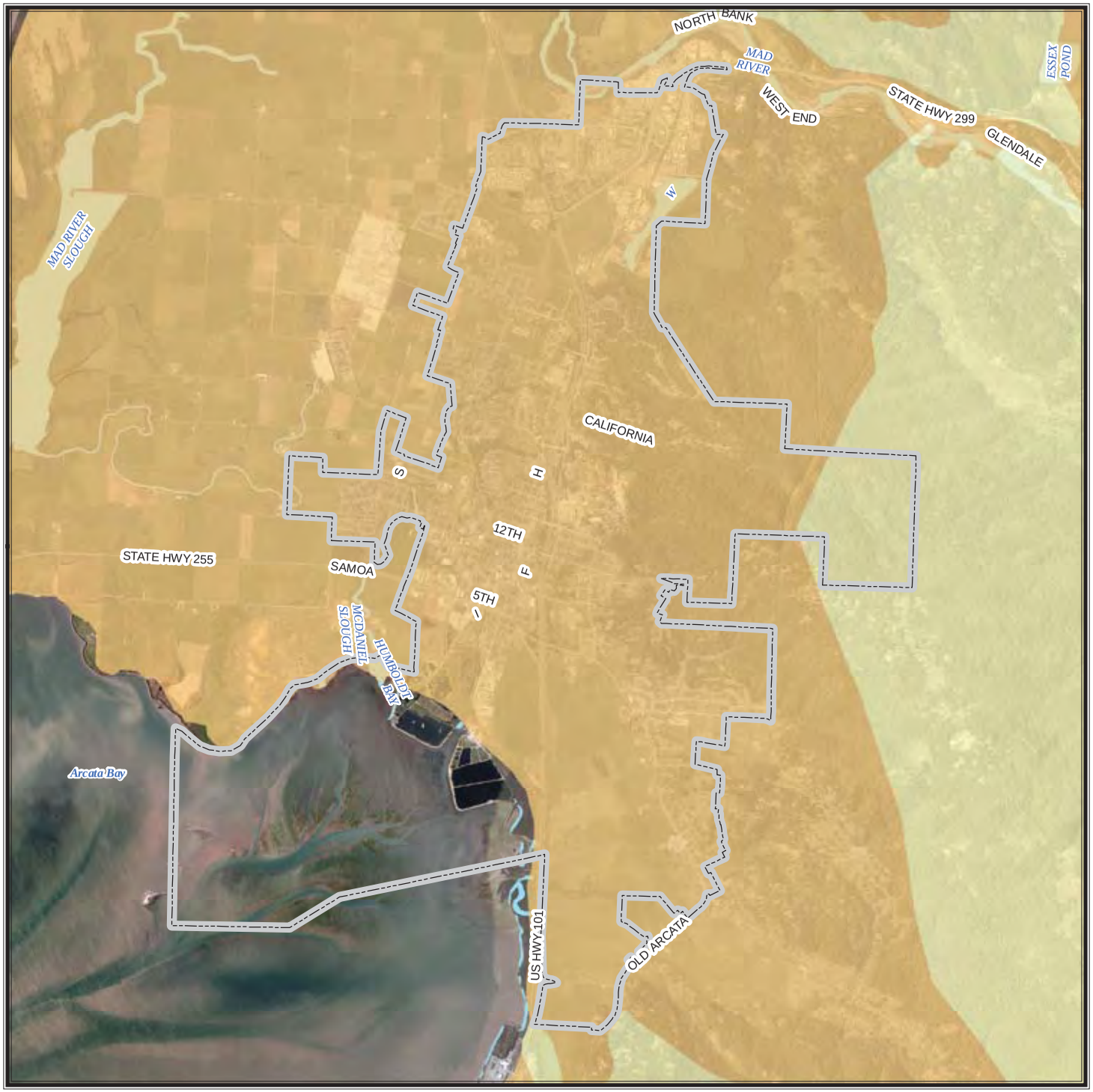
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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**

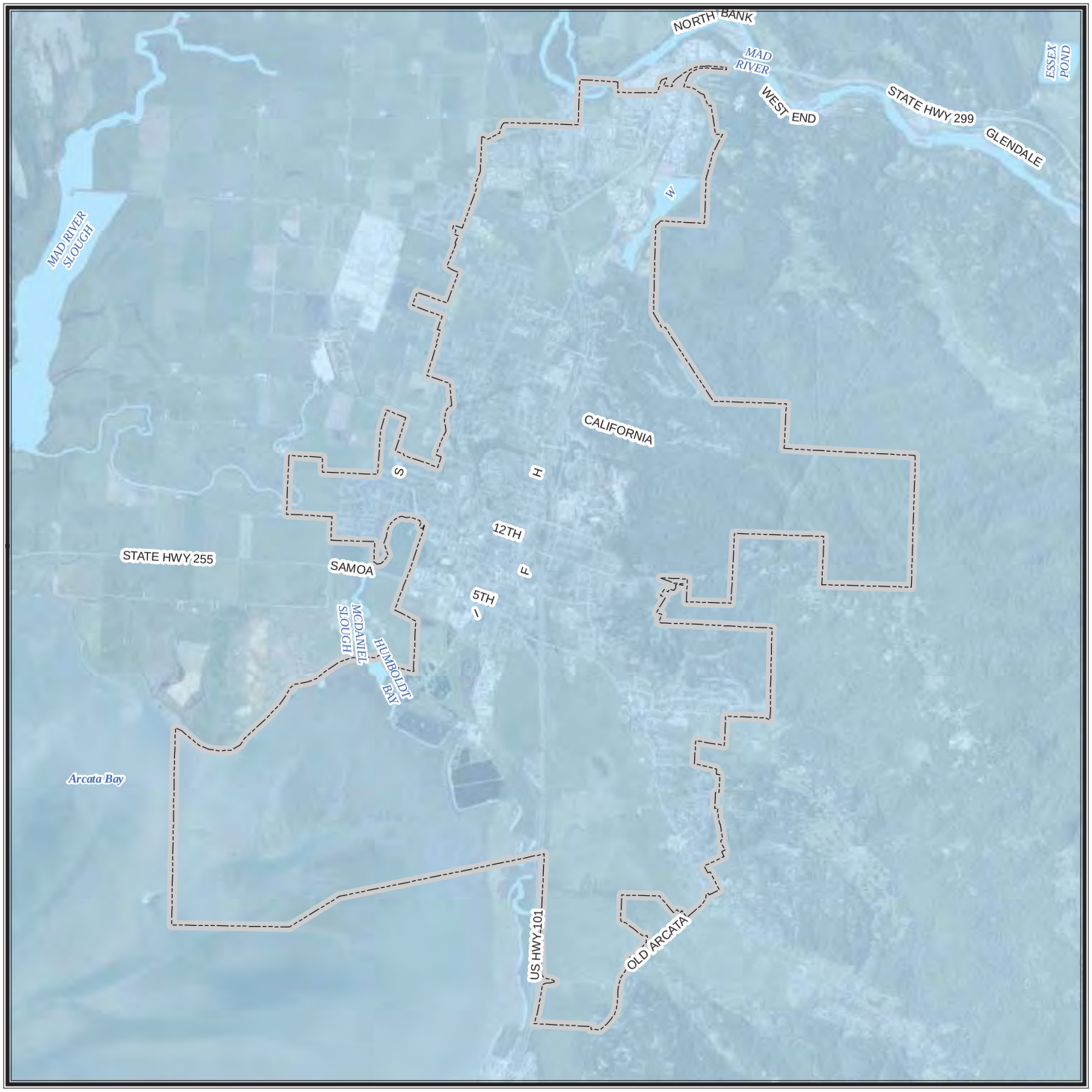
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for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

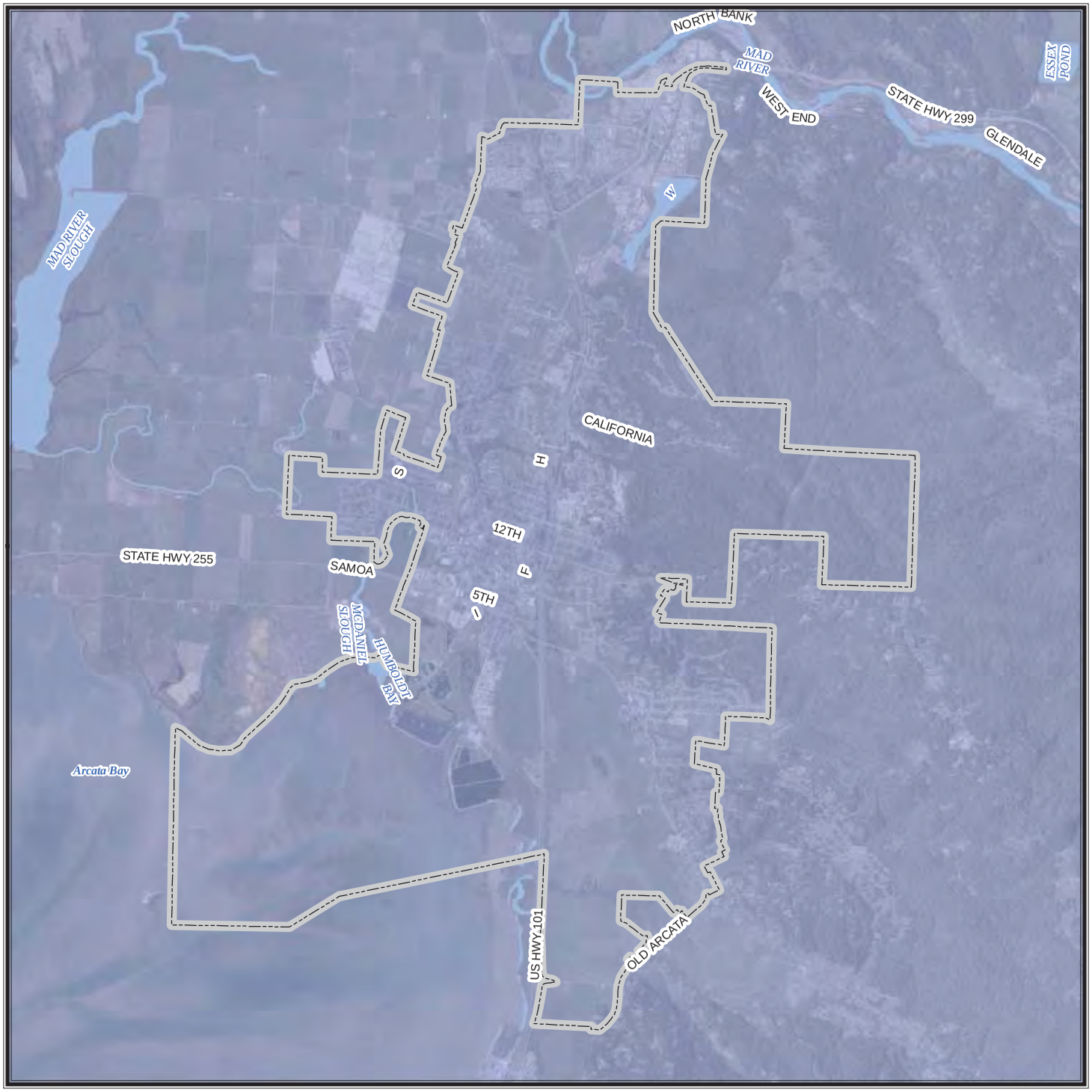
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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

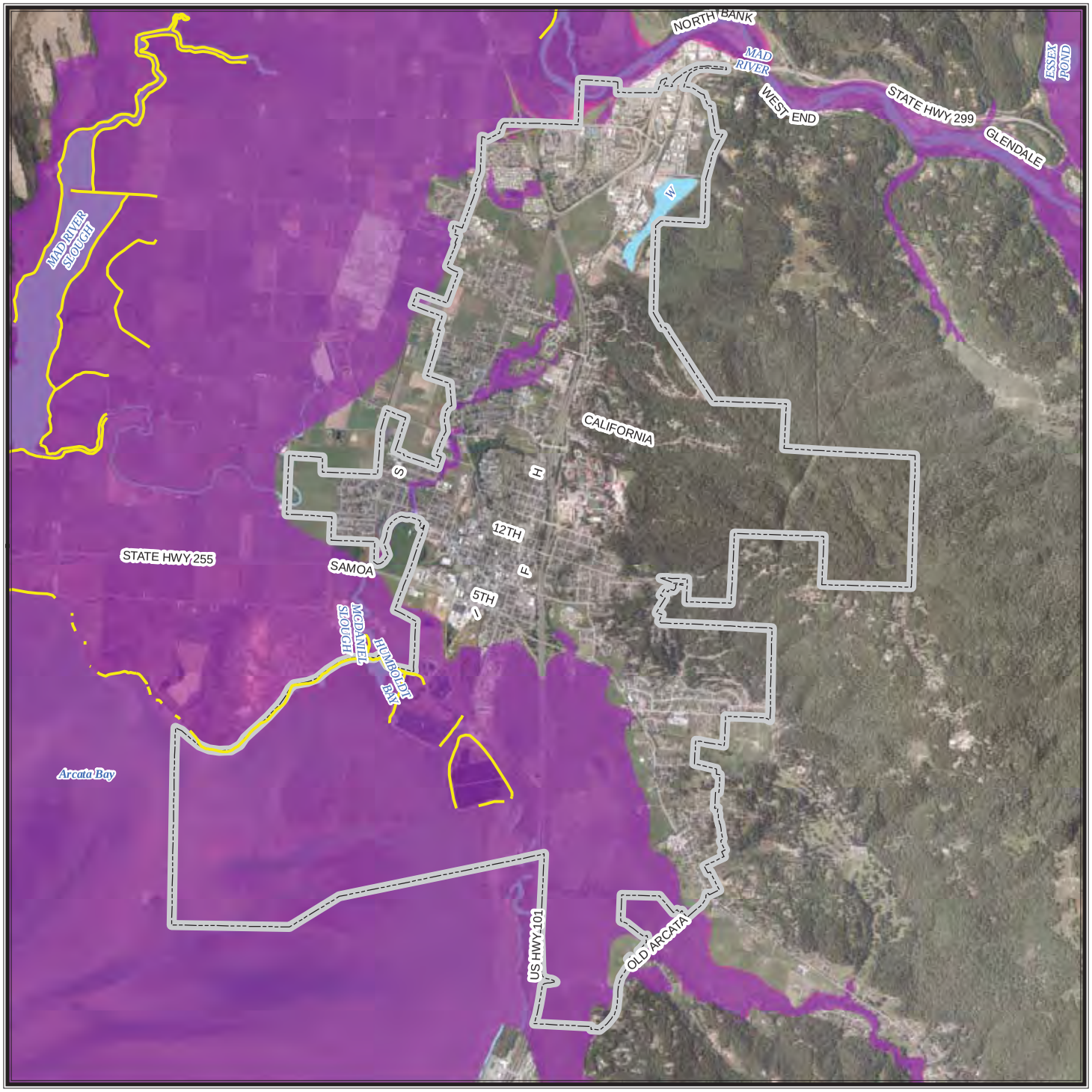
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

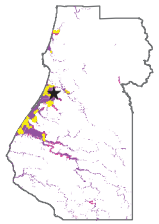
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

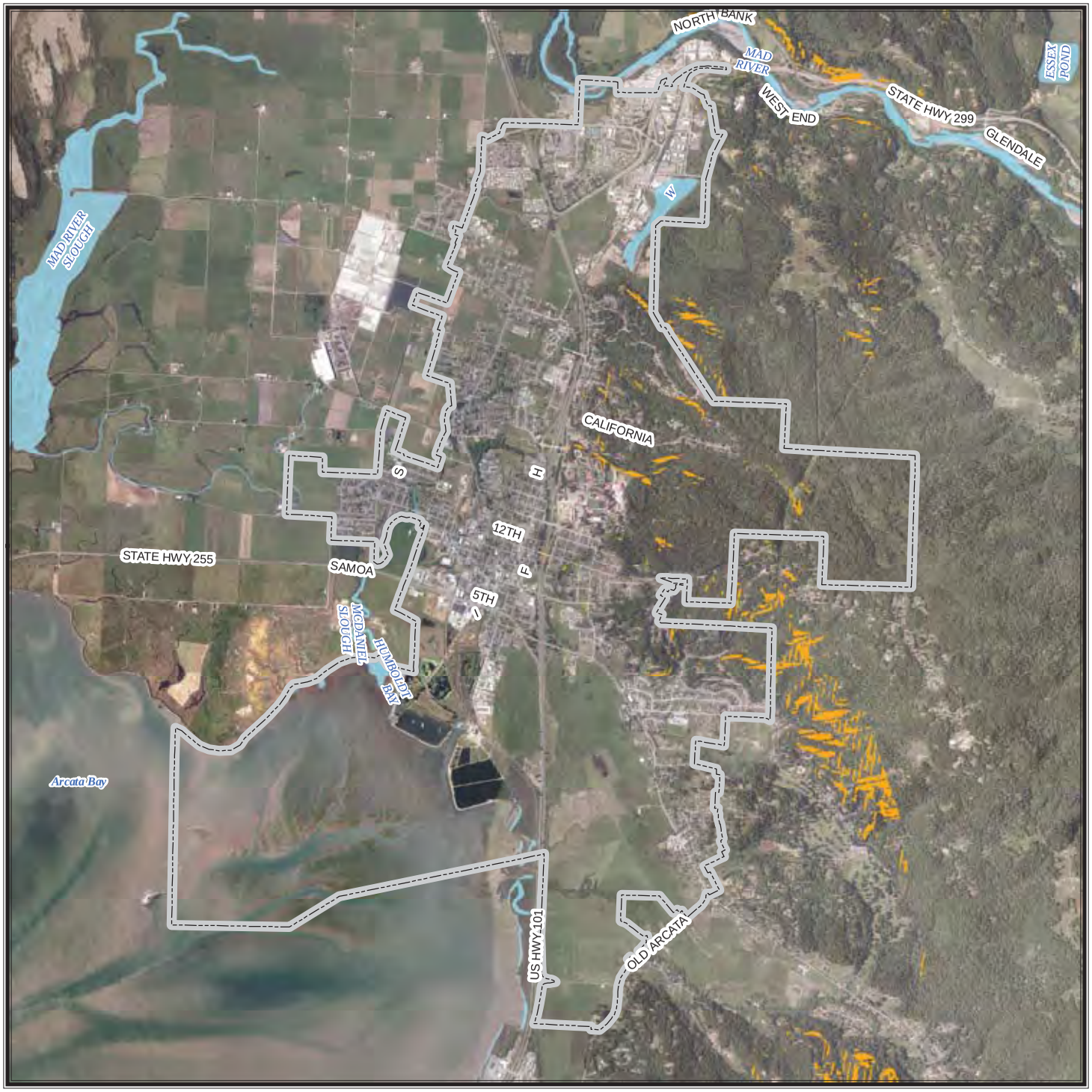
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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).

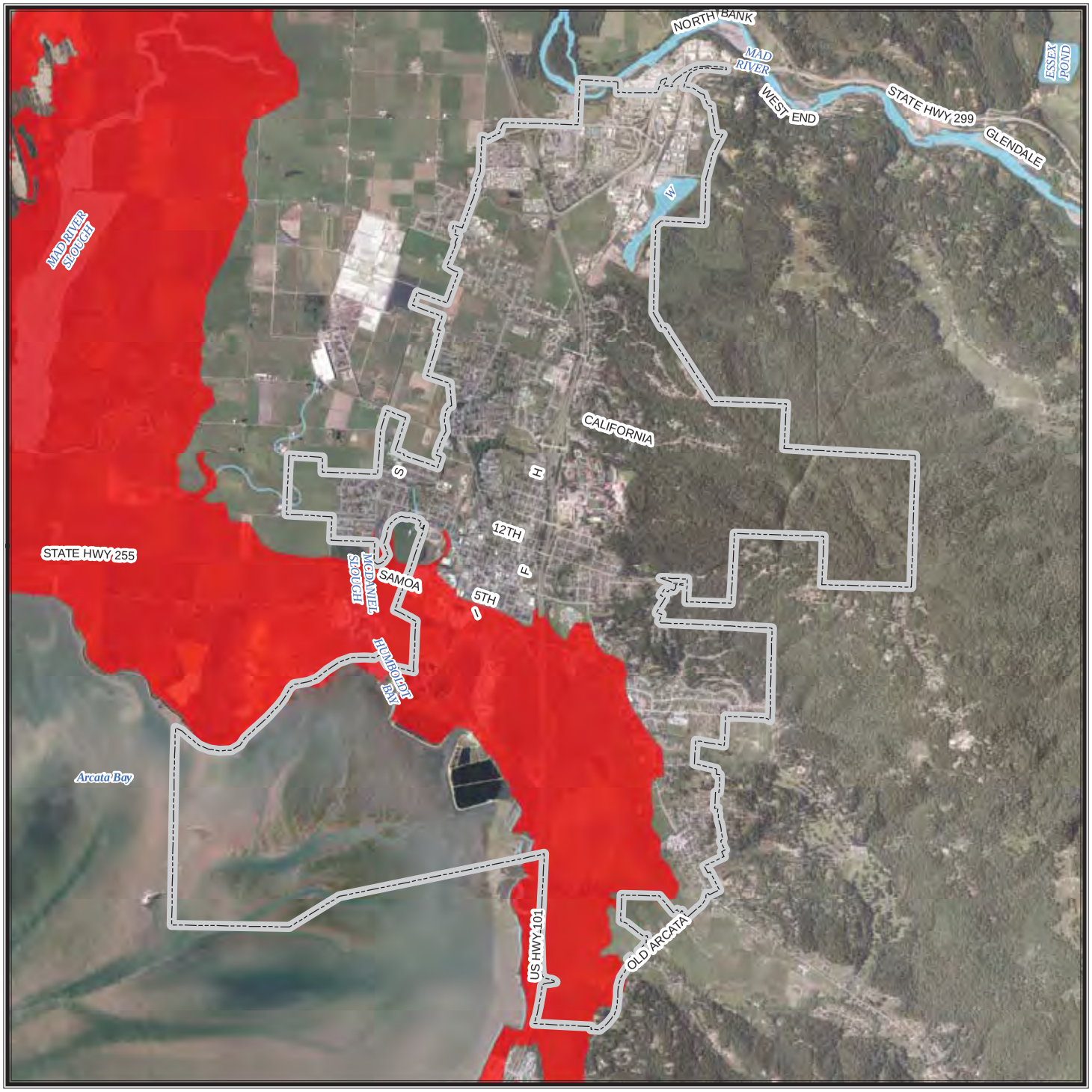
These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

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

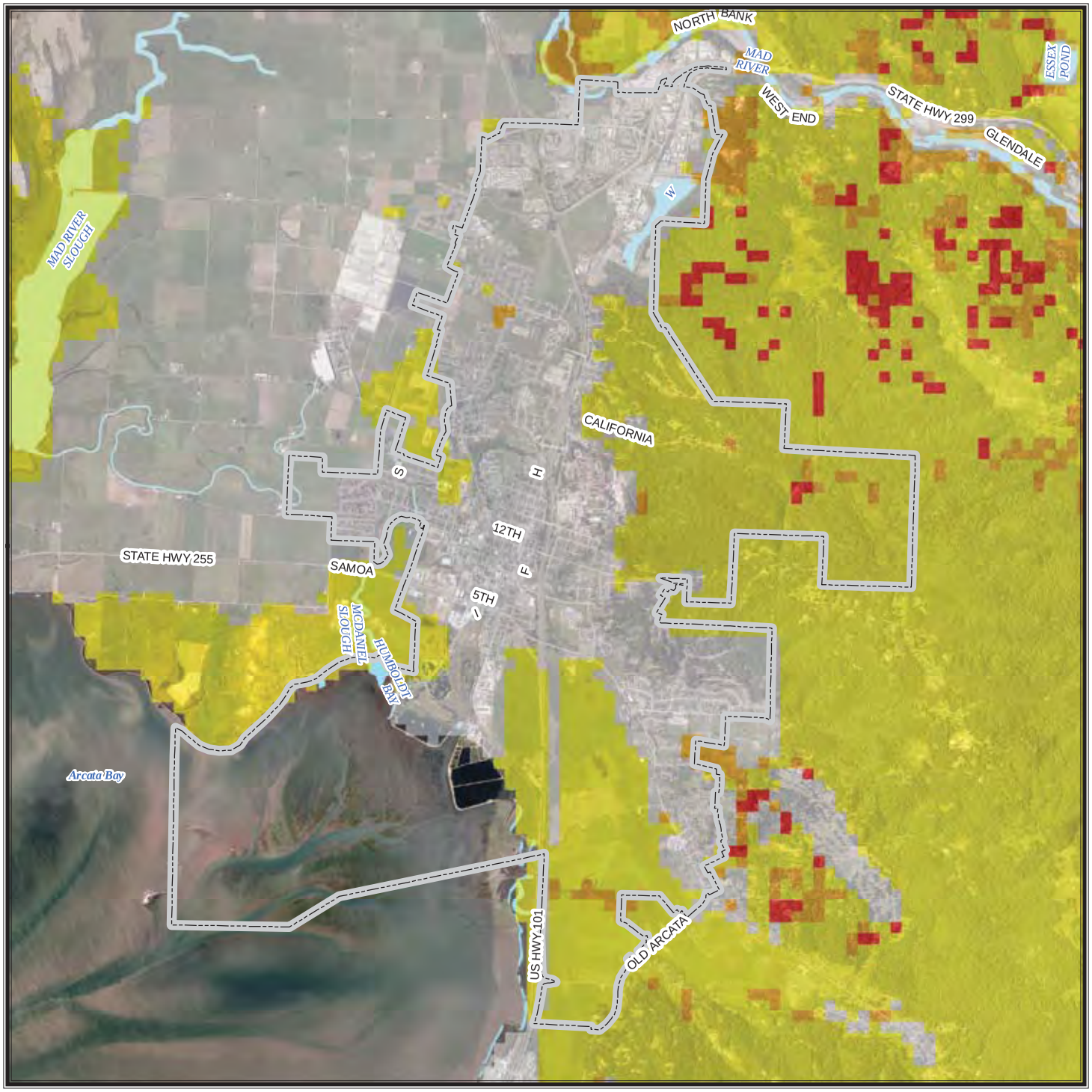
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. 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.

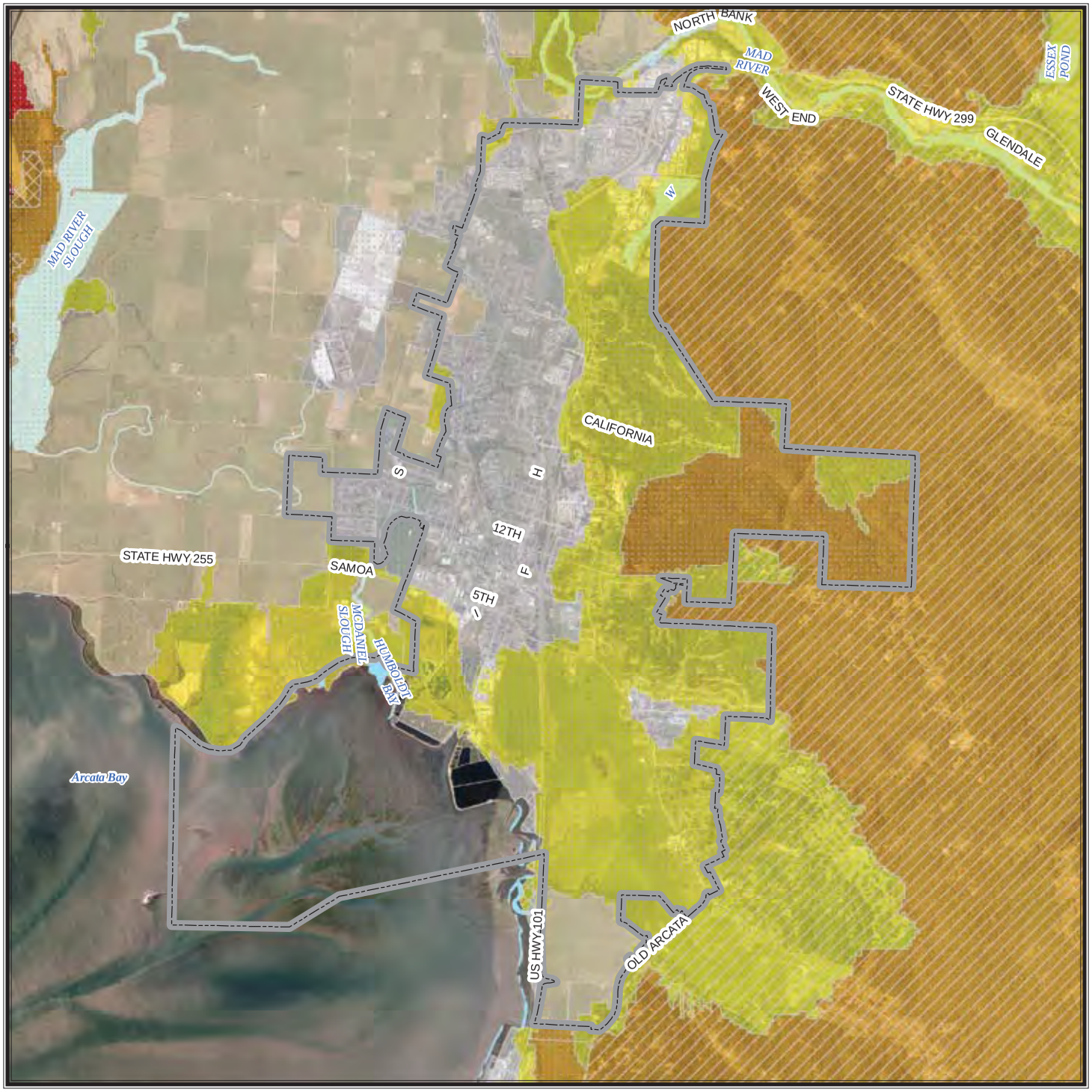
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

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

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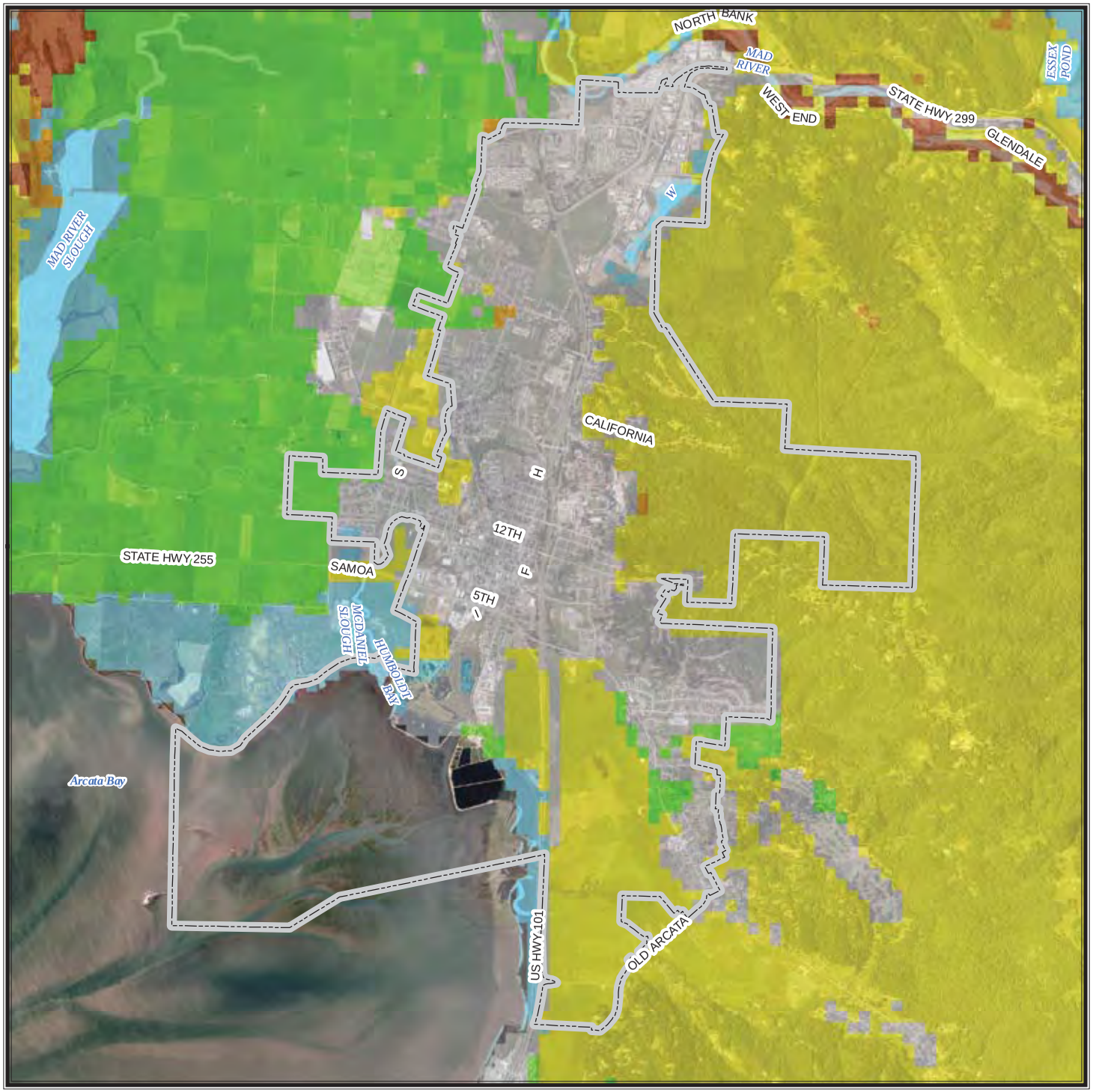


CITY OF ARCATA

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

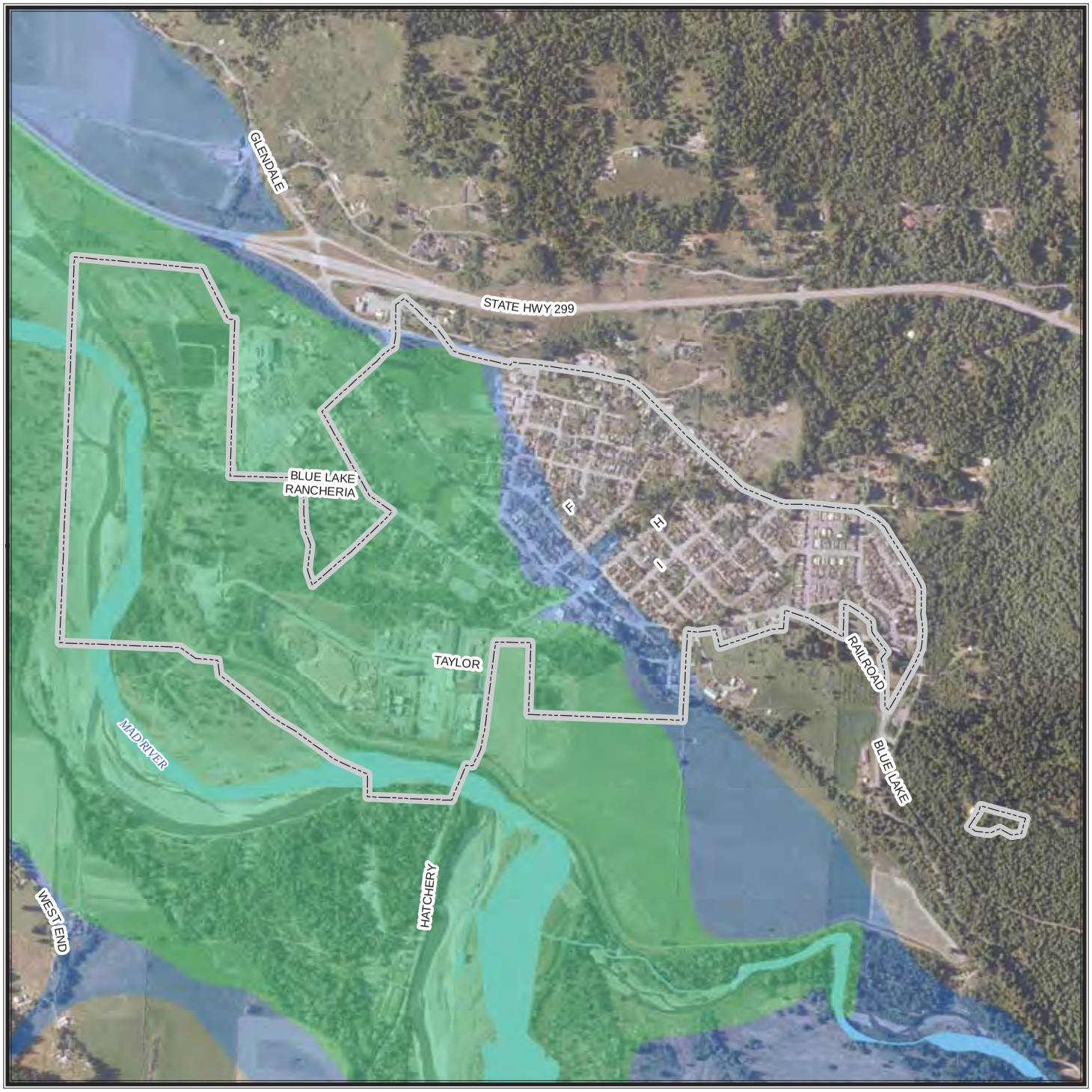
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

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

N
W E
S

0 0.25 Miles

TETRA TECH



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.

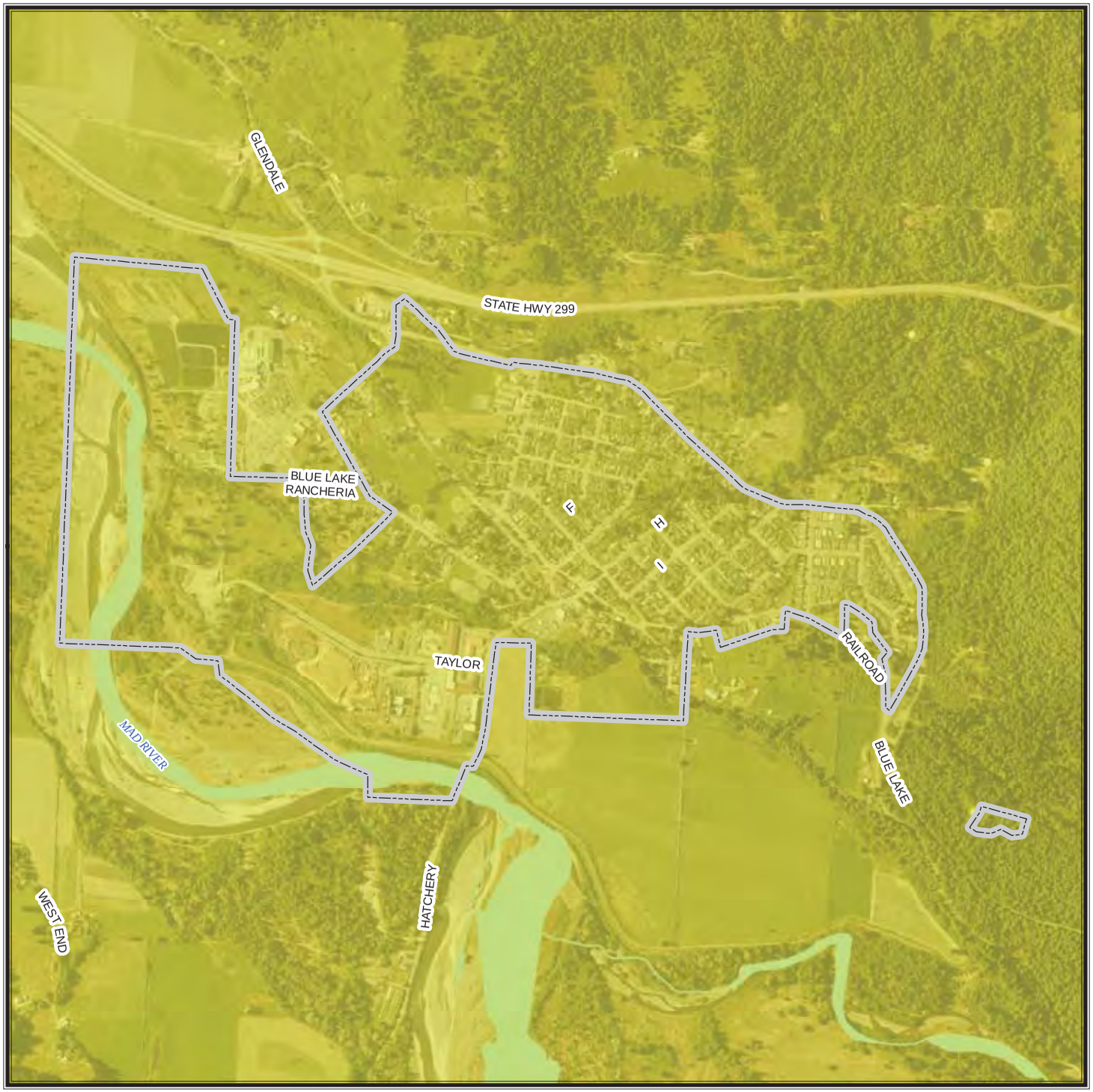
These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow 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

TETRA TECH



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

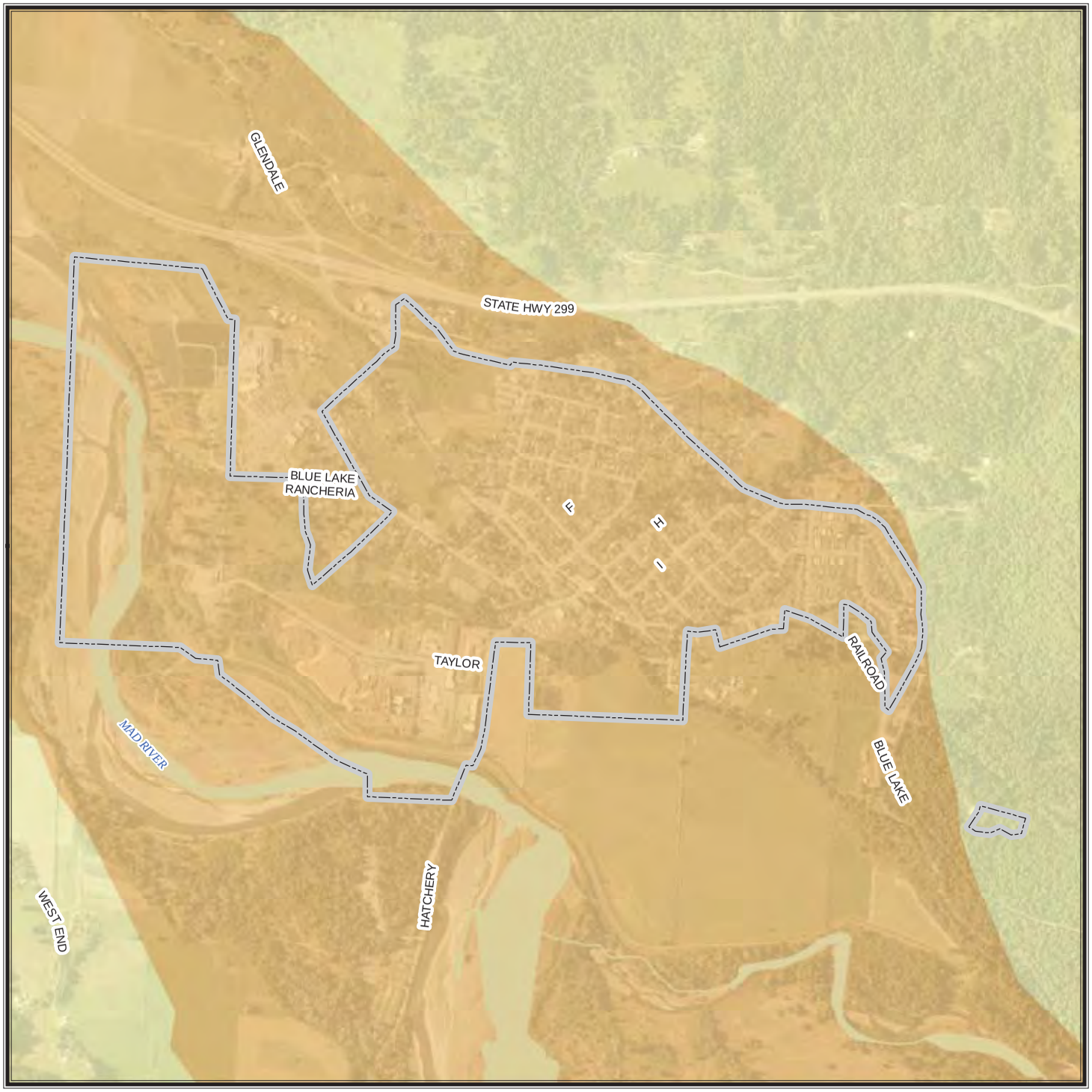
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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**

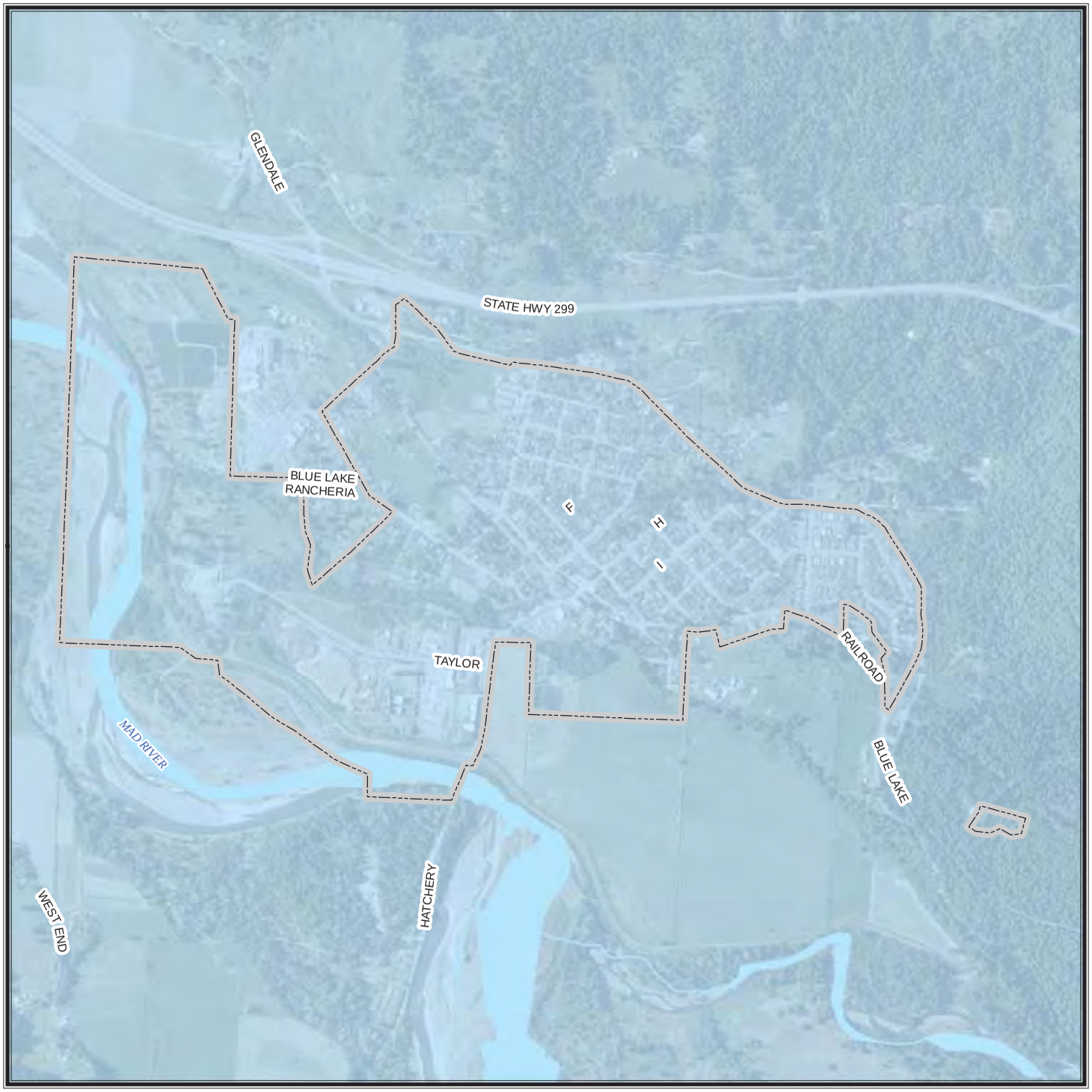
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for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

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

0 0.25 Miles

N W E S

TETRA TECH



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

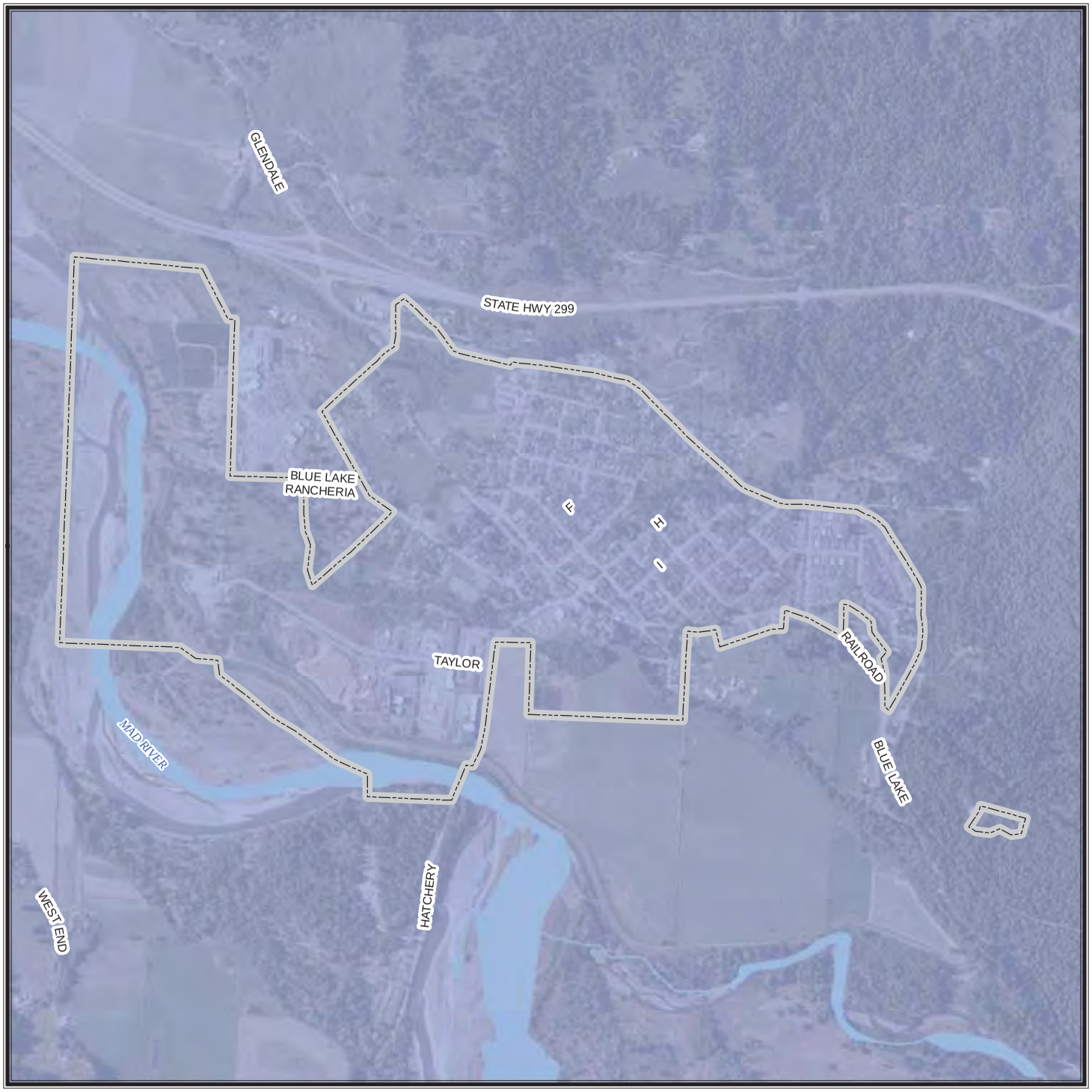
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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

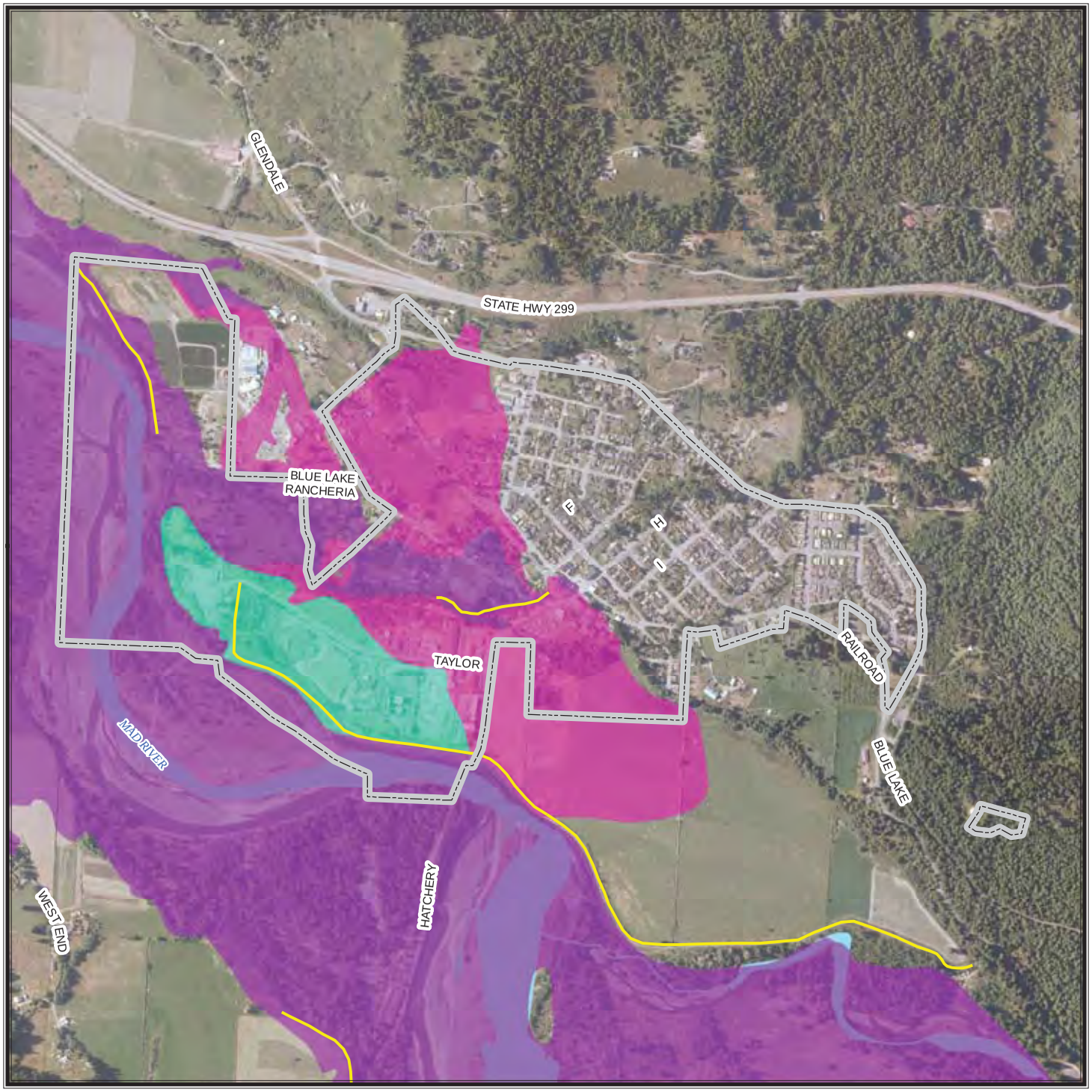
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

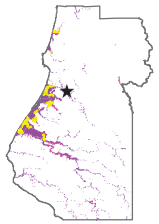
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

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

0 0.25 Miles

N W E S

TETRA TECH



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.

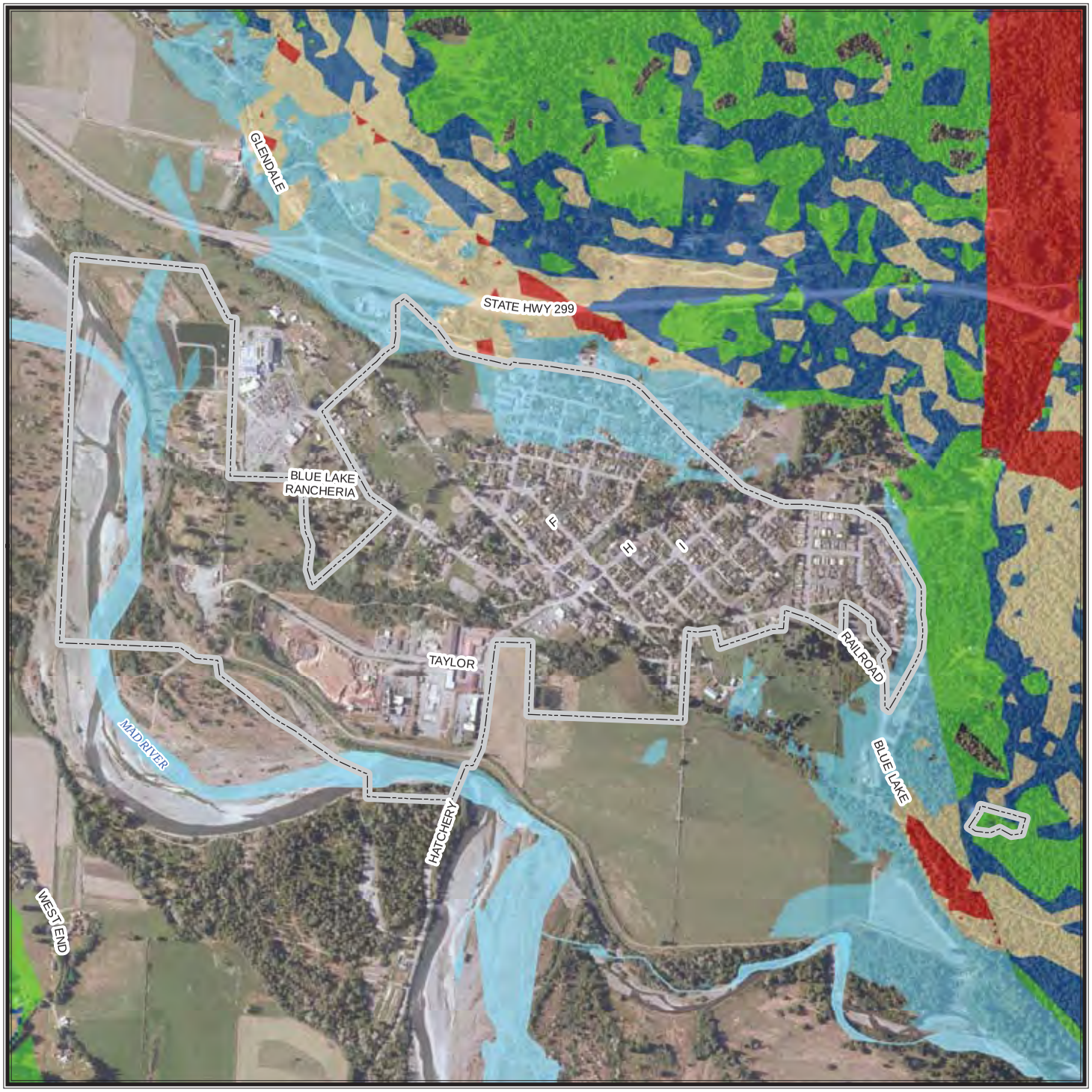
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

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

0 0.25 Miles

N W E S

TETRA TECH



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

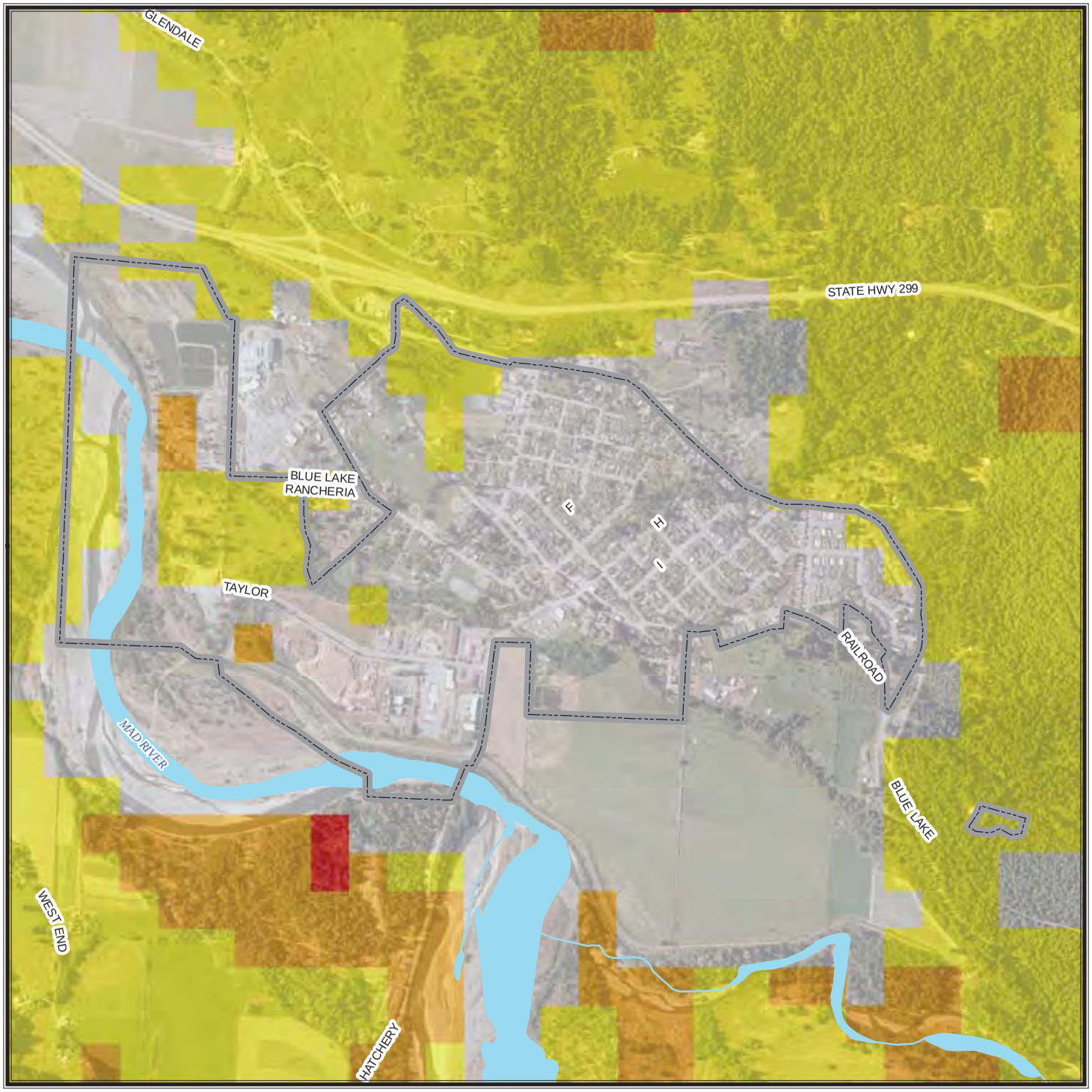
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. 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

TETRA TECH



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.

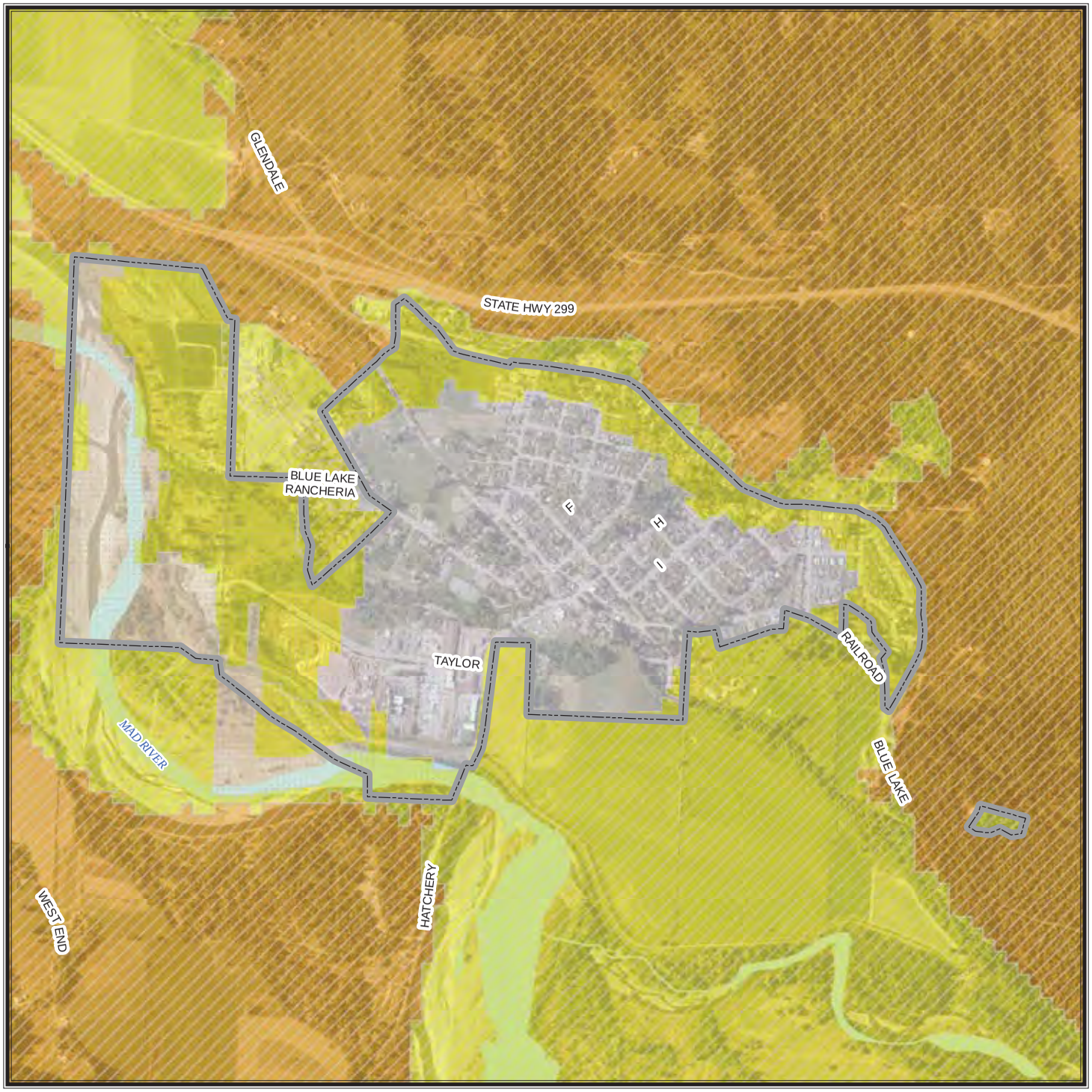
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

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

0 0.25 Miles

N W E S

TETRA TECH



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**

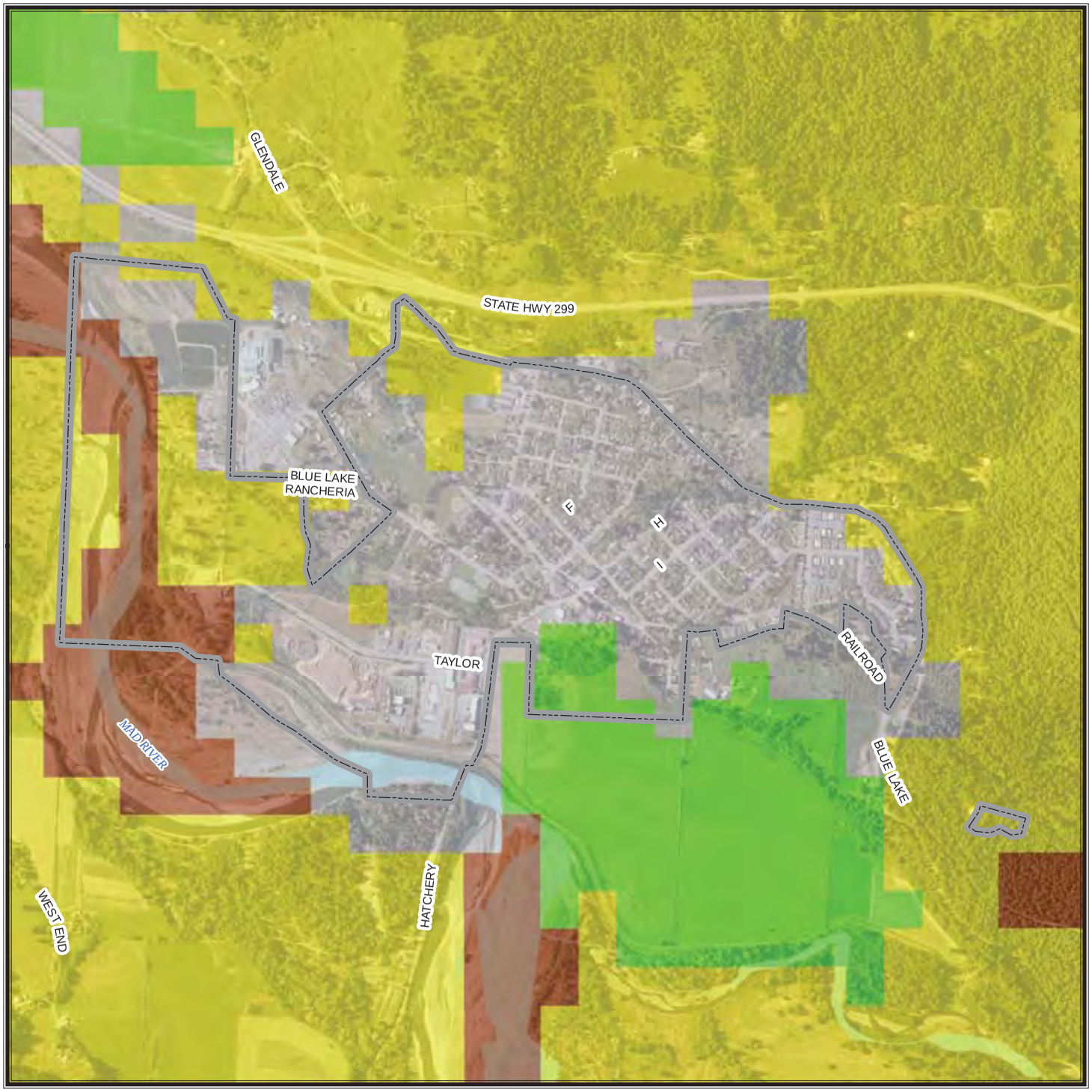
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, 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

TETRA TECH



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
531 K Street
Eureka, CA 95501
707-441-4203
byoung@ci.eureka.ca.gov

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.

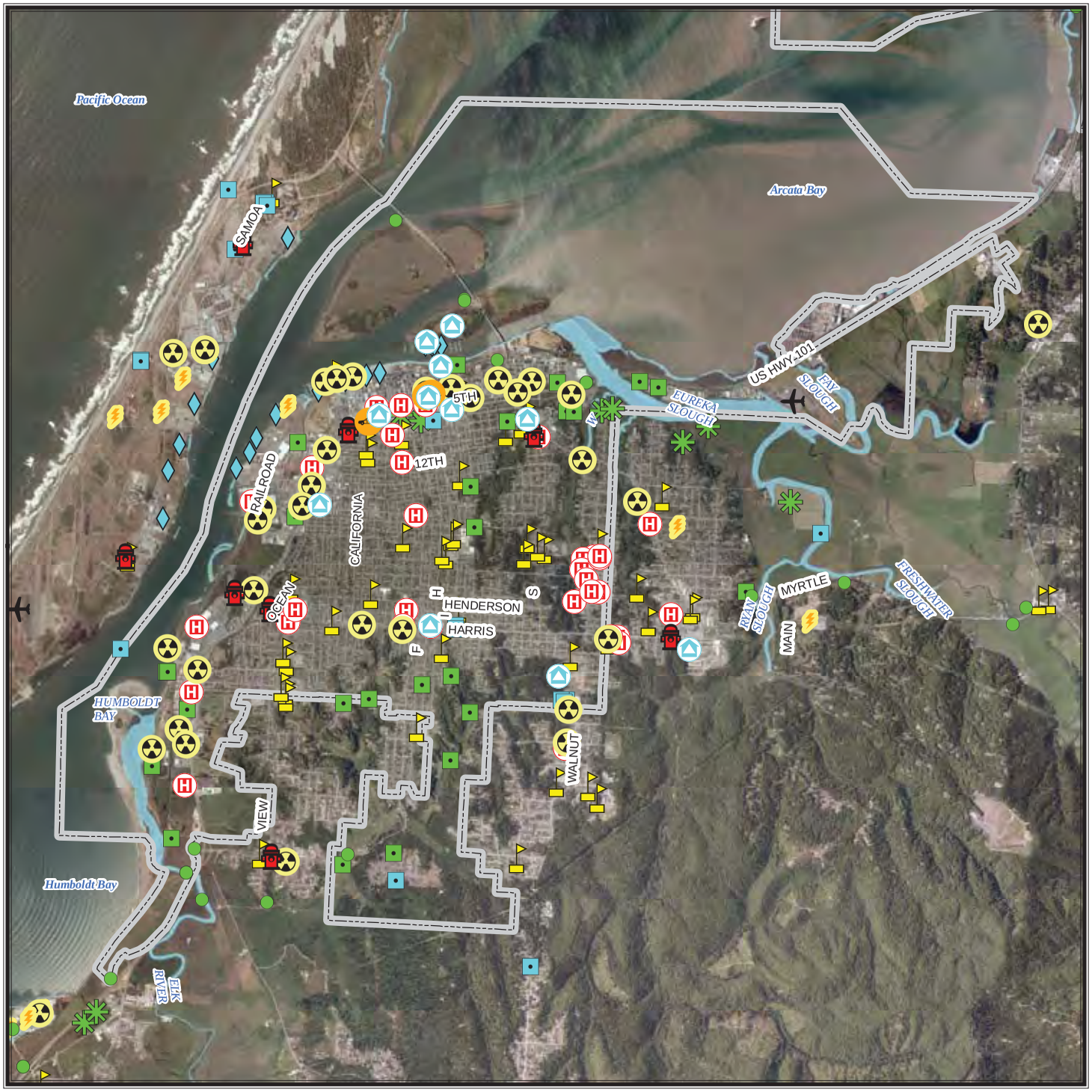
TABLE 6-14.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

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.

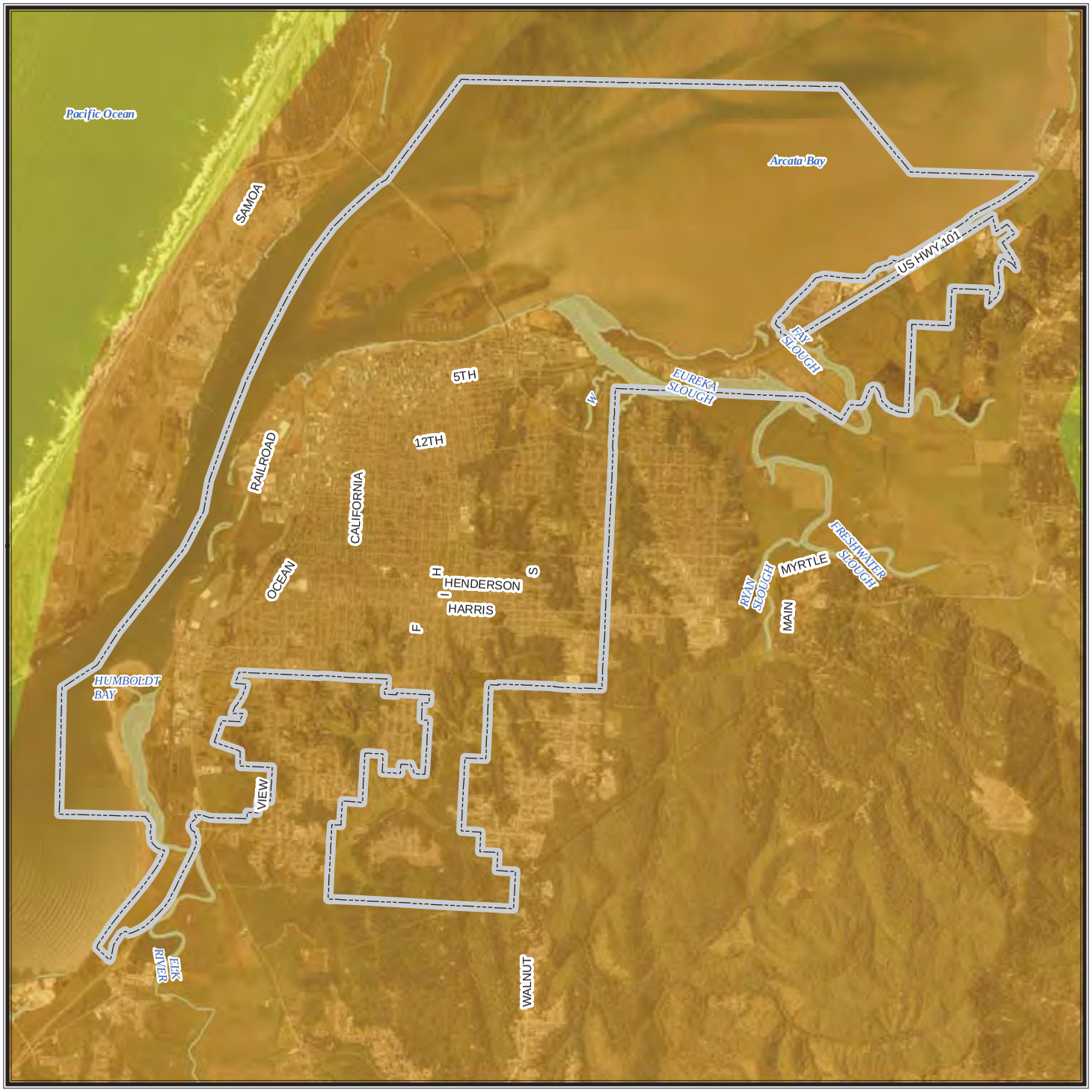
These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow 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

N W E S

TETRA TECH



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

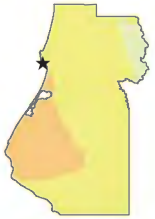
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

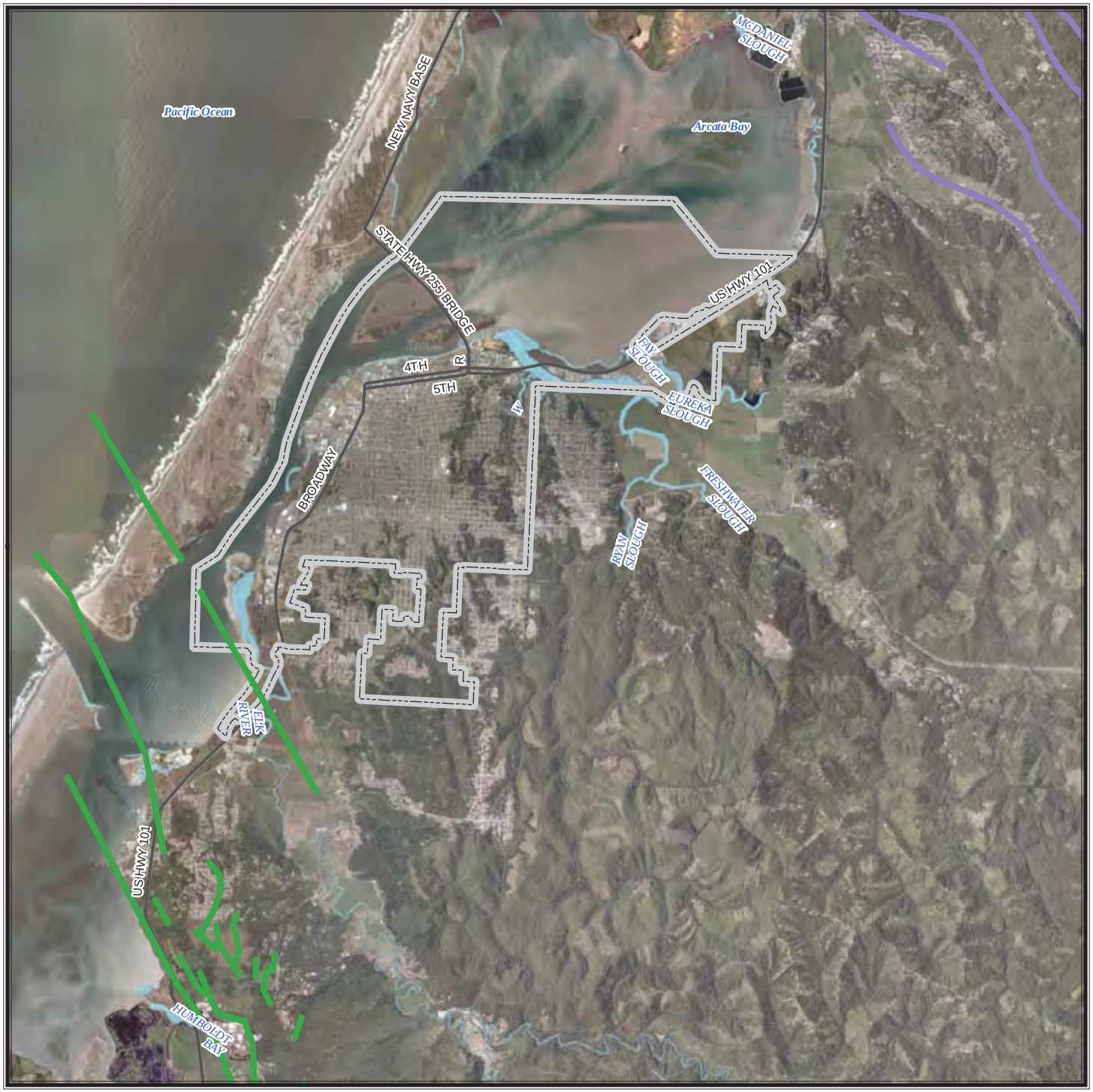
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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

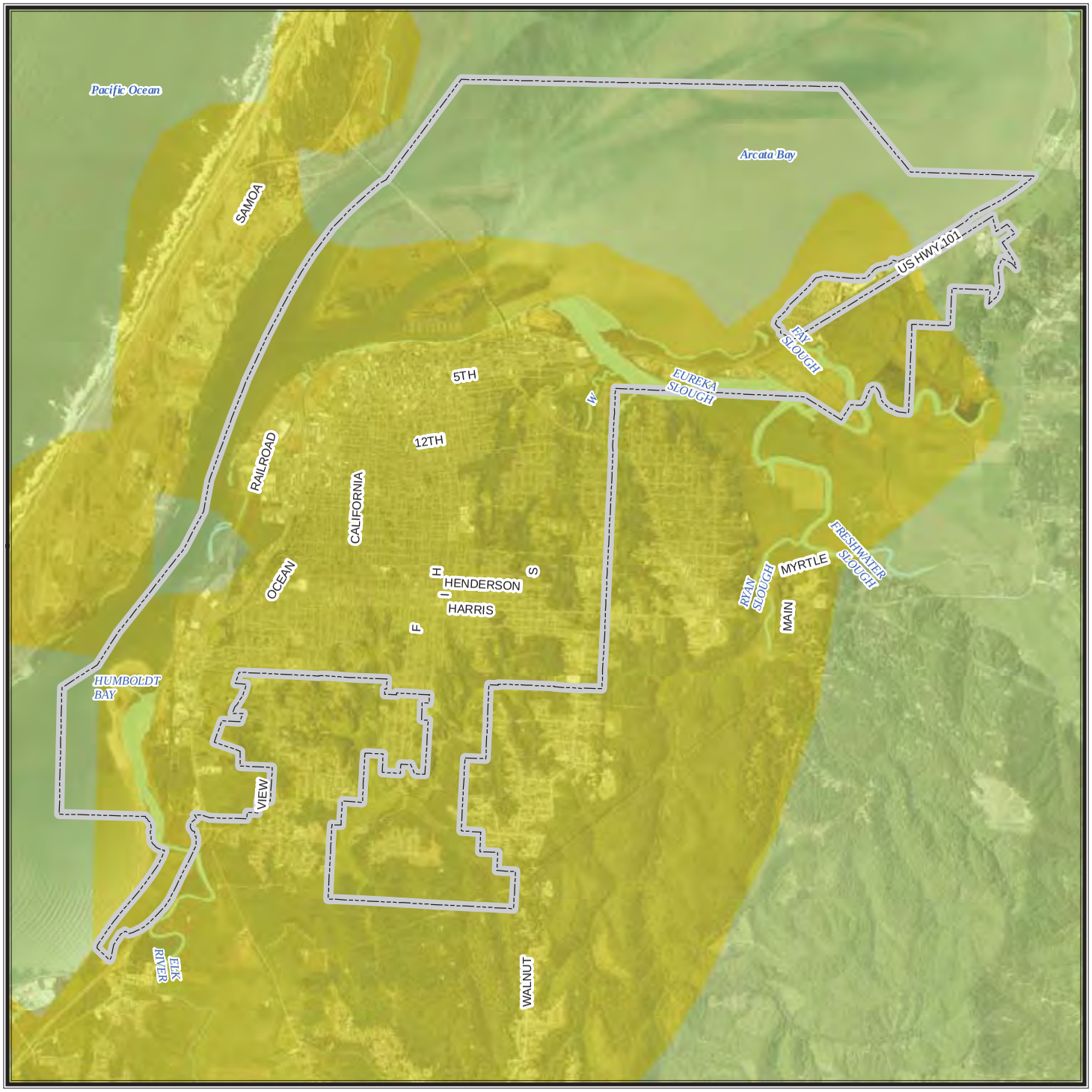
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

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

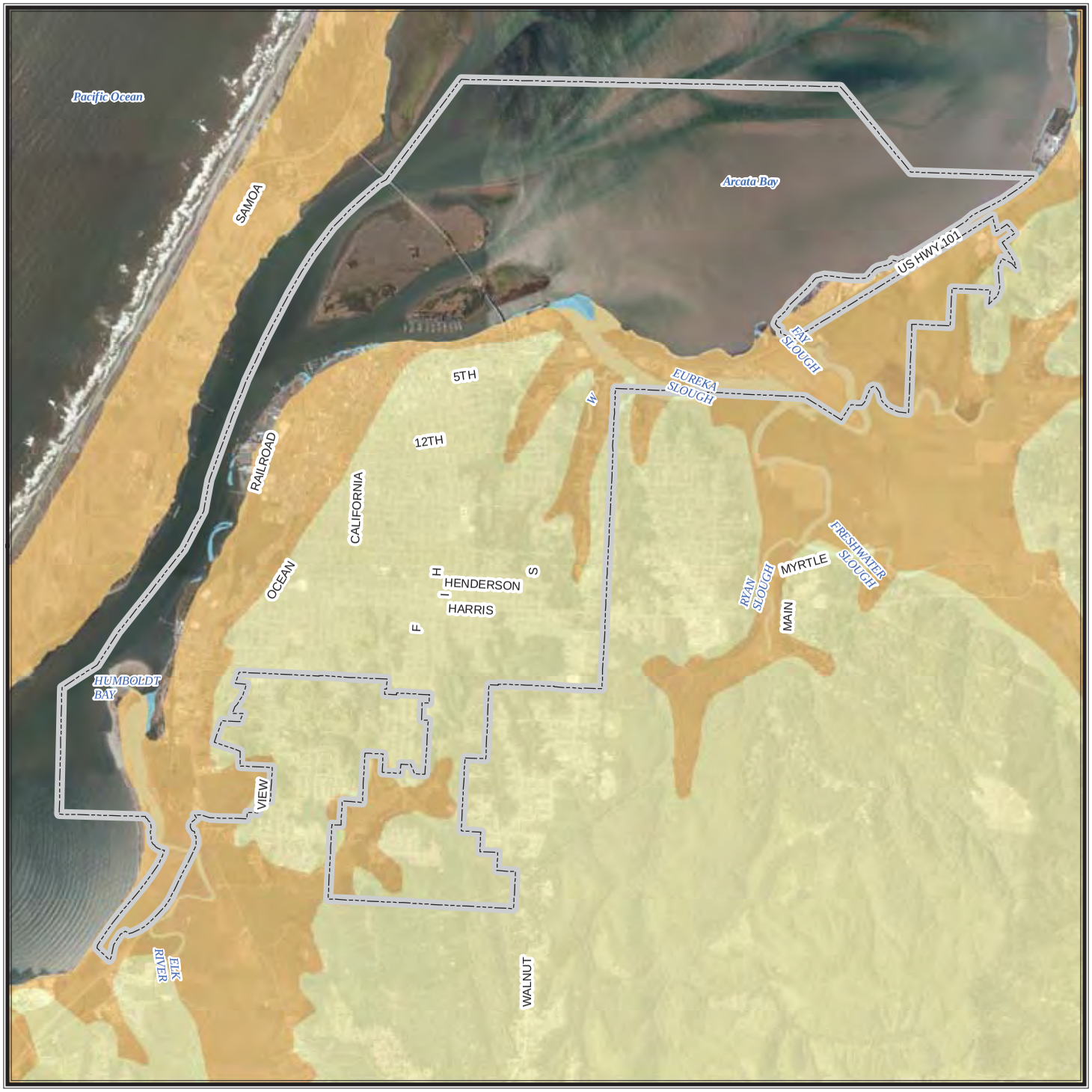
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

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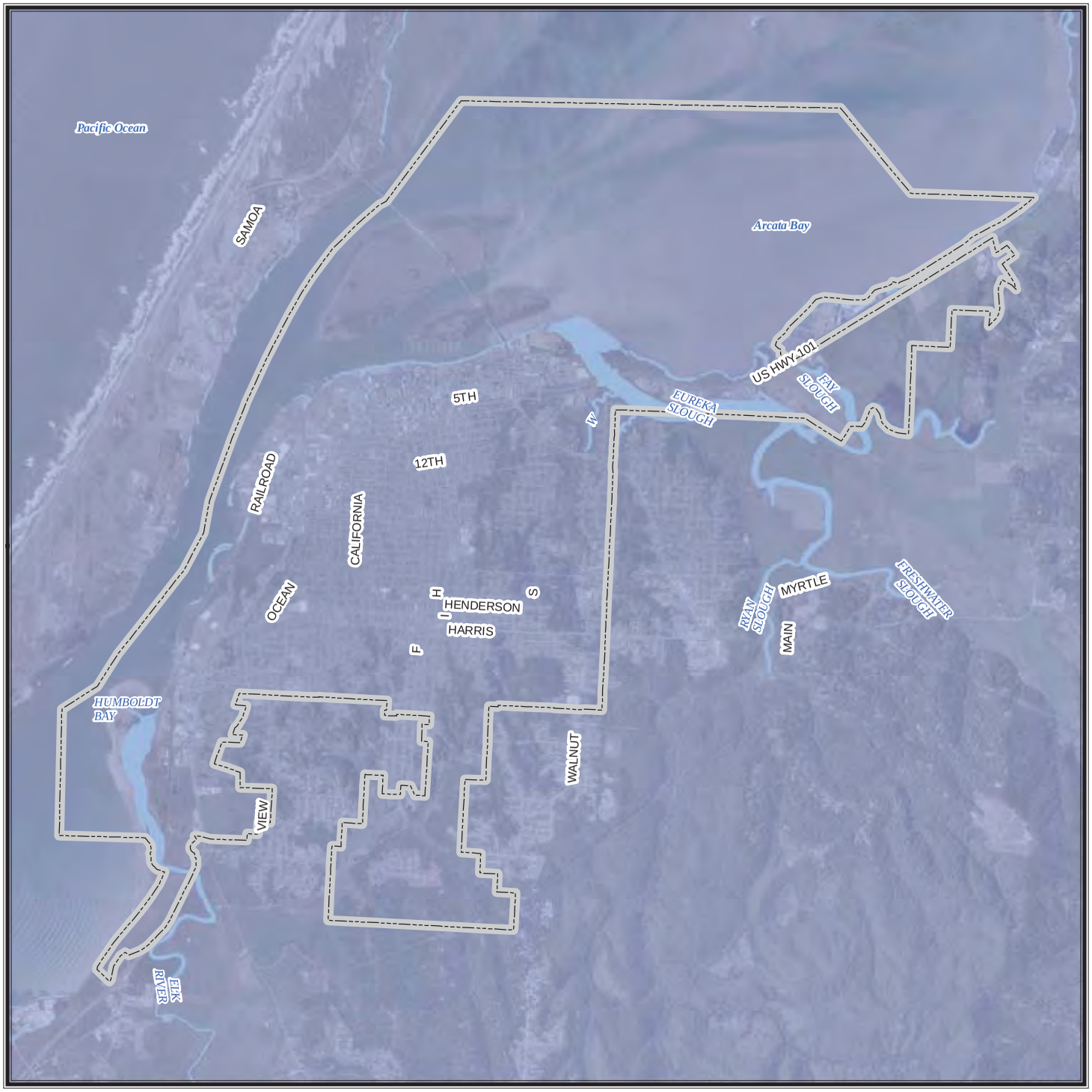

CITY OF EUREKA

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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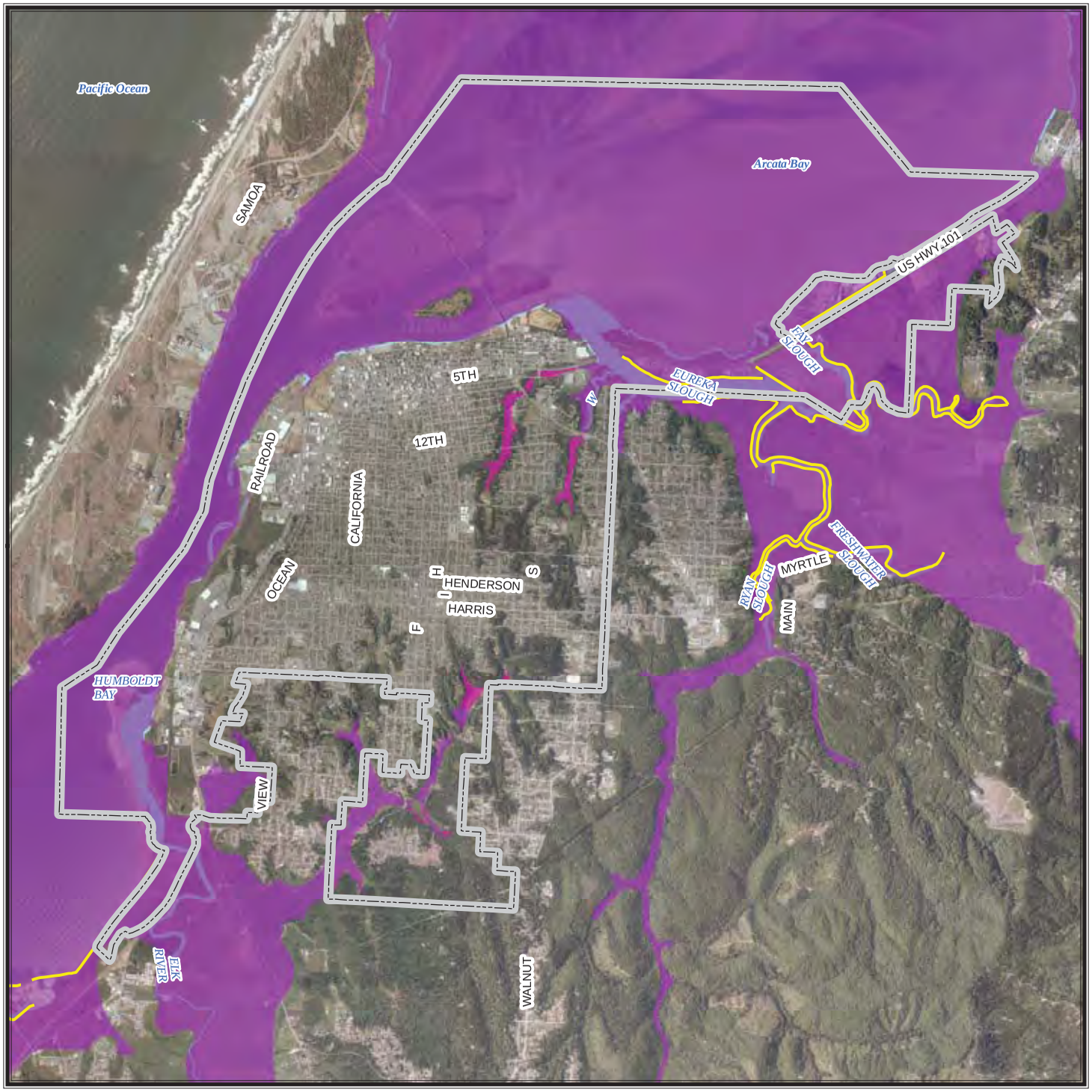

CITY OF EUREKA

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.

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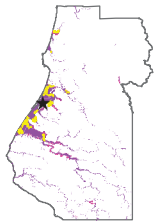

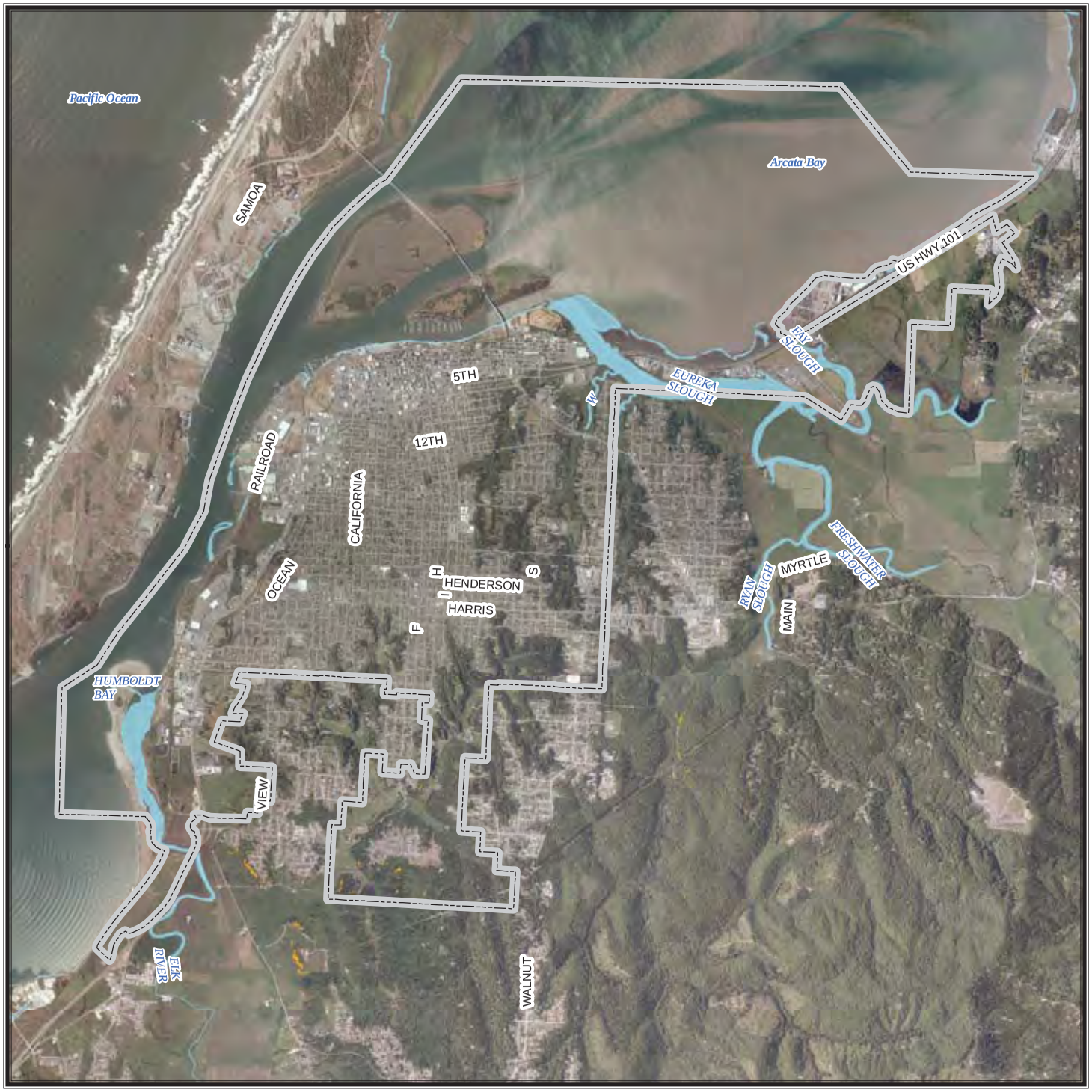

CITY OF TRINIDAD

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.

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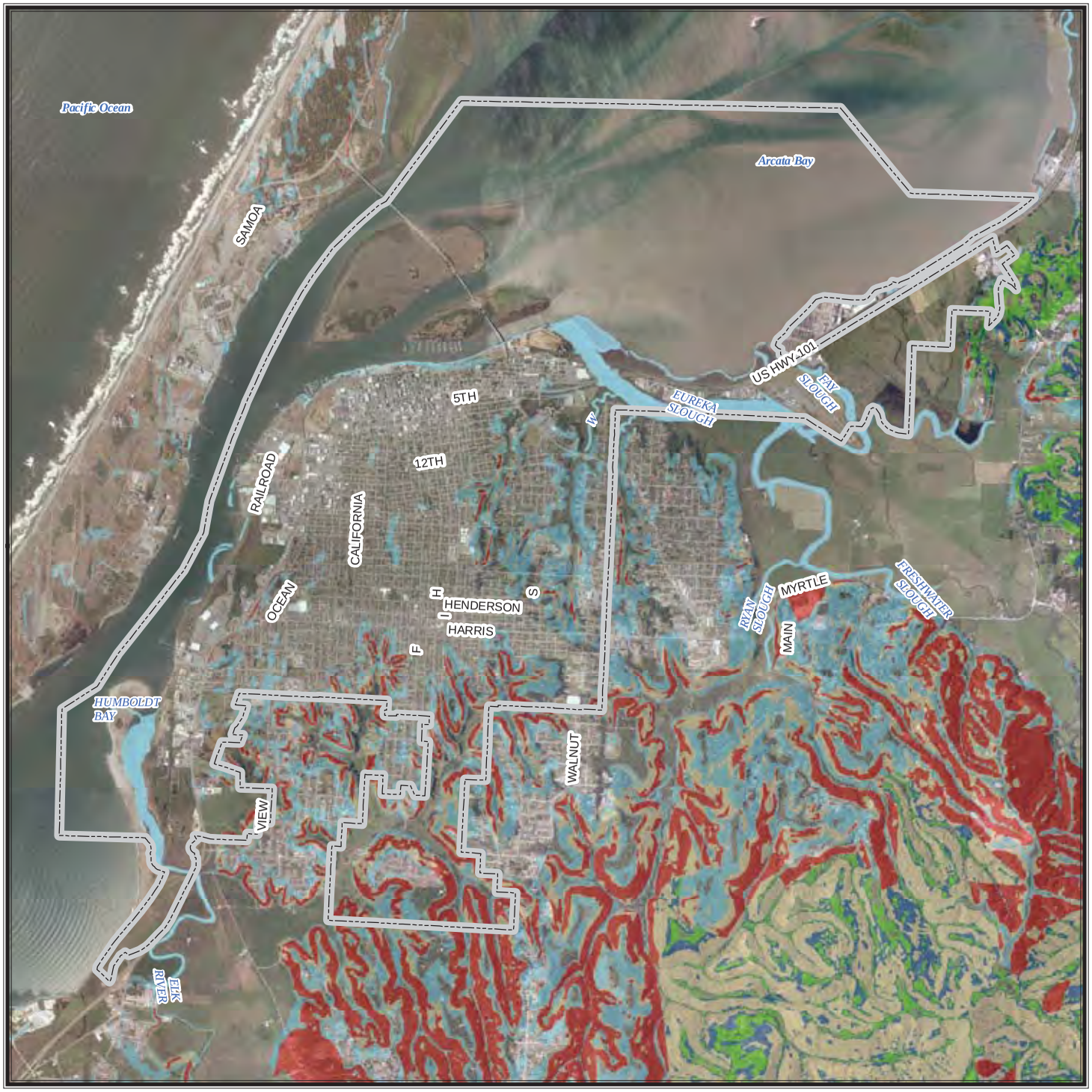

CITY OF EUREKA

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.

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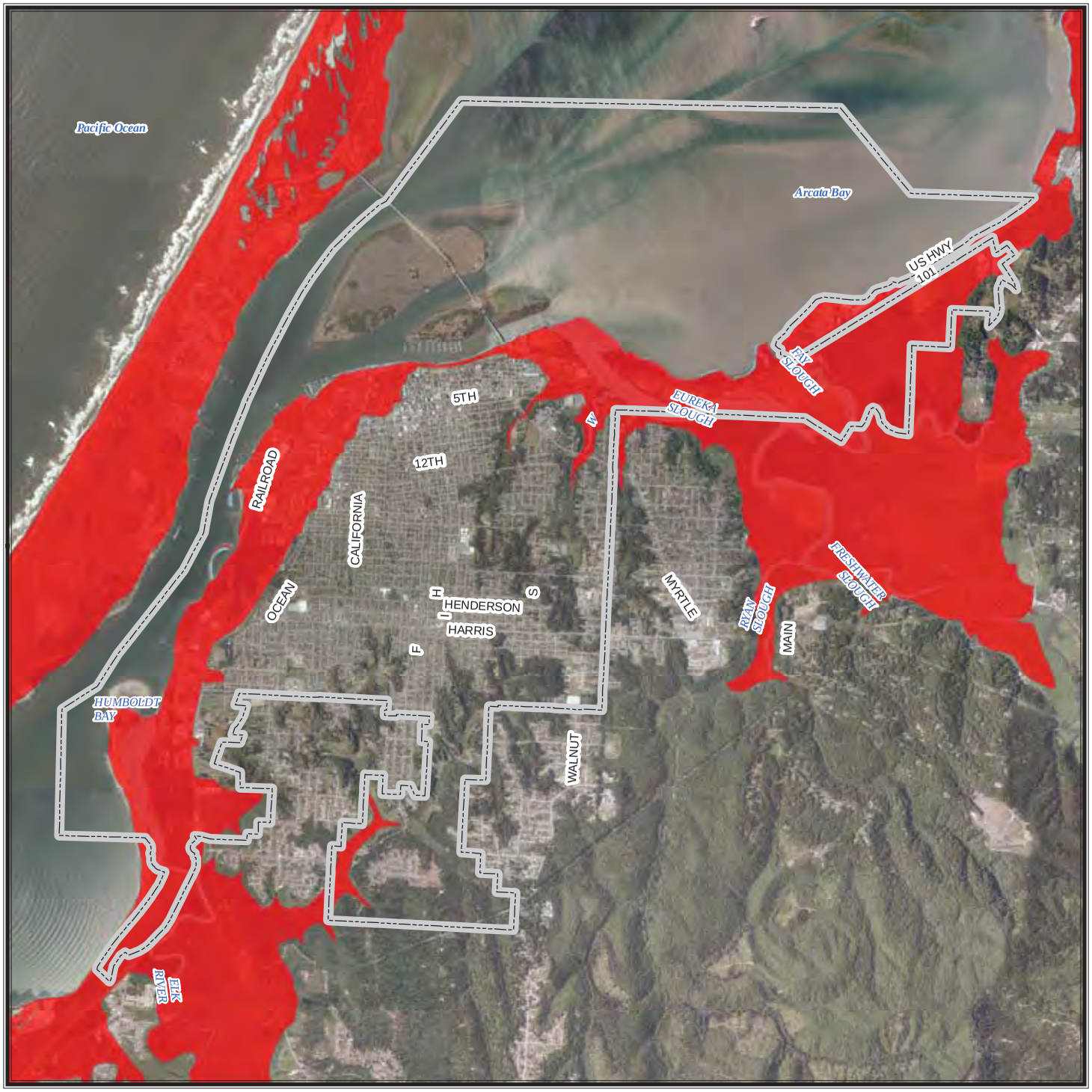

CITY OF EUREKA

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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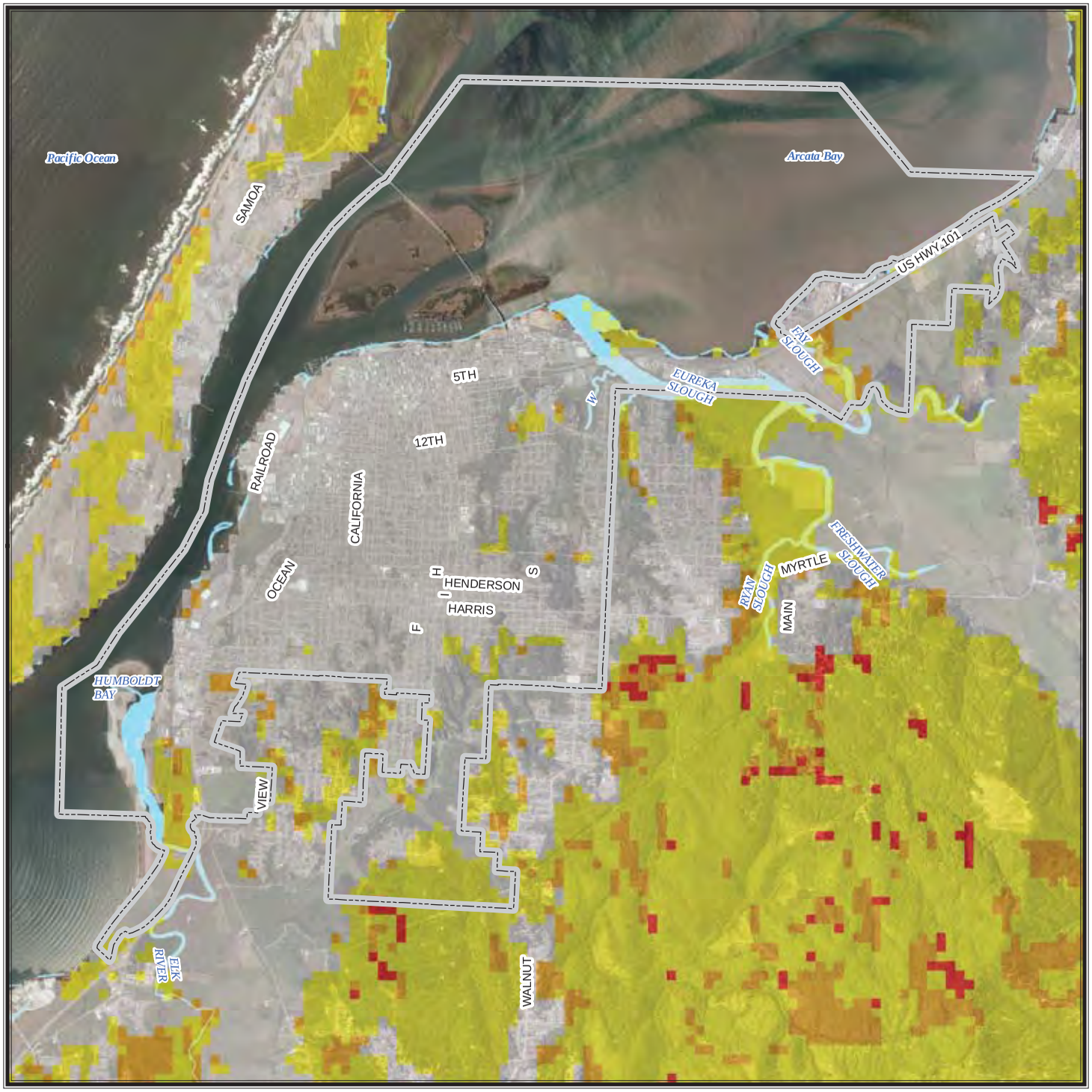

CITY OF EUREKA

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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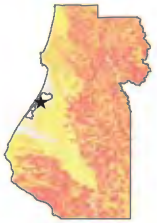

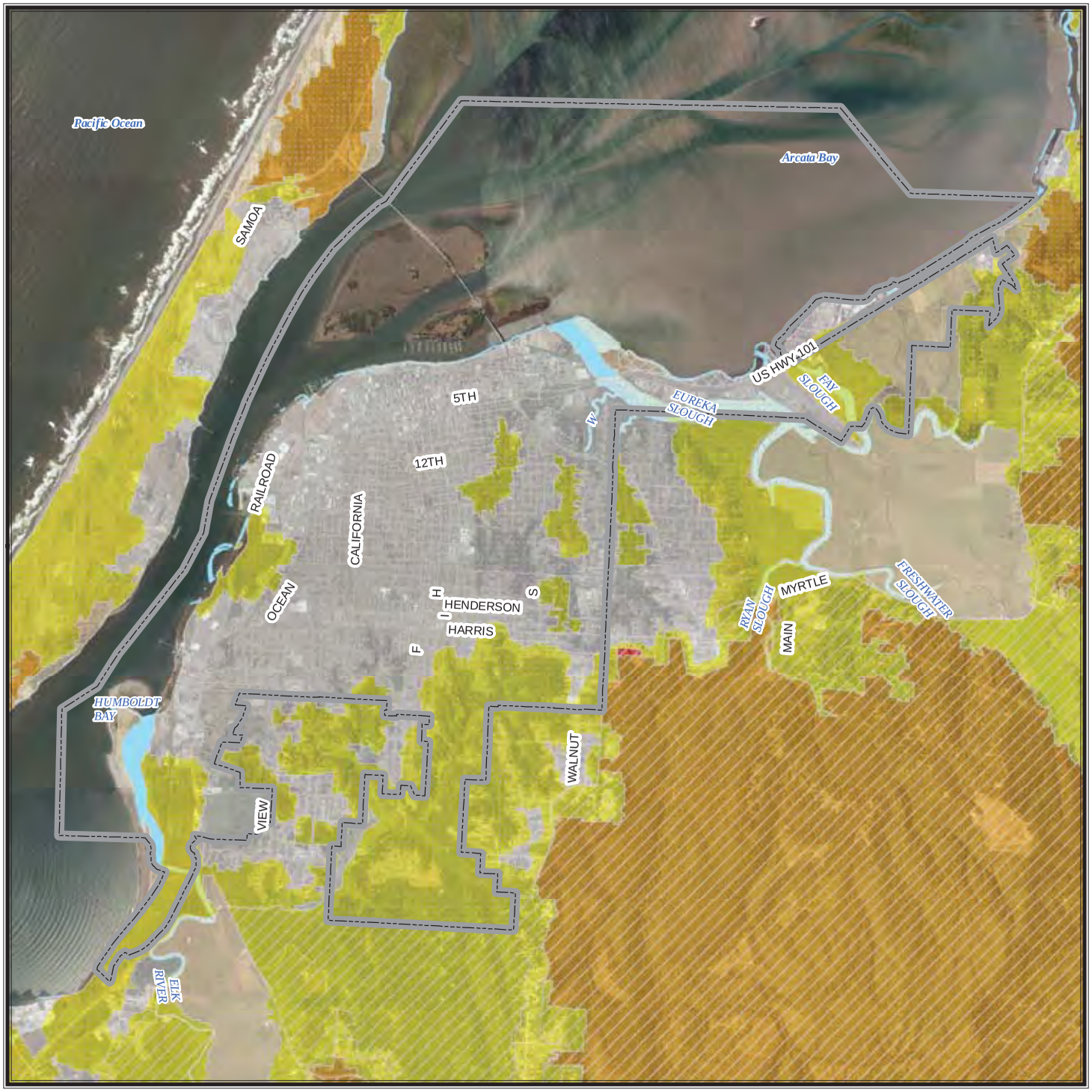

CITY OF EUREKA

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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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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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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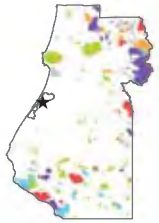

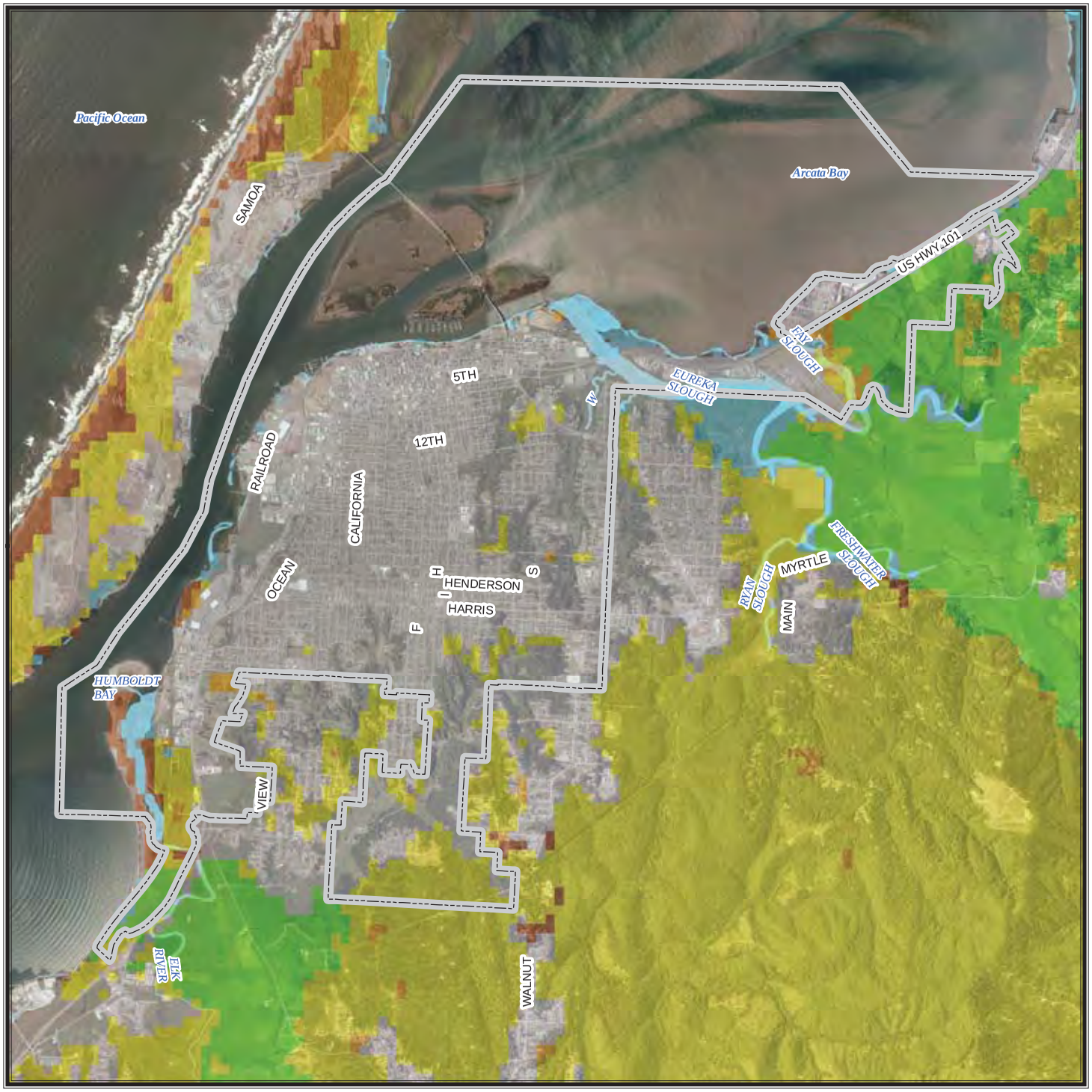

CITY OF EUREKA

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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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.

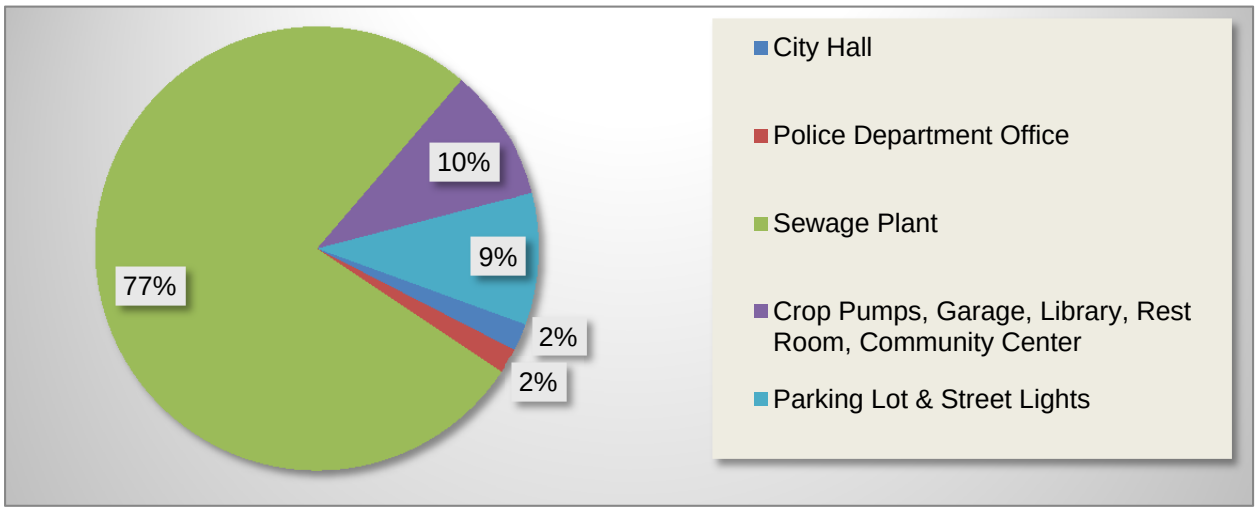


Figure 7-1. Government Electrical Energy Consumption for 2012 (Kilowatt-Hours)

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.

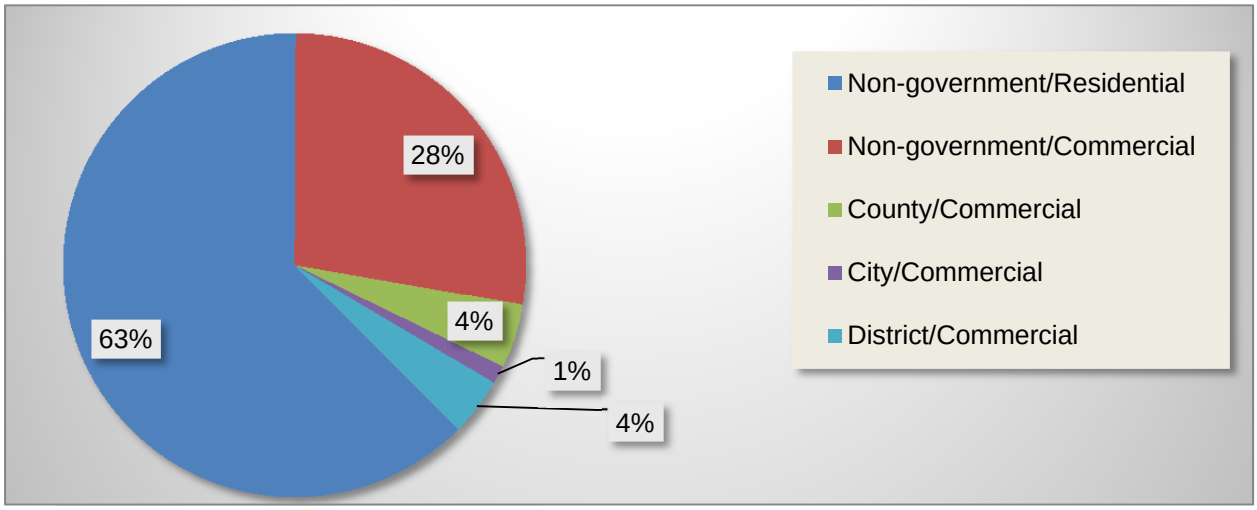


Figure 7-2. Electrical Energy Consumption by Sector for 2011 (Kilowatt-Hours)

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.

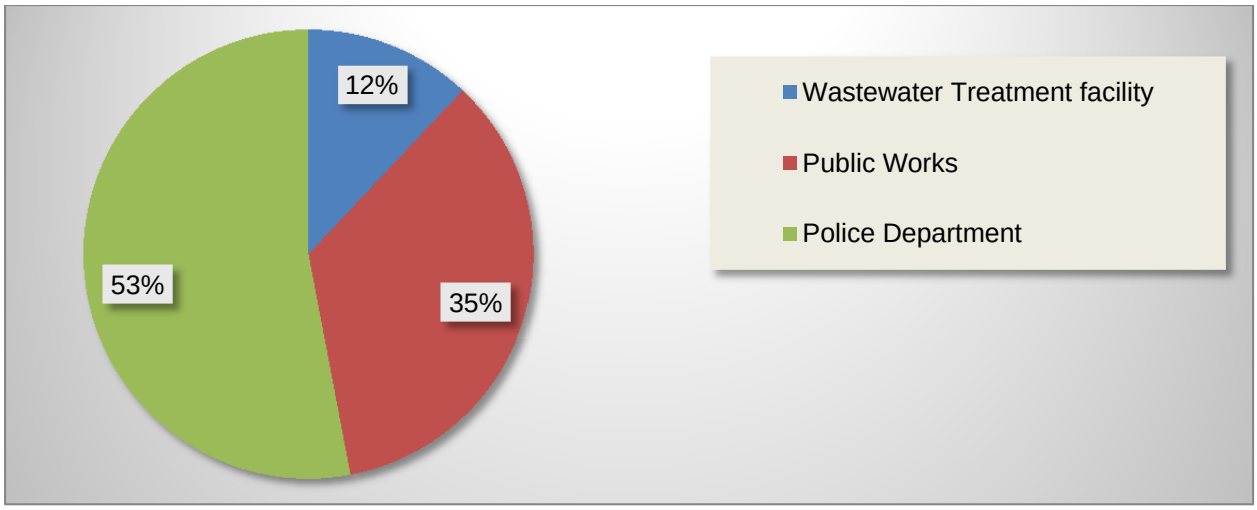


Figure 7-3. Liquid Fuels Energy Consumption for 2012 (Gallons of Gasoline, Kerosene, Diesel)

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.

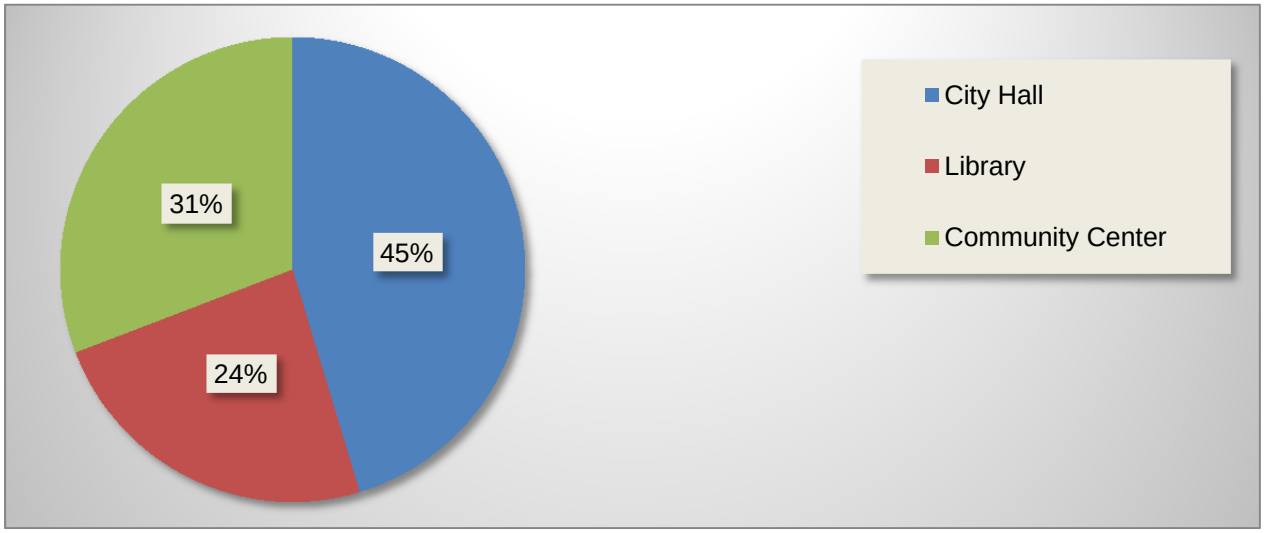


Figure 7-4. Propane Energy Consumption for 2012 (Gallons)

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

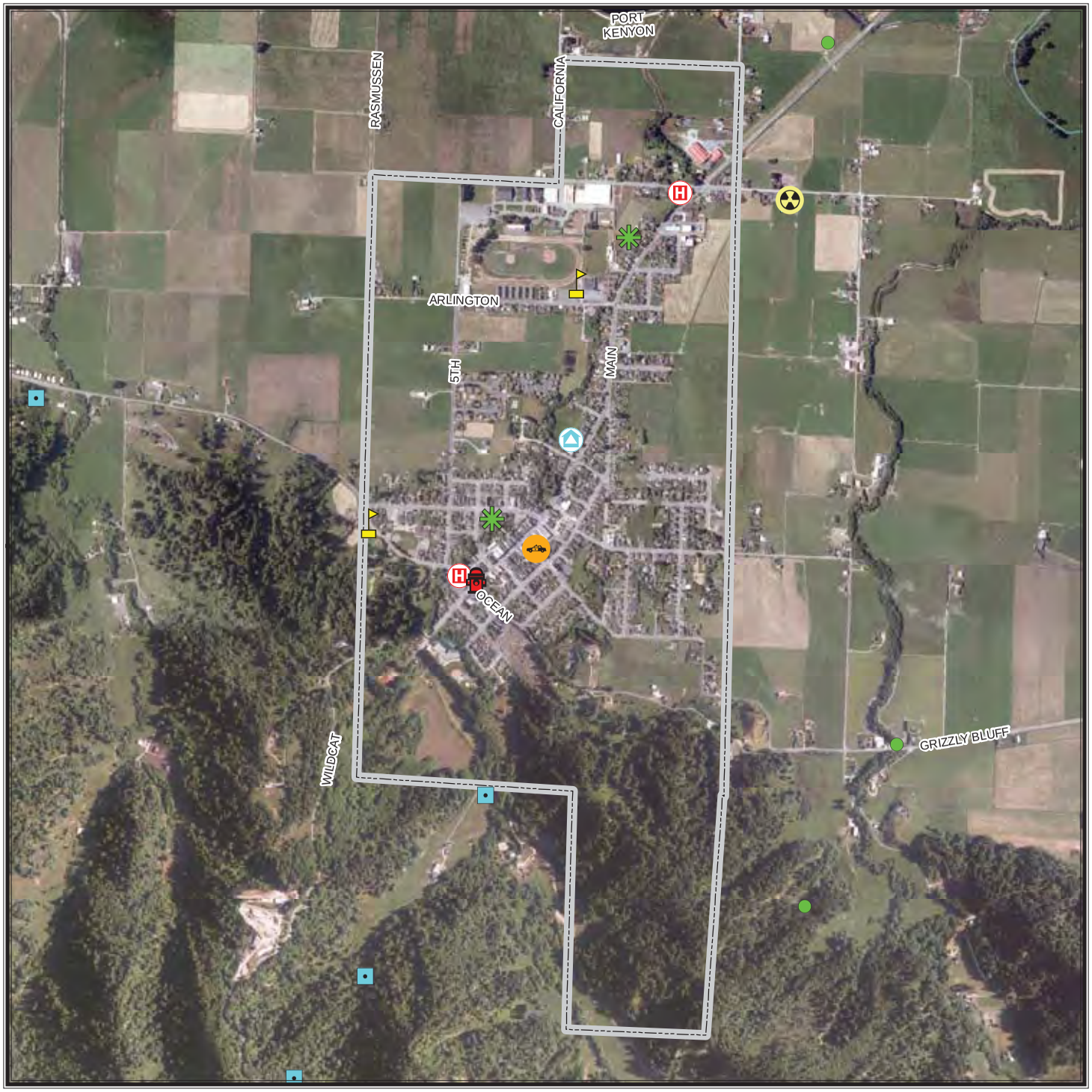
Table 7-14 summarizes the initiatives that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

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

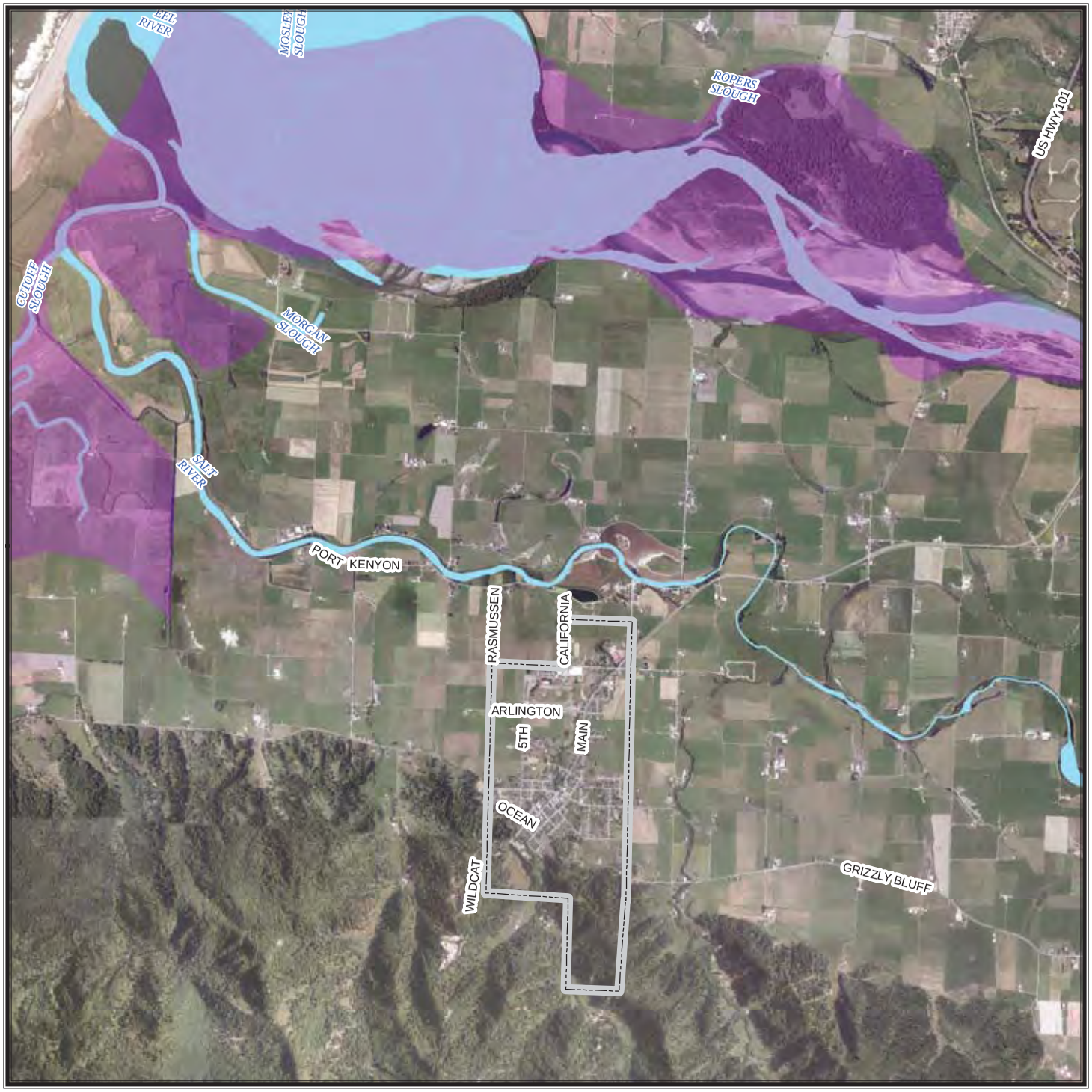
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

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

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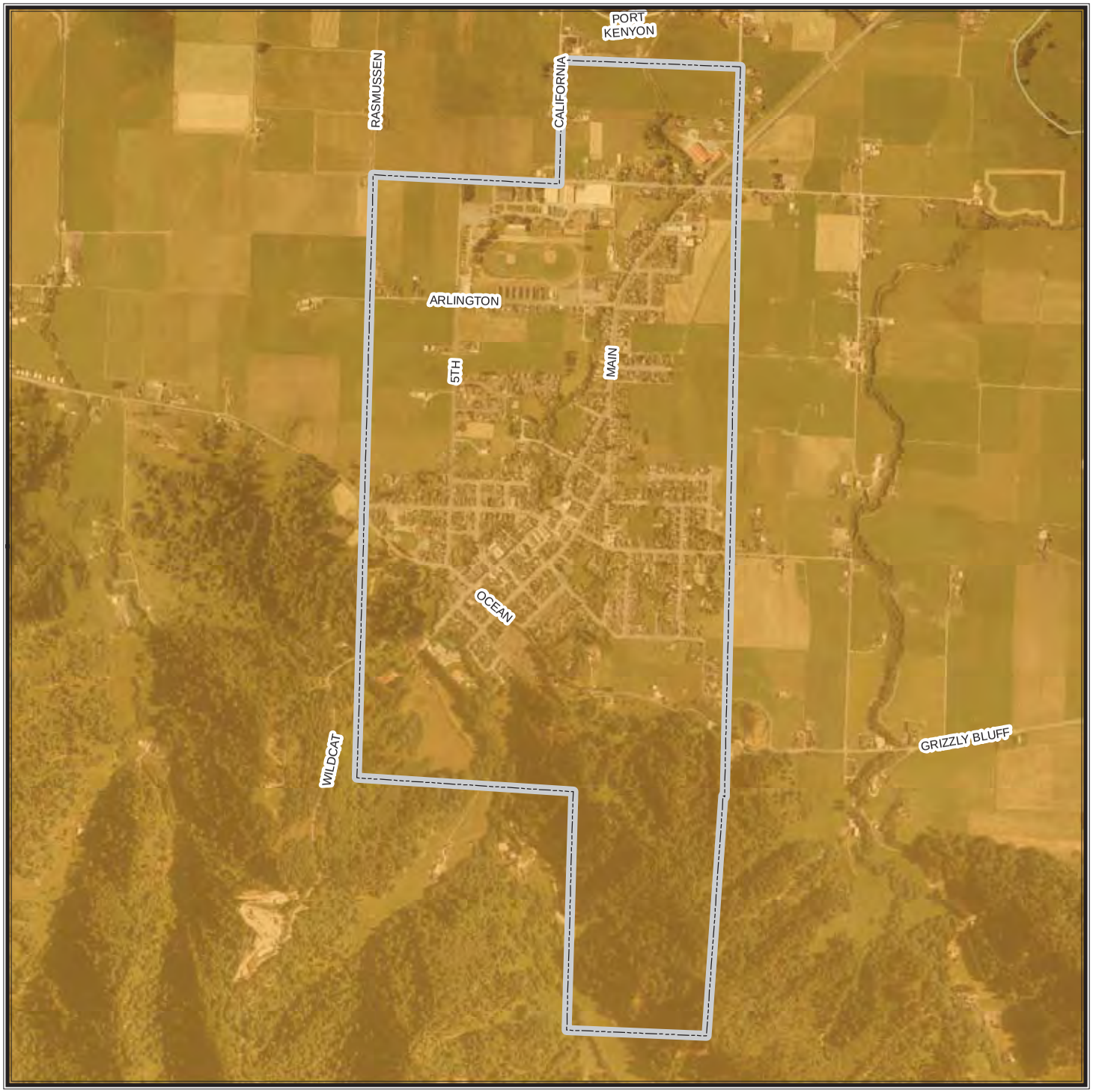


CITY OF FERNDALE

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

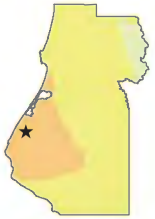
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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**

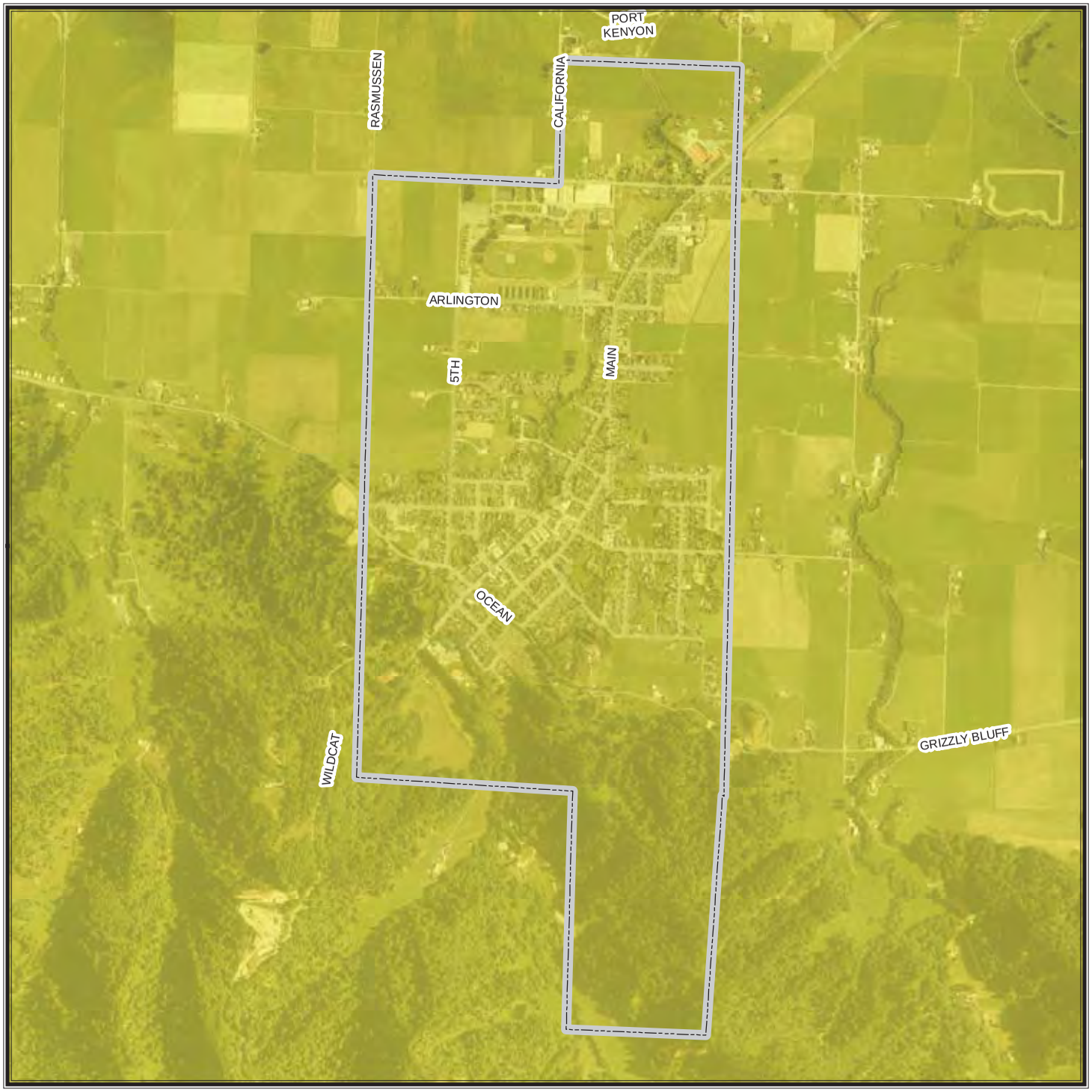
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

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

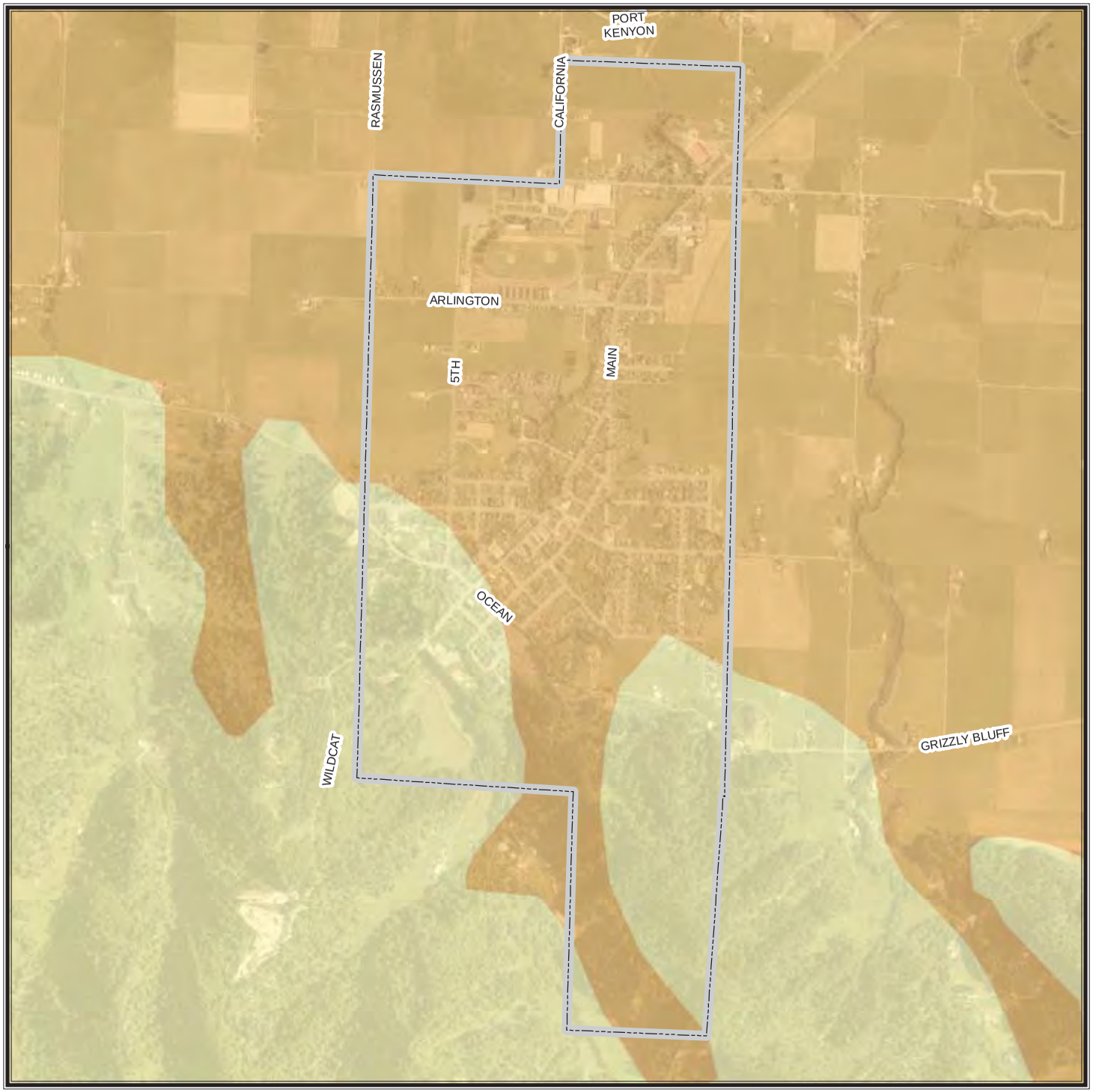
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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**

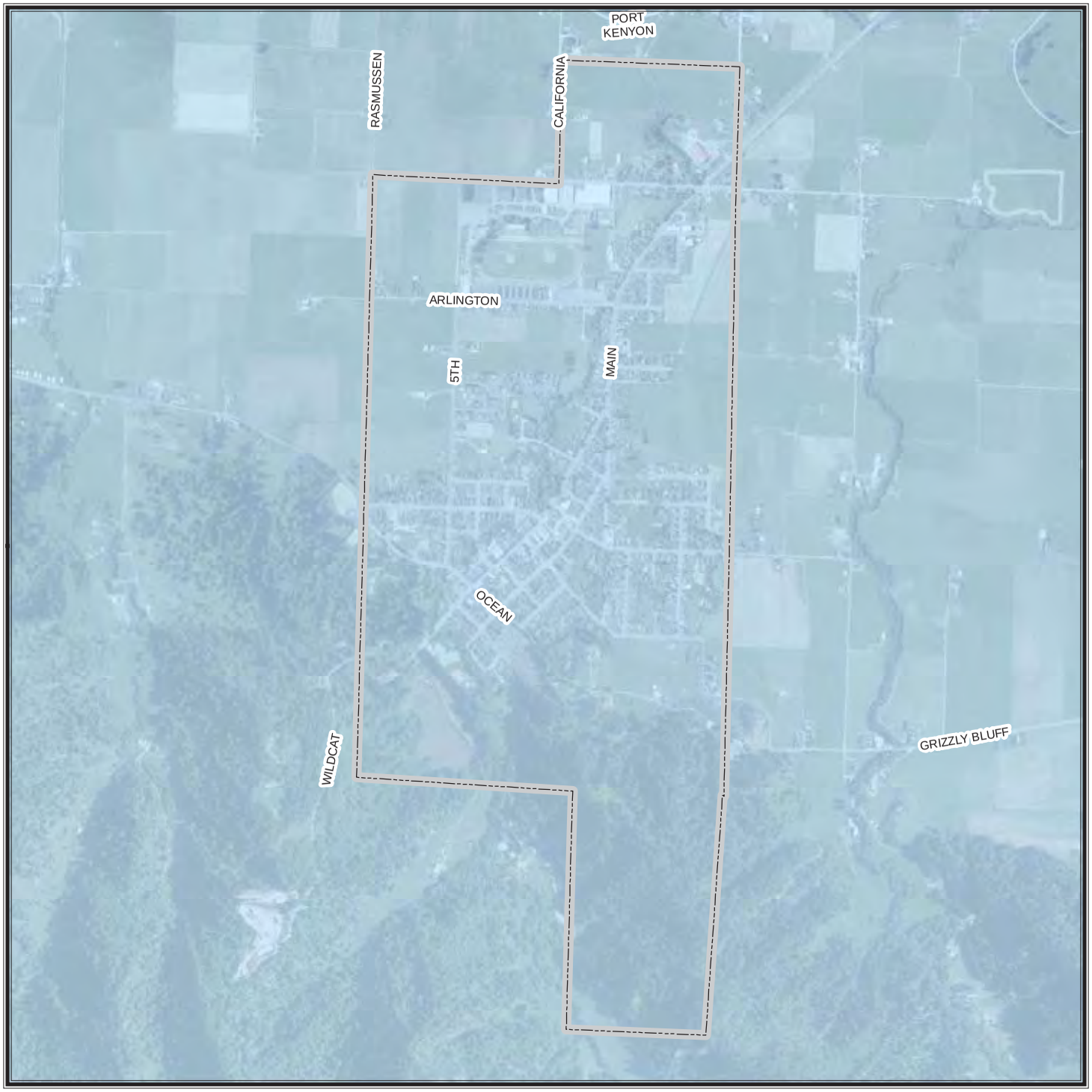
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for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

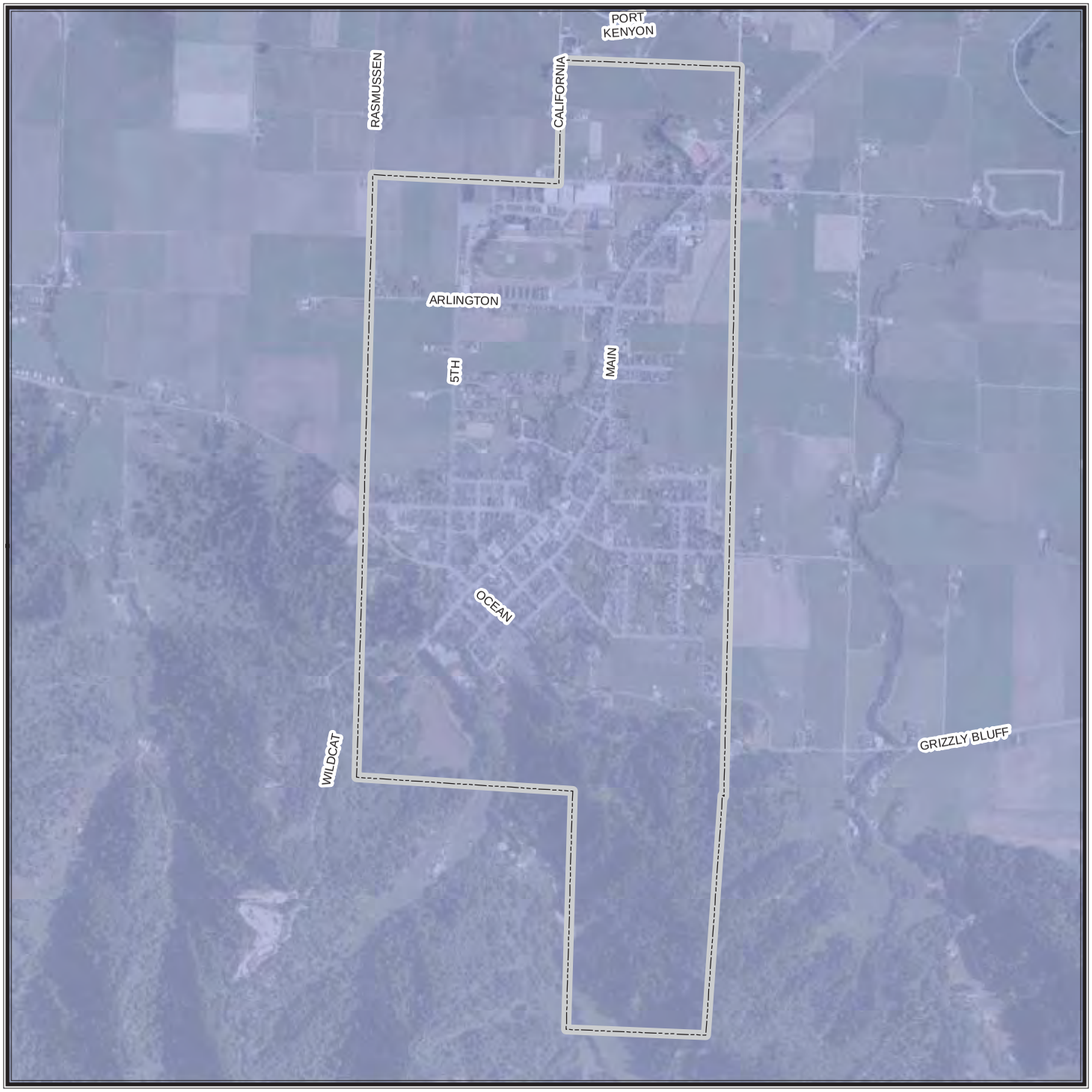
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

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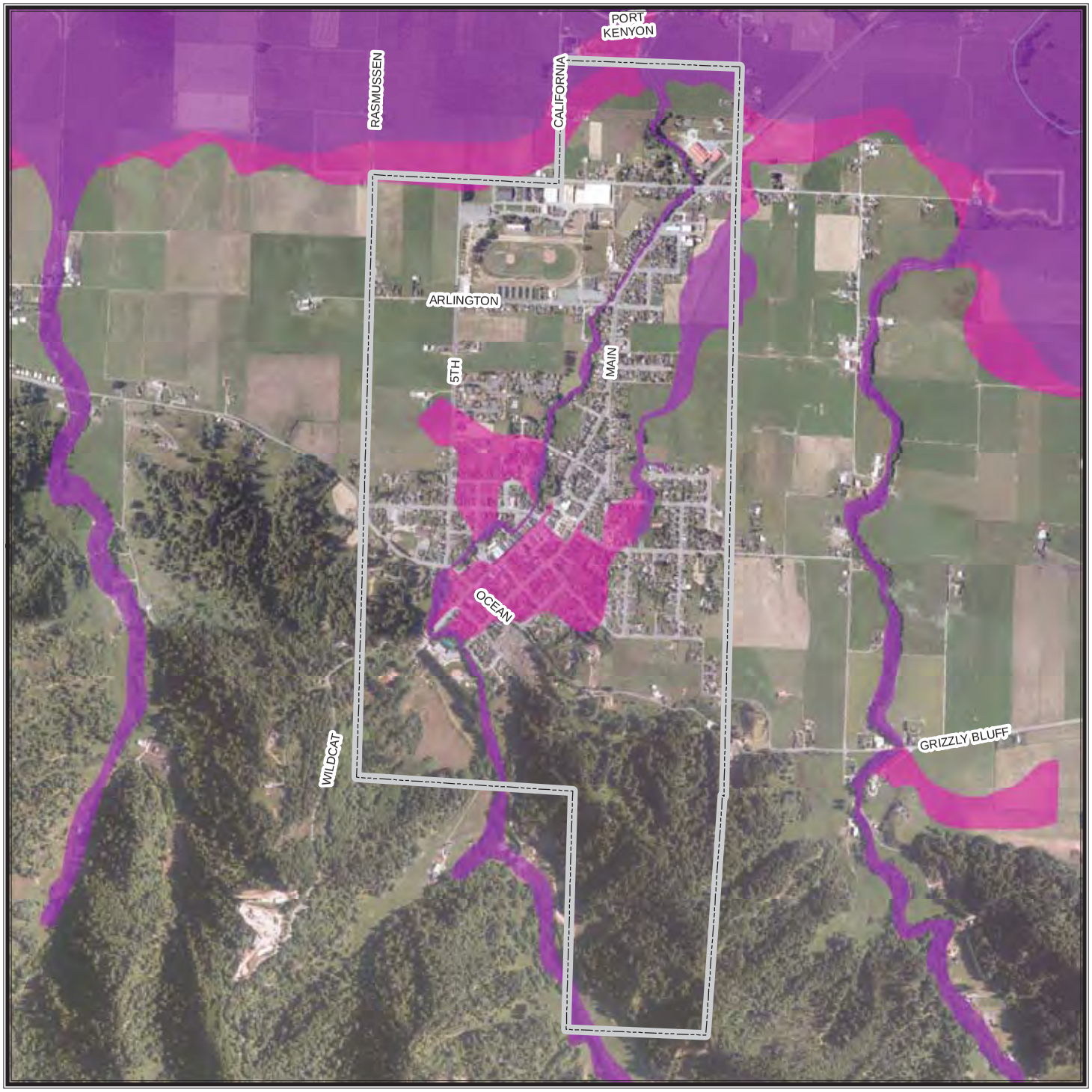

CITY OF FERNDALE

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

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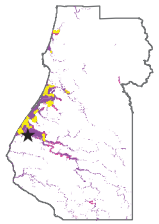
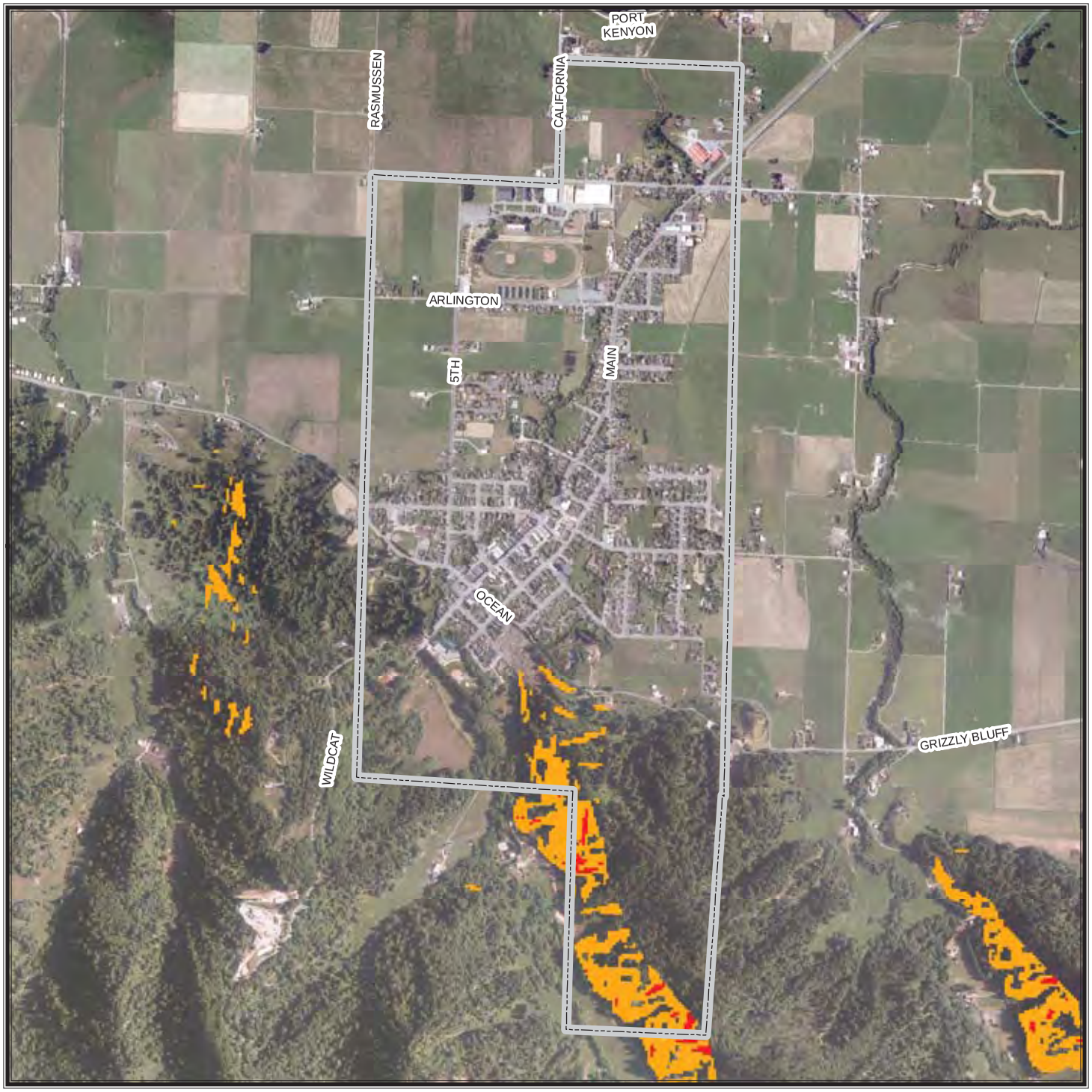




CITY OF FERNDALE

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.

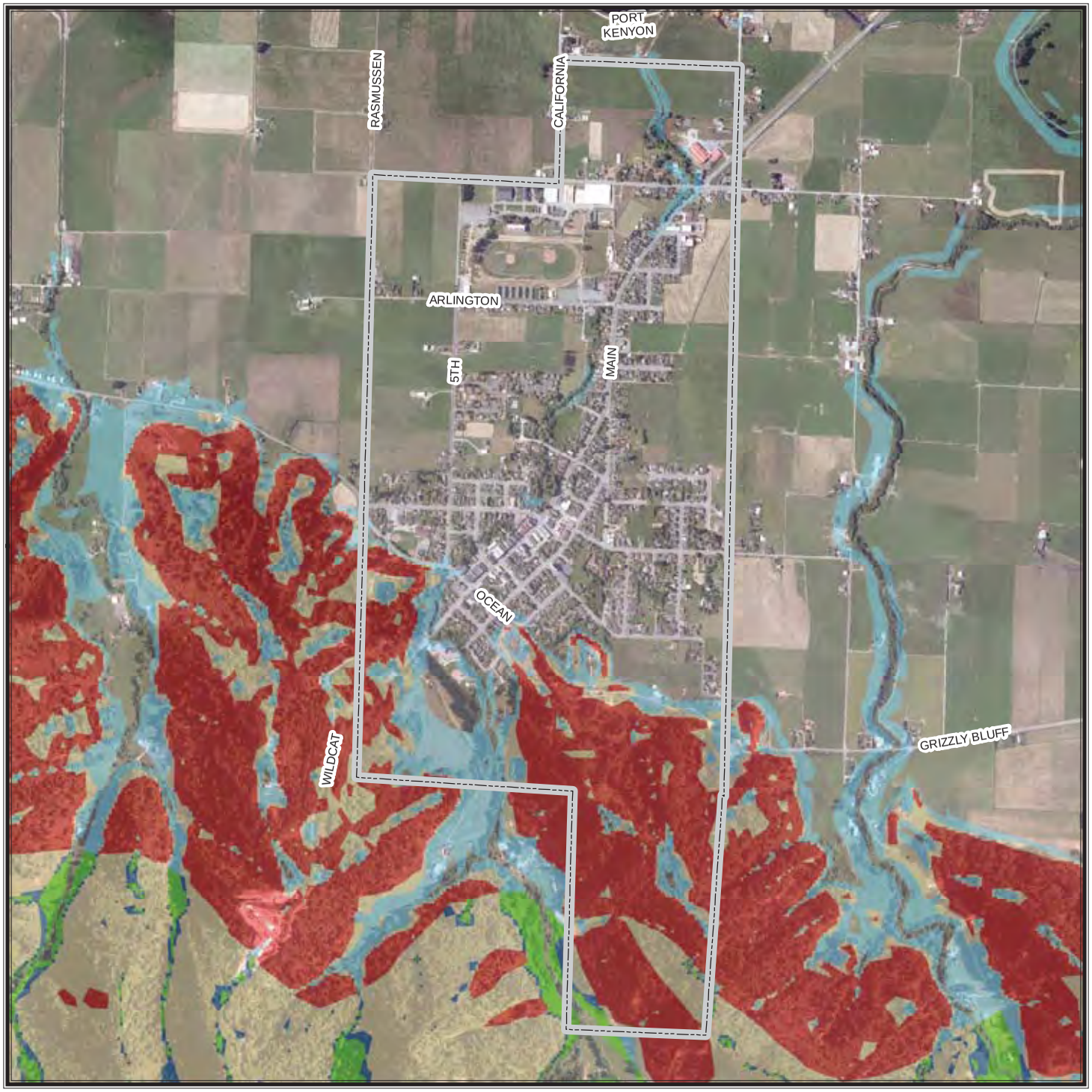
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

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).

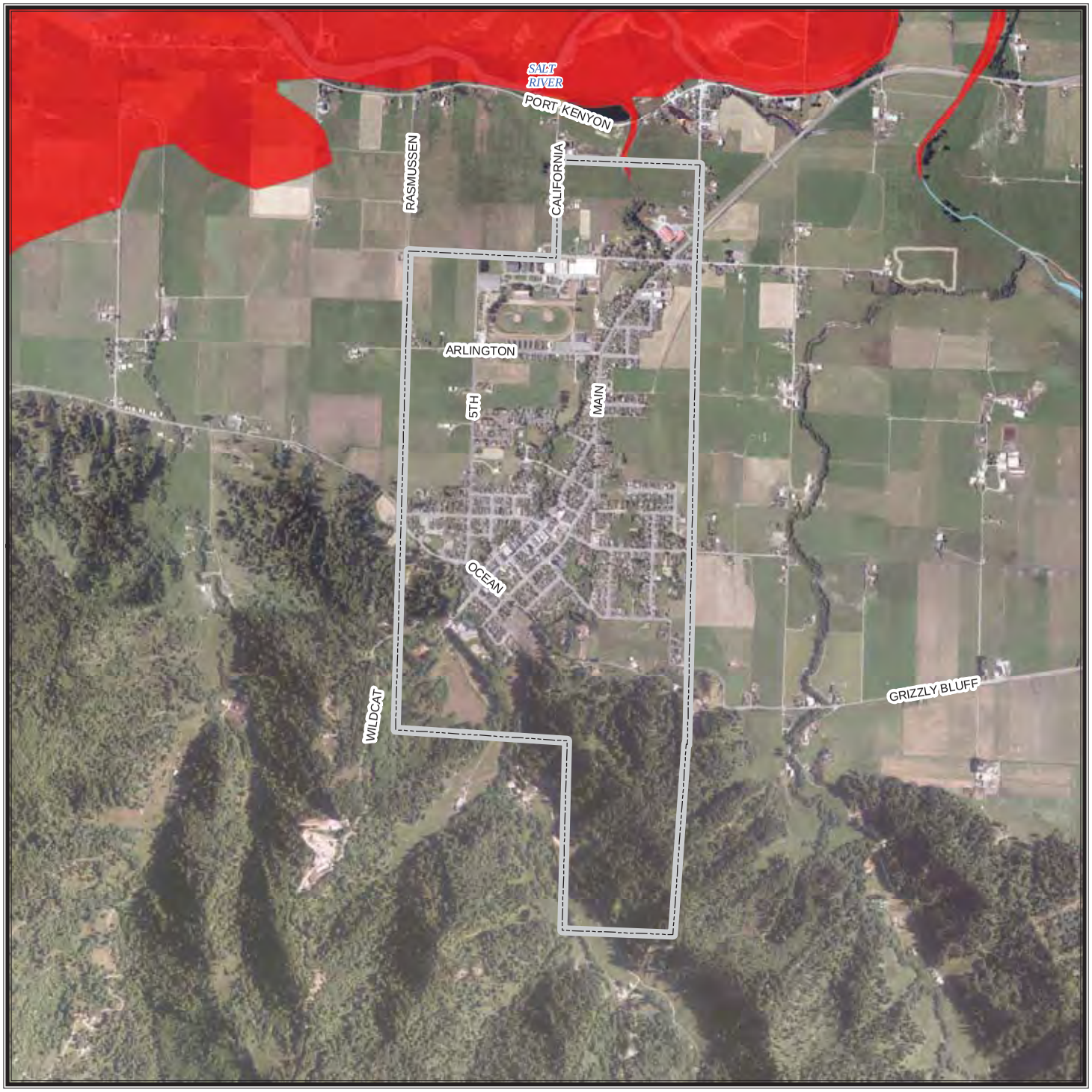
These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with increasing slope angle and decreasing rock strength.

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

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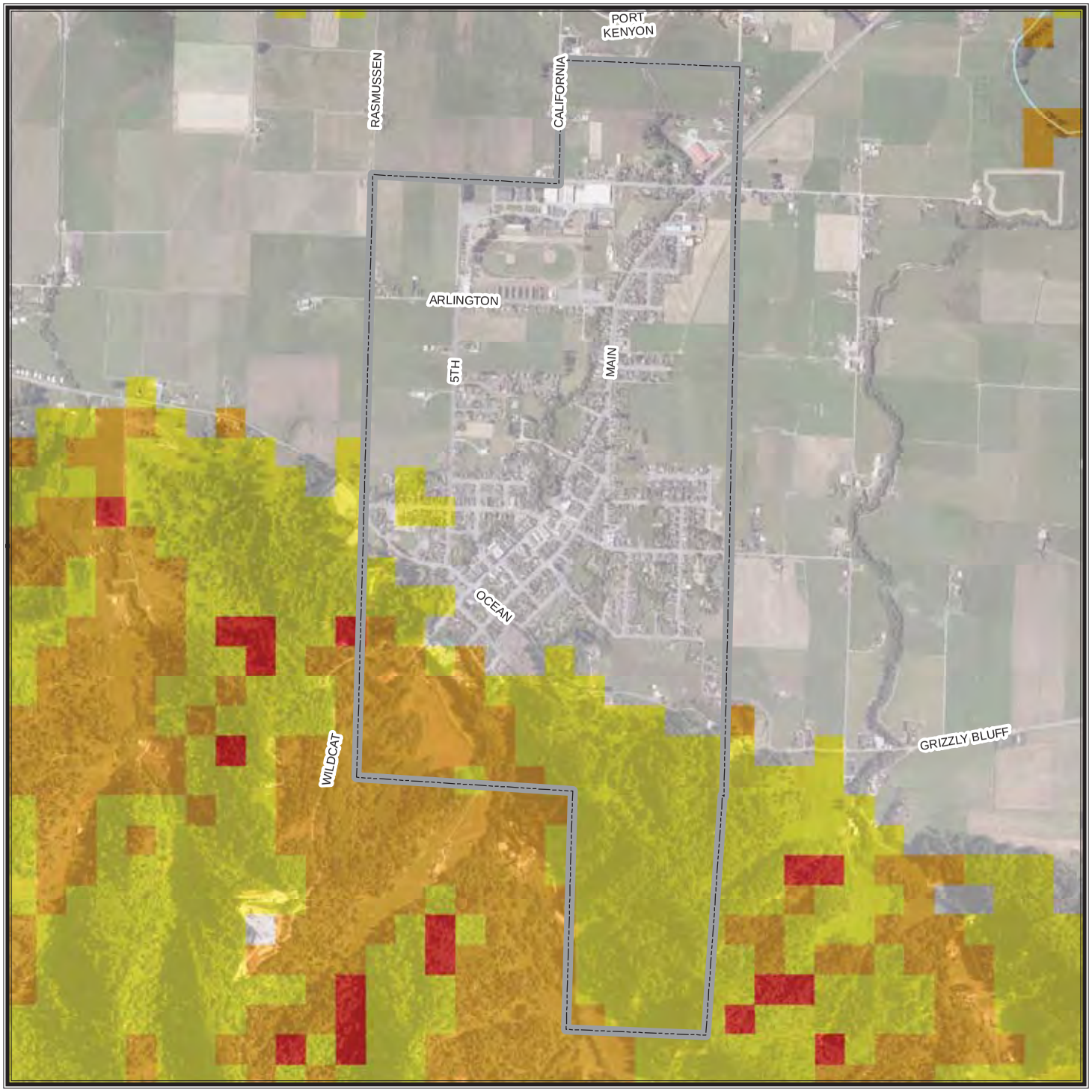

CITY OF FERNDALE

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.

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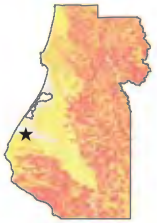

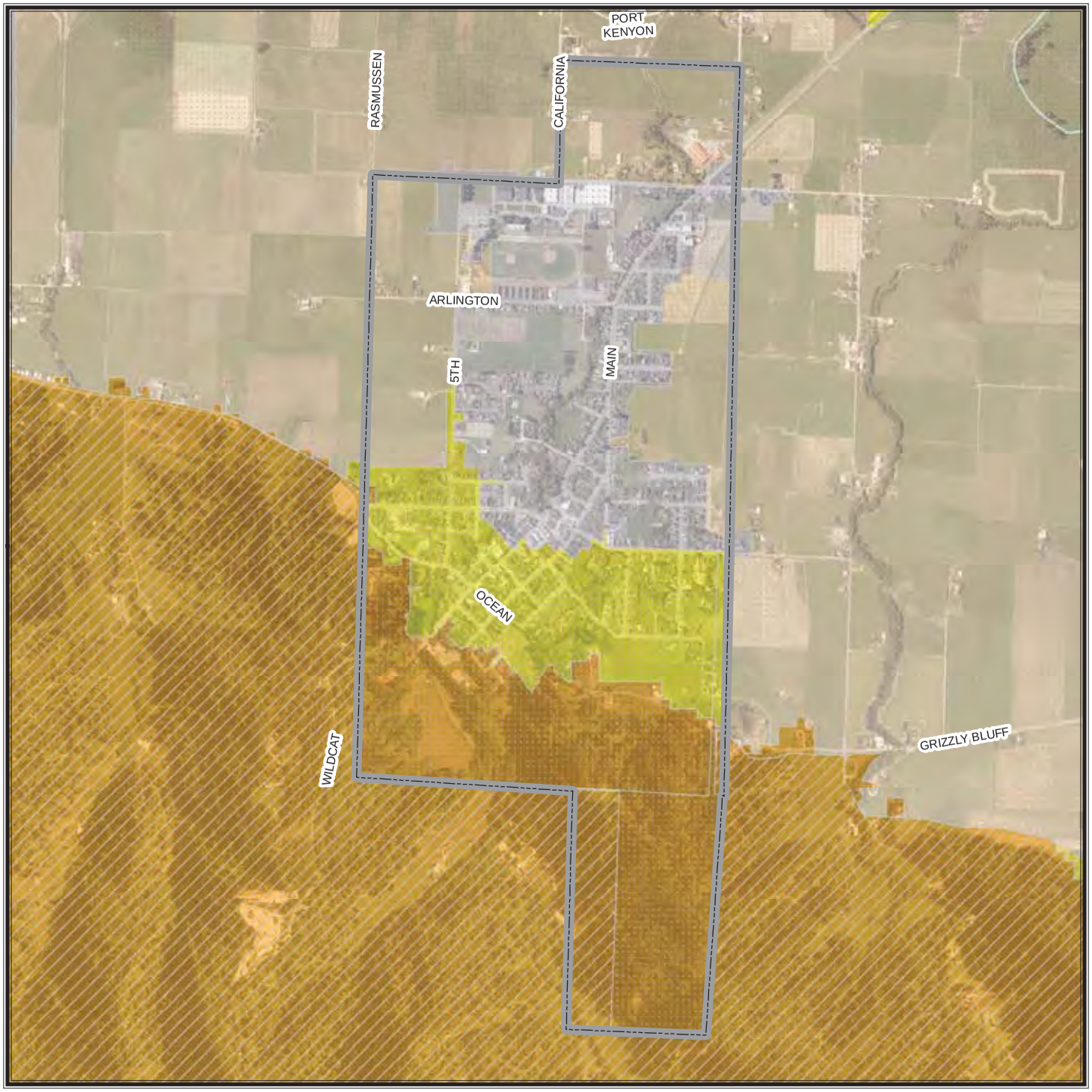

CITY OF FERNDALE

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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0 0.25 Miles

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

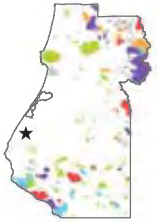
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, 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.

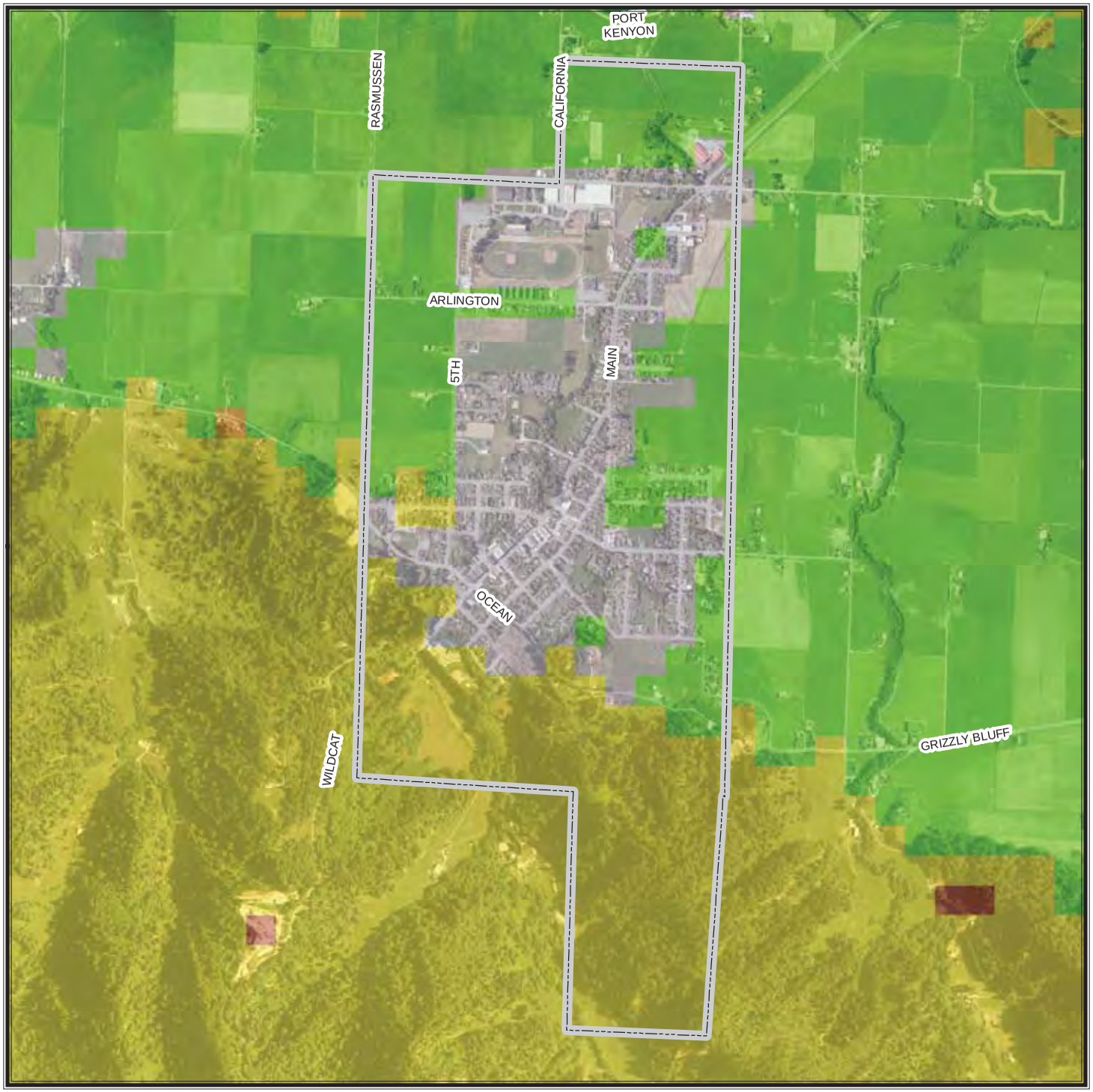
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

0 1 2 Miles

N W E S

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.

N
W E
S

0 0.25 Miles

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
Telephone: 707-725-1478
e-mail Address: kcarter@ci.fortuna.ca.us

Alternate Point of Contact

Liz Shorey, Deputy Director Community Dev.
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.

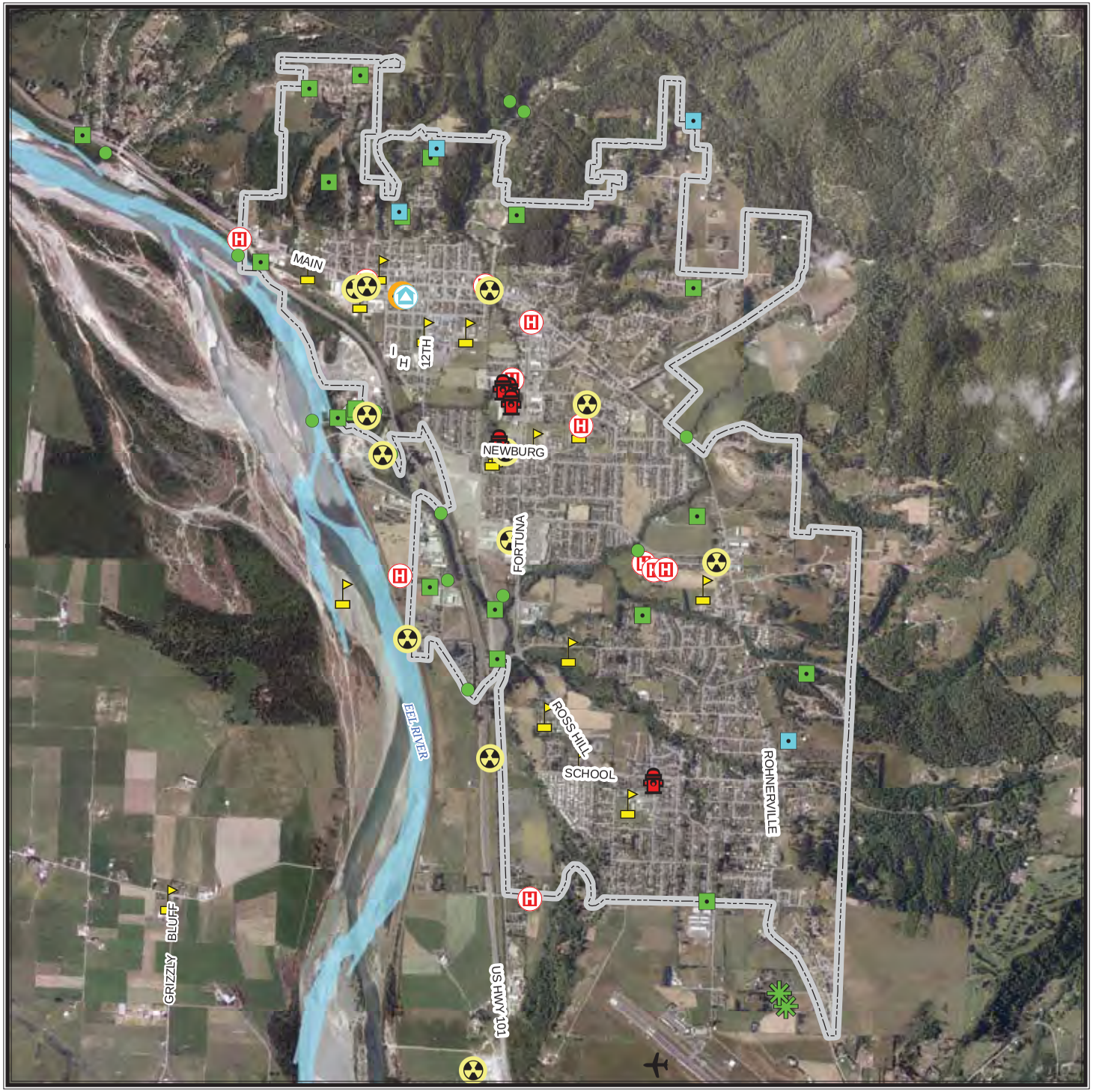
Table 8-13 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

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

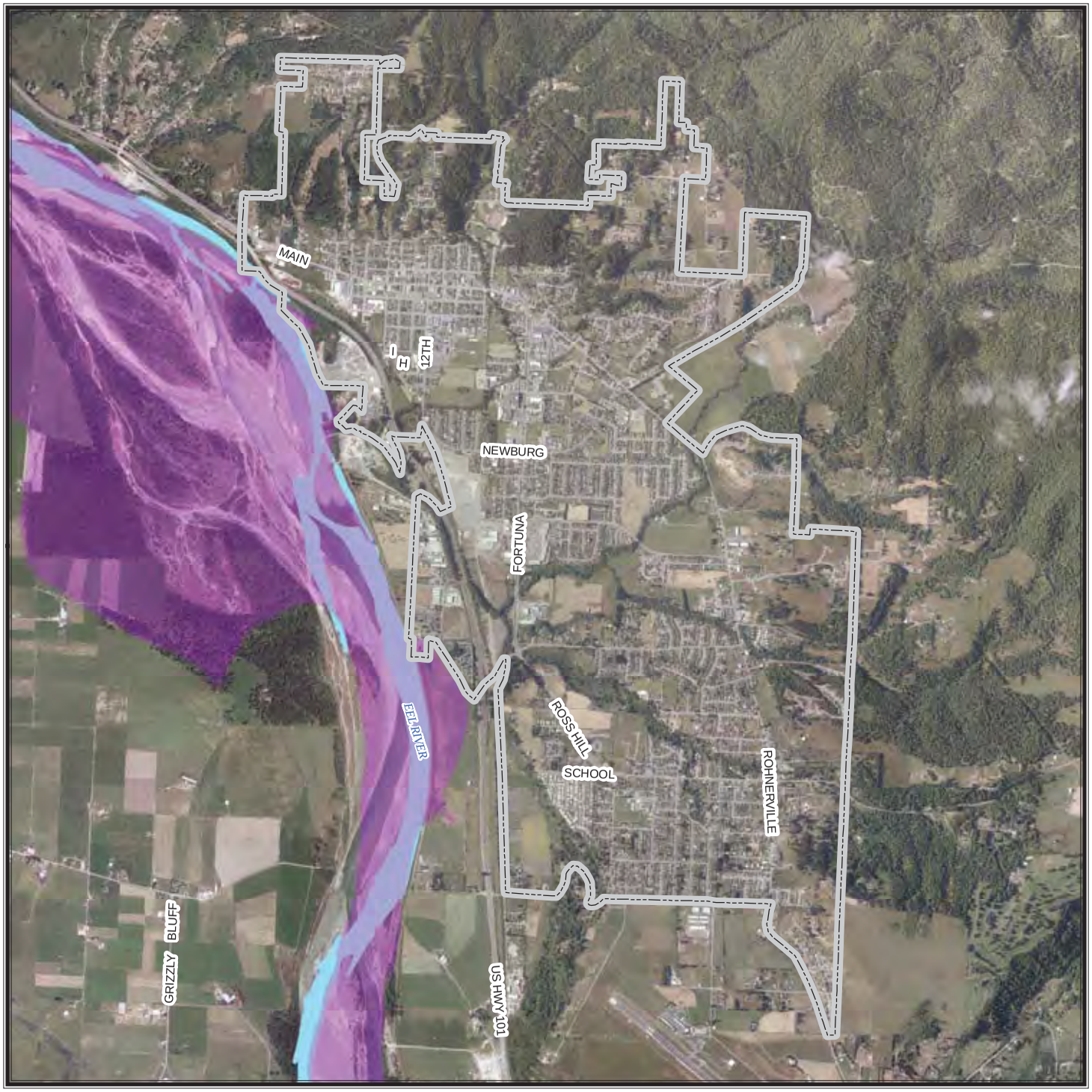
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

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.

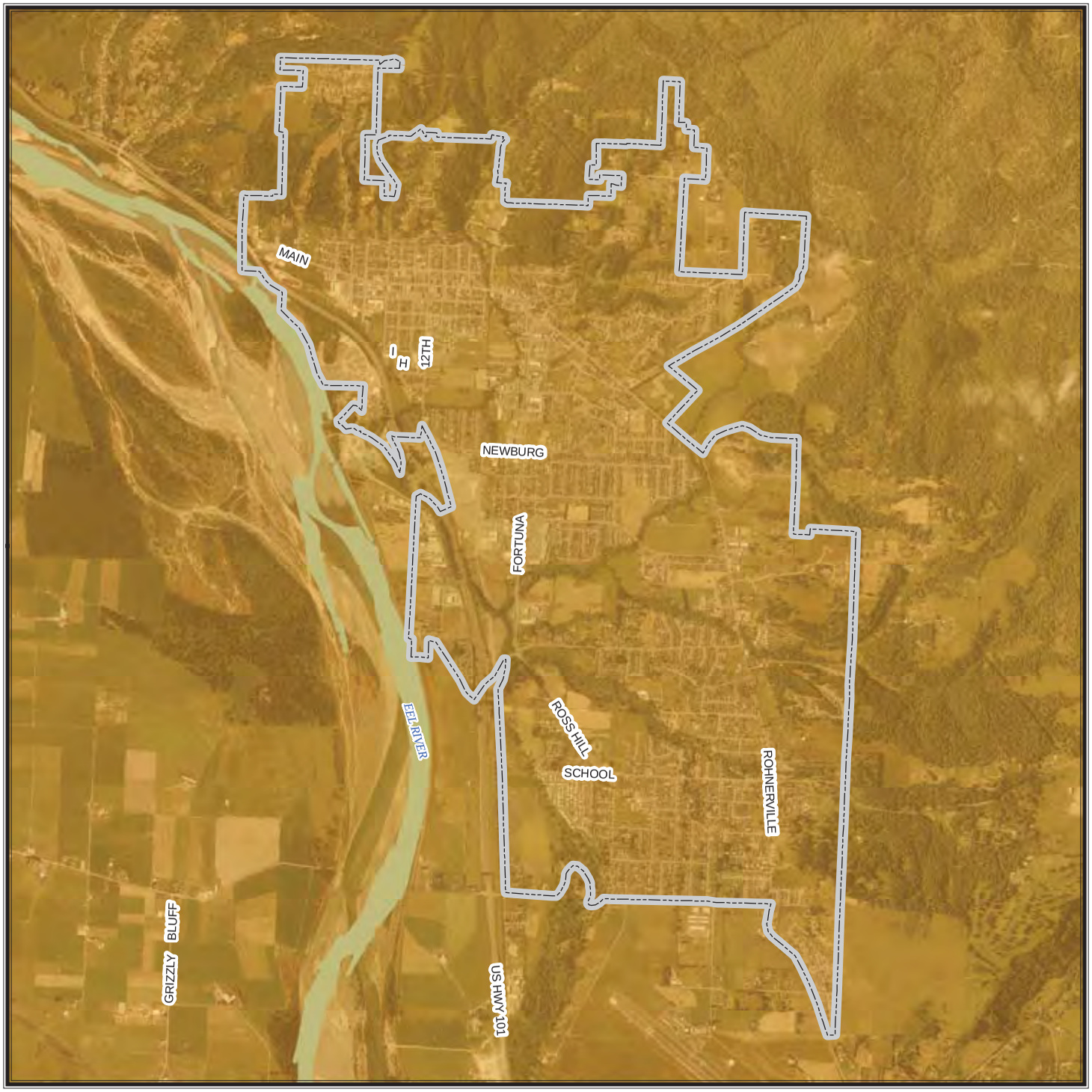
These data only include dams meeting specific size requirements making them subject to the jurisdiction of the State of California. Dams owned by agencies of the United States government are not under the jurisdiction of this program. Inundation maps represent the best estimate of where water would flow 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

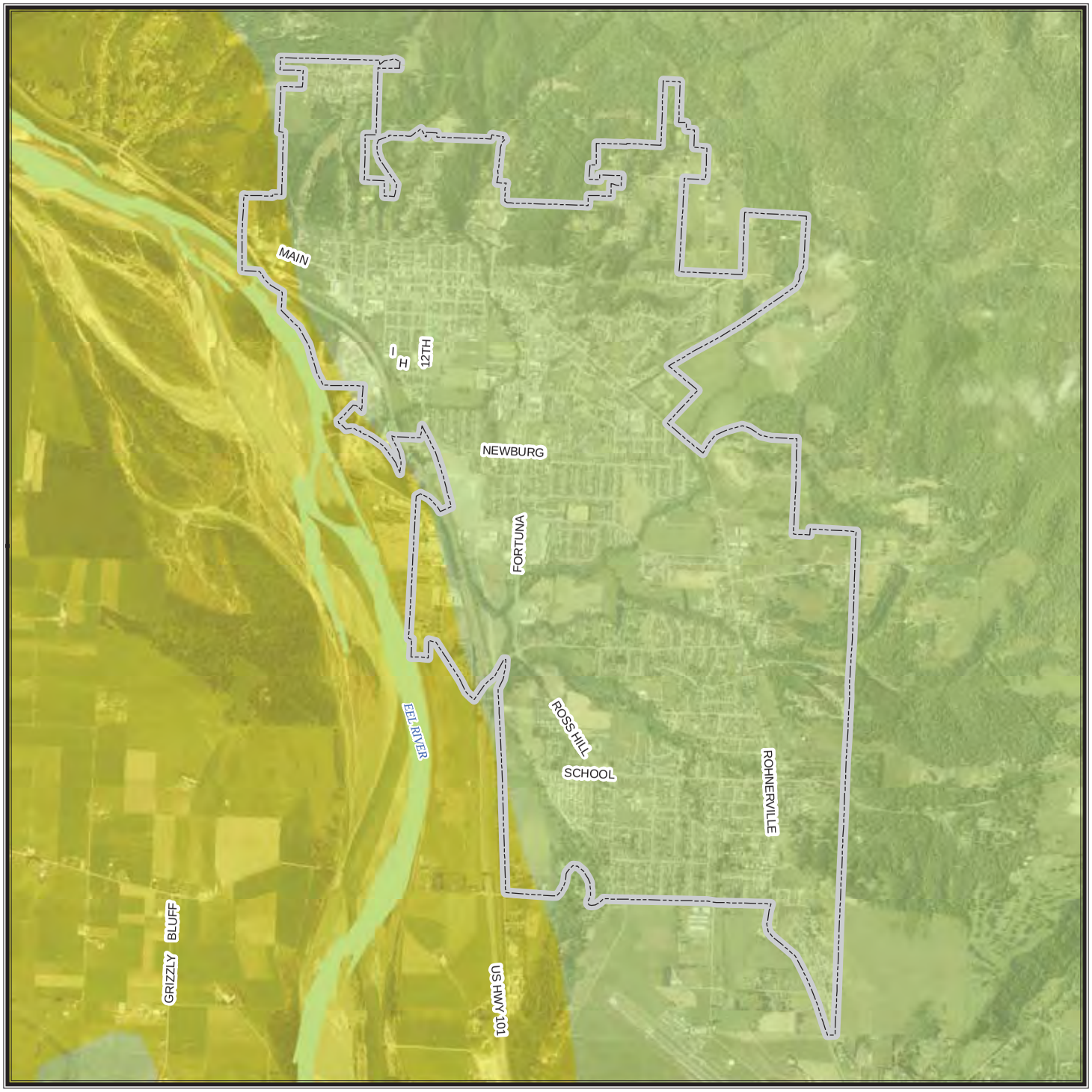
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

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

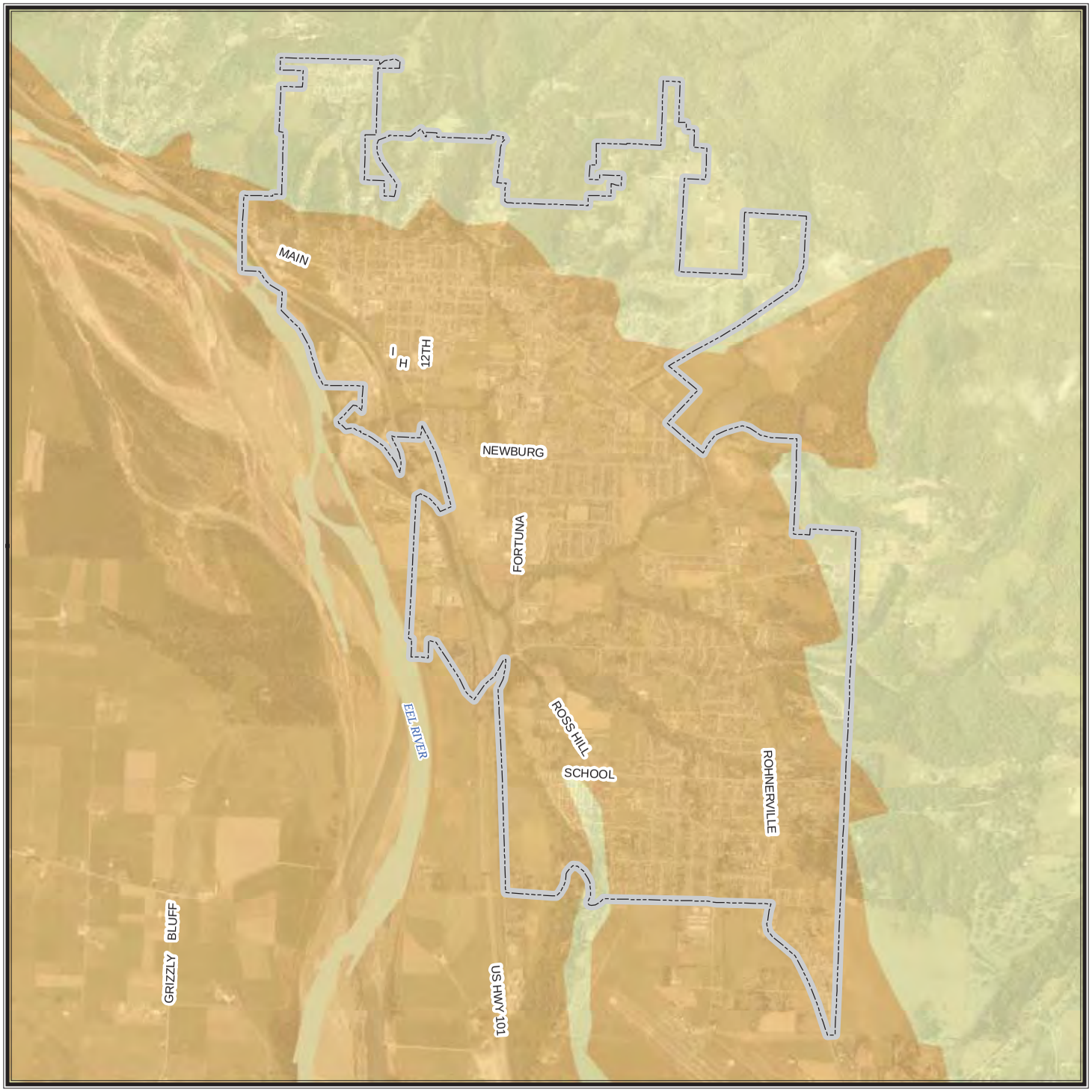
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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**

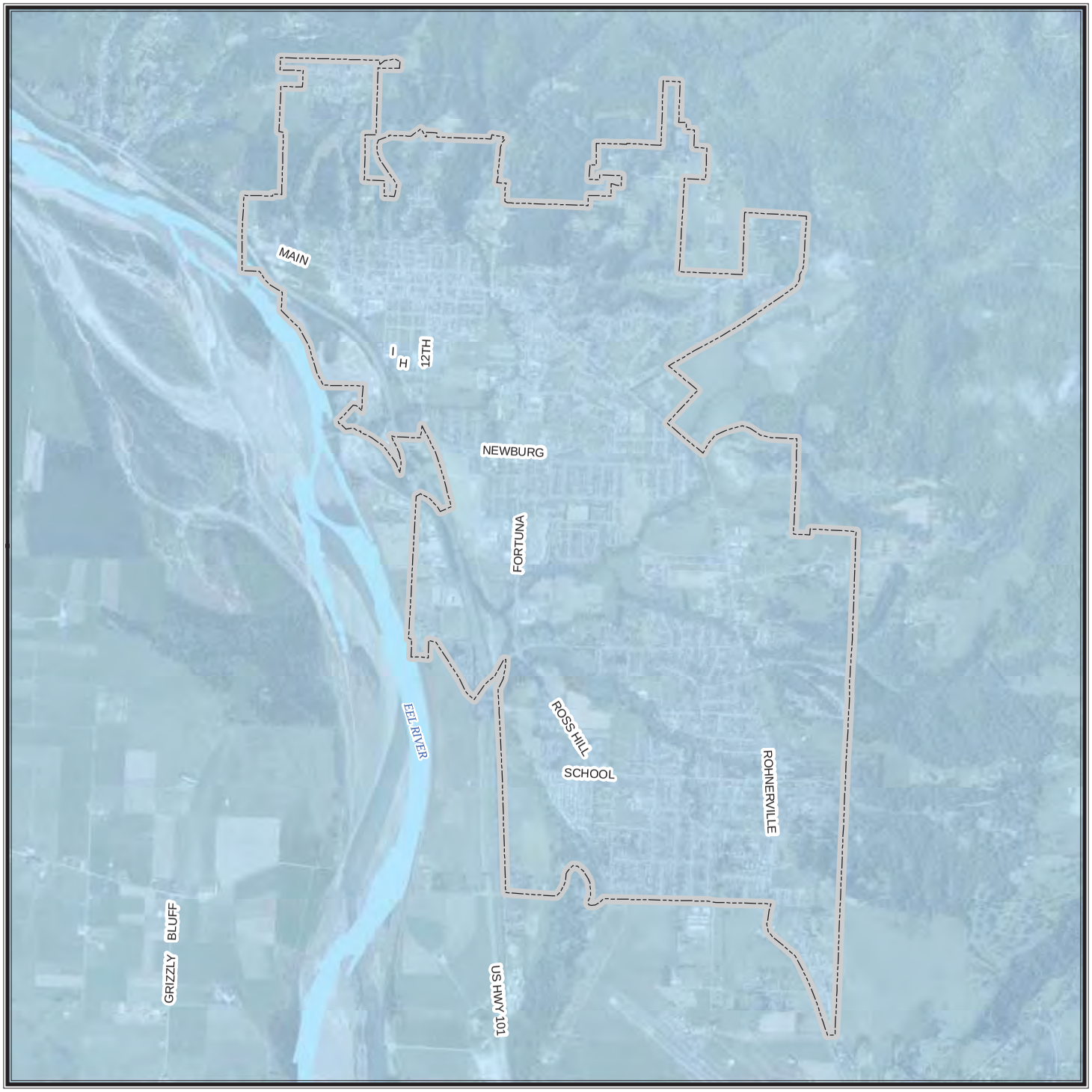
Soils classification data (2008) based on surficial geology published at a scale of 1:250,000 by the California Department of Conservation. The average shear wave velocity to 30 meters (Vs30) was used to develop site categories that can be used for modifying a calculated ground motion to account for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

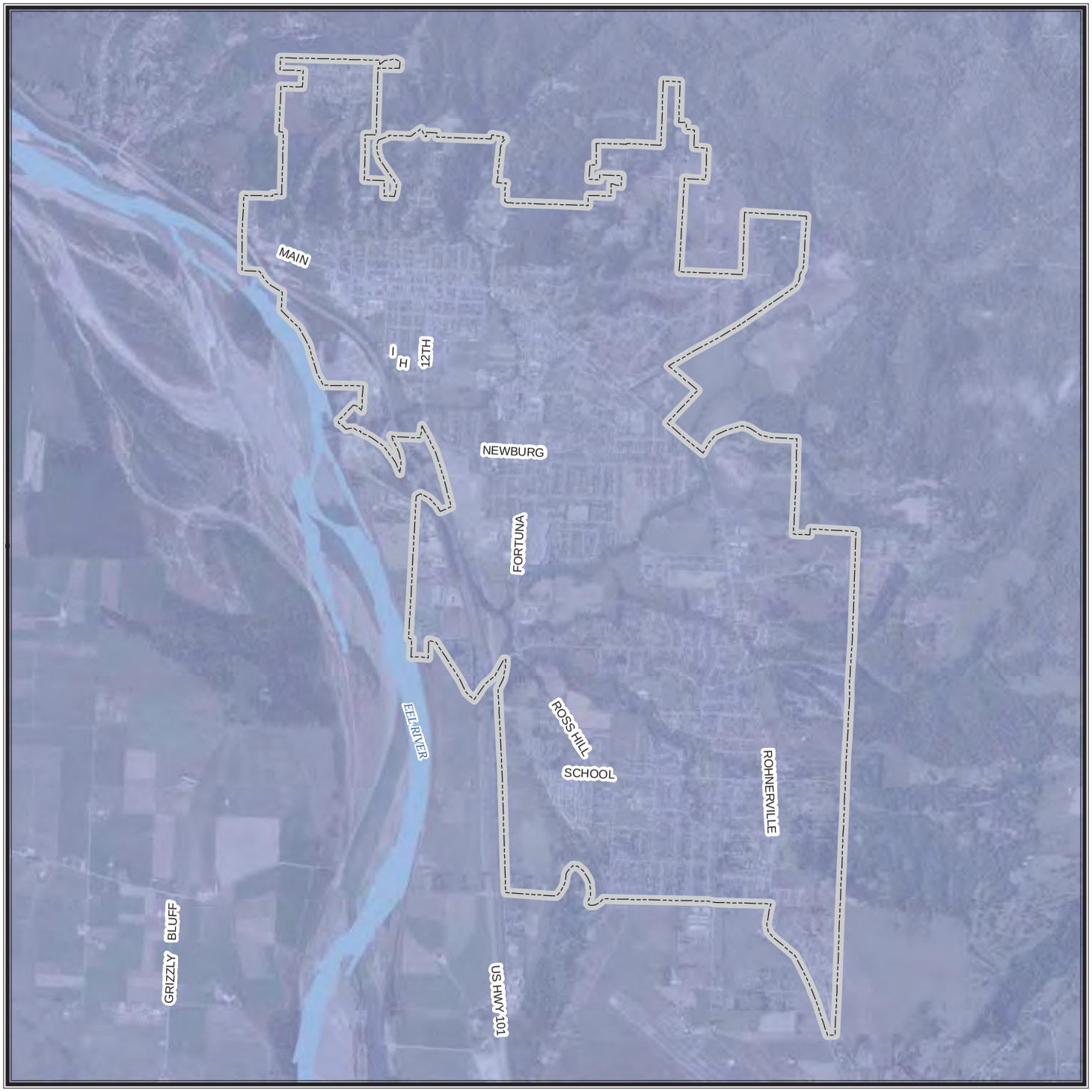
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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

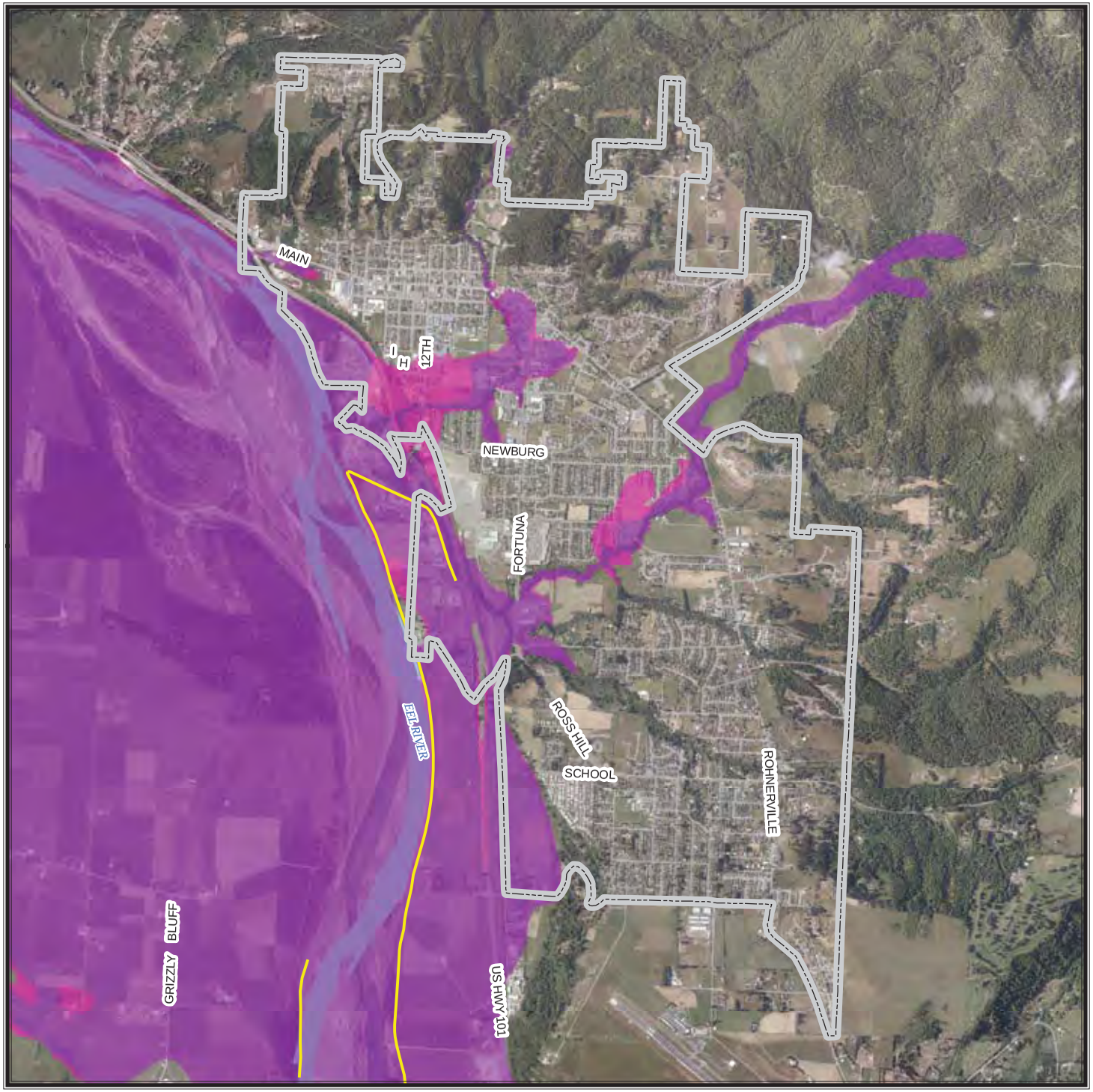
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

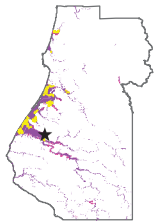
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

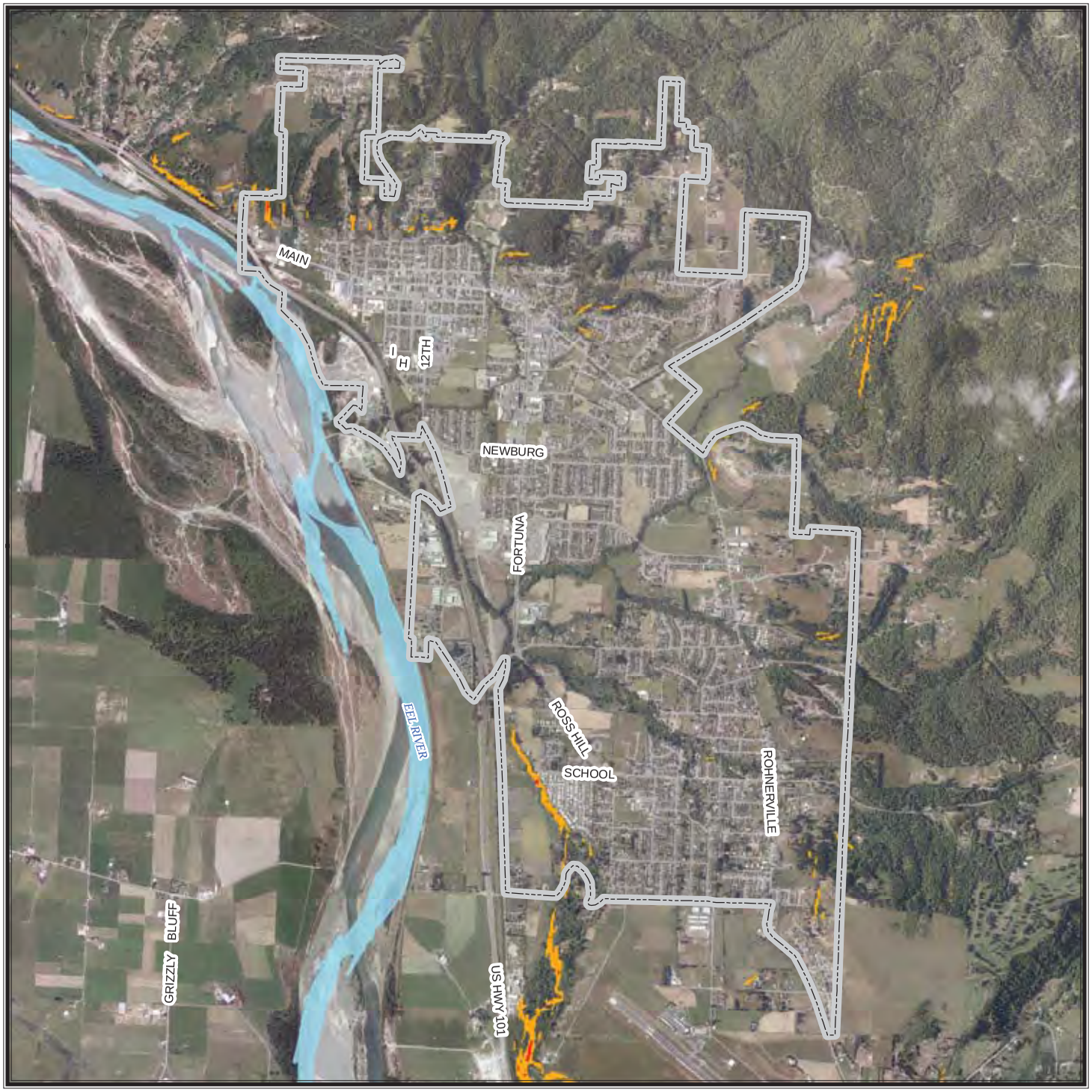
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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.

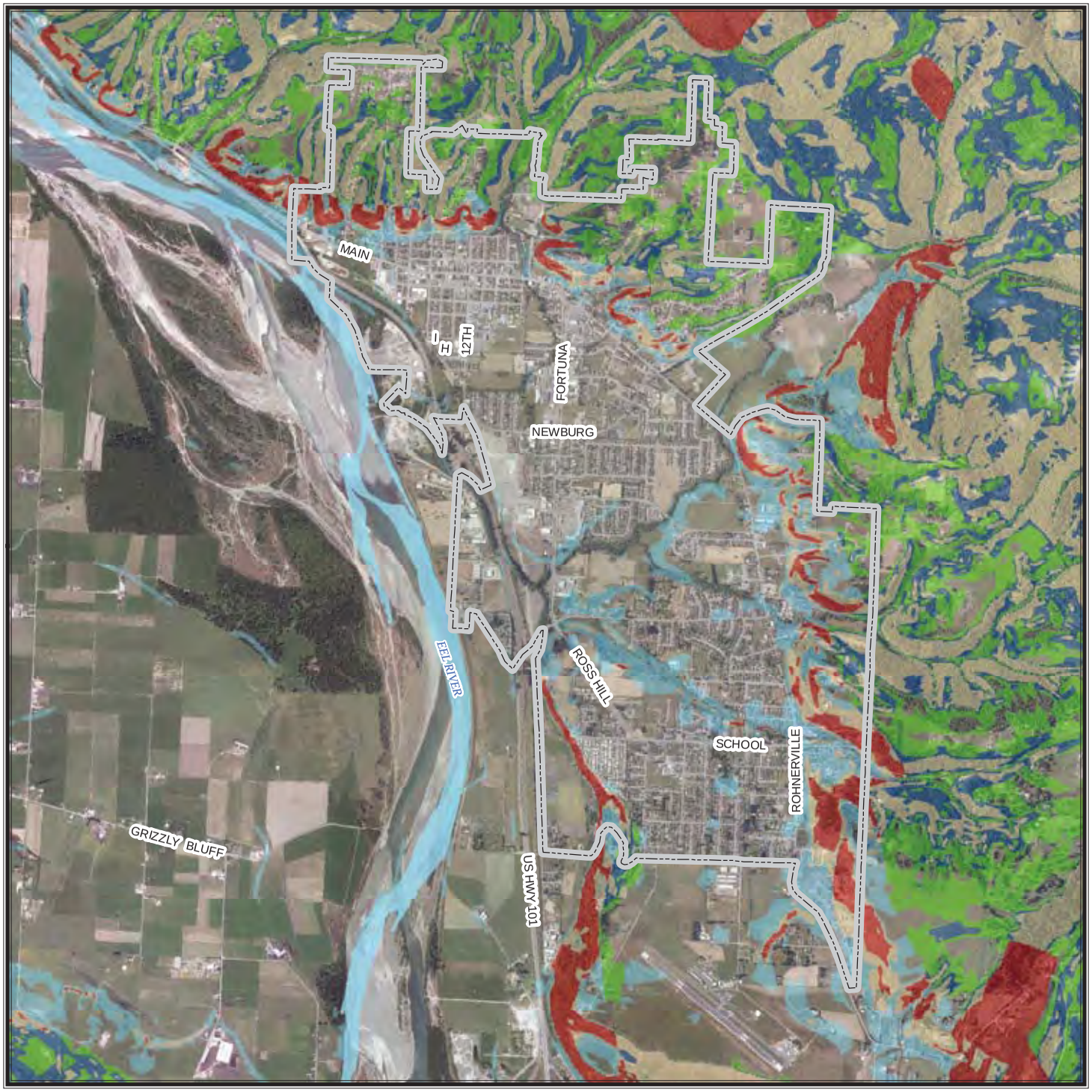
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

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

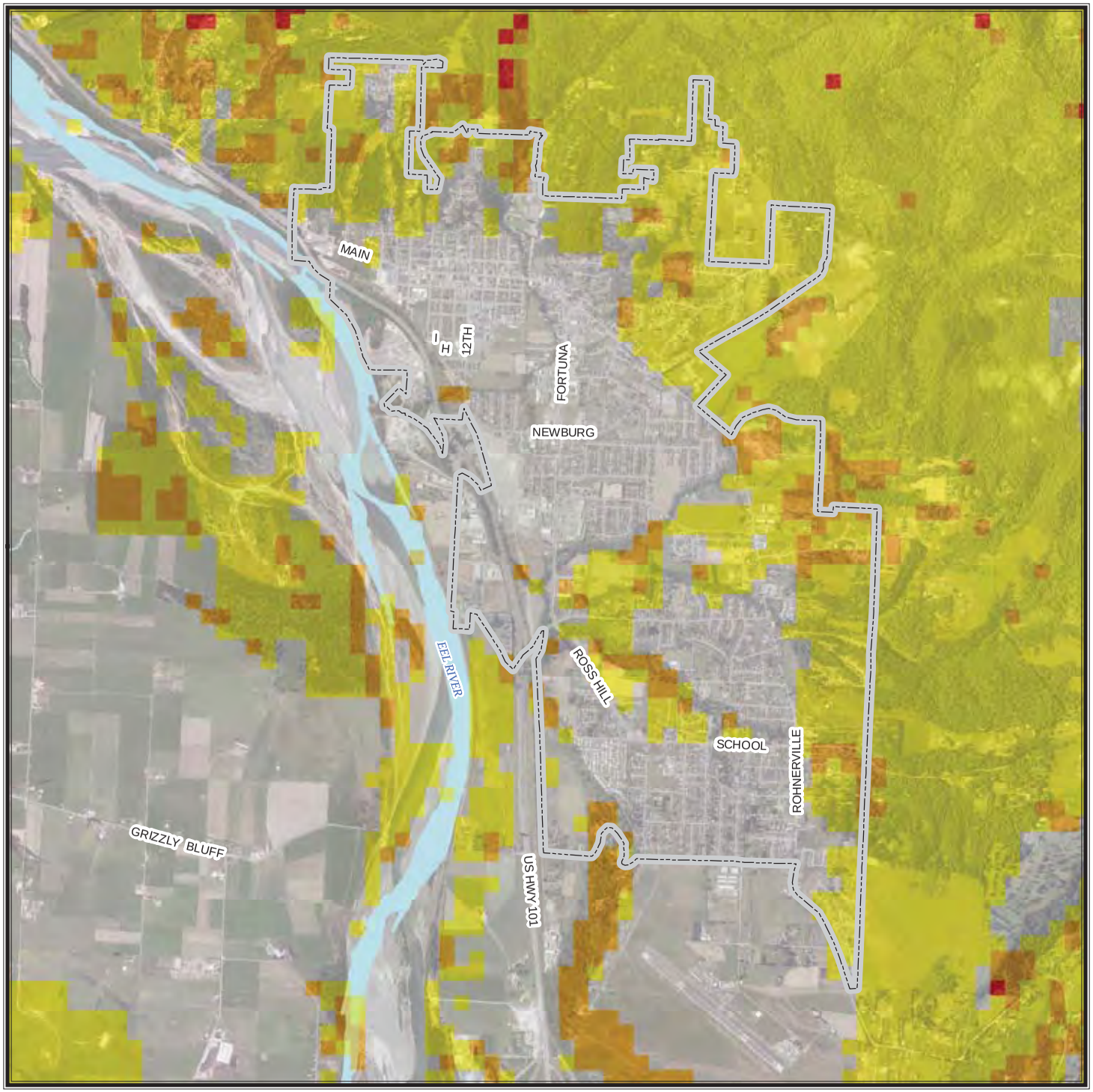
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. 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.

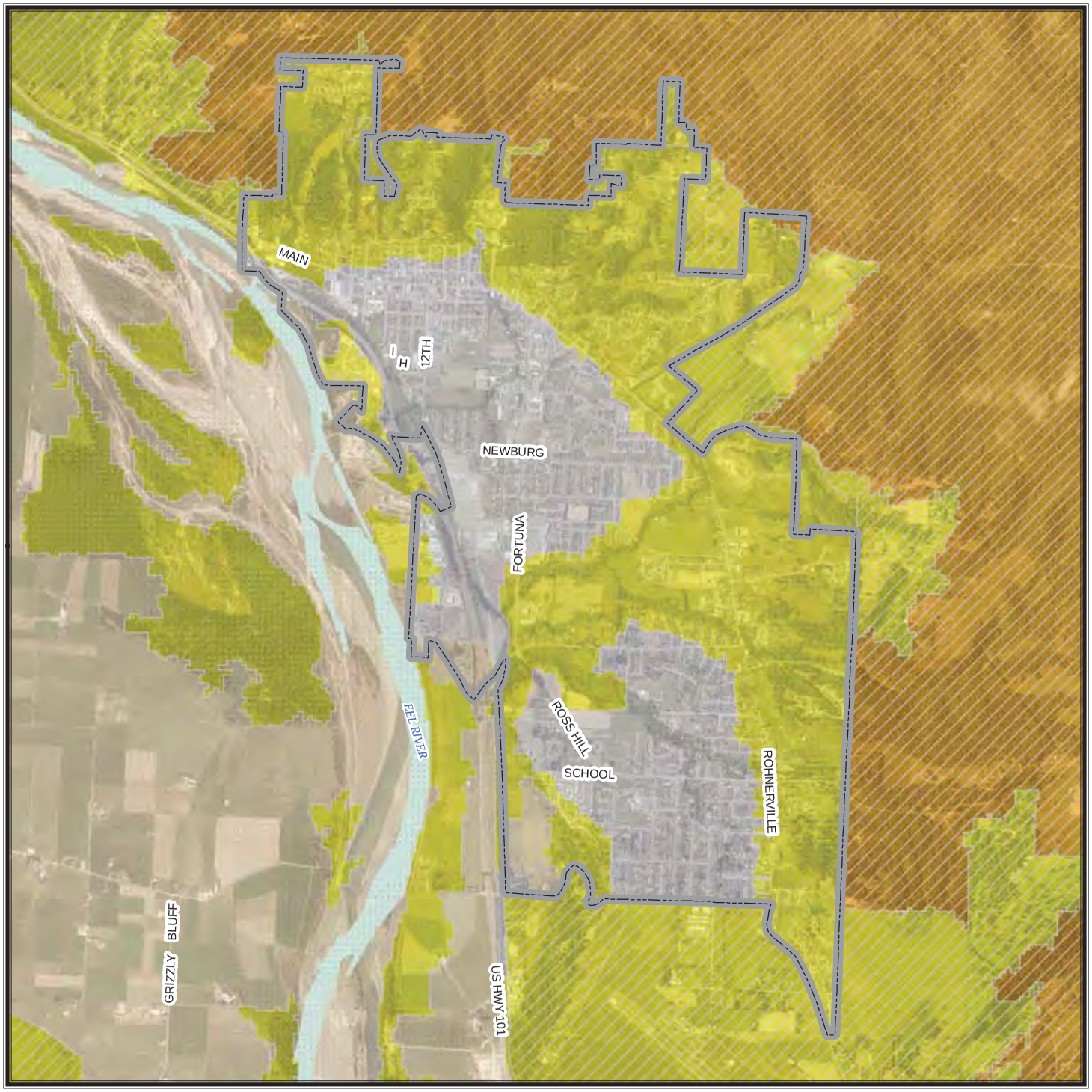
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

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**

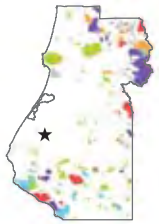
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, 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.

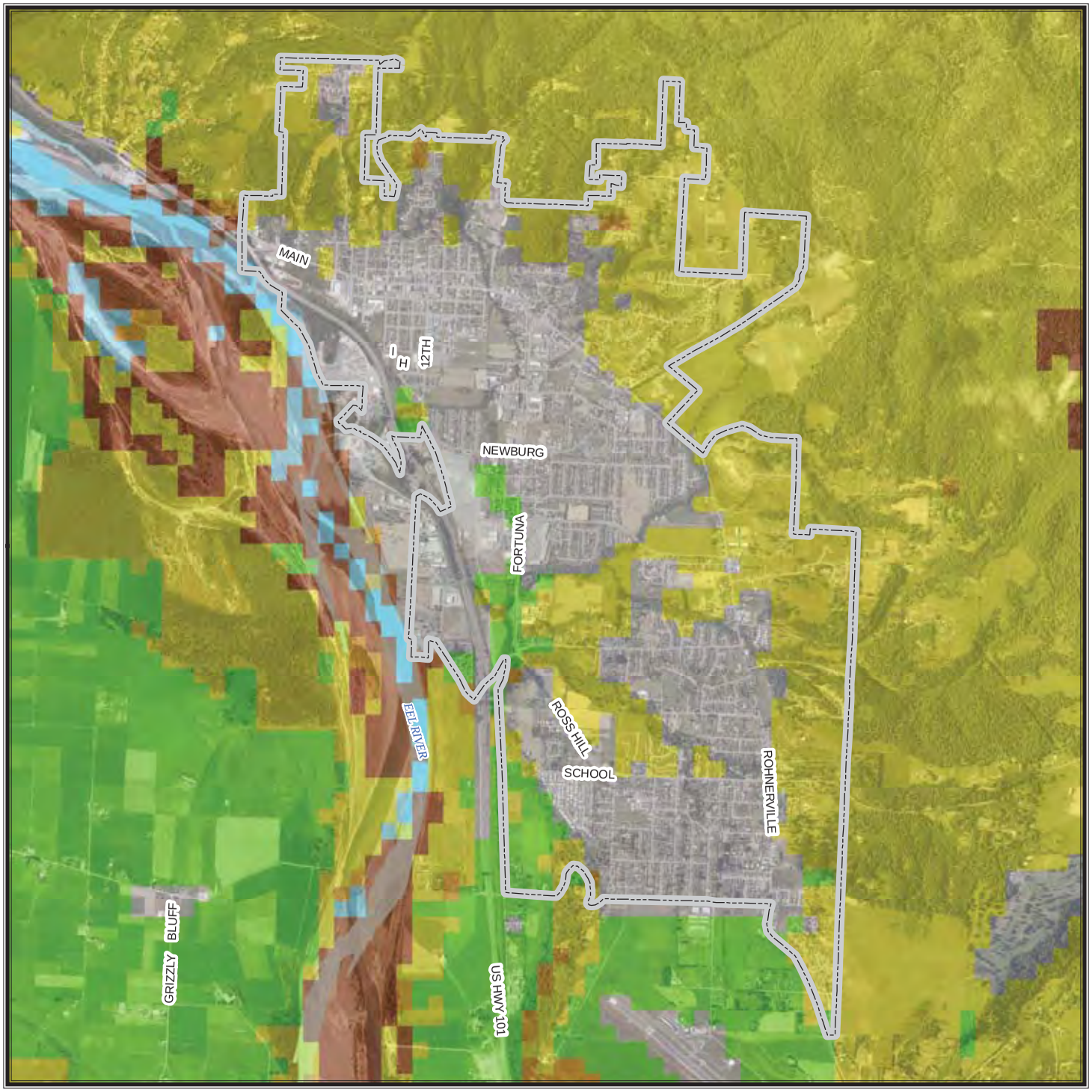
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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

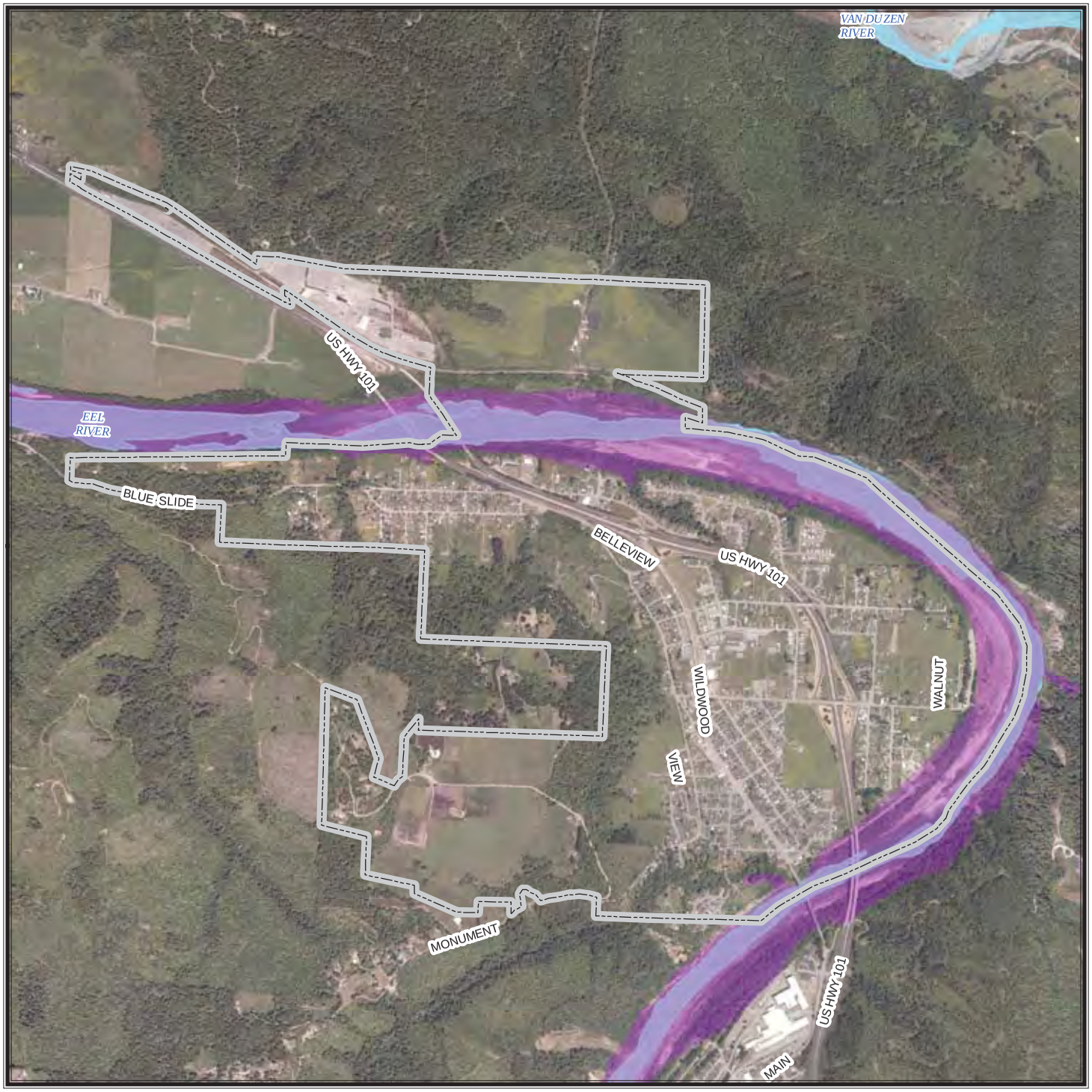
Critical Facilities Data Sources: Hazus MH v.2.1 database updated with Humboldt County GIS data and information from HMP partners.

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

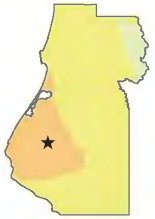
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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

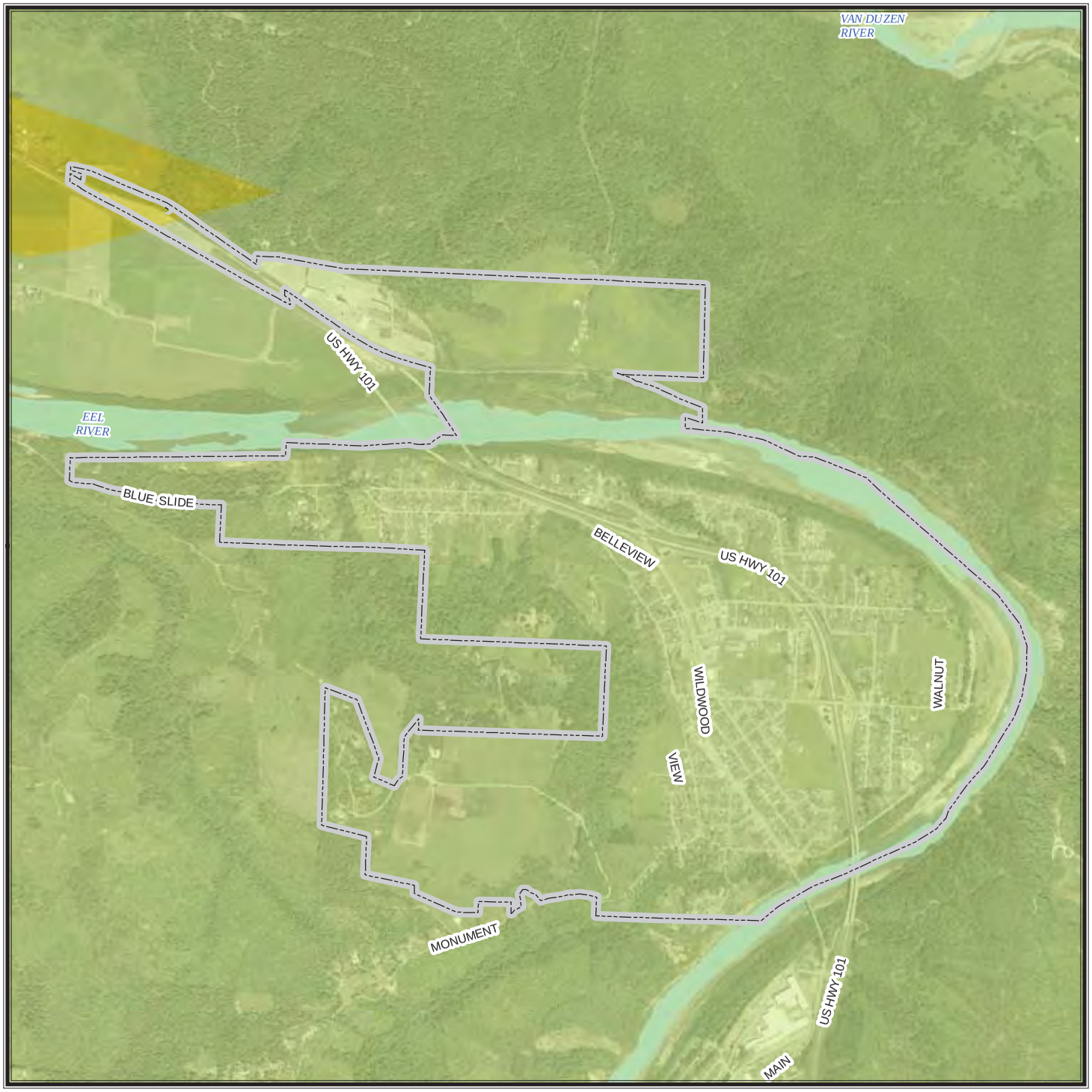
Earthquake fault data: Bryant, W.A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page.

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

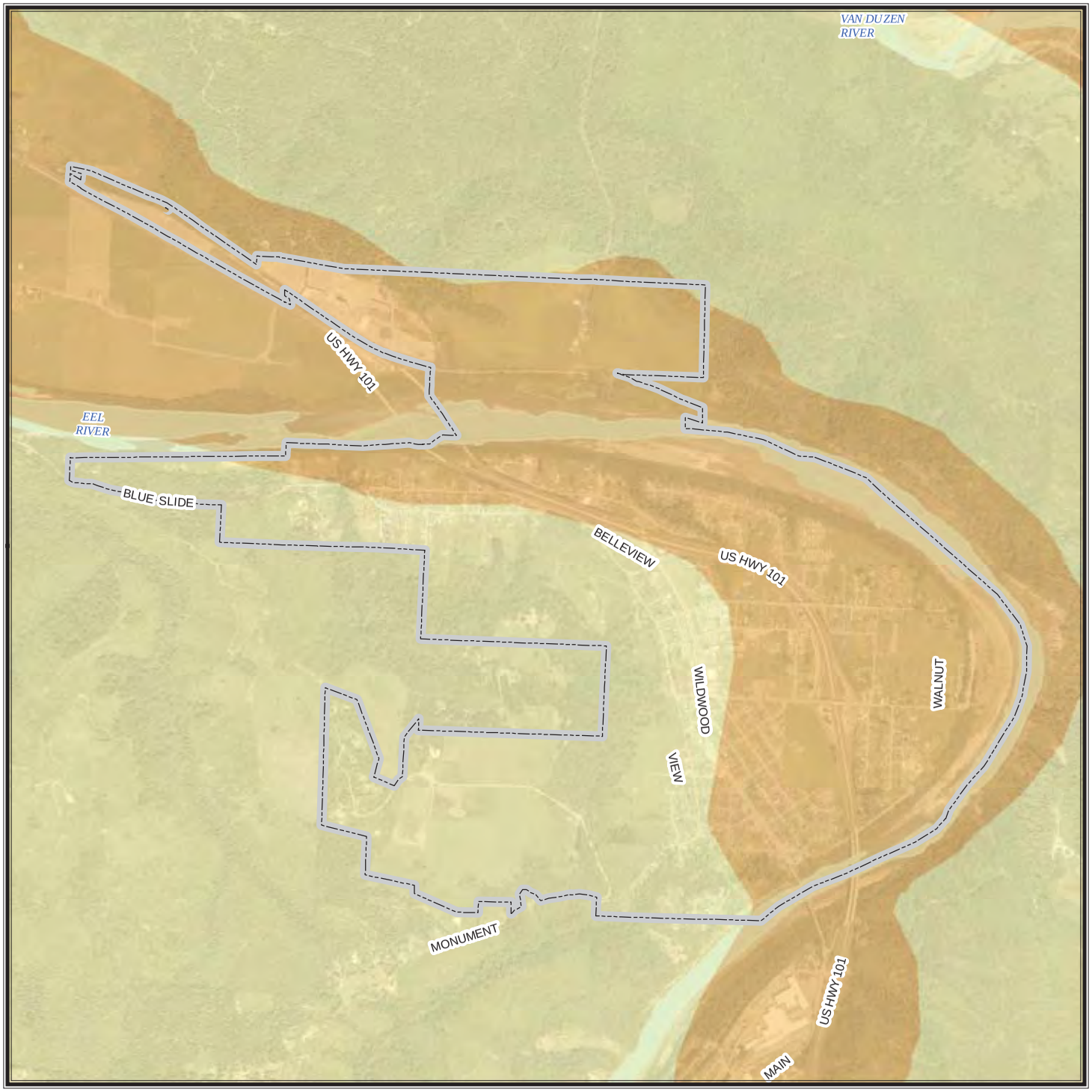
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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

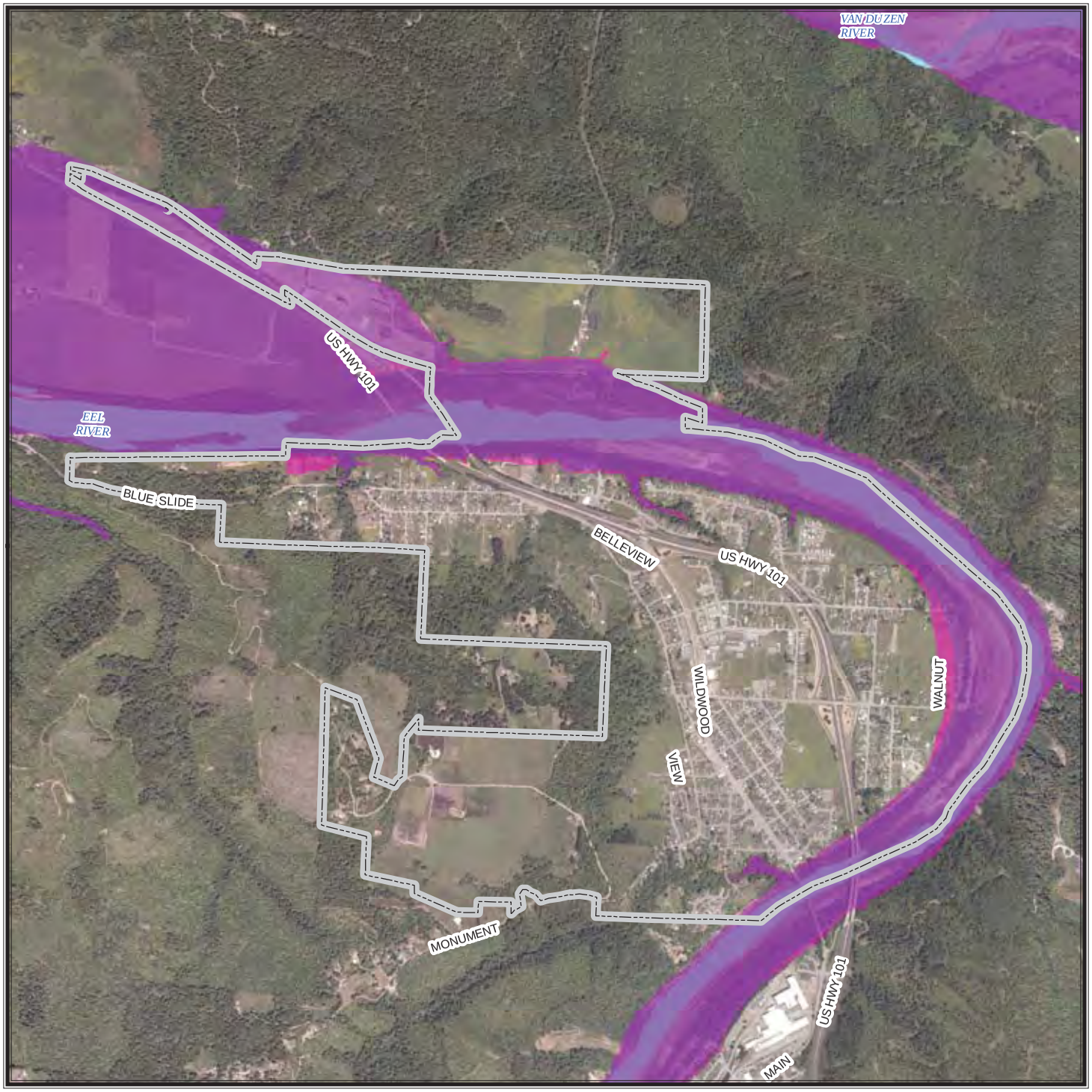
A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), 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.

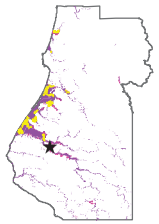
Flood hazard areas as depicted on 2010 FEMA Digital Flood Insurance Rate Maps (DFIRM). Levee data provided by CA Dept of Water Resources.

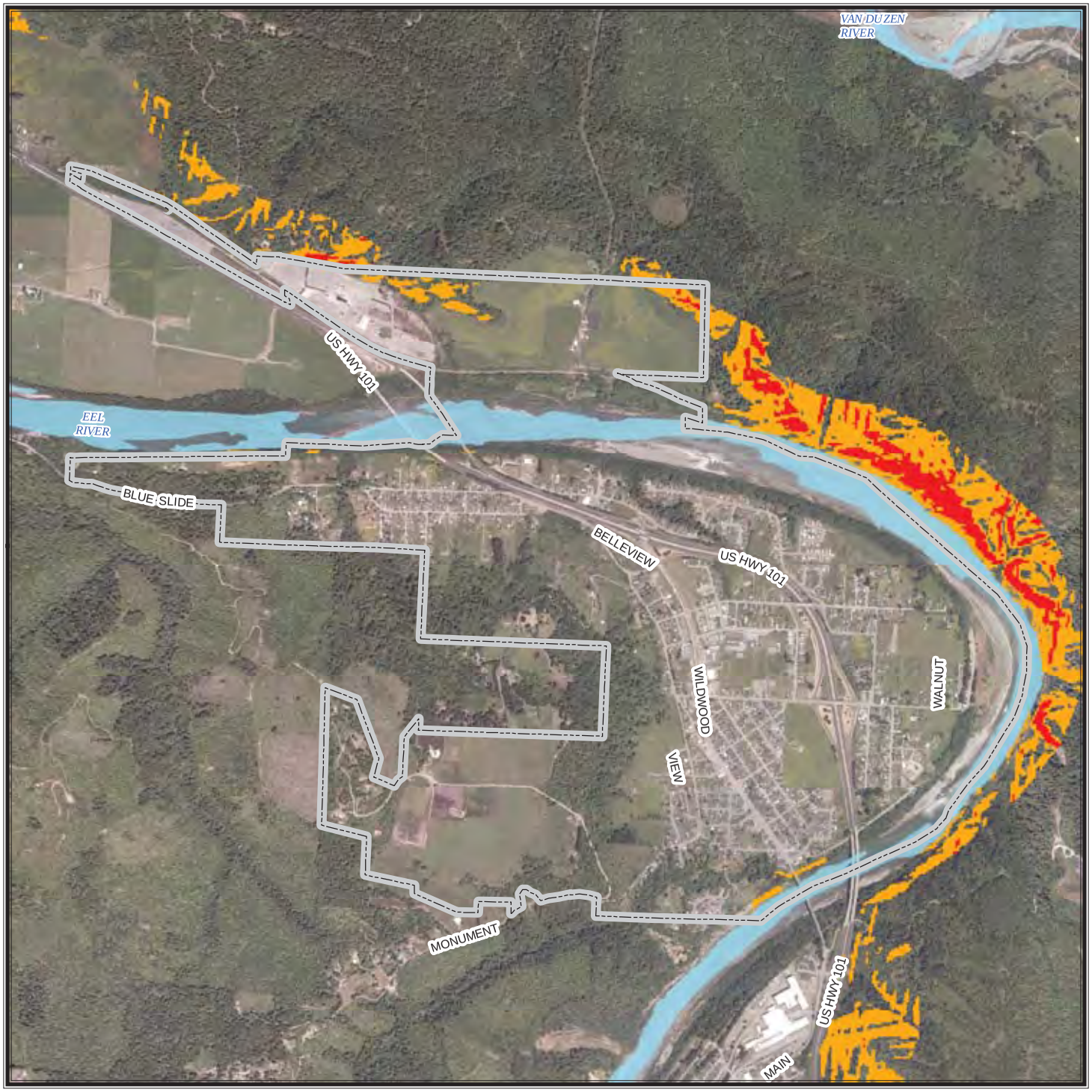
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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.

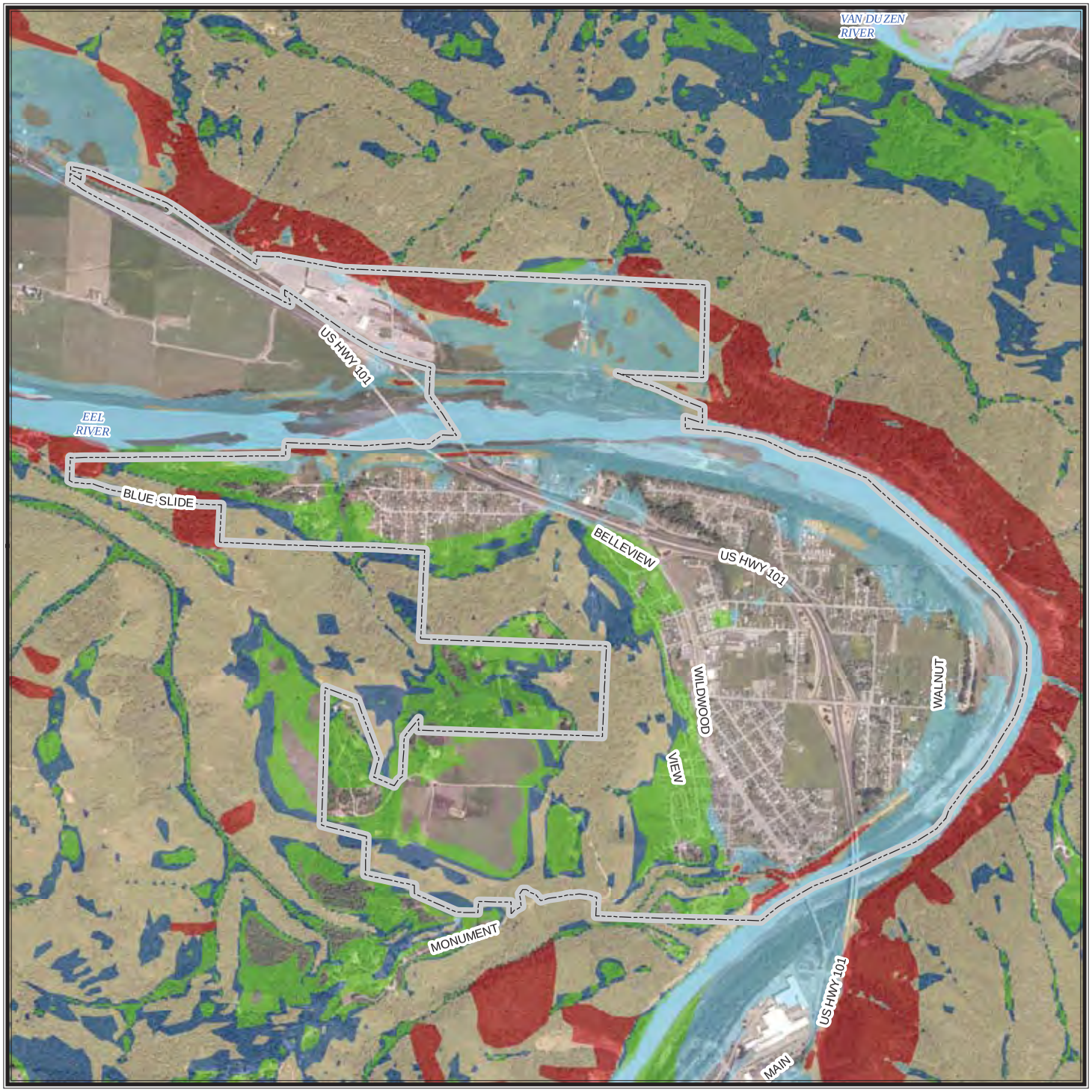
This map shows the intersection of two datasets - slope derived from a 10 meter DEM provided by USGS (2009) and NEHRP soils data provided by the California Geological Survey (2008).

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

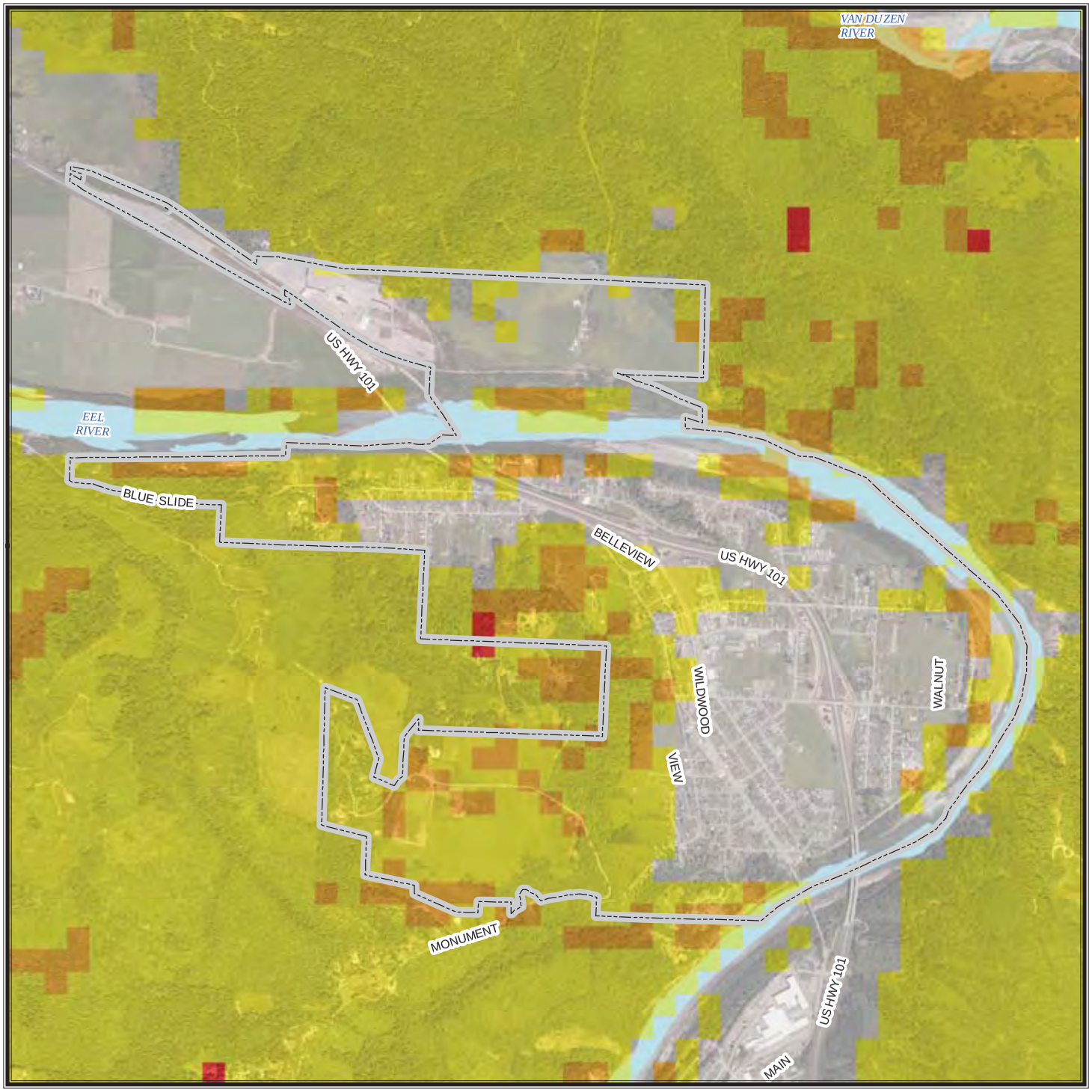
Tsunami inundation area data provided by California Emergency Management Agency. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping. 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.

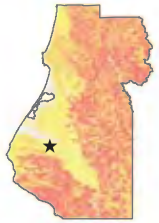
Condition class definitions:
1 - Fire regime within or near historical range.
2 - Fire regime moderately altered from historical range.
3 - Fire regime significantly altered from historical range.
9 - Non Assigned (non-wildlands)

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**

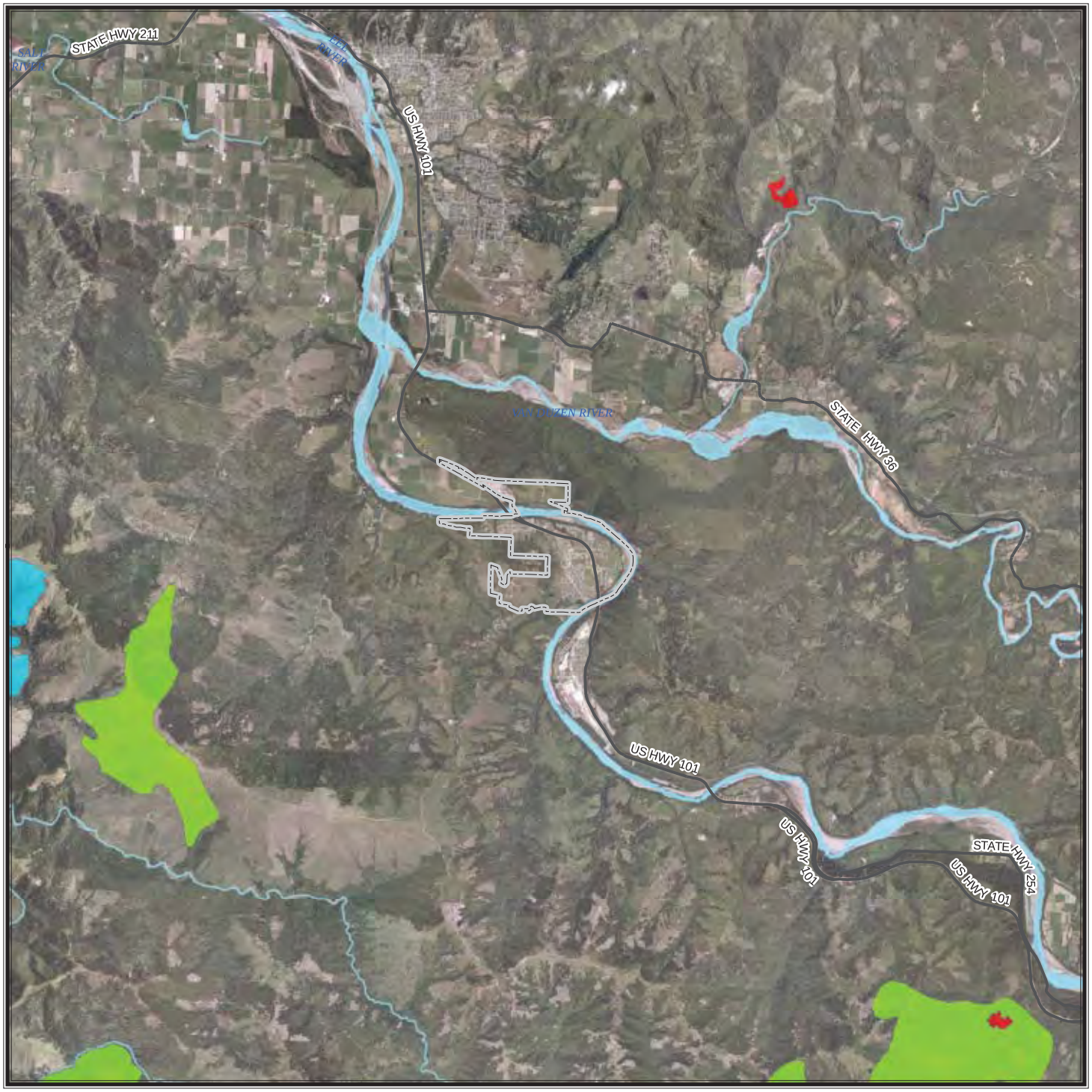
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, 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**

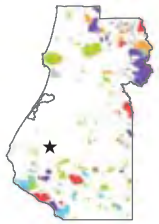
Fire Perimeters dataset provided by CAL FIRE. CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878. For the National Park Service, 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.

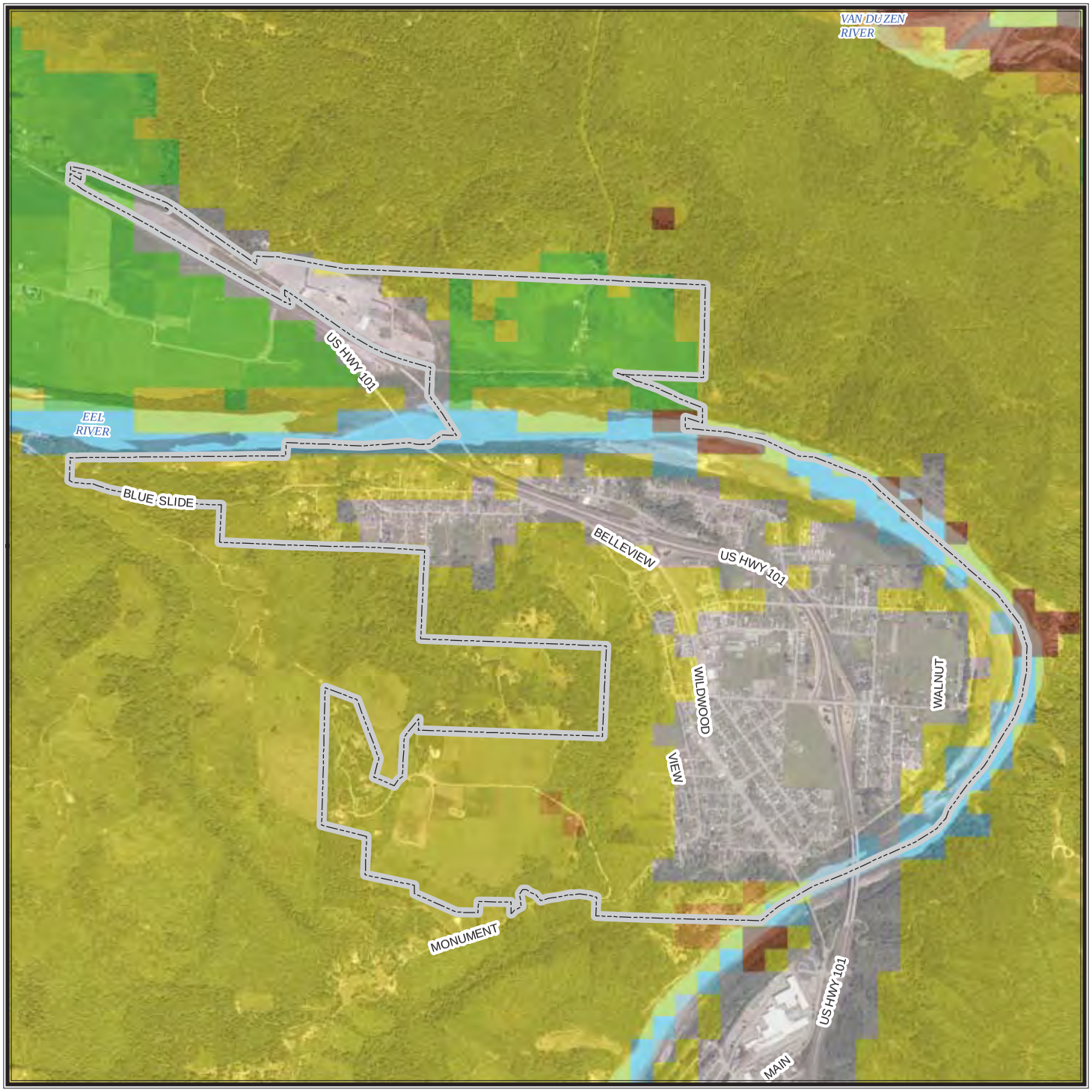
Base Map Data Sources: County of Humboldt, Cal-Atlas, and U.S. Geological Survey.

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).

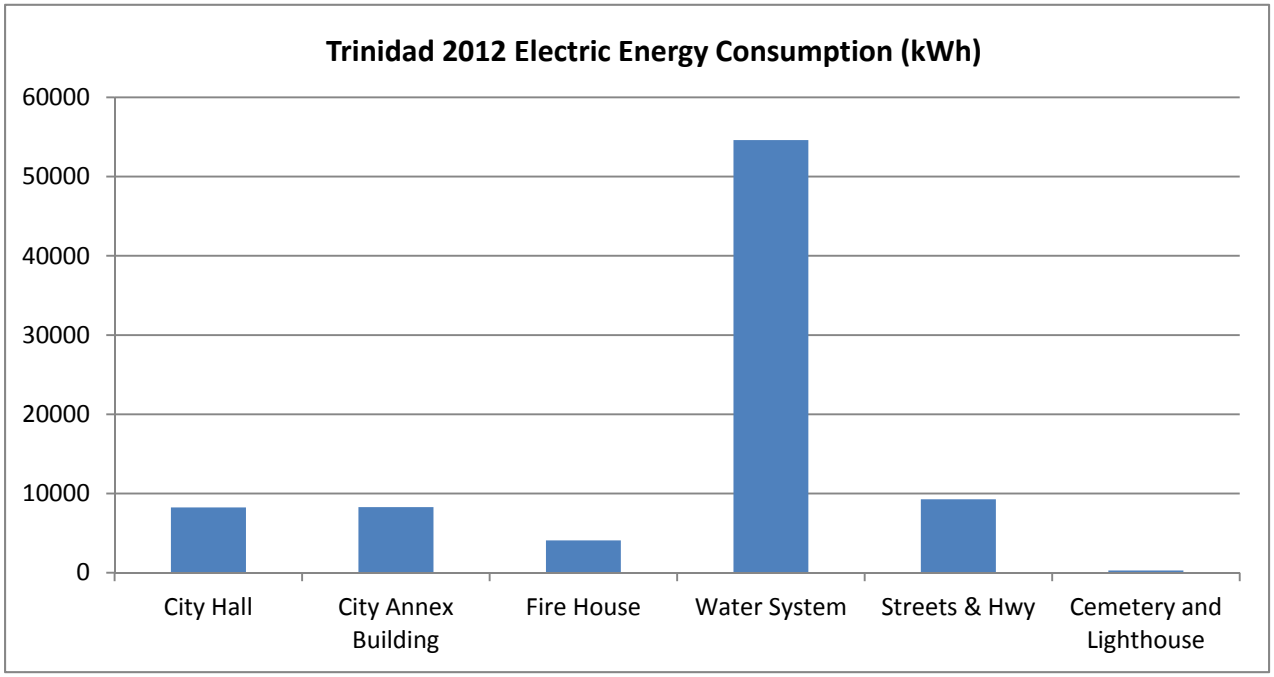
10.3.2 Local Energy Demand

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.

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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

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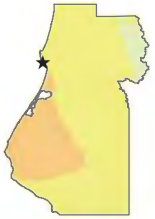
TETRA TECH



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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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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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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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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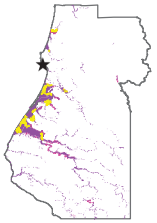

CITY OF TRINIDAD

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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0 0.25 Miles

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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0 0.25 Miles

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.

N
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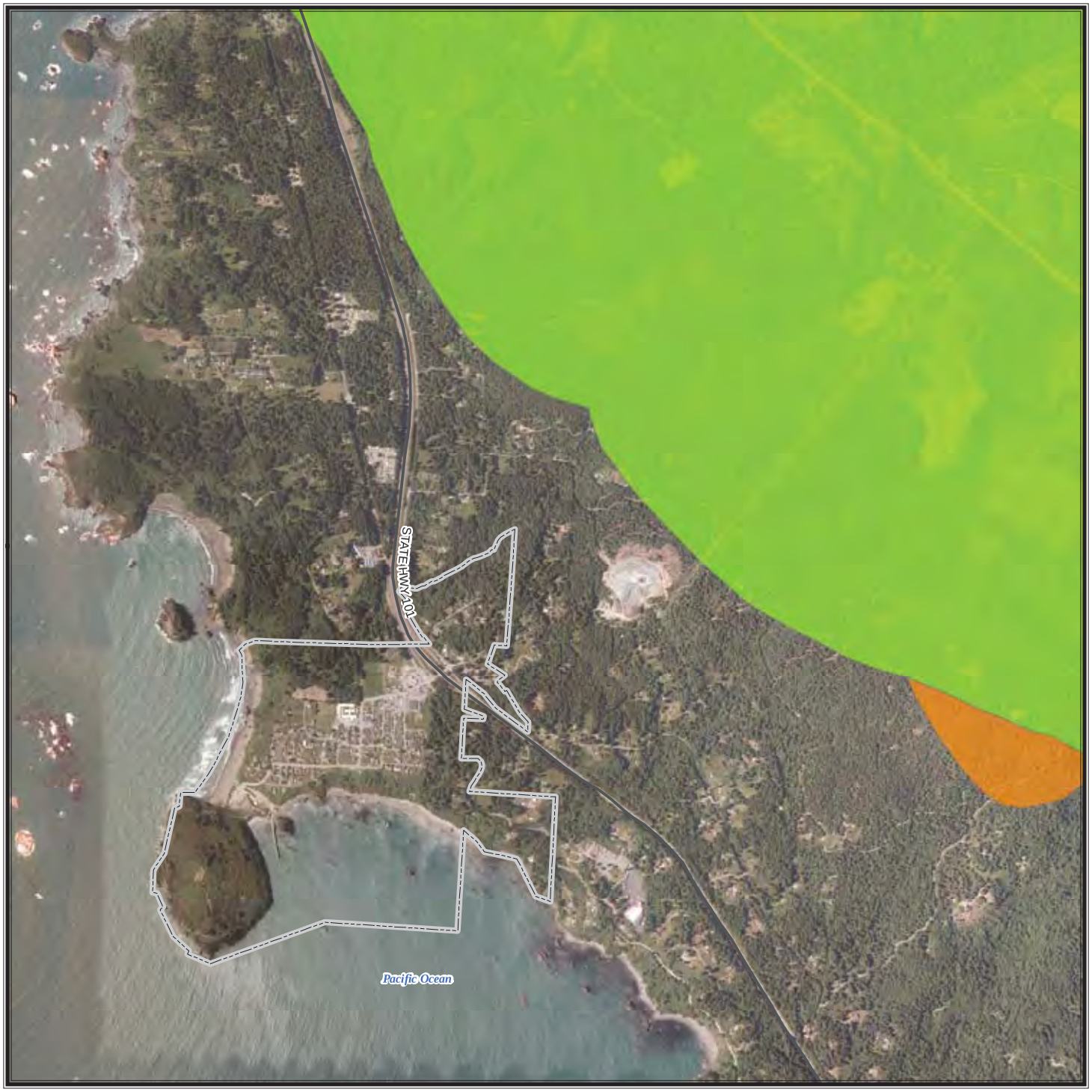
0 0.25 0.5 Miles

TETRA TECH



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.

N
W E
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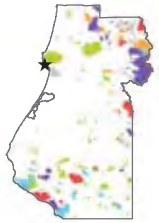
0 0.25 0.5 Miles

TETRA TECH



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.

N
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0 0.25 Miles

TETRA TECH

PART 3—
ANNEXES FOR COMMUNITY SERVICE DISTRICTS

CHAPTER 11.
HUMBOLDT COMMUNITY SERVICE DISTRICT UPDATE ANNEX

11.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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Alternate Point of Contact

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11.2 JURISDICTION PROFILE

Humboldt Community Services District is a Special District created in 1952 to provide water, sewer, and street lighting to the unincorporated area surrounding the City of Eureka known as Pine Hill, Cutten and Rosewood. The District's designated service areas expanded throughout the years to include other unincorporated areas of Humboldt County known as Myrtletown, Humboldt Hill, Fields Landing, King Salmon, Pigeon Point and Freshwater. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan while the General Manager will oversee its implementation. As of June 2013, the District serves 7,526 water connections, 6,326 sewer connections, and Street Lights with a current staff of 21. Funding comes primarily through rates and revenue bonds. See attached map for specific District boundaries.

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

- **Population Served—**Approximately 20,000
- **Land Area Served—**15.25 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $1,143,016,310 (as of 2013)
- **Land Area Owned—**33.91 acres
- **Critical Infrastructure and Equipment Owned:**
  - Approximately 87 miles of water main
  - 3 water wells
  - 13 water booster stations
  - 10 steel water storage tanks
  - 3 metered connections to the City of Eureka
  - 5 un-metered connections to the City of Eureka
  - 1 metered connection to Humboldt Bay Municipal Water District
  - Approximately 70 miles of sewer collection main

  - 29 Sewer Lift Stations
  - 8 Metered sewer connections with the City of Eureka (3 are incorporated as part of the sewer lift stations, 5 are stand-alone).
  - Rolling stock (26 vehicles)
  - Main office compound complete with vehicle and equipment storage and parts storage facilities.
- **Total Value of Critical Infrastructure and Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $116,751,514
- **Critical Facilities Owned:**
  - Transmission and distribution pipelines
  - Wells 1 through 3
  - Water Booster Stations 1 through 13
  - 10 Water storage tanks
  - 3 metered connections to the City of Eureka
  - 5 un-metered connections to the City of Eureka
  - 1 metered connection to Humboldt Bay Municipal Water District
  - Sewer collection system mains
  - Sewer lift stations 1 through 29
  - Sewer meter stations, 4, 5, 6, 7 and 8
  - Office, equipment and parts facilities
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $115,337,341
- **Current and Anticipated Service Trends—**The growth rate within HCSD's service area is based on new residential construction service connections between June 2008 thru June 2013 (5 years). The growth rate during that time period was 2.64%. During that time period there were 86 new apartment units; a few 4 & 6-plex connections; 199 residential connections; and 8 commercial connections. It is expected that approximately the same growth rate will occur between 2014-2018.

11.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 11-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake		1/9/2010	$40,000
Earthquake	N/A	07/09/2007	$150,000
Flooding, severe winters and landslides	DR-1628	02/03/2006	$22,000
Severe weather	N/A	12/1995	$57,161
Winter storms, flooding, landslides	DR-1044	01/09/1995	$3,875
Earthquake	N/A	1994	$158,446
Earthquake	DR-943	04/04/1992	$23,993

Table 11-1 lists all past occurrences of natural hazards within the jurisdiction.

11.4 HAZARD RISK RANKING

TABLE 11-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	45
2	Severe Weather	39
3	Tsunami	24
4	Drought	30
5	Flood	18
6	Wildfire	18
7	Landslide	21
8	Dam Failure	12
9	Earthquake	45

Table 11-2 presents the ranking of the hazards of concern.

11.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- California Department of Public Health
- California and U.S. Environmental Protection Agencies
- Federal Energy Regulatory Commission
- Army Corp of Engineers
- California Environmental Quality Act
- Federal Endangered Species Act
- California Coastal Commission
- Cal Fire/Humboldt Bay Fire Department
- Northern California Unified Air Quality Management District
- HCSD Codes, Ordinances, Policies and Standard Plans and Specifications
- Humboldt County General Plan

11.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 11-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	N/A	--	--
Storm Ready	Not Participating	--	--
Firewise	Not Participating	--	--
Tsunami Ready (if applicable)	Not Participating	--	--

Classifications under various community mitigation programs are presented in Table 11-3.

11.7 HAZARD MITIGATION ACTION PLAN

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

TABLE 11-4.
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?
HCSD-1—Retrofit Tanks							
Existing	Earthquake	1,2,3,4,9	HCSD	600,000.00	HCSD	Completed	Yes
HCSD-2—Enhance water supply system for fire prevention, in areas rated high by Cal Fire							
New and Existing	Wildfire	1,3,4,5	HCSD	1.5 million	HCSD/Grants	Ongoing	Yes
HCSD-3—Acquire support equipment such as backup generators and water pumps							
New and Existing	All Hazards	1,2,3,5,8	HCSD	500,000.00	HCSD/Grants	Ongoing	Yes
HCSD-4—Engineering feasibility study of Critical Facilities for structural and non-structural mitigation							
Existing	Flood & Earthquake	1,2,4,5	HCSD	350,000.00	HCSD/Grants	Long Term	Yes
HCSD-5—Promote public awareness of the risk associated with natural hazards to HCSD rate payers via public information means available to HCSD							
New and Existing	All Hazards	1,2,4	HCSD	15,000.00	HCSD/Grants	Short Term	Yes
HCSD-6—Install earthquake valves on tanks							
Existing	Earthquake	1,2,3,4,9	HCSD		HCSD/Grants	Short Term	No
HCSD-7—Remove tree at Donna Drive tank							
Existing	Severe Weather	1,2,3,9	HCSD	5,000	HCSD	Short Term	No
HCSD-8—Develop and implement a plan to pump water from H.H. system to rest of District							
New and Existing	Earthquake Tsunami Drought	1,3,4,5,7, 10	HCSD	100,000	HCSD/Grants	Short Term	No
HCSD-9—Upgrade water system for fire protection on Ivy League Streets in H.H. area							
New and existing	Wildfire	2,3,4,5	HCSD	301,000	HCSD/Grants	Short Term	No
HCSD-10—Artino St landslide repair							
New and Existing	Landslide	1,2,3	HCSD	20,000	HCSD/Grants	Long Term	No
HCSD-11—Donna Dr. pump house rehab							
Existing	All Hazards	1,2,3,4	HCSD	20,000	HCSD	Short Term	No

TABLE 11-4.
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?
HCSD-12—Ridgewood Booster Station pump							
Existing	All Hazards	1,2,3,4	HCSD	15,000	HCSD/Grants	Short Term	No
HCSD-13—Pine Hill SLS rebuild							
Existing	All Hazards	1,2,3,4	HCSD	125,000	HCSD/Grants	Short Term	No
HCSD-14—Truesdale pump upgrade							
Existing	All Hazards	1,2,3,4	HCSD	200,000	HCSD/Grants	Short Term	No
HCSD-15—Hubbard pump upgrade							
Existing	All Hazards	1,2,3,4	HCSD	15,000	HCSD/Grants	Short Term	No
HCSD-16—Hillcrest/ Vista/Linda water main upgrade (fire protection)							
Existing	Wildfire	1,2,3,4	HCSD	403,000	HCSD/Grants	Long Term	No

11.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 11-5.
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]
HCSD-1	5	H	L	YES	YES	YES	-
HCSD-2	4	M	L	YES	YES	YES	HIGH
HCSD-3	5	H	L	YES	NO	YES	LOW
HCSD-4	4	M	H	NO	NO	NO	LOW
HCSD-5	3	L	L	YES	YES	NO	LOW
HCSD-6	5	H	H	YES	YES	NO	HIGH
HCSD-7	4	H	M	YES	YES	NO	HIGH
HCSD-8	6	M	H	NO	YES	NO	MED
HCSD-9	4	H	H	YES	YES	YES	HIGH
HCSD-10	3	H	M	YES	YES	YES	HIGH
HCSD-11	4	M	M	YES	YES	NO	HIGH
HCSD-12	4	M	L	YES	YES	YES	HIGH
HCSD-13	4	M	L	YES	YES	YES	HIGH
HCSD-14	4	M	M	YES	YES	NO	HIGH
HCSD-15	4	M	L	YES	YES	NO	HIGH
HCSD-16	4	H	M	YES	YES	YES	HIGH

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

Table 11-5 identifies the priority for each initiative.

11.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 11-6.
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	8,4	1, 6	5		3	1,4,6,8,11-15
Severe Weather	8,4	7	5		3	4,8,11-15
Tsunami	8,4		5		3	4,8,11-15
Drought	8,4		5			4,8,11-15
Flood	8,4		5		3	4,8,11-15
Wildfire	2, 8, 9,16	2,8,9,16	5	2,8,9,16	2,3,9	4,8,9,11-16
Landslide	8,4	10	5		3	4,8,10,11-15
Dam Failure	8		5			4,8,11-15

a. See Chapter 1 for description of mitigation types.

Table 11-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

11.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 11-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
HCSD-1	**X**			
HCSD-2		**X**		Ongoing
HCSD-3		**X**		Ongoing
HCSD-4		**X**		Ongoing
HCSD-5		**X**		Ongoing

Table 11-7 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.

11.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Focused engineering studies of critical infrastructure/facilities

CHAPTER 12.
MANILA COMMUNITY SERVICE DISTRICT UPDATE ANNEX

12.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
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12.2 JURISDICTION PROFILE

Manila is a rural coastal community with approximately 1000 people. The Manila Community Services District is an independent multi-purpose district located in coastal northern California. The Community Services District is governed by a locally elected 5 member board of directors and was formed on July 20, 1965 by the Humboldt County Board of Supervisors. The district employs a General Manager responsible for administering and implementing policies set by the board.

The district boundary encompasses approximately a 4 mile by 2/3 mile strip of land running generally from the Samoa Bridge to the mouth of the Mad River slough between Humboldt Bay and the Pacific Ocean. The population base and water sewer infrastructure service area encompass a 1/3 mile by 2 1/3 mile section centrally located in the above mentioned strip (Figure 29.4).

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

- **Population Served—**Approximately 1000 people
- **Land Area Served—**Approximately 4.67 square miles
- **Value of Area Served—**The assessed value of improvements within the Manila voting district is $26,716,890 (2007 certified roll, Humboldt County Assessor).

  The assessed value of the property associated with the above improvements within the Manila voting district is $10,999,025 (2007 certified roll, Humboldt County Assessor).

  The assessed value of the property and improvements within the Manila voting district is $37,715,915 (2007 certified roll, Humboldt County Assessor)
- **Land Area Owned—**Approximately 135 Acres
- **Critical Infrastructure and Equipment Owned:**
  - Water Delivery System and pressure control infrastructure, booster station (District Office) one (100,000 gallon) redwood storage reservoir one surge protector all associated appurtenances and delivery pipe.
  - Wastewater Treatment Plant, 311 lift stations associated with Septic Tank Effluent Pumping System, associated conveyance infrastructure. Constructed wastewater treatment facilities including: aeration ponds, oxidation ponds, rapid infiltration basins

and all related conveyance infrastructure. Laboratory, essential for wastewater treatment tasks. Backup generator for treatment plant.

  - Backhoe, critical for repair of water delivery and sewage removal systems.
  - Tractor
  - 2 Service Vehicles, critical for communication and system evaluation in emergencies as well as for daily operations.
  - Heavy Duty Septic Tank Pumper Truck
- **Total Value of Critical Infrastructure and Equipment—$1,308,350**
- **Critical Facilities Owned:**
  - District Office (Water Delivery Booster Station and Surge Protection)
  - Service Yard
  - Wastewater Treatment Plant and Laboratory
  - Community Center
- **Total Value of Critical Facilities—$5,523,720**
- **Current and Anticipated Service Trends—**Presently, the Manila Community Services District has 371 service connections. The Humboldt County General Plan predicts growth for the county to be approximately 4% every 5 years (http://co.humboldt.ca.us/planning/Genplan/Framewk/index.htm) . Historically, Manila has followed Humboldt County growth trends. Presently, growth in Manila is constrained by the limited capacity of the 100,000 gallon water storage reservoir. For our present population, 135,000 gallon capacity is desired. When this occurs, growth is anticipated to match or surpass county growth predictions. We presently have 61 unused service applications on file with the district. These are expected to become active within the next seven years. If these unused service applications are activated it will represent an 11.74% growth in 5 years; over double the County's predicted growth.

12.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 12-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Weather	023-17BEF-00	01/01/2006	$4,000 reimbursement; $19,180 actual. $ value of damage unknown.
Earthquake	n/a	04/25-26/1992	Magnitude 7.1, 6.6 and 6.7 within 24 hour period. Private property damage occurred, but the total value is not known.

Table 12-1 lists all past occurrences of natural hazards within the jurisdiction.

12.4 HAZARD RISK RANKING

TABLE 12-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Tsunami	36
2	Earthquake	54
3	Severe Storm	54
4	Flood	39
5	Wildfire	22
6	Drought	6
7	Landslide	6
8	Flood	6
9	Volcano	0

Table 12-2 presents the ranking of the hazards of concern.

12.5 APPLICABLE REGULATIONS AND PLANS

There are no existing applicable hazard mitigation laws, codes, ordinances or policies in effect by this district that could support or enhance the mitigation initiatives identified in this annex. However, Humboldt County planning employs the following: consideration of appropriate land use designations in order to limit the populace exposed to hazardous areas; 2) assessment and conditioning of development applications according to the hazards on a site; 3) policies tailored to specific hazardous conditions; and, 4) an action program to improve overall safety conditions within the County. Furthermore, the State of California Uniform Building Code (UBC) has very strict building codes that intend to keep residents and property safe during hazard events like earthquakes, wildfires, and floods, and the Humboldt County Planning Department enforces these standards during the building application process.

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- None

12.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 12-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	Yes	--	--

Classifications under various community mitigation programs are presented in Table 12-3.

12.7 HAZARD MITIGATION ACTION PLAN

TABLE 12-4.
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?
M-1 Achieve Tsunami Ready Status for Manila							
New and Existing	EQ/T	6, 10, 12	Manila CSD	$14,000 (Low)	NOAA grant (possible)	Short term Ongoing	Yes
M-2 Educate/Train Community regarding evacuation/preparedness							
New and Existing	EQ/T/SW	1,3,5,6,7, 12	Manila CSD	$5,000 (Low)	Grants, HAF	Short term	Yes
M-3 Designate Evacuation Routes							
Existing	T	1,3,5,6,7, 10	Manila CSD	$1,000 (Low)	RCTWG, Property taxes	Short term	Yes
M-4 Train Staff, Management, Board of Directors and Community Leaders in NIMS ICS							
Existing	All	all	Manila CSD/ OES	$4,000 (Low)	Grants, Loans	Short Term	Yes
M-5 Seismic and Tsunami retrofit the Community Center							
New and Existing	EQ/T	2,4	Manila CSD	$500,000 (High)	FEMA HMGP and PDM	Long Term Depends on financing	Yes
M-6: Work with PGE to protect community from transmission lines /either automatically throw power to them or bury them							
New and Existing	EQ/T/SW	1,2,3,4,5,8, 10	MCSD/PGE	$250,000 (Medium)	FEMA HMGP and PDM / PGE	Long Term Depends on financing	Yes

Table 12-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

12.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 12-5.
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]
M-1	3	High	Low	Yes	No	Maybe	Medium
M-2	6	High	Low	Yes	Yes	Yes	Medium
M-3	6	High	Low	Yes	Yes	Maybe	Medium
M-4	5	High	Low	Yes	Yes	Maybe	Medium
M-5	2	High	High	Yes	yes	No	Medium
M-6	7	High	Medium	Yes	maybe	No	Medium

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

Table 12-5 identifies the priority for each initiative.

12.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 12-6.
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						
Drought						
Earthquake	M1-M4		M1-M4			
Fish Losses						
Flood						
Landslide						
Severe Weather	M1-M4		M1-M4			
Tsunami	M1-M4		M1-M4			
Wildfire						

a. See Chapter 1 for description of mitigation types.

Table 12-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

12.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 12-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
M-1	✓	✓		Achieved, in process awaiting signage
M-2	✓			
M-3	✓			
M-4		✓		
M-5		✓		
M-6		✓		

Table 12-7 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.

CHAPTER 13.
MCKINLEYVILLE COMMUNITY SERVICE DISTRICT UPDATE ANNEX

13.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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13.2 JURISDICTION PROFILE

McKinleyville Community Services District is a small community located just north of the Mad River in Humboldt County. The District was formed on April 14, 1970 when the District residents voted for water and sewer services. The District serves an area of about 12,140 acres located between Little River on the north and the Mad River on the south. At later dates, drainage, street lights, parks and recreation and library services were added to the District's authorities. The District is governed by a five member publicly elected Board that meets monthly. The District purchases all drinking water from Humboldt Bay Municipal Water District. Wastewater is collected and treated within the District, then discharged to the Mad River in winter. During summer, treated effluent is recycled by pasture irrigation to ranch lands.

The District serves a population of about 15,997 with 5400 water services 4500 sewer services. Most water and sewer revenues are from monthly service charges. The District does receive a small percentage of property tax to fund the park and recreation department. Additionally, Proposition 218 assessment districts for the library, park and recreation, street lights and open space have been voted in by the area residents. McKinleyville is primarily a residential area with light commercial and no heavy industry.

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

- **Population Served—**15,997 as of 2012
- **Land Area Served—**12,140 acres
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $1,0452,763,764.00
- **Land Area Owned—**356 acres
- **Critical Infrastructure and Equipment Owned:**
  - Water Reservoirs: six water reservoirs with capacity of 5.25 MG;
  - Wastewater Treatment Plant: a thirty-acre site with six treatment ponds and headworks
  - Water Distribution System: 85 miles of pipe, an 18" transmission line under the Mad River, three reservoir sites and three water distribution pumping stations.
  - Sewer Collection system: 65 miles of sewer main and four sewer pumping stations.

  - Wastewater Treatment Plant: a thirty-acre site with a control building and six-waste treatment ponds.
  - Wastewater Disposal Areas: A 150-acre Ranch for wastewater disposal.
  - Storm water Marsh System: a 10-acre storm water marsh consisting of four separate marshes.
  - Street Lights (303).
- **Total Value of Critical Infrastructure and Equipment—**$178.242 million
- **Critical Facilities Owned:**
  - Wastewater Treatment Facility
  - Main & Field Offices/Garages
  - Activities Center/Law Enforcement building/Library
  - Fischer Ranch/Barns
- **Total Value of Critical Facilities—**$14.343 million
- **Current and Anticipated Service Trends—**During our last Hazard Mitigation Plan, we had been experiencing a 3% growth rate for sewer and water services over the prior 25 years. Growth during the last 5 years has leveled off, as McKinleyville builds out. The population growth is averaging around 1.8% annually but has been dropping steadily as more seniors and single parents move into our area. Expansion projects will include a new water reservoir, waste treatment plant upgrade, and upgraded pumping stations for water and sewer to accommodate the expected growth. We do expect growth to slow over the next 5 year cycle due to infrastructure costs and land availability.

13.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 13-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Winter storms, flooding, landslides, mud flows	DR-1044	1/9/1995	$10,000.00 $15 million countywide
Flooding, severe winter storms, and landslides	DR-1628	02/03/2006	$85,000.00 $20,208,206 countywide

Table 13-1 lists all past occurrences of natural hazards within the jurisdiction.

13.4 HAZARD RISK RANKING

TABLE 13-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	48
2	Flood	45
3	Severe Weather	42
4	Tsunami	20
4	Landslide	18
5	Wildfire	12
6	Drought	9

Table 13-2 presents the ranking of the hazards of concern.

13.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- County of Humboldt Emergency Operations Plan
- MCSD Risk Control and Safety Plan (Emergency Operations Plan)
- Process Safety Management Plan (For Accidental release of Chlorination and Sulfur Dioxide)
- Hazard Communication Control Plan (Humboldt County Requirement)
- Security Vulnerability Assessment Template (EPA requirement)

13.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 13-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 13-3.

13.7 HAZARD MITIGATION ACTION PLAN

TABLE 13-4.
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?
MCSD- #1 Earthquake :Mitigate for loss of water transmission line under the Mad River							
Existing	Earthquake, Tsunami	1,2	MCSD	High	Capital reserves	Long-term, ongoing	Yes
MCSD -#2 Develop a local well for an alternative to the water supply that is currently vulnerable to damage from multiple hazard events, particularly where the existing water supply main runs under the Mad River							
New and Existing	Earthquake, Flood, Tsunami, Severe Weather	1,2,4,5	MCSD	High	Capital reserves	Short term, ongoing	Yes
MCSD# 3- Continue to support countywide initiatives identified in Volume 1 of this plan							
New and Existing	All Hazards	All Objectives	MCSD	Low	General fund	Ongoing	No
MCSD# 4- Continue to participate in and support the "emergency intertie" project that will provide redundant water supply transmission piping and availability under emergency circumstances such as water main failure caused by earthquake, flood, tsunami, or severe weather.							
New and Existing	Earthquake, Flood, Tsunami, Severe Weather	1,2,3,4	MCSD in partnership with Humboldt Bay Municipal Water District, and the Cities of Eureka and Arcata		State grant funds	Ongoing	No

Table 13-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

13.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 13-5.
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]
MCSD-1	2	High	High	Yes	Yes	Yes	High
MCSD-2	4	High	High	Yes	Yes	No	Medium
MCSD-3	12	High	Low	Yes	No	Yes	High
MCSD-4	5	High	Low	Yes	Yes	No	High

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

Table 13-5 identifies the priority for each initiative.

13.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 13-6.
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	MCSD-3	MCSD-2	MCSD-3		MCSD-3	
Drought	MCSD-3	MCSD-2	MCSD-3		MCSD-3	
Earthquake	MCSD-3	MCSD-2	MCSD-3		MCSD-3	MCSD-1 MCSD-4
Fish Losses	MCSD-3	MCSD-2	MCSD-3		MCSD-3	
Flood	MCSD-3	MCSD-2	MCSD-3		MCSD-3	MCSD-4
Landslide	MCSD-3	MCSD-2	MCSD-3		MCSD-3	
Severe Weather	MCSD-3	MCSD-2	MCSD-3		MCSD-3	MCSD-4
Tsunami	MCSD-3	MCSD-2	MCSD-3		MCSD-3	MCSD-1 MCSD-4
Wildfire	MCSD-3	MCSD-2	MCSD-3		MCSD-3	

a. See Chapter 1 for description of mitigation types.

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

13.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 13-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
MCSD 1		✓		MCSD-1
MCSD 2	✓			This addressed flooding and river bank stabilization on Mad River east bank. MCSD, along with several other planning partners, worked to stabilize the Mad River's eastern bank. The project used several different types of protection, including planting willow trees, rip rap, etc. This has helped to stabilize the eastern bank more than adequately.
MCSD 3		✓		MCSD-2

Table 13-7 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.

CHAPTER 14.
ORICK COMMUNITY SERVICE DISTRICT UPDATE ANNEX

14.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Karla Youngblood, OCSD Board Member
P O Box 63
Orick, CA 95555
Phone: 707-488-6605, or 707-845-0935
e-mail: orickcsd@gmail.com

Alternate Point of Contact

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Orick, CA 95555
Phone: 707-845-6753
e-mail: orickcsd@gmail.com

14.2 JURISDICTION PROFILE

Orick Community Services District is operated by a five-person elected Board of Directors. This Board will assume responsibility for the adoption and implementation of this plan. There are two part-time office staff, an office manager and an administrative assistant who take care of day-to-day operations. There is also a water operator who works mostly on an on-call basis. The district is funded by local taxes, water customer fees, and donations.

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

- **Population Served—**357 as of 2010 census
- **Land Area Served—**2.3 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is– $47,650,000
- **Land Area Owned—**3.5 acres
- **Critical Infrastructure and Equipment Owned:**
  - (2) 100,000-gal tanks
  - pumps (xxx),
  - chlorinator,
  - 5 miles of pipeline,
  - 23 hydrants,
  - 132 hook ups,
  - Fire protection equipment
- **Total Value of Critical Infrastructure and Equipment—**$4,062,000
- **Critical Facilities Owned:**
  - Office building, 25 x 30
  - Fire hall, 35 x 60
  - Community Hall 65 x 80

- **Total Value of Critical Facilities—**$2,589,000
- **Current and Anticipated Service Trends—**
  - Potable water supply and distribution.
  - Fire Protection Services.
  - Latent Powers:
  - Sewage Collection

  Anticipated changes in service trends:

  - Provide wastewater
  - Additional 100 unit motel and additional tourist 'attractions' through the Redwood Lodge Association developments

  Based on the data tracked by the California Department of Finance, Unincorporated Humboldt County has experienced a relatively flat rate of growth. The overall population has increased only 4.1% since 2000 and has averaged 0.73% per year from 1990 to 2007. Considering these historical trends and future population projections produced by the state, anticipated development trends for the planning area are considered low, consisting primarily of residential development.

14.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 14-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Flooding, severe winter storms, and landslides	DR-1628	02/03/2006	$20,208,206 countywide Minor damages to district facilities
1964 Flood	DR-183	12/24/1964	Losses in the millions countywide

Table 14-1 lists all past occurrences of natural hazards within the jurisdiction.

14.4 HAZARD RISK RANKING

TABLE 14-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	42
3	Tsunami	54
4	Drought	12
5	Flood	6
6	Wildfire	6
7	Landslide	6
8	Dam Failure	6
9	Fish Losses	0

Table 14-2 presents the ranking of the hazards of concern.

14.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- CEQA
- ESA for anadromous fish (4), spotted owl, marbled murrelet, snowy plover
- Coastal Zone—Coastal Commission
- Applicable county permits

14.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 14-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	N/A	N/A	N/A
Storm Ready	Awareness level	N/A	Awareness level
Firewise	yes	2007	yes
Tsunami Ready (if applicable)	yes	2007	yes

Classifications under various community mitigation programs are presented in Table 14-3.

14.7 HAZARD MITIGATION ACTION PLAN

TABLE 14-4.
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?
O-1 —Provide public outreach for tsunami awareness							
New and Existing	Tsunami	3, 6, 7, 8, 10	Orick tsunami ready	$500	NOAA, NPS	Short Term/ Ongoing	Yes
O-2 —Seismic retro fit of water supply system							
Existing	EQ, Wildfire	1, 2, 4, 9	OCSD	$10 mil	OCSD District funding, Hazard Mitigation Grant	Long term, Depends on financing	Yes
O-3 —Upgrade levees to 250 years flood Protection Level							
Existing	Flood	1, 2, 3, 9	Humboldt County	High	Benefit assessment, Army Corps of Engineers 205 funding, HMGP	Long term, Depends on financing	Yes
O-4 —Continue to support countywide initiatives identified in Volume 1 of this plan							
New and Existing	All Hazards	All Objectives	OCSD	Low	OCSD Funding	Ongoing	No

Table 14-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

14.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 14-5.
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]
O-1	5	Medium	Low	Yes	No	Yes	High
O-2	4	High	High	Yes	Yes	No	Medium
O-3	4	High	High	Yes	Yes	No	Medium
O-4	12	Medium	Low	Yes	No	Yes	High

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

Table 14-5 identifies the priority for each initiative.

14.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 14-6.
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	O-4		O-4		O-4	
Drought	O-4	O-2	O-4		O-4	O-2
Earthquake	O-4		O-4		O-4	
Fish Losses	O-4		O-4		O-4	
Flood	O-4	O-3	O-4		O-4	O-3
Landslide	O-4		O-4		O-4	
Severe Weather	O-4		O-4		O-4	
Tsunami	O-4		O-1, O-4		O-4	
Wildfire	O-4		O-4		O-4	

a. See Chapter 1 for description of mitigation types.

Table 14-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

14.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 14-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
O-1		✓		Orick Volunteer Fire Department is continuing to work with the school and community members to increase awareness of Tsunami escape routes. There was a successful siren test performed in March 2013.
O-2		✓		We have not been able to seek funding for retrofitting the water supply system.
O-3		✓		Orick is working with Humboldt County to bring the levees to the 250-year flood protection level.

Table 14-7 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.

14.11 ADDITIONAL COMMENTS

Orick has a disproportionate number of people on public assistance. There are very few services to meet the needs of these individuals and yet, there is the perception that Humboldt County Social Service agencies continue to send them here.

CHAPTER 15.

REDWAY COMMUNITY SERVICE DISTRICT UPDATE ANNEX

15.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Business Manager
PO Box 40
Redway, CA 95560
Telephone: 707-923-3101
e-mail Address: rcsd@earthlink.net

Alternate Point of Contact

Board Chairman
PO Box 40
Redway, CA 95560
Telephone: 707-923-3101
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15.2 JURISDICTION PROFILE

Redway Community Services District was formed in 1965 from a private water system. In 1977 Redway CSD was reorganized to include the former Redway Sanitary District. The Eel River flows around the community from the southwest to the north. The eastern boundary is Highway 101 and State Park lands. The District is governed by a Board of 5 members of the community. The Board members are elected to four year terms, or can be appointed if there is no opposition. The Board of Directors meet once a month or more often as needed. Redway CSD is an enterprise district that bills for its services, monthly, for water and wastewater treatment. As a Special District RCSD also receives some property tax revenues that add to the operating funds. RCSD currently employs one Operations Manager and one Business Manager. In addition to the Operations Manager there are two licensed operators and one operator in training. There is also a customer service manager/billing clerk/office assistant.

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

- **Population Served—**1500 as of 2012/2013 SDRMA Insurance Renewal Questionnaire
- **Land Area Served—**Approximately 1280 acres are served by RCSD.
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $83,603,000.00.
- **Land Area Owned—**Redway CSD owns 8 small parcels within Redway, as well as many easements and the acreage for the wastewater treatment and disposal facilities.
- **Critical Infrastructure and Equipment Owned:**
  - RCSD water lines-25 miles of water mains
  - RCSD sewer mains/manholes 25 miles of sewer mains
  - 2001 Dodge Dakota
  - 1995 Nissan King Cab Pickup
  - 2001 Dodge Ran 2500
  - 2005 Pace American Trailer
  - John Deere 3520 Tractor w/loader, bucket and mower

- **Total Value of Critical Infrastructure and Equipment—**$33,069,532.00
- **Critical Facilities Owned:**
  - Sewage Treatment Plant
  - Sludge Drying System
  - Storage Barn-Wastewater Plant
  - Lift Station-Azalea
  - Main Lift Station-Dogwood
  - Lift Station-Evergreen
  - Lift Station-Mill
  - Lift Station West Coast
  - Water Treatment Plant #1
  - Water Treatment Plant office
  - Booster Station-Meadows
  - Back wash supply tank
  - Water Intake Filters
  - Water Plant self-contained Stand By Generator
  - Water Tank #1 (small tank)
  - Water Tank #2 (New large tank)
  - Meadows Water Tank
  - Contact Chamber
  - Pump House ,Barnes Lane Warehouse
  - Finished Water pump station
  - Pressure Reduction vault (Oakridge)
  - Pressure Reduction Vault (orchard)
  - Business Office-contents
- **Total Value of Critical Facilities—**$4,664,550.00
- **Current and Anticipated Service Trends—**RCSD has approximately 1% growth this year with a large annexed property adjacent which could accommodate substantial growth.

15.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 15-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Winter Storms, Flooding Landslides, Mud Flow	1046	2/13/1995	$253,551.00
Severe Winter Storms, Flooding, Landslides, Mud Flow	1628	12/17/2005	$10,304.00

Table 15-1 lists all past occurrences of natural hazards within the jurisdiction.

15.4 HAZARD RISK RANKING

TABLE 15-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	36
2	Flood	24
3	Slide	*21*
4	Storm	24
5	Fire	28
6	Drought	12

Table 15-2 presents the ranking of the hazards of concern.

15.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- Resolution No. 2007/2008-06
- Emergency Preparedness General Plan

15.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 15-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	N/A	--	--

Classifications under various community mitigation programs are presented in Table 15-3.

15.7 HAZARD MITIGATION ACTION PLAN

TABLE 15-4.
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?
RCSD-1—Reinforce river bank at water treatment plant							
Existing	Flood and earthquake	1,2,9	RCSD	High	RCSD, Mitigation Grant funding	Long-term	Yes
RCSD-2—Community Outreach/education disaster preparedness							
New and Existing	All Hazards	6,7	RCSD	Low	RCSD	Ongoing	Yes
RCSD-3—Add alternate/Redundant Aerial crossing for effluent from Wastewater Treatment Plant							
Existing	EQ, Flood, Landslide	1,2,9	RCSD	High	RCSD, Mitigation Grant funding	Short term	Yes
RCSD-4—Fuel Load Reduction at Wastewater Treatment Plant							
New and existing	Wildfire	1,2,3,4,9	RCSD	Medium	RCSD, Mitigation Grant funding	Short term	No
RCSD-5—Enhance stormwater management capability within the district, with an emphasis on upgrades to existing stormwater conveyance system							
New and Existing	Severe Weather, Flood	1,2,3,8	RCSD	High	RCSD, Mitigation Grant funding	Long Term	Yes
RCSD-6—Continue to support countywide initiatives identified in Volume 1 of this plan							
New and existing	All Hazards	All Objectives	RCSD	Low	RCSD	Ongoing	No

Table 15-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

15.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 15-5.
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]
RCSD-1	3	High	Med	Yes	Yes	Yes	High
RCSD-2	8	Low	Low	Yes	No	Yes	High
RCSD-3	3	High	Med	Yes	Yes	Yes	High
RCSD-4	3	Med	Med	Yes	Yes	Yes	High
RCSD-5	4	High	High	Yes	Yes	No	Medium
RCSD-6	12	Medium	Low	Yes	No	Yes	High

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

Table 15-5 identifies the priority for each initiative.

15.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 15-6.
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	RCSD-6		RCSD-2, RCSD-6		RCSD-6	
Drought	RCSD-6		RCSD-2, RCSD-6		RCSD-6	
Earthquake	RCSD-6	RCSD-1, RCSD-3	RCSD-2, RCSD-6		RCSD-6	RCSD-1
Flood	RCSD-6	RCSD-1, RCSD-3' RCSD-5	RCSD-2, RCSD-6		RCSD-6	RCSD-1, RCSD-5
Landslide	RCSD-6	RCSD-3	RCSD-2, RCSD-6		RCSD-6	
Severe Weather	RCSD-6	RCSD-5	RCSD-2, RCSD-6		RCSD-6	RCSD-5
Tsunami	RCSD-6		RCSD-2, RCSD-6		RCSD-6	
Wildfire	RCSD-6	RCSD-4	RCSD-2, RCSD-6	RCSD-4	RCSD-6	

a. See Chapter 1 for description of mitigation types.

Table 15-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

15.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 15-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
RW1		✓		In Capital Improvement Plan
RW2		✓		Now Humboldt County Responsibility. Initiative carried over. Now initiative #RCSD-5
RW3		✓		Ongoing
RW4		✓		Project in Progress

Table 15-7 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.

CHAPTER 16.
WEOTT COMMUNITY SERVICE DISTRICT UPDATE ANNEX

16.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Name: Lou Iglesias
Title: Director
Mailing address: P.O. Box 218,
Weott, CA 95571
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Alternate Point of Contact

Name: Barbara Kennedy
Title: Director, Chairperson
Telephone: 946-2248
Email Address: bkenn202@att.net

16.2 JURISDICTION PROFILE

Weott Community Services District, located approximately 50 miles south of Eureka on State Highway 101, was incorporated within Humboldt County on September 28, 1965. The purpose of the district is to provide potable water, septic and fire protection to the community of Weott, population of about two hundred eighty eight residents. The district has adopted authority and is governed by five elected board members. This board will assume responsibility for the adoption and implementation of this plan. They are Chair, Barbara Kennedy, and Directors, Lou Iglesias, Jeff and Bonnie O'Neil. The Board meets at Weott Community Center every fourth Tuesday of the month. The District has one part time employee, Christine Conn, General Manager. The Operations and Maintenance of both water treatment plant and wastewater plant are contracted with Hank Brenard Environmental Consultants, FPC. The Fire Department is managed by Volunteer Chief Kim Frame who supervises an eight member volunteer firefighting staff, and manages operations, administration, training and maintenance of the fire station, fire engine and rescue vehicle.

Along with the fire department, the district operates and maintains a water system consisting of source springs, well, water treatment plant; transmission lines a septic wastewater plant leach field, lift station and community center. The operations of the district are funded by monthly fees levied on each parcel service hook up within the Weott service area. According to recent Humboldt County Planning data, Weott Community Services District boundary is three hundred sixteen acres. Additionally, the response area for the fire department is slightly over 26,000 acres. Geographically, Weott is centered within Humboldt Redwoods State Park. The Eel River is the District's western boarder and has historically flooded the district dramatically changing the footprint of a once thriving logging town. Currently the district services about one hundred and twenty seven users which include Agnes Johnson primary school, Cal Fire Weott Station, two Churches, Humboldt Redwoods State Park campground and US Post Office 95571. The last commercial retail establishment closed December 2006.

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

- **Population Served—**288 as of 2010 US Census Data
- **Land Area Served—**Weott Community Services District boundary is 316 acres. The response area for the fire department is slightly over twenty six thousand acres.
- **Value of Area Served—**The secured value is $17,949,304.00 and the unsecured value is $269,350.00

- **Land Area Owned—**approximately 3 acres: sites of water purification plant, site of sewer plant, site of A & B water tanks and the Weott Community Center
- **Critical Infrastructure and Equipment Owned:**
  - Fire Equipment
  - 2005 Kenworth Fire Engine
  - Chevrolet Suburban Emergency Light Rescue Vehicle
  - Biofilters & Fittings
  - Sodium Hypochlorite Feed Equipment
  - Submersible Pumps (4)
  - Emergency Onan Generator
  - John Deere Generator 8-KW
  - Pressure Filtration System
  - Electrical Transfer Switches
  - Office Equipment
- **Total Value of Critical Infrastructure and Equipment—**$2,958,000.00
- **Critical Facilities Owned:**
  - WVFD Fire House
  - Sewerage Treatment Plant
  - Water Treatment Plant
  - Storage Tank "A"
  - Storage Tank "B"
  - Milligan Community Center
  - Water Collection System
  - Water Transmission System
  - Sewerage Collection System
  - Leach Field System
- **Total Value of Critical Facilities—**$18,218,654.00
- **Current and Anticipated Service Trends—**We currently serve approximately one hundred and thirty accounts which include single family dwellings, a Cal Fire station, a California Department of Parks and Recreation camping facility, two non-operational commercial facilities, District facilities and an elementary school. We do not anticipate significant growth of services in the near future. Our priorities are to replace old and deteriorating components of our water system.

16.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 16-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe winter storms, flooding	DR-1203	2/9/1998	$5,000.00
Storm	NA	12/13/2002	$5,000.00
Storm	NA	12/17/2005	$5,000.00

Table 16-1 lists all past occurrences of natural hazards within the jurisdiction.

16.4 HAZARD RISK RANKING

TABLE 16-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Severe Weather	48
2	Earthquake	48
3	Flood	36
4	Landslide	36
5	Wildfire	36
6	Drought	9
7	Tsunami	0
8	Dam Failure	0
9	Other Hazards of Concern	0

Table 16-2 presents the ranking of the hazards of concern.

16.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- Weott Community Services District Ordinances and By-Laws; Gives the authority to the District to administer and implement policy to develop and maintain services to the Community of Weott.

16.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 16-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	8/9	2012
Storm Ready	No	N/A	N/A
Firewise	Yes	Unknown	Unknown
Tsunami Ready (if applicable)	No	N/A	N/A

Classifications under various community mitigation programs are presented in Table 16-3.

16.7 HAZARD MITIGATION ACTION PLAN

TABLE 16-4.
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?
WCSD#7 Replacement of 600 feet of "A" line under South Fork Eel River							
Yes	SW, F, LS, EQ	All Objectives	WCSD	$250,000	California Department of Public Health, CA Prop 84	11/2013 Short Term	No
WCSD#8 Replacement of 90,000 gallon Water Storage Tank							
Yes	LS, EQ	1,2,3,4	WCSD	$186,000	Prop 50, District Funds, FEMA hazard mitigation grant	Short Term	Yes
WCSD#2 Upgrade/Replace Water Treatment Plant and Transmission lines							
Yes	EQ, LS	1,2,3	WCSD	$2,500,000	Prop 50, District Funds, FEMA hazard mitigation grant	Long Term	Yes
WCSD#3 Develop Back Up Water Source							
No	EQ, LS	1,2,3	WCSD	$75,000	Prop 50, District Funds, Government grant/loan	Long Term	Yes
WCSD#5 Establish "Defensible" space Among critical facilities							
Yes	WF, SW Drought	1,2,3	WCSD	$3,000	Self-Funded	Ongoing/ Long Term	Yes
WCSD#6 Support countywide initiatives identified in the HCAHMP							
Yes	All Hazards	All Objectives	WCSD	Low	Funded through existing/ ongoing programs	Short Term/ ongoing	Yes
WCSD#4 Retrofit Community Hall							
Yes	EQ, F, SW	1,2	WCSD	High	Prop 50, District Funds, Government grant/loan	Long Term	Yes

Table 16-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

16.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 16-5.
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]
WCSD#7	All	High	High	Yes	Yes	No	High
WCSD#8	All	High	High	Yes	Yes	No	High
WCSD#2	All	High	High	Yes	Yes	No	High
WCSD#3	All	High	High	Yes	Yes	No	High
WCSD#5	All	High	Low	Yes	No	Yes	High
WCSD#6	All	High	Low	Yes	No	Yes	High
WCSD#4	All	High	High	Yes	Yes	No	High

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

Table 16-5 identifies the priority for each initiative.

16.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 16-6.
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	WCSD 6	WCSD 6	WCSD 6	WCSD 6	WCSD 6	WCSD 6
Drought	WCSD 5,6	WCSD 5,6	WCSD 5,6	WCSD 5,6	WCSD 5,6	WCSD 5,6
Earthquake	WCSD 7,8, 2, 3, 6, 4	WCSD 7,8, 2, 3, 6, 4	WCSD 7,8, 2, 3, 6, 4	WCSD 7,8, 2, 3, 6, 4	WCSD 7,8, 2, 3, 6, 4	WCSD 7,8, 2, 3, 6, 4
Flood	WCSD 7,6,4	WCSD 7,6,4	WCSD 7,6,4	WCSD 7,6,4	WCSD 7,6,4	WCSD 7,6,4
Landslide	WCSD 7,8, 2, 3, 6	WCSD 7,8, 2, 3, 6	WCSD 7,8, 2, 3, 6	WCSD 7,8, 2, 3, 6	WCSD 7,8, 2, 3, 6	WCSD 7,8, 2, 3, 6
Severe Weather	WCSD 4,5	WCSD 4,5	WCSD 4,5	WCSD 4,5	WCSD 4,5	WCSD 4,5
Tsunami	WCSD 6	WCSD 6	WCSD 6	WCSD 6	WCSD 6	WCSD 6
Wildfire	WCSD 5,6	WCSD 5,6	WCSD 5,6	WCSD 5,6	WCSD 5,6	WCSD 5,6
Other Hazards of Concern	WCSD 6	WCSD 6	WCSD 6	WCSD 6	WCSD 6	WCSD 6

a. See Chapter 1 for description of mitigation types.

Table 16-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

16.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 16-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
WCSD-1	✓			Project completed using District funds. Cost of project was lowered by utilizing district personnel and acquiring used meters from the City of Rio Del, CA
WCSD-2		✓		
WCSD-3		✓		
WCSD-4		✓		
WCSD-5		✓		

Table 16-7 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.

16.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Most future needs have been identified and posted. Any further listing for this cycle will depend on future hazard conditions.

16.12 ADDITIONAL COMMENTS

The difficulty to implementing our goals will be lessened with continued diligence for the safety and well-being of our community and cooperation with our neighbors both local and countywide.

CHAPTER 17.
WESTHAVEN COMMUNITY SERVICE DISTRICT ANNEX

17.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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Alternate Point of Contact

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17.2 JURISDICTION PROFILE

The Westhaven Community Services District, located three miles south of the City of Trinidad, is a special-purpose district created in 1987 to provide domestic water service to that portion of the unincorporated community of Westhaven / Moonstone previously served by the Westhaven Mutual Water Company. Due to limited water source capacity the District's designated service area has not increased since formation. The District currently supplies 205—210 active service connections and an estimated population of 490. The District staff includes one full-time position and two part-time positions.

The District is governed by a five-member elected Board of Directors. The board assumes responsibility for adoption of this plan; the General Manager will oversee its implementation.

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

- **Population Served—**490 estimated as of January 2013
- **Land Area Served—**0.60 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $56,000,000
- **Land Area Owned—**21 acres
- **Critical Infrastructure and Equipment Owned:**
  - 3 Surface Water Collection Structures $30,000
  - ¼ mi. Supply Transmission Pipeline $20,000
  - 6 Supply Transmission Valves $1,800
  - 1 80 GPM Slow Sand Filter $150,000
  - 2 500,000 gallon Back-up Reservoirs $100,000
  - 1 100' deep Groundwater Well $5,000
  - 2 Chlorination / Treatment Facilities $1,500
  - 1 Booster Pumping Station $6,000
  - 1 Pressure Reducing Station $10,000

–	1	100,000 gallon Water Tank	$150,000
–		Treatment Plant Yard Piping	$10,000
–	6	Treatment Plant Yard Valves	$1,800
–	7	Miles of Water Mains	$1,500,000
–	70	Distribution System Valves	$28,000
–	8	ACV Valves	$1,000
–	2	Master Meters	$1,500
–	1	Flushing / Hydrant Meter	$1,100
–	224	Residential Meters	$20,000
–	1	Service Truck	$15,000

- **Total Value of Critical Infrastructure and Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $2,052,700
- **Critical Facilities Owned:**

–	1	Maintenance Shop	$30,000
–	1	Chlorinator / Booster Pump Shed	$10,000
–	1	Chlorinator / Calcite Filter Shed	$10,000
–	1	Business Office (rented)	$20,000

- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $70,000
- **Current and Anticipated Service Trends—**The Westhaven CSD currently provides residential water service to an estimated population of 490. Due to limited water source capacity no change is anticipated.

17.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 17-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Wind / Power Outage		11/20/2012	N/A
Wind / Power Outage		11/05/2011	N/A
Wind / Power Outage		05/01/2011	N/A
Wind / Power Outage		03/02/2011	N/A
Wind / Power Outage		04/09/2010	N/A
Wind / Power Outage		01/17/2010	N/A
Wind / Power Outage		01/09/2010	N/A
Wind / Power Outage		01/04/2008	N/A
Wind / Power Outage		12/27/2006	N/A
Wind / Power Outage		12/31/2005	N/A
Wind / Power Outage		11/07/2002	N/A
Wind / Power Outage		02/14/2000	N/A
Wind / Power Outage		03/04/1996	N/A
Wind / Power Outage		12/11/1995	N/A
Freezing		12/20/1990	N/A
Wind / Power Outage		02/17/1988	N/A

Table 17-1 lists all past occurrences of natural hazards within the jurisdiction.

17.4 HAZARD RISK RANKING

TABLE 17-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Storm	51
3	Drought	26
4	Wildland Fire	18
5	Landslide	11
6	Volcano (ash fall)	5
7	Dam Failure	0
8	Flood	0
9	Tsunami	0

Table 17-2 presents the ranking of the hazards of concern.

17.5 APPLICABLE REGULATIONS AND PLANS

There are no existing applicable hazard mitigation laws, codes, ordinances or policies in effect by this district that could support or enhance the mitigation initiatives identified in this annex. However, Humboldt County planning employs the following: consideration of appropriate land use designations in order to limit the populace exposed to hazardous areas; 2) assessment and conditioning of development applications according to the hazards on a site; 3) policies tailored to specific hazardous conditions; and, 4) an action program to improve overall safety conditions within the County. Furthermore, the State of California Uniform Building Code (UBC) has very strict building codes that intend to keep residents and property safe during hazard events like earthquakes, wildfires, and floods, and the Humboldt County Planning Department enforces these standards during the building application process.

17.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 17-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready (if applicable)	No	N/A	N/A

Classifications under various community mitigation programs are presented in Table 17-3.

17.7 HAZARD MITIGATION ACTION PLAN

TABLE 17-4.
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?
WHCSD-1—Retrofit and repair water tank roof							
Existing	Earthquake Wildfire Drought	O1-O5	WCSD	$150,000	District Funds, State Grant	Short Term	N/A
WHCSD-2—Upgrade / Retrofit water distribution system for earthquakes and landslides							
Existing	Earthquake Wildfire Landslide	O1-O5	WCSD	High	District Funds, HMGP Grants	Short Term	N/A
WHCSD-3—Install back-up generator at treatment plant							
New	Earthquake Severe Weather	O1-O5	WCSD	$10,000	District Funds	Short Term	N/A
WHCSD-4—Adopt a long-term capital improvement plan.							
New and Existing	All Hazards	All	WCSD	Low	District Funds	Short Term	N/A
WHCSD-5—Continue to periodically update Emergency Operations Plan, including Recovery Operations.							
New and Existing	All Hazards	All	WCSD	Low	District Funds	Short Term	N/A
WHCSD-6—Support countywide initiatives identified in the County Hazard Mitigation Plan							
New and Existing	All Hazards	All	WCSD	Low	District Funds	Ongoing	N/A
WHCSD-7—Continue to support the implementation, monitoring, maintenance and updating of the Humboldt Operational Area Hazard Mitigation Plan							
New and Existing	All Hazards	All	District	Low	District Funds	Ongoing	N/A

Table 17-4Table 17-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

17.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 17-5.
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]
WHCSD-1	5	High	Medium	Yes	Yes	No	High
WHCSD-2	5	High	High	Yes	Yes	No	High
WHCSD-3	5	High	Low	Yes	No	Yes	High
WHCSD-4	9	High	Low	Yes	No	Yes	High
WHCSD-5	9	High	Low	Yes	No	Yes	High
WHCSD-6	12	High	Low	Yes	No	Yes	High
WHCSD-7	12	High	Low	Yes	No	Yes	High

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

Table 17-5 identifies the priority for each initiative.

17.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 17-6.
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	WCSD-6, WCSD-7		WCSD-6, WCSD-7		WCSD-6, WCSD-7	
Drought	WCSD-6, WCSD-7		WCSD-6, WCSD-7		WCSD-6, WCSD-7	WCSD-1
Earthquake	WCSD-6, WCSD-7	WCSD-1, WCSD-2	WCSD-6, WCSD-7		WCSD-6, WCSD-7	WCSD-1, WCSD-2
Flood	WCSD-6, WCSD-7		WCSD-6, WCSD-7		WCSD-6, WCSD-7	
Landslide	WCSD-6, WCSD-7	WCSD-2	WCSD-6, WCSD-7		WCSD-6, WCSD-7	WCSD-2
Severe Weather	WCSD-6 WCSD-7	WCSD-3	WCSD-6 WCSD-7		WCSD-6, WCSD-7	WCSD-3
Tsunami	WCSD-6, WCSD-7		WCSD-6, WCSD-7		WCSD-6, WCSD-7	
Wildfire	WCSD-6, WCSD-7	WCSD-1 WCSD-2	WCSD-6, WCSD-7		WCSD-6, WCSD-7	WCSD-1

a. See Chapter 1 for description of mitigation types.

Table 17-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

CHAPTER 18.
WILLOW CREEK COMMUNITY SERVICE DISTRICT UPDATE ANNEX

18.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
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18.2 JURISDICTION PROFILE

In 1964 the Willow Creek Community Services District was incorporated. The original role of the District was to provide water and unify multiple small private water systems into one system that would serve the whole community. In the middle seventies the WCCSD entered into the role of recreation. Shortly after focusing on recreation the District proceeded with receiving Latin power for wastewater. The District is currently working on a study for a downtown wastewater system.

The District employs four full time employees the General Manager, Chief Operator, Office Manager and Operator II positions. During the summer months the district also hires one water tech, two recreation techs and one part time office/grant writer tech.

The WCCSD operates on a rate based financial structure with water and recreation fees. The District supplements income with rental and property based taxes.

The District is governed by five elected directors with who established policy and enacts ordinances. The Board directs the Manager to conduct the District's business within described guidelines. This Board will assume the responsibility for the adoption and implementation of this plan.

The community has 945 water service connections with a population base of 1,710. We are located in the Trinity River valley basin of eastern Humboldt County. Located on Hwy 299 and 96 from the Trinity County line to the east and three north on highway 96 toward Hoopa Valley Reservation. The District has over thirty square miles of water shed to the west of town on the Willow Creek.

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

- **Population Served—**1,710 as of 2010 US Census
- **Land Area Served—**3700 acres
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $300,000,000.
- **Land Area Owned—**50 + A
- **Critical Infrastructure and Equipment Owned:**
  - Water Treatment and Distribution System

  - 30 acres Parks
  - Campground
  - Six Rivers Community Center
  - Office
  - Museum
- **Total Value of Critical Infrastructure and Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $30,000,000.
- **Critical Facilities Owned:**
  - Treatment Plant
  - Water Tanks
  - Wells
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $20,000,000.
- **Current and Anticipated Service Trends—**Slow growth of about 1 percent

18.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 18-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
1964 500 yr. flood Trinity River	N/A	12/25/1964	Widespread tens of millions
Trinity river flooding	8620704	1/8/1973	Roads and Infrastructure
Drought	N/A	1977	FMHA Drought relief $ 200,000
Winter weather flooding	68294	2/14/1992	Road drop out FEMA $30,000
Winter storm /2005	404956	12/31/2005	Loss of Distribution Main $40,000

Table 18-1 lists all past occurrences of natural hazards within the jurisdiction.

18.4 HAZARD RISK RANKING

TABLE 18-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Wildfire	27
2	Earthquake	12
3	Flood	12
4	Severe Storm	12
5	Dam Failure	6
6	Drought	3
7	Landslide	3
8	Volcanic Ash Fall	3
9	Tsunami	0

Table 18-2 presents the ranking of the hazards of concern.

18.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- District approved ten year CIP plan 2012-2022 by District Board.

18.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 18-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready	No	--	--
Firewise	Yes	Firewise	12/2010
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 18-3.

18.7 HAZARD MITIGATION ACTION PLAN

TABLE 18-4.
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?
WCCSD-1—Continue to support countywide initiatives identified in Volume 1 of this plan.							
New and Existing	All Hazards	All Objectives	WCCSD	Low	WCCSD general Fund	Ongoing	Yes
WCCSD-2—Construct Stormwater Interceptor							
New and Existing	Flood, Severe Weather	1,2,3,4	CSD	High	Prop 84/Match	August 2013	No
WCCSD-3—Retrofit Bussell water storage tank							
Existing	Flood, Wildfire, Earthquake, Landslide	1,2,3,4	CSD	High	Agency	Short-term	No
WCCSD-4—Willow Tower Tanks Renovation							
Existing	Flood, Wildfire, Earthquake, Landslide	1,2,3,4	CSD	High	Agency	Short term	No
WCCSD-5—Retrofit Brannon Mtn. Water Tank							
Existing	Flood, Wildfire, Earthquake, Landslide	1.2.3.4	CSD	High	Agency, Grant	Long-term	No
WCCSD-6—Hwy 299 Dist. Ln. Replacement							
Existing	Flood, Wildfire, Earthquake, Landslide	1,2,3,4	CSD	High	Agency, Grant	Long term	No

Table 18-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

18.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 18-5.
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]
WCCSD-1	12	Medium	Low	Yes	No	Yes	High
WCCSD-2	4	High	High	Yes	Yes	Yes	High
WCCSD-3	4	High	High	Yes	Yes	Yes	High
WCCSD-4	4	High	High	Yes	Yes	Yes	High
WCCSD-5	4	High	High	Yes	Yes	No	Medium
WCCSD-6	4	High	High	Yes	Yes	No	Medium

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

Table 18-5 identifies the priority for each initiative.

18.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 18-6.
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	WCCSD-1	--	WCCSD-1	--	WCCSD-1	--
Drought	WCCSD-1	--	WCCSD-1	--	WCCSD-1	--
Earthquake	WCCSD-1	WCCSD-3, WCCSD-4, WCCSD-5, WCCSD-6	WCCSD-1	--	WCCSD-1	--
Flood	WCCSD-1	WCCSD-3, WCCSD-4, WCCSD-5, WCCSD-6	WCCSD-1	--	WCCSD-1	WCCSD-2
Landslide	WCCSD-1	WCCSD-3, WCCSD-4, WCCSD-5, WCCSD-6	WCCSD-1	--	WCCSD-1	--
Severe Weather	WCCSD-1	--	WCCSD-1	--	WCCSD-1	WCCSD-2
Tsunami	WCCSD-1	--	WCCSD-1	--	WCCSD-1	--
Wildfire	WCCSD-1	WCCSD-3, WCCSD-4, WCCSD-5, WCCSD-6	WCCSD-1	--	WCCSD-1	--

a. See Chapter 1 for description of mitigation types.

Table 18-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

18.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 18-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
WCCSD-1	✓			Replace single tank with two at Panther site, doubling capacity and fire protection
WCCSD-2	✓			Replace redwood 100,000 with steel 110,000 gal. tank at Hodgson site
WCCSD-3	✓			Replace corroded steel tank with new 150,000 gal. Bigfoot Site

Table 18-7 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.

PART 4—
ANNEXES FOR FIRE PROTECTION DISTRICTS

CHAPTER 19.
ARCATA FIRE PROTECTION DISTRICT UPDATE ANNEX

19.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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19.2 JURISDICTION PROFILE

The Arcata Fire Protection District was established in 1949 and operates as an all-risk agency. We are a combination (50 % volunteer) fire department protecting the 37,000 residents of the City of Arcata, the communities of McKinleyville, Bayside, Manila and other rural areas for a total service area of 63 square miles on the remote coast of Northern California. The District is governed by an elected Board of Directors and employs 19 career personnel. Our local response area consists of industrial, commercial, residential, agricultural, beaches and wild land areas. Our district and local auto/mutual aid areas contain a significant urban/wild land interface threat. Located just off the coast is the Cascadia Subduction Zone, a seismically active area, which makes our communities vulnerable to significant earthquakes and tsunamis resulting in possible fires and natural disasters.

The Arcata Fire Protection District is a Special District, which under California law cannot charge or receive supplementary tax revenue such as Sales Tax, Utility Tax, Bed Tax or Vehicle License Fees. The District depends upon property taxes for the majority of our funding. In 1977, California's Proposition 13 shifted a large portion of property tax revenues away from local government agencies causing the loss of nearly 50% of our property tax funding. It also fixed future tax rates, limiting future income. In 1986, and again in 2001, our citizens voted to assess themselves an annual Special Fire Tax in an effort to preserve the level of service we have historically provided.

In 2006, we were successful in establishing a new special tax to hire additional firefighters and increase our staffing to two firefighters per station. We re-staffed a fire station that had been temporarily unstaffed and in November of 2012 we added a career-staffed engine at the Arcata Fire Station. We continue to augment our emergency response with volunteer staffing. This special tax currently accounts for 42% of our annual budget. Our 2012-2013 revenue (including property tax and special tax revenue is approximately $3,935,000.00. The expenses are dedicated to personnel (78%) and operating costs (22%). Personnel costs continue to remain relatively low as volunteer firefighters supplement the needed staff. A Chief Officer position remains unfilled keeping our career staff personnel at a bare minimum to cover operational costs. Our reserve funds are allocated for operating and personnel expenses prior to receiving our yearly tax allocation along with designations for Capital Improvements, Contingency, and PERS. The following is a summary of key information about the jurisdiction:

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

- **Population Served—**37,000 as of 2012

- **Land Area Served—**63 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $2,913,000,000
- **Land Area Owned—approximately 1.5 acres**
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction:**
  - 5 Type 1 Engines
  - 1 Type 3 Engine
  - 1 100' Aerial
  - 1 3000 gallon water tender
  - 1 Rescue Truck
  - 4 Ford F350 Utility pickups & 1 Sedan (Chevy Impala)
  - All tools, equipment, appliances associated with
- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $5,500,000.
- **List of Critical Facilities Owned by the Jurisdiction:**
  - McKinleyville Fire Station
  - Mad River Fire Station
  - Arcata Fire Station (leased from Volunteer Association)
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $3,500,000.
- **Current and Anticipated Service Trends—**Areas within the District continue to be developed for housing and commercial uses. Infill is planned in the Arcata area and the McKinleyville area continues to see housing developments constructed. Increased population will create an increased demand for service and call volume. Fire District revenues will need to increase to allow us to maintain and improve service levels. Additional personnel will be needed to staff stations and respond to calls. Upgrades to stations will need to be considered. Long-range plans should include the construction of a station to serve the north end of McKinleyville along with staffing at the County Airport, increased career staffing, and the possible purchase of another aerial device to serve the McKinleyville area. The Fire District should also begin looking for a site to develop as a training facility.

  Based on the data tracked by the California Department of Finance, Arcata and its surrounding areas has experienced a relatively flat rate of 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. Overall, the County in the last year had growth reported at 0.5%. With this rate of growth, the anticipated development trends for Arcata and its surrounding areas are considered low to moderate, consisting of primarily residential development Areas within the District continue to be developed for housing and commercial uses. Infill is planned in the Arcata area and the McKinleyville area continues to see housing developments constructed. Increased population will create an increased demand for service and call volume. Fire District revenues will need to increase to allow us to maintain and improve service levels. Since 2008, the Arcata Fire

District has experienced a 20.8% increase in requests for service. This trend is likely to continue as the population ages, additional housing and residential complexes are constructed, and with the anticipated increase in FTE students at Humboldt State University.

19.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 19-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Weather (Wind)	DR-1628	12/31/2005	$18,000
Earthquake	DR-943	4/25/1992	$50 million (countywide)

Table 19-1 lists all past occurrences of natural hazards within the jurisdiction.

19.4 HAZARD RISK RANKING

TABLE 19-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	45
3	Tsunami	24
4	Drought	18
5	Flood	12
6	Landslide	12
7	Wildfire	12
8	Dam Failure	6

Table 19-2 presents the ranking of the hazards of concern.

19.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- CA Environmental Quality Act (CEQA)
- Americans with Disabilities Act (ADA)
- CA Fire Code
- CA Building Code
- Health and Safety Code (Title 19)

19.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 19-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	4/8B	2005
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 19-3.

19.7 HAZARD MITIGATION ACTION PLAN

Table 19-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 19-4.
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?
AFD #1—Continue support of countywide disaster planning/hazard mitigation initiatives							
New and Existing	All Hazards	All Objectives	AFD	Low	AFD	Ongoing	Yes
AFD-2 #—Conduct seismic retrofit of headquarters fire station							
Existing	Earthquake	1,2,5	AFD	Medium	AFD, Hazard Mitigation Grants	Short Term	No
AFD #3—Relocate Administrative Offices to McKinleyville to create redundancy and ensure business continuity							
Existing	All Hazards	1,2,5	AFD	High	AFD, Hazard Mitigation Grants	Long term, Depends on financing	No
AFD #4—Install PV and Solar energy systems at all 3 fire stations to enable "off grid" operations							
Existing	All Hazards	1,2,4,5	AFD	Medium	AFD, Hazard Mitigation Grants	Short term	No
AFD #5—Install automatic fire sprinklers and alarm system at headquarters fire station							
Existing	Fire	1,2,4,5	AFD	Medium	AFD, Hazard Mitigation Grants	Short Term	No

TABLE 19-4.
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?
AFD #6—Replace above-ground fuel tank at McKinleyville fire station with above-ground concrete vault							
Existing	Earthquake, Flood, Tsunami	1,2,3,4,5	AFD	Low	District Funds, Hazard Mitigation Grants	Short term	No
AFD #7—Ensure a reliable and effective distribution of fire hydrants throughout district in cooperation with water purveyors							
New and Existing	All Hazards	1,2,4,5,8	AFD	Low	District budget/purveyors	Ongoing	No
AFD #8—Description Elevate/relocate Mad River fire station to protect against flooding							
Existing	Flood, Earthquake	1,2,4,5	AFD	High	AFD, Hazard Mitigation Grants	Long Term	No
AFD #9—Utilize social media to support Hazard Mitigation Plan and provide education/information to the public							
New and Existing	All Hazards	6,7,8,9,10, 11	AFD	Low	District Funds	Ongoing	Yes
AFD #10—Continue support of amateur emergency radio (HAM) system operators by providing fire station site/antennae, etc.							
New and Existing	All Hazards	6,7,8,9,10, 11	AFD	Medium	District Funds	Ongoing	No
AFD #11—Actively support HSU CERT program for housing/campus safety							
New and Existing	All Hazards	6,7,8,9,10, 11	AFD	Low	District Funds	Ongoing	No
AFD #12—Initiate NIMS compliant training/event planning in cooperation with HSUPD/APD							
New and existing	All Hazards	6,7,8,9,10, 11	AFD	Low	District Funds	Ongoing	No

19.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 19-5.
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]
AFD-1	12	Medium	Low	Yes	No	Yes	High
AFD-2	3	High	Medium	Yes	Yes	No	Medium
AFD-3	3	High	High	Yes	Yes	No	Medium
AFD-4	4	High	Medium	Yes	Yes	Yes	High
AFD-5	4	High	Medium	Yes	Yes	No	High
AFD-6	5	Medium	Low	Yes	No	Yes	Medium
AFD-7	5	High	Low	Yes	No	Yes	High
AFD-8	4	High	High	Yes	Yes	No	High
AFD-9	6	High	Low	Yes	No	Yes	High
AFD-10	6	High	Low	Yes	No	Yes	High
AFD-11	6	High	Low	Yes	No	Yes	High
AFD-12	6	High	Low	Yes	No	Yes	High

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

Table 19-5 identifies the priority for each initiative.

19.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 19-6.
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	8	3, 8	9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Drought			9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Earthquake	1	1, 3, 5, 6, 7	9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Flood	8	3, 8	9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Landslide			9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Severe Weather	8	3, 8	9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Tsunami	8	3, 8	9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8
Wildfire			9, 10, 11, 12		1, 3, 5, 6, 7	2, 3, 4, 5, 6, 8

a. See Chapter 1 for description of mitigation types.

Table 19-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

19.10 STATUS OF PREVIOUS PLAN INITIATIVES

Arcata Fire has enjoyed a great deal of success in implementing our previous initiatives. We have updated our webpage to include links to other agencies and to provide disaster planning information. In addition, we are utilizing Facebook to reach out to our constituents and provide them with additional information. Our stations are all equipped with new, limited-combustible roof materials. We have adopted the countywide apparatus numbering system and provided all of our responding with new radios. Four of our engines have been equipped with the Type 3 US&R required tool and equipment complements.

TABLE 19-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
AFD-1		✓		Included in new plan under Initiative 9.
AFD-2		✓		Incorporated in new plan, Initiative 9.
AFD-3	✓			
AFD-4	✓			New radios purchased as part of grant
AFD-5	✓			US&R equipment/tools/supplies placed in service on engines
AFD-6			✓	Interface of thermal imager cameras no longer technologically sound
AFD-7	✓			All vehicles/apparatus identified per countywide numbering program
AFD-8		✓		Incorporated in new plan as Initiative 1

Table 19-7 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.

19.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Ongoing assessment of vulnerability and pre-disaster mitigation should be undertaken in order to establish a framework for grant funding requests, station/facility upgrades, and business continuity. Continued support of community initiatives is needed to better gauge public support for initiatives to mitigate or perform pre-disaster hazard mitigation.

CHAPTER 20.
BRICELAND FIRE PROTECTION DISTRICT ANNEX

20.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
Tim Olsen, BVFD Department Chief
4438 Briceland-Thorn Rd. / P.O.B. 1249
Redway, CA 95560
Telephone: 707-223-3323
E-mail Address: bricelandfire@yahoo.com

Alternate Point of Contact
Peter Ryce, BFPD District Board Vice President
4438 Briceland-Thorn Rd. / P.O.B. 1141
Redway, CA 95560
Telephone: 707-923-2009
E-mail Address: pryce@asis.com

20.2 JURISDICTION PROFILE

On August 28, 2012, The Briceland Fire Protection District (BFPD); with a 5 member governing board of directors, was approved by the registered voters living within the Briceland Volunteer Fire Departments jurisdictional boundaries. Initiated by the Briceland Volunteer Fire Department (BVFD) [a 501 (c)(3) Org., operating under California, H&S Code, Division 12, Part 4, Chap. 1,2, &3], with the intention of a district with a special tax, would ensure that the fiscal needs of the BVFD are meet, also opening the opportunity to make ordinances aimed at public safety. Presently the BVFD is under an agreement with the BFPD to provide fire protection, prevention, and emergency medical services for the district. Jurisdictional boundaries follow the same boundaries of BVFD that have been in place for 35 years along with the infrastructure and equipment. All of which began with the original fire department Beginnings Volunteer Fire Department in 1978, in 2005 it became Briceland VFD. Administrative duties are maintained by the BVFD—(Agency Agreements, Mutual Aid agreements, Contracts, and Grants.) The BFPD and the BVFD believe that this arrangement with its agreement (MOU) would prevent duplication of many administrative activities and services provided, thus making these resources to the community more fiscally responsible.

The Briceland Fire Protection District jurisdictional area covers 44 square miles of forested land and grasslands with residents inter-disbursed throughout the area on private roads. The roads are broken up into various road groups for maintaining egress and ingress to many of its residents throughout the area, forming small “communities.” The 2010 Census shows that there are 602 residents. The BFPD in there survey (2013) show that with some adjustment over the past 3 years that the residential may be as high as 1200 to 1300 persons residing in our jurisdictional area. The town of Briceland rests in the middle of jurisdictional area of the fire district, where the Briceland Community Services District (BCSD) provides water to 26 of its residential properties within the township. The BCSD also provides 9000-gallon tank of stored water for fire suppression. Within the community of Briceland is the community center of Beginnings Inc. a non-profit (501(c)(3)) organization providing a preschool, elementary school and an assembly building. The Beginnings Octagon, a 3000 sq. ft., building with assembly hall with a fully operational “commercial” kitchen, the “Octagon” also serves as a Red Cross Disaster Center. Within the infrastructure of the community center is an Alternate Care Site (ACS Cache) acquired from the State of California Department of Health and Human Services by the BVFD for the disaster center. This can turn the community centers Octagon into a 52 bed alternative hospital with its extensive medical supplies.

Beginnings Inc. with its “Octagon” being the center for many fire department and fire district activities, with no charges for public meetings are in support one another.

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

- **Population Served—**602 as of the 2010 Census, 324 households
- **Land Area Served—**38,000 acres—44 sq. mi.
- **Value of Area Served—**The estimated value of the area $190,000,000
- **Land Area Owned—.**99 acres, undeveloped, future fire station site
- **Critical Infrastructure and Equipment Owned:**
  - E5411, Type 1, 1989 Ford F250: $28,000
  - E5436, Type 3, 1993 Int'l M-60: $31,000
  - A5446, Type 4, 1992 Ford F250: $21,000
  - WT5462, W-Tend, 1988 Int'l Navistar: $26,000
  - R5471, Ambulance, 1998 Ford AM: $35,000
  - 11,000 water storage tank: $11,000
  - 3,000 water storage tank (suppression): $3,000
- **Total Value of Critical Infrastructure and Equipment—$155,000**
- **Critical Facilities Owned:**
  - 3 Engine bay W/office 1500 sq. ft. Fire Station: $90,000
  - .99 Acres raw land for new Fire Station facilities: $140,000
  - 10' x 20' storage facility (ACS Cache): $3,500
- **Total Value of Critical Facilities—$233,500**
- **Current and Anticipated Service Trends—**With an annual growth rate of 4-6% the BFPD will need to address increased structure fire protection as well as Wildland Urban Interface protection thus making water resources, water storage facilities, water tenders and apparatus for fire suppression support, a much needed aspect. This would also include stations and necessary staffing in the areas of greater population concentrations. The BFPD as new entity will need to address these issues in the very near future.

20.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 20-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Wildland Fire	N/A	07/21/2011	7 acre fire directly across from the BVFD fire station along Briceland Thorn Rd. posing a threat to 3 several residents and the fire station. Fire cause: vehicle being towed with a faulty tire exposing the rim causing sparks, igniting the dry grasses at the edge of the road for a 200-yard section. Fortunately the station was staffed at the time of incident, offering a quick response. Cal Fire was in the area and responded quickly. This may have caused a major event with great residential property loss.
Wildland Fire	N/A	09/14/2008	
Severe Weather	DR-1203	02/06/1998	$7.5 million in countywide damages, road closers, power lines down, slides, etc.
Earthquake	DR-943	04/25/1992	7.1 magnitude followed by a series of strong aftershocks into the following day. Slight damages to private property in our area, value unknown. Landslides blocking many rural roads.

Table 20-1 lists all past occurrences of natural hazards within the jurisdiction.

20.4 HAZARD RISK RANKING

TABLE 20-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	48
2	Wildfire	42
3	Severe Storm	30
4	Landslide	20
5	Drought	10
6	Dam Failure	1
7	Flood	1
8	Volcano	0
9	Tsunami	0

Table 20-2 presents the ranking of the hazards of concern.

20.5 APPLICABLE REGULATIONS AND PLANS

The BFPD jurisdictional area lays within the California Department of Forestry and Fire Protection (Cal Fire) State Responsibility Area where there are regulations regarding wildfire exposure clearances around residential buildings and structures. Humboldt County has, through the Humboldt County Fire Safe Council, set standards for fire safety throughout the unincorporated areas of Humboldt and adapted and enforced through the Humboldt Planning Department. The State of California Uniform Building Code (UBC) sets strict standards regarding building codes intended for the safety of its residents during events as wildfire, flooding, severe weather, and earthquakes.

20.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 20-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	9/8	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	N/A	--	--

Classifications under various community mitigation programs are presented in Table 20-3.

20.7 HAZARD MITIGATION ACTION PLAN

TABLE 20-4.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline
BCL-1 Repairing water storage: 11,000-gallon tank repair + install new 2½ inch distribution line to station site (hydrant 2½ inch)						
Existing	WF/SW	1,2,3,5,8,9	BVFD/BFPD	$15,000	Grants, Cap Ex.	Short Term, Ongoing
BCL-2 Build 100,000-gallon water storage tank(s) with new connection lines, 2½ inch.						
New	WF/SW	1,2,3,5,8,9	BVFD/BFPD	$86,000	Grants, Loans	Short Term
BCL-3 Earth Quake Retrofit existing Fire Station Apparatus Bay Doors						
Existing	WF/EQ/ SW	1,2,3,4,5	BVFD/BFPD	$4,000	Grants, Loans, Cap Ex.	Short Term
BCL-4 New Station 4 Bay with Offices and Quarters						
New	WF/EQ/ SW	1,2,3,4,5,9	BVFD/BFPD	$1.1 million	Grant, Cap Ex.	Long Term, Ongoing
BCL-5 Fuel Reduction for Road Clearances - Increase Access-for Fire Apparatus ingress-egress +Fuel Break						
New and Existing	WF/EQ/SW	1,2,3,4,5,8,9, 10	BVFD/BFPD	$250,000	Grant,	Long Term, Ongoing
BCL-6 Support countywide initiatives—Volume 1 Chapter. 18 in this plan.						
New and Existing	All Hazards	All	County	Low	Budget	Ongoing

Table 20-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

20.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 20-5.
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]
BCL-1	6	High	Med	Yes	Yes	Yes	High
BCL-2	6	High	Med	Yes	Yes	No	High
BCL-3	5	High		Yes	Yes	Yes	High
BCL-4	6	High	High	Yes	Yes	No	High
BCL-5	8	High		Yes	Yes	No	Medium
BCL-6	12	High	Low	Yes	No	Yes	High

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

Table 20-5 identifies the priority for each initiative.

20.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 20-6.
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	BCL-6		BCL-6			
Drought	BCL-6		BCL-6		BCL-1 BCL-2, BCL-4 BCL-6	
Earthquake	BCL-6	BCL-3 BCL-5	BCL-6		BCL-1, BCL-3, BCL-6	
Fish Losses						
Flood	BCL-6		BCL-6			
Landslide	BCL-6		BCL-6			
Severe Weather	BCL-6	BCL-4	BCL-6		BCL-4 BCL-6	
Tsunami	BCL-6		BCL-6			
Wildfire	BCL-6	BCL-1 BCL-2, BCL-3 BCL-4, BCL-5	BCL-6	BCL-5	BCL-1 BCL-4 BCL-5	

a. See Chapter 1 for description of mitigation types.

Table 20-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

20.10 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

The BFPD is located in an area of heavy forested hills to steep mountainous terrain, covered with dense Tan Oak and Madrone, and stands of Douglas Fir with inter-disbursed grasslands. This is sustained with heavy rainfall in the winter months creating a web of small streams and rivers. Within this matrix are many rural residences, which are accessed by a network of private roads. The private roads serving the area have many bridge crossings, some engineered and many installed many years ago that weren't engineered. This presents a hazard in time of an earthquake disaster: if during an earthquake bridges are compromised ingress and egress to effected residents will curtail any timely response, this would also be complicated if this were to happen in the middle of fire season with the possibility of a wildland event were to start due to downed power lines or a residential fire spreading to the wildland. An event of this nature will affect response of fire and rescue, and evacuations of residents. Mitigating the possibility of such an event is questionable.

Presently, the risk of drought is now at hand with water supplies low and tapped. Limited water storage resources for fire suppression brings serious concerns to the fire departments ability to mitigate a threatening fire event. The BCSD provides 9,000 of suppression water from a tank that has a dubious lifetime. The BVFD has an 11,000-gallon water tank that is in need of repairs to its roof. The tank has been out of service for several years due to the lack of sufficient water supply and a compromised distribution line. Just recently the fire department acquired a water source that will facilitate an adequate water supply for the departments present needs. Future needs would require additional or larger storage facilities and an adequate distribution system. We are presently looking for a grant process to assist in mitigating the problem and fulfilling our needs.

20.11 ADDITIONAL COMMENTS

Briceland-Thorn Rd. a two land county road is only the main thoroughfare serving the "Lost Coast" and the communities of Whale Gulch, Whitethorn, Ettisburg, and Shelter Cove, passing through the middle of BFPD jurisdiction. A 2007 survey, conducted by county public works, showed a traffic flow of 3,000 vehicles a day, along the Briceland-Thorn Rd. corridor. Within this corridor are a series of bridges, 6 in all with 4 in the BFPD jurisdiction. With this is a steep mountain slope close to the road that has the potential to close the road from a landslide, as it has done in the past. These hazards can, in time of a large earthquake, cause closure of the Briceland-Thorn Rd. thus affecting any emergency response and stranding drivers along its corridor. This was not addressed in this document, it will take time in the near future for research and assessment, but nonetheless that of great concern.

The Briceland Fire Protection District is going through growing pains and organizational structuring with many challenges, this document being one of the newer challenges. We have a short history as a district, 1 year old, so many of the fields in this document have been left blank due to our short history. Filling out this document is certainly adding to our lessons and new gained wisdom.

CHAPTER 21.
FORTUNA FIRE PROTECTION DISTRICT ANNEX

21.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Stephen Underwood, Firefighter
320 S. Fortuna Boulevard
Fortuna CA, 95540
Telephone: 707-768-1942
e-mail Address: SUnderwood@fortunafire.com

Alternate Point of Contact

Lon Winburn, Chief
320 S. Fortuna Boulevard
Fortuna CA, 95540
Telephone: 707-725-5021
e-mail Address: LWinburn@fortunafire.com

21.2 JURISDICTION PROFILE

The Fortuna Fire Protection District was approved by taxpayers and organized as a County Fire Protection District in June of 1937. In 1957 the district expanded to include the already existing Hydesville Fire Company which then became part of the Fortuna Volunteer Fire Department as Company #4. The Campton Heights fire Station was opened in 1967 which included the formation of Company #5. The district includes the city of Fortuna, Hydesville, Alton, and the Metropolitan and Palmer Creek areas. The fire department provides services for approximately 13,800 citizens within the District. The fire department responds to structural fires, motor vehicle accidents, hazardous conditions and wildfires throughout the district. In addition the department responds to medical emergencies occurring in the district but outside city limits. A five member Board of Commissioners appointed by the Humboldt County Second District County Supervisor governs the department and appoints the fire chief. The first and second assistant chiefs and the safety officer are elected by the volunteer firefighters with the consent of the chief. There are five fire companies in the department, companies #1 #2 and #3 are located down town at the Main Station while company #4 is in Hydesville and company #5 is in Campton Heights. The Board assumes responsibility for the adoption of this plan; the Fire Chief will oversee its implementation.

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

- **Population Served—**15,000 as of 2012
- **Land Area Served—**26 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is 1,166,990,000
- **Land Area Owned—**3.5 acres
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction:**
  - 15 apparatus and equipment $4,520,000
  - SCBA filling station $125,000
  - personal protective equipment for 60 fire fighters $120,000
  - Generators $24,000
  - Communications equipment $12,000

- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $4,801,000.
- **List of Critical Facilities Owned by the Jurisdiction:**
  - Main Station $1,200,000
  - Hydesville Station $600,000
  - Campton Heights $210,000
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $ 2,010,000
- **Current and Anticipated Service Trends—**The population of Fortuna has increased from 10,400 in 1999 to 11,939 in 2010. Requests for service increased from 257 to 309 between 2006 and 2012, a 20% increase.

21.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 21-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Wind event		3/4/2006	There were numerous roofs damaged and metal buildings impacted when high winds surfaced. Power lines were damaged in a number of locations. Numerous tree limbs were broken off. Estimated damage not available.
Flood		12/24/2003	Floodwaters entered a number of residences with estimated damages two to three hundred thousand dollars.
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.
Earthquake (Cape Mendocino earthquake)	DR-943	4/25/1992	89-106 homes damages @ $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-677	1/25//1983	Localized flooding on Fortuna Blvd.
Wind event		1979-80	There were numerous roofs damaged when high winds were experienced. Estimated damage not available.

Table 21-1 lists all past occurrences of natural hazards within the jurisdiction.

21.4 HAZARD RISK RANKING

TABLE 21-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	51
2	Severe Weather	48
3	Flood	15
4	Wildfire	14
5	Landslide	5
6	Drought	0
7	Dam Failure	0
8	Tsunami	0
9		

Table 21-2 presents the ranking of the hazards of concern.

21.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- City of Fortuna Emergency Operations Plan
- Fortuna Fire Department Hazard Response Plan

21.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 21-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	9/8	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 21-3.

21.7 HAZARD MITIGATION ACTION PLAN

TABLE 21-4.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline
FFD 1—Conduct an evaluation of each fire station in the district to determine its ability to survive an earthquake and/or wind event and steps needed to make it resilient.						
Existing	Earthquake, Severe Weather	O-1, O-2, O-4	Fortuna	$15,000	PDM, District	Short term
FFD 2—Perform necessary retro-construction to assure facility resilience to survive an earthquake and/or wind event.						
Existing	Earthquake, Severe Weather	O-1, O-2, O-4	Fortuna	High	PDM, District	Short term
FFD 3—Support countywide initiatives identified in Volume 1 of this plan.						
New and Existing	All Hazards	All Objectives	FFD	Low	District Funds	Ongoing

Table 21-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

21.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 21-5.
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]
FFD-1	3	High	Medium	Yes	Yes	No	High
FFD-2	3	High	High	Yes	Yes	No	Medium
FFD-3	12	Medium	Low	Yes	No	Yes	High

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

Table 21-5 identifies the priority for each initiative.

21.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 21-6.
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	FFD-3		FFD-3		FFD-3	
Drought	FFD-3		FFD-3		FFD-3	
Earthquake	FFD-3	FFD-1	FFD-3		FFD-3	FFD-2
Flood	FFD-3		FFD-3		FFD-3	
Landslide	FFD-3		FFD-3		FFD-3	
Severe Weather	FFD-3	FFD-1	FFD-3		FFD-3	FFD-2
Tsunami	FFD-3		FFD-3		FFD-3	
Wildfire	FFD-3		FFD-3		FFD-3	

a. See Chapter 1 for description of mitigation types.

Table 21-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

CHAPTER 22.
HUMBOLDT FIRE PROTECTION DISTRICT NO. 1 UPDATE ANNEX

22.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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Alternate Point of Contact

Kathi Hendricks, Executive Secretary
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22.2 JURISDICTION PROFILE

Humboldt No. 1 Fire Protection District was formed in 1929, and has been reorganized two times, most recently under The Fire Protection District Law of 1987, which is the source of statutory authority. A five member Board of Directors, elected by the voters of the District, governs the District. The District currently employs 2 Chief Officers, 19 career Firefighters and an administrative assistant. The District also utilizes 15 Volunteer Firefighters. Our operations are funded by property taxes and fire benefit assessments passed in 1985 and 2004. The District covers approximately 40 square miles surrounding the City of Eureka in a wildland urban interface, and serves about 26,000 residents. We are in the process of consolidating with the City of Eureka Fire Department into the Humboldt Bay Fire Joint Powers Authority. The City of Eureka's population is 27,021 and the area served is 14.4 square miles.

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

Population Served—of key information about the jurisdiction:

- **Population Served—**The District's population is approximately 26,000 and the City of Eureka's is 27,021 totaling approximately 53,021 as of January 2013. Our District holds 18 care homes, seven elementary schools, three veterinary clinics, and the state fairgrounds. The only hospital is in our first-in response area, as is the Surgicenter and many doctors' offices.
- **Land Area Served—**The District consists of 40 square miles and works under and automatic aid agreement with the City of Eureka Fire Department that is 14.4 square miles. Both Agencies are combining into Humboldt Bay Fire Authority making the total land area served 54.4 square miles.
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $1,616,171,687. This includes a net value of $1,548,535,195 with $67,636,492 in exemptions.
- **Land Area Owned—**Humboldt No. 1 Fire Protection District owns one (1) total acre of property including .67 acres for Fire Station 11 and .33 acres for Fire Station 12.
- **Critical Infrastructure and Equipment Owned:**
  - Three Type 1 Fire Engines - $1,500,000 replacement cost

  - One Type III Fire Engine - $300,000 replacement cost
  - One 2000 gallon Water Tender - $300,000 replacement cost
  - Two Command vehicles - $90,000 replacement cost ($45,000 apiece)
  - Two Utility Pick Ups - $55,000 replacement cost
- **Total Value of Critical Infrastructure and Equipment—**$2,245,000
- **Critical Facilities Owned:**
  - Station 11 (Headquarters) - $ 1,746,627
  - Station 12 (Bayview) - $ 1,009,397
  - Donna Drive Radio Repeater Site - $ 114,572
- **Total Value of Critical Facilities—**$ 2,870,596
- **Current and Anticipated Service Trends—**The District has experienced a 26% increase in call volume in the last five years. There is a current planning application for a large housing development within the District (900-1422 units). The funding for infrastructure would currently be based solely upon the increased property taxes and benefit assessments. The development does include space for a fire station, but no funding. There are also plans to convert land within the District owned by local timber companies to a "community forest" recreational area which could significantly increase the amount of wildland fires and medical response within said community forest. Several other significant development areas exist in the Cutten area that could add up several thousand parcels. In 2011 Humboldt Fire District adopted a development impact fee that, with the continued development of properties within the District, monies from projects are paid to the Fire District to fund infrastructure and capital costs in order to maintain our level of service provided.

22.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

Table 22-1 lists all past occurrences of natural hazards within the jurisdiction.

TABLE 22-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake 7.4	n/a	11/8/80	None Available
Coastal Storm	n/a	1/18/81	None Available
Storm	n/a	11/13—16/81	None Available
Storm/Flood	n/a	12/19/81	None Available
Storm/Flood	n/a	3/31/82	None Available
Coastal Storm, Floods, Slides	DR-677	1/25/93	$3.82 million countywide
Storm/Flood	n/a	12/25/83	None Available
Flood	DR-758	2/21/1986	$5.0 million countywide
Storm	n/a	1/29/87	None Available
Storm	n/a	1/3/88	None Available
Storm	n/a	11/22/88	None Available
Storm	n/a	1/6—11/89	None Available
Storm	n/a	2/15/89	None Available
Storm	n/a	3/9/89	None Available
Storm	n/a	1/8/90	None Available
Storm	n/a	3/5-14/91	None Available
Flood	DR-935	2/25/92	None Available
Earthquake	DR-943	2/25/92	356 injured, $48.3 million damage countywide
Storm/Flood	n/a	12/31/92	None Available
Storm	n/a	1 /4-6/93	None Available
Storm/Flood	n/a	1/20/93	None Available
Storm	n/a	1/24-26/94	None Available
Storm	n/a	2/15/94	None Available
Earthquake	n/a	12/26/94	None Available
Winter Storms, Flooding, Landslides, Mudflows	DR-1044	2/25/92	$15 million countywide
Severe Winter Storms, Flooding	DR-1046	3/12/1995	$1.3 million countywide
Windstorm/Flood	n/a	12/11-13/95	None Available
Storm/Flood	n/a	12/29-31/95	None Available

TABLE 22-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Storm/Flood	n/a	12/8-15/96	None Available
Severe Winter Storms/ Flooding	M#1155	1/4/97	$35 million countywide
Severe Winter Storms/ Flooding	M#1203	2/9/98	$7.75 million countywide
Flood	n/a	1/10/01	Flooding to residences in King Salmon—2’
Severe Weather	n/a	11/28/01	Trees/Power Lines down, long term power outages
Landslides on Broadway, Flooding Elk River, Evacuations	n/a	12/27/02	None Available
Storm/Flood	n/a	12/2-4/03	None Available
Severe Weather	n/a	12/23/03	None Available
Severe Weather	n/a	10/25/04	None Available
Severe Weather	n/a	12/17/05—1/3/06	None Available
Severe Storm/Wind	n/a	04/05/2006	None Available
Severe Weather	n/a	12/27/06	None Available
Severe Storm/Wind	n/a	01/30/2008	$16,235 countywide Reported
Severe Storm/Wind	n/a	10/30/2008	None Available
Severe Storm/Wind	n/a	12/21/2008	None Available
Earthquake	n/a	01/09/2010	$28 million in City of Eureka
Tsunami	n/a	03/10/2011	None Available
Severe Storm/Flood	n/a	03/16/2012	None Available
Severe Storm/Flood	n/a	03/30/2012	None Available
Severe Storm/Flood	n/a	11/30/2012	None Available
Severe Storm/Flood	n/a	12/21/2012	None Available

22.4 HAZARD RISK RANKING

TABLE 22-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	42
3	Flood	26
4	Wildland Fire	26
5	Tsunami	22
6	Landslide	22
7	Drought	16
8	Dam Failure	0

Table 22-2 presents the ranking of the hazards of concern.

22.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- California Fire Code
- California Building Code
- Health and Safety Code
- California Environmental Quality Act (CEQA)
- American Disabilities Act (ADA)
- Humboldt County Fire Safe Plan
- Humboldt County Emergency Operations Plan

22.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 22-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	ISO 4/9*	12/1/2007
Storm Ready	No	n/a	n/a
Firewise	No	n/a	n/a
Tsunami Ready (if applicable)	No	n/a	n/a

Classifications under various community mitigation programs are presented in Table 22-3.

22.7 HAZARD MITIGATION ACTION PLAN

Table 22-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 22-4.
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 HFD-1—Seismic Retrofit of Fire Station 12							
New & Existing	Earthquake	O-1, O-2, O-3, O-4, O-5	HBF	$1,000,000	HMGP Grant	Long Term	Y
Initiative HFD-2—Upgrade to full time Advanced Life Support							
New & Existing	All Hazards	O-4, O-5, O-6	HBF	$250,000	Operational Budget	Long Term	N
Initiative HFD-3—Establishment of District-Wide CERT Program							
New & Existing	All Hazards	O-1, O-3, O-4, O-5, O-6	HBF	$10,000	Operational Budget	Short Term	N
Initiative HFD-4—Disaster Operations Policies and Procedures							
New & Existing	All Hazards	O-1, O-4, O-5	HBF	Low	Operational Budget	Short Term	N
Initiative HFD-5—Establish a comprehensive and regular training regimen with Humboldt County OES EOC							
New & Existing	All Hazards	O-1, O-4, O-5, O-7	HBF	Low	Operational Budget	Mid term	N
Initiative HFD-6—Enhance Department Website to include more comprehensive disaster planning resources							
New & Existing	All Hazards	O-3, O-6, O-8	HBF	Low	Operational Budget	Short Term	N
Initiative HFD-7—Enhance Department Newsletter to increase public awareness and education in regard to disaster planning and preparedness							
New & Existing	All Hazards	O-3, O-6, O-8	HBF	$2000-5000	Operational Budget	Mid Term	N
Initiative HFD-8—Rural Water Supply Tank Program							
New & Existing	Wildland Fire	O-2, O-3, O-4, O-5, O-9	HBF	$10-15000	PDM Grant	Long Term	N
Initiative HFD-9—Support countywide initiatives in the Humboldt Operational Area Hazard Mitigation Plan.							
New & Existing	All Hazards	All Objectives	HBF	Low	Operational Budget	Short Term	N

TABLE 22-4.
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 HFD-10—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	HBF	Low	Operational Budget	Short Term	N
Initiative HFD-11—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	HBF	Low	Operational Budget	Short Term	N

22.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 22-5.
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]
HFD-1	5	High	High	Yes	Yes	No	Low
HFD-2	3	High	High	Yes	No	No	Low
HFD-3	5	High	Low	Yes	Yes	Yes	High
HFD-4	3	High	Low	Yes	No	Yes	High
HFD-5	4	High	Low	Yes	No	Yes	High
HFD-6	3	Medium	Low	Yes	No	Yes	Medium
HFD-7	3	Medium	Medium	Yes	No	Yes	Medium
HFD-8	5	High	High	Yes	Yes	No	Medium
HFD-9	12	Low	Low	Yes	No	Yes	High
HFD-10	4	Medium	Low	Yes	No	Yes	High
HFD-11	6	High	Low	Yes	No	Yes	High

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

Table 22-5 identifies the priority for each initiative.

22.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 22-6.
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	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7 HFD-8 HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-8, HFD-9,	HFD-6, HFD-7, HFD-9,	HFD-4, HFD-5 HFD-8 HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-8, HFD-9, HFD-11	HFD-1, HFD-9
Severe Weather	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7, HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-9	HFD-6, HFD-7, HFD-9	HFD-4, HFD-5, HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-9 HFD-11	HFD-1, HFD-9
Flood	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7 HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-9	HFD-6, HFD-7 HFD-9	HFD-4, HFD-5, HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-9 HFD-11	HFD-1, HFD-9
Wildland Fire	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7 HFD-8 HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-8, HFD-9	HFD-6, HFD-7 HFD-9	HFD-4, HFD-5 HFD-8 HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-8, HFD-9, HFD-11	HFD-1, HFD-9
Tsunami	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7 HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-9	HFD-6, HFD-7, HFD-9	HFD-4, HFD-5, HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-9 HFD-11	HFD-1, HFD-9
Landslide	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7, HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-9	HFD-6, HFD-7, HFD-9	HFD-4, HFD-5, HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-9 HFD-11	HFD-1, HFD-9
Drought	HFD-1, HFD-3, HFD-4, HFD-5, HFD-6, HFD-7, HFD-9 HFD-10	HFD-1, HFD-3, HFD-6, HFD-7, HFD-9	HFD-6, HFD-7, HFD-9	HFD-4, HFD-5, HFD-9	HFD-1, HFD-2, HFD-3, HFD-4, HFD-5, HFD-9 HFD-11	HFD-1 HFD-9

a. See Chapter 1 for description of mitigation types.

Table 22-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

22.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 22-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
HFD-1		✓		Seismic Retrofit of Station 12
HFD-2	✓			Private Bridge Safety Program
HFD-3	✓			Training Facilities - Multi Agency
HFD-4	✓			Support the District's CPR education program
HFD-5	✓			Employee Disaster Response Plan
HFD-6	✓			Seismic Retrofit of Station 11

Table 22-7 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.

22.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Better hazard mapping and demographics of unincorporated areas with associated cumulative damages and losses.

22.12 ADDITIONAL COMMENTS

As previously stated, Humboldt No. 1 Fire Protection District has consolidated services with the Eureka City Fire Department to form the Humboldt Bay Fire Joint Powers Authority. While HFD still exists as a legal entity, all programs and mitigations listed in this annex will be carried out through Humboldt Bay Fire. This consolidation helps reduce redundancy and makes the entire organization more efficient and able to move disaster planning measures forward with greater efficiency and lower cost..

As previously stated in the last annex five years ago, our agency tracks property loss dollars only associated with fires. Even then, the losses are purely estimates by our personnel. We have no reliable means of estimating dollar losses associated with natural disasters within our jurisdiction other than previously established procedures from the county and state.

CHAPTER 23.
LOLETA FIRE PROTECTION DISTRICT ANNEX

23.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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Alternate Point of Contact

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23.2 JURISDICTION PROFILE

Loleta Volunteer Fire Department was established in 1900 and functions today under the Loleta Fire Protection District as an all-risk agency providing emergency and non-emergency services including fire prevention, fire investigation, mutual aid response and medical aid with paramedics. We operate one station staffed on a complete volunteer basis. We serve the residents of the community of Loleta, Table Bluff Rancheria, and the Bear River Band of the Rohnerville Rancheria. The fire department is 100% volunteer and the District is run by a board of 5 elected commissioners. The Loleta Fire Protection District is a Special District, which under California law cannot charge or receive supplementary tax revenue such as sales tax, utility tax, bed tax or vehicle license fees. The District depends upon property taxes for the majority of its funding.

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

- **Population Served—**750+ as of 2010
- **Land Area Served—**37 Square Miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is priceless.
- **Land Area Owned—**5 acres
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction:**

4 Engines/Pumpers	$1,200,000 Replacement Value
1 Water Tender	$150,000 Replacement Value
1 Rescue Truck	$175,000 Replacement Value
1 kw Station Generator	$50,000 Replacement Value
20,000 of fire hose	$100,000 Replacement Value
Miscellaneous tools/equipment/radios	$150,000 Replacement Value

- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $1,825,000.00
- **List of Critical Facilities Owned by the Jurisdiction:**

Fire Station	$600,000 Replacement Value
Fire Hall	$1,200,000 Replacement Value

- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $1,800,000.00
- **Current and Anticipated Service Trends—**The town of Loleta is experiencing some growth in town with a new apartment complex and housing sub-division. In addition, one of the Rancheria's is experiencing rapid and heavy growth. Over the past two years, and projected for the next two years, it is estimated that 40 additional single family homes, an apartment complex, community center, hotel, pool, and sewage plant have already been, or are currently being built. **This represents an almost 25% growth of service recipients.**

23.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

No known events have impacted District property within the last 10 years.

23.4 HAZARD RISK RANKING

TABLE 23-1.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	3 x (9+6+3) = 54
2	Flood	3 x (9+6+3) =54
3	Wildfire	3 x (9+ 4+2) = 45
4	Severe Weather	3 x (9+4+2) = 45
5	Landslide	3 x (6+4+2) = 36
6	Tsunami	2 x (9+6+2) = 34
7	Dam Failure	0
8	Drought	0

Table 23-1 presents the ranking of the hazards of concern.

23.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- None of note

23.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 23-2.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	9/9	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 23-2.

23.7 HAZARD MITIGATION ACTION PLAN

TABLE 23-3.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline
LFPD-1 Develop a post disaster action plan						
New and Existing	All Hazards	1,2,3,4,5,6	LFPD	High	LFPD	Short term
LFPD-2 In conjunction with the County of Humboldt, develop a tsunami evacuation plan						
New and Existing	Tsunami	1,6,8,12	LFPD	$10,000 Low	LFPD ,Humboldt County	Short term
LFPD 3—Install an early warning disaster siren and evacuation plan						
New and Existing	All Hazards	1,2,6	LFPD	$4,500 Medium	LFPD	Short term
LFPD-4 Support countywide initiatives identified in Volume 1 of this plan						
New and Existing	All Hazards	All Objectives	LFPD	Low	LFPD	Short term/ Ongoing
LFPD-5 Continue to coordinate with the Humboldt County Fire Safe Council to implement wildfire mitigation actions recommended in the Community Wildfire Protection Plan that are relevant to our jurisdiction – such as educating residents about defensible space and fire safe construction materials**.**						
New and Existing	Wildfire	1,3,6,8,9	LFPD	Low	LFPD/grants	Short term/ Ongoing

Table 23-3 lists the initiatives that make up the jurisdiction's hazard mitigation plan. Note: This hazard mitigation action plan does not contain a specific mitigation initiative for earthquake because the fire district's infrastructure (fire station) is a steel building that will withstand the impacts of an earthquake without sustaining major damage.

23.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 23-4.
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]
LFPD-1	6	High	High	Yes	Yes	No	Medium
LFPD-2	4	High	Low	Yes	Yes	Yes	High
LFPD-3	3	High	Medium	Yes	Yes	No	Medium
LFPD-4	12	Medium	Low	Yes	No	Yes	High
LFPD-5	5	Medium	Low	Yes	Yes	Yes	High

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

Table 23-4 identifies the priority for each initiative.

23.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 23-5.
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	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	
Drought	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	
Earthquake	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	
Flood	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	
Landslide	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	
Severe Weather	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	
Tsunami	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-2, LFPD-3	
Wildfire	LFPD-4		LFPD-4		LFPD-1, LFPD-4, LFPD-3	

a. See Chapter 1 for description of mitigation types.

Table 23-5 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

23.10 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

We are looking to purchase modern SCBA equipment for the department.

23.11 ADDITIONAL COMMENTS

This is an exceeding complicated process for a small volunteer fire department

CHAPTER 24.
PETROLIA FIRE PROTECTION DISTRICT ANNEX

24.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
Travis Howe-Fire Chief
58 Sherman Street-Box 169
Petrolia CA 95558
707-629-3558
Petroliafire@Frontiernet.Net

Alternate Point of Contact
Lori Cook-Dispatch Officer
58 Sherman St
Petrolia CA 95558
707-629-3558
Petroliafire@Frontiernet.Net

24.2 JURISDICTION PROFILE

Petrolia Fire District was formed in 1951 and is located along the Mattole River 2 miles from the Pacific Ocean. Our area of response encompasses about 200 square miles of grass, timber, agriculture, and recreational land which includes a portion of the Kings Range National Conservation area as well as about 12 miles of coast line. We are governed by three publicly elected commissioners and have 20 volunteers that act as firefighters, medical technicians, dispatchers, secretaries and auxiliary members. The Fire District population is approximately 600 and increases to about 800 in the summer months.

In addition to fire and medical, we respond to search, rope, water and other specialized rescue operations and are involved in many community service type events.

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

- **Population Served—**800 as of 7-1-13
- **Land Area Served—**200 sq. miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $30,090,628
- **Land Area Owned—**1/2 acre
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction:**
  - Type 1 Fire Engine 300,000
  - Two Type 3 Fire Engines 500,000
  - 1 Water Tender 175,000
  - 1 Medical Rescue 75,000
  - 1 fast attack 40,000
  - 1 ATV 10,000
- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is 2,000.000
- **List of Critical Facilities Owned by the Jurisdiction:**
  - Fire Station 300,000

- Water Storage and System 10,000
- Communications 35,000

- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is 345,000.
- **Current and Anticipated Service Trends—**The demand for service has been steadily rising over time and there is a very large demand for service from areas outside our jurisdictional boundary. We are obliged to respond as the closest fire department but call it "good-will" service because we do not receive tax revenue from those areas. The cost of responding to emergency and other calls is constantly rising along with insurance and training costs. The list of mandatory requirements placed on the fire service is increasing as well. Basically the cost of running a fire department is increasing annually and is difficult to have a clear picture of equipment replacement and up keep costs very far into the future.

24.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 24-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Earthquake	DR-943	4/25 and 26/1992	Magnitude 7.1, 6.6, and 6.7 within a 24 hour period. Private property damage occurred but the total value is not known. The Petrolia fire Station was Destroyed and the General Store Burned Down.

Table 24-1 lists all past occurrences of natural hazards within the jurisdiction.

24.4 HAZARD RISK RANKING

TABLE 24-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Storm	54
3	Wildfire	24
4	Flood	6
5	Landslide	6
6	Tsunami	6
7	Drought	4
8	Dam Failure	0

Table 24-2 presents the ranking of the hazards of concern.

24.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- Humboldt County General Plan, particularly the Safety Element
- California Building Code implemented by the County Building Inspection Division. The WUI Code Chapter 7A is very relevant to wildfire hazards in our jurisdiction.
- Humboldt County Fire Safe Regulations for State Responsibility Areas—Authorized by Section 4290 of the Public Resources Code.

24.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 24-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	9	2012
Storm Ready	No	--	--
Firewise	Yes	--	2011
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 24-3.

24.7 HAZARD MITIGATION ACTION PLAN

Table 24-4Table 24-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 24-4.
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 PET-1—Complete a District annexation to expand the jurisdictional boundary to more accurately reflect where services are provided on a regular basis and to generate additional and much needed revenue.							
New and Existing	Wildfire	1, 2, 4, 5, 9	PFPD, LAFCo, County of Humboldt	High	Private Foundations, County grants, Assistance to Firefighters grants, private donations	Short Term	No
Initiative PET-2—Repair/retrofit water tank at fire station to improve access with a hydrant, harden for hazards, and expand capacity.							
Existing	Wildfire, Earthquake, Severe Storms	1, 2, 3, 5	PFPD	High	Grants, fundraising, budgeted funds	Long Term	No
Initiative PET-3—Support and participate in a community water supply program of purchasing, installing, maintaining, and retrofitting as necessary water tanks reserved for firefighting and strategically located throughout our service area.							
Existing and New	Wildfire, Earthquake, Severe Storms	1, 2, 3, 5, 6, 8	PFPD, Mattole Restoration Council (MRC), Lower Mattole Fire Safe Council (LMFSC)	High	Grants, Donations	Short Term, Ongoing	No
Initiative PET-4—Maintain our Community Firewise certification through continued implementation of our Firewise Action Plan and by annually submitting the appropriate renewal paperwork.							
Existing and New	Wildfire	3, 5, 6, 7, 8, 9	PFPD, MRC, LMFSC, Humboldt County Fire Safe Council	Low	Volunteers, Donations, and Grants	Short Term, Ongoing	No

TABLE 24-4.
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 PET-5—Assist with community fuels reduction projects in priority areas as identified in the Lower Mattole and Humboldt County Community Wildfire Protection Plans with an emphasis on ensuring safe access for our fire engines as well maintained defensible space from which we can protect homes from wildfire.							
Existing and New	Wildfire	3, 5, 6, 8, 9,	PFPD, MRC, LMFSC, Humboldt County Fire Safe Council	High	FEMA and State Fire Safe Council Grants, Volunteers, and donations	Short-Term, Ongoing	No
Initiative PET-6- Support countywide initiatives identified in Volume 1 of this plan							
New and Existing	All Hazards	All Objectives	PFPD	Low	PFPD	Ongoing	N/A

24.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 24-5.
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]
PET-1	5	High	High	Yes	Yes	No	High
PET-2	4	Med	Med	Yes	Yes	No	Med
PET-3	6	Med	High	No	Yes	No	Med
PET-4	6	Med	Low	Yes	Yes	Yes	High
PET-5	5	High	High	Yes	Yes	No	Med
PET-6	12	Medium	Low	Yes	No	Yes	high

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

Table 24-5 identifies the priority for each initiative.

24.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 24-6.
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
Wildfire	PET-6	PET-4	PET-3, PET-4, PET-5, PET-6	PET-1, PET-2, PET-3, PET-5	PET-1, PET-2, PET-6	
Earthquake	PET-6		PET-6		PET-1, PRT-6	
Severe Storm	PET-6		PET-6		PET-1, PRT-6	
Flood	PET-6		PET-6		PET-1, PET-6	
Landslide	PET-6		PET-6		PET-1, PET-6	
Tsunami	PET-6		PET-6		PET-1, PET-6	
Drought	PET-6		PET-6		PET-1, PET-6	

a. See Chapter 1 for description of mitigation types.

Table 24-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

24.10 ADDITIONAL COMMENTS

The Petrolia Fire District is located in an area subject to extreme wildfire potential in the summer months and extreme weather conditions in the winter months. The region of California where are District is located is very seismically active and prone to Earthquakes.

CHAPTER 25.
RIO DELL FIRE PROTECTION DISTRICT UPDATE ANNEX

25.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Shane Wilson, Fire Chief
50 West Center St.
Rio Dell, CA 95562
Phone: 707-764-3329
e-mail: shanewilson@riodellfire.com

Alternate Point of Contact

Andrew Gonzales, Senior Prevention Officer
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Rio Dell, CA 95562
Phone: 707-764-3329
e-mail: andrewgonzales@riodellfire.com

25.2 JURISDICTION PROFILE

Rio Dell Fire Protection District serves the City of Rio Dell and surrounding areas of Monument Rd, and Blueslide Rd. The fire department was formed in 1941 and operates with a 100% volunteer staff. The fire district is an elected board consisting of 5 commissioners. This board will assume the responsibility for the adoption and implementation of this plan. The Rio Dell Fire Protection District is a Special District, which under California law cannot charge or receive supplementary tax revenue such as Sales Tax, Utility Tax, Bed Tax or Vehicle License Fees. The District depends upon property taxes for the majority of our funding.

Under the direction of the fire chief, we consist of two assistant chiefs and three fire companies, totaling 22 volunteer firefighters. Rio Dell Fire responds to an average of 350 calls per year including fires, vehicle accidents, and medical aid calls. We respond to both incorporated areas as well as rural and wild land areas.

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

- **Population Served—**3372 as of 2011 Census (within City Limits)
- **Land Area Served—**62 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $121,398,185 (within city limits)
- **Land Area Owned—**4.3 Acres of commercial property
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction**
  - 3—Engine/Pumpers $425,000
  - 1—Water Tender $50,000
  - 1—Rescue/Quick Attack $125,000
  - 1—Command Vehicle $70,000
  - 1 - 20 kw Station Generator $10,000
  - 1 - 6,000 PSI SCBA Air Compressor $40,000
  - 1 - Hose Dryer $12,000

- 1—Hose Washer $5,000
- 1—Base Station Communications Center $2,000
- 4—Admin/Prevention Computers/Printers/Scanners $8,000

- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $747,000
- **List of Critical Facilities Owned by the Jurisdiction:**
  - Fire Station-11,000 square feet $900,000
  - Library / Chamber of Commerce building-1,000 square feet $150,000
  - Public Park with facilities (playground, bathrooms, etc.) 176,000 square feet $150,000
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $1,200,000
- **Current and Anticipated Service Trends—**Based on the data tracked by the California Department of Finance, Rio Dell has experienced a relatively flat rate of growth. The overall population has increased only 2.03% since 2000 and has averaged 0.47% per year from 1990 to 2007. With this rate of growth, the anticipated development trends for Rio Dell are considered low to moderate, consisting of primarily residential development. The Fire District is currently in the process of annexing the Scotia Fire District which would double the current services and equipment. New development and construction is also anticipated to increase over the next 5 years.

25.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 25-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Flooding, severe winter storms, and landslides	DR-1628	02/03/2006	$3,000 $20,208,206 countywide
Severe Weather	N/A	11/1997	$10,000
Earthquake	DR-943	04/04/1992	$20,000

Table 25-1 lists all past occurrences of natural hazards within the jurisdiction.

25.4 HAZARD RISK RANKING

TABLE 25-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	48
3	Flood	24
4	Wildfire	22
5	Landslide	6
6	Drought	0
7	Dam Failure	0
8	Tsunami	0
9	Fish losses	0

Table 25-2 presents the ranking of the hazards of concern.

25.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- City of Rio Dell Hazard Mitigation Plan
- City of Rio Dell Emergency Response Plan
- County of Humboldt Hazard Mitigation Plan
- Rio Dell Fire Protection District Standard Operating Procedures
- Rio Dell Fire Protection District Emergency Command Center Operations Guide

25.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 25-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	4/9	--
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 25-3.

25.7 HAZARD MITIGATION ACTION PLAN

TABLE 25-4.
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?
RDFD-1—Develop a post disaster action plan							
New and Existing	All Hazards	1,4,5,8	RDFPD	Medium	RDFPD City of Rio Dell	Short Term, Ongoing	Yes
RDFD-2—Initiate Public outreach and education efforts, including an active Firewise program.							
New and Existing	Wildfire	6,7,8	RDFPD	Medium	City of Rio Dell, Humboldt County, Cal-Fire, RDFPD	Short Term, Ongoing	Yes
RDFD-3—Clear fuels on land that can trigger or maintain wildfires.							
New and Existing	Wildfire	2,3,9	RDFPD	Medium	Cal-Fire, Private landowners	Short term	Yes
RDFD-4—Establish and maintain mutual aid agreements between fire service agencies.							
New and existing	All Hazards	1,4,5,8,12	RDFPD	Low	RDFPD	Short Term, Ongoing	Yes
RDFD-5—Identify and create emergency vehicle access in high hazard areas.							
New and Existing	All Hazards	1,4,5,8	RDFPD	Medium	City of Rio Dell, Humboldt County, Private landowners	Long Term, Depends on financing	Yes
RDFD-6—Install fire suppression sprinkler system throughout fire station at 50 West Center St.							
Existing	Wildfire	1,2,4	RDFPD	Medium	RDFPD	Long Term, Depends on financing	Yes
RDFD-7—Support countywide initiatives identified in Volume 1 of this plan							
New and Existing	All Hazards	All Objectives	RDFPD	Low	RDFPD	Ongoing	No

Table 25-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan. Note: This hazard mitigation action plan does not contain a specific mitigation initiative for earthquake because the fire district's infrastructure (fire station) is already built to a standard intended to withstand seismic impacts.

25.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 25-5.
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]
RDFD-1	4	High	Medium	Yes	Yes	No	Medium
RDFD-2	3	High	Medium	Yes	Yes	No	Medium
RDFD-3	3	High	Medium	Yes	Yes	No	Medium
RDFD-4	5	High	Low	Yes	Yes	Yes	High
RDFD-5	4	High	Medium	Yes	Yes	No	Medium
RDFD-6	3	High	Medium	Yes	Yes	No	Medium
RDFD-7	12	Medium	Low	Yes	No	Yes	High

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

Table 25-5 identifies the priority for each initiative.

25.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 25-6.
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	RDFD-7		RDFD-2, RDFD-7		RDFD-1 RDFD-4 RDFD-5, RDFD-7	
Severe Weather	RDFD-7		RDFD-2, RDFD-7		RDFD-1 RDFD-4 RDFD-5, RDFD-7	
Flood	RDFD-7		RDFD-2, RDFD-7		RDFD-1 RDFD-4 RDFD-5, RDFD-7	
Wildfire	RDFD-3, RDFD-7	RDFD-3 RDFD-5 RDFD-6	RDFD-2, RDFD-7	RDFD-3	RDFD-1 RDFD-4 RDFD-5, RDFD-7	RDFD-6
Landslide	RDFD-7		RDFD-2, RDFD-7		RDFD-1 RDFD-4 RDFD-5, RDFD-7	
Drought	RDFD-7		RDFD-7			
Dam Failure	RDFD-7		RDFD-2, RDFD-7		RDFD-1 RDFD-4 RDFD-5, RDFD-7	
Tsunami	RDFD-7		RDFD-2, RDFD-7		RDFD-1 RDFD-4 RDFD-5, RDFD-7	

a. See Chapter 1 for description of mitigation types.

Table 25-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

25.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 25-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
RDFD-1	No	Yes	N/A	Still in process. Working with City of Rio Dell to Combine efforts.
RDFD-2	No	Yes	N/A	Public outreach program initiated through new Fire Prevention Division in 2012 as well as new website in 2008 and Facebook page in 2011. Firewise program not initiated.
RDFD-3	No	Yes	N/A	Not enough resources for actions. No plans in place at this time.
RDFD-4	Yes	Yes	N/A	New mutual aid agreements with Fortuna FPD, Loleta FPD, Carlotta FPD and Ferndale FPD for water tender auto aids in 2013. Updated existing auto aid agreements with Ferndale FPD and Fortuna FPD for auto aid in rural areas in 2013. Countywide mutual agreement signed in 2009.
RDFD-5	No	Yes	N/A	Have made identifications in key areas, i.e.: Redwood Drive bridge replacement. Working with City of Rio Dell for plans. Identified rural locations with limited egress (one road access). No actions in place at this time.
RDFD-6	No	Yes	N/A	No actions at this time. Plans are limited to funding resources.

Table 25-7 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.

CHAPTER 26.
SAMOA PENINSULA FIRE PROTECTION DISTRICT UPDATE ANNEX

26.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Troy Nicolini, Board Chair
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Samoa, CA 95564
Telephone: 707-496-5959
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Alternate Point of Contact

Dale Unea, Chief
1982 Gass Street
Samoa, CA 95564
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e-mail Address: samoavfd@gmail.com

26.2 JURISDICTION PROFILE

The Samoa Fire District was formed in 1902. The Fairhaven Fire District was formed in 1952. The two districts merged in 1994 and formed the Samoa Peninsula Fire Protection District. The district is organized and governed by the Fire Protection District Act of 1987 (Health & Safety Code section 13800 et seq. ; the "Act") and former Health & Safety Code section 13800 et seq. The district is governed by a five member Board of Directors, elected by the voters of the District. This board will assume responsibility for the adoption of this plan. The district is served by 22 volunteers, a chief, training officer, and a district manager. The district covers 8 square miles and serves 350 residents including a public school, US Post Office, a county campground, several industrial sites, a small municipal airport, and an off road vehicle park. We operate with the Arcata Fire District under a mutual aid agreement, which increases our response and service area by more than double of our first response area. Our district is funded by property taxes under the AB 8 process and by a voter approved special tax, which the voters passed in 1997.

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

- **Population Served—**approximately 350 residents as of 2013. Additionally, 200 workers of the industrial areas served and the recreational venues serve hundreds of visitors during weekends and holidays.
- **Land Area Served—**8 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $53,500,00
- **Land Area Owned—**12.5 acres
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction:**
  - 4 engines and their equipment - $ 230,000
- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $230,000
- **List of Critical Facilities Owned by the Jurisdiction:**
  - Main fire station and annex structure that houses fire engines -

- **Total Value of Critical Facilities—**$800,000

Current and Anticipated Service Trends—Service rates declined from about 2000 until 2011 due to the closure of several industrial facilities in the service area. One of these facilities was converted into a light industrial business park that now employs over 200 people. The remaining sites are currently in the planning phases of also being converted into business parks that meet the emerging needs of area commercial enterprises.

The town of Samoa is in the final planning stages of adding over 100 new homes, visitor serving facilities, and commercial infrastructure.

Visitor serving facilities have also been enhanced in other regions of the District, including beach access parking areas. These have resulted in a steady increase in tourism in the district and resultant needs for services.

The above activities are expected to result in a significant net increase in the services provided in the next five to ten years.

26.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 26-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster #	Date	Preliminary Damage Assessment
Wildfire		2008	62 acres burned upwind of town of Fairhaven and Fairhaven Business Park. Total damages estimated to be $60,000

Table 26-1 lists all past occurrences of natural hazards within the jurisdiction.

26.4 HAZARD RISK RANKING

TABLE 26-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Tsunami	54
2	Earthquake	32
3	Severe weather	26
4	Flood	18
5	Wildfire	16
6	Dam Failure	0
7	Drought	0
8	Landslide	0

Table 26-2 presents the ranking of the hazards of concern.

26.5 APPLICABLE REGULATIONS AND PLANS

Efforts are ongoing at the County level and at the California Coastal Commission to mitigate for tsunami hazard with any future development in the tsunami hazard zones of the District.

It is the mission of the Samoa Peninsula Fire Protection District to provide the best possible protection from fire, medical and other emergencies to the citizens of the District.

- To arrive at the emergency scene within the shortest amount of time.
- To utilize relevant regulations to insure that structures and occupant practices are as safe as possible.
- To provide regular fire safety education programs in schools and other forums, to minimize fire injury and death.
- To provide the safest possible work environment for Samoa Peninsula Fire Protection District employees and volunteer firefighters.
- To provide quality equipment and training for the rapid management and control of emergency incidents.
- To regularly evaluate our performance and provide a strategic vision for public safety in the community.
- To accomplish necessary change, institute quality programs, and nurture employee relationships with a strong commitment to innovation.
- To facilitate employee and volunteer career development by sharing of responsibility and authority so that they may ultimately reach their full potential.
- To conserve Samoa Fire Protection District resources by operating in an efficient and cost effective manner.
- To cooperate with other public agencies to improve service and efficiency.
- To promote a strong relationship with local news media to support public education and to maintain a positive public image of the fire service in general, and Samoa Peninsula Fire Protection District in particular.

26.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 26-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	5/9	ISO 2002
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	Yes	--	Expected 2015

Classifications under various community mitigation programs are presented in Table 26-3.

26.7 HAZARD MITIGATION ACTION PLAN

TABLE 26-4.
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?
SPFD 1—Addition of external stairs to existing steel reinforced concrete building to create a vertical evacuation site for residents and visitors to use in the case of a major tsunami event, and relocation of some emergency response to the vertical evacuation site to enable post disaster response							
Existing	tsunami	1,3,4,5	Samoa Fire	$250,000 High	PDM Grant, partner agencies	Short term	Yes
SPFD 2—Achieve TsunamiReady status for town of Fairhaven							
Existing	Tsunami	3,6,7	Samoa Fire	$5,000 Low	NOAA, State, operating budget	Short term	Yes
SPFD 3—Initiate wildland fire educational campaign for communities of Fairhaven and Samoa							
Existing	Wildland fire	3,6,9	Samoa Fire	Low	Not needed	Short term	No
SPFD 4—Initiate Earthquake education campaign for communities and business in Fairhaven and Samoa							
Existing and new	Earthquake	2,3,6	Samoa Fire	Low	Not needed	Long term	No
SPFD 5—Support countywide initiatives identified in Volume 1 of this plan.							
New and existing	All Hazards	All Objectives	Samoa Fire	Low	Samoa Fire	Ongoing	No

Table 26-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

26.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 26-5.
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]
SPFD-1	4	High	High	Yes	Yes	No	High
SPFD-2	3	Medium	Low	Yes	No	Yes	High
SPFD-3	3	Medium	Low	Yes	No	Yes	High
SPFD-4	3	Medium	Low	Yes	No	Yes	High
SPFD-5	12	Medium	Low	Yes	No	Yes	high

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

Table 26-5 identifies the priority for each initiative.

26.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 26-6.
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	SPFD-5		SPFD-5		SPFD-5	
Drought	SPFD-5		SPFD-5		SPFD-5	
Earthquake	SPFD-5	SPFD - 4	SPFD-4, SPFD-5		SPFD-5	
Fish Losses	SPFD-5		SPFD-5		SPFD-5	
Flood	SPFD-5		SPFD-5		SPFD-5	
Landslide	SPFD-5		SPFD-5		SPFD-5	
Severe Weather	SPFD-5		SPFD-5		SPFD-5	
Tsunami	SPFD-5		SPFD-2, SPFD-5		SPFD-1, SPFD-5	SPFD - 1
Wildland Fire	SPFD-5	SPFD - 3	SPFD-3, SPFD-5	SPFD - 3	SPFD-5	

a. See Chapter 1 for description of mitigation types.

Table 26-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

26.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 26-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
SPFD-1			✓	Integrated into the SPFD—1 whereby some response capability will be located at the evacuation site so that emergency personnel can respond after a major earthquake/tsunami
SPFD-2		✓		The achievement of Tsunami Ready cannot occur as long as there does not exist an evacuation site for the residents of Fairhaven. This is to be accomplished through SPFD - 1
SPFD-3		✓		The construction of a vertical evacuation site for tsunami response was not achieved because grant funding was not obtainable. This was due the inability to calculate a benefit to cost ratio for projects to mitigate for the tsunami hazard. This obstacle has been addressed in the intervening years.
SPFD-4	✓			Completed in 2010

Table 26-7 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.

CHAPTER 27.
WILLOW CREEK FIRE PROTECTION DISTRICT UPDATE ANNEX

27.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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Alternate Point of Contact

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27.2 JURISDICTION PROFILE

The Willow Creek Volunteer Fire Department was established in 1957 shortly after a major fire disaster that destroyed most of the down town business area. The Willow Creek Fire Protection District was established in 1959. Both entities occupy the original fire hall located at 51 Willow Road in Willow Creek, California. Today, the Fire District averages between 15 and 22 active firefighters including two dispatchers. A publicly elected Board of Directors consisting of a panel of five, including a board president/chairman governs the Fire District. This Board will assume the responsibility for the adoption and implementation of this plan. All members of the Fire Department and the Board of Directors are volunteers. The Board of Directors employs a Clerk of the Board.

The Willow Creek Fire Department responds to both structural and wild land fires in and outside the district. The firefighting staff is cross trained and outfitted for both types of fire response. In addition to fire response calls, the Fire Department staff is often asked to respond to medical emergencies, assist to Emergency Medical Services and called to traffic accidents. Our staff is also trained and certified in handling medical emergencies. These skills are often employed during the sometimes-lengthy wait for EMS to arrive on scene. Our rate of calls for service average between 250 and 300 per year and seems to be on the rise with the increase of higher population growth/density.

The District has grown over the years and has acquired some updated personal safety equipment for the fire fighters as well as upgrading some of our firefighting apparatus. We currently operate one rescue vehicle, a primary (first out) Urban Interface fire truck, and a primary structural fire engine with one secondary structural fire engine. The District currently has no water tender to supplement fire suppression units in the field. The District currently has direct access to an appropriate fire hydrant system that is maintained by the Willow Creek Community Services District.

The Fire District is funded through grant applications, a 1% proportional tax base and a local fire fee assessment schedule. The following is a summary of key information about the jurisdiction:

- **Population Served—**1710 as of 2010
- **Land Area Served—**2700 Acres
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $3,000,000.00

- **Land Area Owned—**Approx. 2 acres
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction:**

  Main Fire Station $1,000,000

  Apparatus X-5 $1,000,000

  Second Station Property $100,000
- **Total Value of Critical Infrastructure/Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is Fire Station, Apparatus, second station property $2,100,000.00
- **Current and Anticipated Service Trends—**The District currently responds to 250 to 300 calls for service annually. The calls for service are increasing as the population base grows and ages. Recent land development projects are bringing new construction into the area. These new development projects are for both residential and business sites. The increase in new construction projects has added further requirements on the volunteer fire administrative staff to complete fire inspections as required under the county's building code and construction project permit process. Population growing 1% annually. WCFPD in need of a paid Chief.

27.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 27-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
1964 500 year flood Trinity River	N/A	12/25/64	Wide spread Tens of million dollars
Trinity River flooding	8620704	01/08/73	Roads and infrastructure in the millions.
Major Wildland fires, Megram Fire		08/21/99 10/21/99	Massive destruction to our local forest, and threatened the local communities of Willow Creek and surrounding areas

Table 27-1 lists all past occurrences of natural hazards within the jurisdiction.

27.4 HAZARD RISK RANKING

TABLE 27-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Wildfire	54
2	Earthquake	45
3	Flood	39
4	Severe Weather	36
5	Landslide	12
6	Dam Failure	6
7	Drought	0
8	Tsunami	0

Table 27-2 presents the ranking of the hazards of concern.

27.5 APPLICABLE REGULATIONS AND PLANS

No existing codes, ordinances, policies or plans were identified that are applicable to this hazard mitigation plan.

27.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 27-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	Yes	5-9	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	N/A	--	--

Classifications under various community mitigation programs are presented in Table 27-3.

27.7 HAZARD MITIGATION ACTION PLAN

TABLE 27-4.
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 WCFD #1—Structural/ non-structural seismic retrofit of current station.							
Existing	Earthquake	2,4	WCFD	High	WCFD, Grant funding	Long-term	Yes
Initiative WCFD#2—Construct a 2nd fire station within the District							
New	All Hazards	1,2,4,5	WCFD	High	WCFD, bonds, SAFER Grants, AFG grants	Long term	No
Initiative WCFD #3—Replace Current Rescue Truck							
New and Existing	All hazards	1,2,4,5	WCFD	High	WCFD, SAFER grants, AFG grants	Short-term	No
Initiative WCFD#4—Replace current Fire Engine							
New and Existing	All hazards	1,2,4,5,	WCFD	High	WCFD, SAFER grants, AFG grants	Long-term	No
Initiative WCFD#5—Support countywide initiatives identified in Volume 1 of this plan.							
New and Existing	All Hazards	All Objectives	WCFD	Low	WCFD	Ongoing	Yes

Table 27-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan. Note: This hazard mitigation action plan does not contain a specific flood mitigation action initiative because the district's infrastructure is not located within the flood zone.

27.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 27-5.
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]
WCFD-1	2	High	High	Yes	Yes	No	Medium
WCFD-2	4	High	High	Yes	Yes	No	Medium
WCFD-3	4	High	High	Yes	Yes	Yes	High
WCFD-4	4	High	High	Yes	Yes	No	Medium
WCFD-5	12	Medium	Low	Yes	No	Yes	High

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

Table 27-5 identifies the priority for each initiative.

27.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 27-6.
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	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Drought	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Earthquake	WCFD-5	WCFD-1	WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Flood	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Landslide	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Severe Weather	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Tsunami	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	
Wildfire	WCFD-5		WCFD-5		WCFD-2, WCFD-3, WCFD-4, WCFD-5	

a. See Chapter 1 for description of mitigation types.

Table 27-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

27.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 27-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
WCFD-1		✓		
WCFD-2			✓	Action is considered to be no-longer feasible and has been replaced by initiative WCFD#2.
WCFD-3		✓		

Table 27-7 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.

PART 5—
ANNEXES FOR OTHER SPECIAL-PURPOSE DISTRICTS

CHAPTER 28.
GARBERVILLE SANITARY DISTRICT UPDATE ANNEX

28.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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28.2 JURISDICTION PROFILE

Garberville Sanitary District was formed on April 12, 1932 by vote of the Humboldt County Board of Supervisors for the purpose of providing sanitary wastewater collection, treatment and disposal for the residents in the Garberville area. In November 2004, the District purchased the Garberville Water Company and now provides water and wastewater services to the customers in its service area.

Garberville Sanitary District is governed by a five-member of the Board of Directors elected by the Districts' voters or appointed to a fixed term of office by the Board of Supervisors. The governing board is responsible for setting and adopting policies and management creates and implements procedures according to the adopted policies.

The District is located in Southern Humboldt County on the South Fork Eel River approximately 65 miles south of Eureka, California. The District serves 419 water connections and 347 sewer connections The District is primarily funded through water and sewer service charges, connection fees, property tax revenue, and grants.

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

- **Population Served—**2032 as of 2010 U.S. Census
- **Land Area Served—**Approximately 581 acres
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is $72,484,058
- **Land Area Owned—**36.3 acres
- **Critical Infrastructure and Equipment Owned:**
  - Eel River Infiltration Galley $255,500
  - Water Treatment Filter-1974 (1160 Hillcrest Drive) $95,300
  - Main Tank 200,000 gallons-1940 (1160 Hillcrest Drive) $150,000
  - Tank #2 20,000 gallons (Arthur Rd) $50,000
  - Tank(Robertson) 50,000 gallons—1936 $240,000
  - Tank (Alderpoint Rd) 30,000 gallons - 1970s $30,000

- Tank (Wallen Rd) 10,000 gallons—1970s $10,000
- Booster Station—Main (Hillcrest Drive) $30,000
- Booster Station (Alderpoint Rd) $15,000
- Booster Station (Wallan Rd) $15,000
- Booster Station on Oak St $15,000
- Lift Station at Meadows at Linda Ln $10,000
- Lift Station at Sunnybank $40,000
- Chlorination Facility $125,000
- Telemetry & Systems Monitoring $290,000
- Water Transmission Lines $3,168,000

- **Total Value of Critical Infrastructure and Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $4,583,800
- **Critical Facilities Owned:**
  - Pump House / Storage Pine St $60,000
  - Wastewater Treatment Building $321,000
  - Water Treatment Facility $331,600
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $712,000
- **Current and Anticipated Service Trends—**Growth in the next 20 years within the District is anticipated to be low. The District contains mostly low and medium density residential and commercial uses in the downtown area, with limited available land for urban-type development. The existing infrastructure that serves this area was installed in the early 30s and is deteriorated. The District has identified capital improvement projects needed to replace the deteriorated infrastructure.

28.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 28-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Landslides	NA	12/26/2010	$7923.00
Landslides	DR# 201001	01/09/2010	$8267.00
Severe winter storms,	DR-1628	02/03/2006	$19,633
Storm/Flood	N/A	2002	$17,541
Severe winter storms, flooding	DR-1203	2/9/1998	$13,721
Severe winter storms, flooding	DR-1155	1/4/1997	$35,500
Winter storms, flood	DR-1044	1/9/1995	$13,757
Storm	*N/A*	1989	$8,504
Flood	DR-758	2/21/1986	$8,052
Storm/Flood	*N/A*	1982	$7,576

Table 28-1 lists all past occurrences of natural hazards within the jurisdiction.

28.4 HAZARD RISK RANKING

TABLE 28-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Severe Weather	42
3	Flood	36
4	Wildfire	36
5	Landslide	21
6	Drought	0
7	Tsunami	0
8	Dam Failure	0
9		

Table 28-2 presents the ranking of the hazards of concern.

28.5 APPLICABLE REGULATIONS AND PLANS

No existing codes, ordinances, policies or plans were identified that are applicable to this hazard mitigation plan.

28.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 28-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready (if applicable)	No	N/A	N/A

Classifications under various community mitigation programs are presented in Table 28-3.

28.7 HAZARD MITIGATION ACTION PLAN

TABLE 28-4.
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?
GSD1—Replace Old Redwood Water Tank							
Existing	EQ/LS/SW	1,2,3,4,5	GSD	$600,000	CIP Funds	Short term	No
GSD2—Replace Waterline Connected to Trees Though Steep Canyon							
Existing	EQ/LS/SW	1,2,3,4,5	GSD	$2 million	Grants, multiple agencies, Loan, CIP	Short term	No
GSD3—Map Water and Wastewater System							
Existing and New	EQ/LS/SW/F	1,2,3,4	GSD	$23,000	Operating Budget	Long term, Ongoing	Yes
GSD4—Educate Public in Awareness, Preparation, Mitigation							
Existing	EQ/LS/SW/F	3,5,6	GSD	$15,000	Operating Budget	Long term	Yes
GSD5—Consider store water/captured water Techniques							
New	EQ/LS/SW/F	1,2,	GSD	$75,000	Operating Budget	Long term	Yes
GSD6-Support countywide initiatives identified in volume 1 of this plan							
New and Existing	All Hazards	All Objectives	GSD	Low	GSD	Ongoing	No

Table 28-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

28.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 28-5.
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]
GSD1	5	High	Low	Yes	Yes	Yes	High
GSD2	5	High	High	Yes	Yes	No	Med
GSD3	4	High	Low	Yes	Yes	Yes	High
GSD4	3	Med	Low	Yes	No	Yes	Med
GSD5	2	High	Low	Yes	No	No	Low
GSD6	12	Medium	Low	Yes	No	Yes	high

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

Table 28-5 identifies the priority for each initiative.

28.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 28-6.
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	GSD3,GSD6	GSD1, GSD2	GSD4, GSD6		GSD3, GSD5, GSD6	
Severe Weather	GSD3,GSD6	GSD1, GSD2	GSD4, GSD6		GSD3, GSD5, GSD6	
Flood	GSD3, GSD4, GSD6		GSD4, GSD6		GSD4, GSD5, GSD6	
Wildfire	GSD5, GSD6	GSD1, GSD2	GSD4, GSD6		GSD4, GSD5, GSD6	
Landslide	GSD6	GSD1, GSD2	GSD3, GSD4, GSD6		GSD3, GSD4, GSD6	
Dam Failure	--	--	--	--	--	--
Drought	--	--	--	--	--	--
Tsunami	--	--	--	--	--	--

a. See Chapter 1 for description of mitigation types.

Table 28-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

28.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 28-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
GSD1	✓			Data Transferred to District GIS.- Ongoing—Changed to Long Term - Changed to GSD3
GSD2		✓		Change to Long Term—Ongoing—Change to GSD5
GSD3		✓		Change to Long Term—Ongoing—Change to GSD4
GSD4	✓			Is Part Of Water Treatment Plant Project—Will be Completed Within the Next Year
GSD5	✓			Completed in 2013

Table 28-7 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.

CHAPTER 29.
HUMBOLDT BAY HARBOR, RECREATION AND CONSERVATION DISTRICT UPDATE ANNEX

29.1 HAZARD MITIGATION PLAN POINT OF CONTACT

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29.2 JURISDICTION PROFILE

The Humboldt Bay Harbor, Recreation and Conservation District was formed by an act of the State of California legislature in 1970 and ratified by the local electorate in 1973. The Harbor District's purpose is to promote the orderly development of commerce, fisheries, navigation, recreation and the protection of the Humboldt Bay environment as defined in the District's enabling legislation contained in Appendix II of the California Harbors and Navigation Code. The territory of the Harbor District is all of Humboldt County and is governed by five elected Commissioners that share the same division boundaries as the Humboldt County Board of Supervisors. The District has development regulation authority over all of Humboldt Bay. The District presently has 14 full-time employees that oversee the operation and maintenance of Woodley Island Marina, Fields Landing Boat Yard, Redwood Marine Terminal, Retired Pulp Mill Site, Park Street Marsh, King Salmon Beach and the Shelter Cove Boat Launching Facility.

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

- **Population Served—**134,623 as of 2010
- **Land Area Served—**All of Humboldt County
- **Value of Area Served—**$5,828,497,443
- **Land Area Owned—**172 Acres
- **Critical Infrastructure and Equipment Owned:**
  - (4) Vessels, (1 Fire/Rescue Boat)
  - Sewer pump station
  - 48-kw generator—fire water storage tank and pumps
  - 1 ton and 2-ton hoists—~700' submerged pressure sewer line
  - Wacker light tower—gas line, electrical line and phone
  - 150 ton—fish cleaning station and outfall pipe
  - Towed array sonar
  - Security zone buoys

  - Travelift
  - emergency communications
  - oil spill response equipment
  - (6) service/security vehicles
- **Total Value of Critical Infrastructure and Equipment—**$5,225,030
- **Critical Facilities Owned:**
  - Redwood Marine Terminal (Berth 1—1,1100 foot wooden wharf, Berth 2—1,000 foot wooden pier; pump dock; five warehouses (~67,000 SF); ~ 20 acres paved laydown area; 2.3 miles paved road)
  - Woodley Island Marina (Government office complex; restaurant; 10 docks with slips and utilities; work dock)
  - Fields Landing Boat Yard (Travelift storage building with office and shop; two Travelift piers)
  - Shelter Cove Boat Launch Facility (concrete launch ramp; rock breakwater; paved access road)
  - King Salmon (two rock groins)
  - Samoa Pulp Mill Property. Retired pulp mill property undergoing clean up that consists of: three warehouses, multiple office spaces, multiple machine rooms, vehicle service shop, power substation with 60,000 step-down transformer, Emergency/fire response vehicle, water tank, multiple firefighting pumps and firefighting equipment, recovery boiler with generator, 2 heavy lift cranes, water and chemical storage tanks.
- **Total Value of Critical Facilities—**$103,360,000
- **Current and Anticipated Service Trends—**Growth is expected in the harbor, recreation and conservation sectors of Harbor District responsibility. Humboldt Bay is one of 11 publicly-owned deep water ports in the State of California. Goods movement demands are expected to grow statewide. Humboldt Bay presently contains approximately 1,000 acres of underutilized coastal dependent industrial property that is available to meet these goods movement challenges. Several new recreational and commercial projects and project planning are underway that will grow the recreational and commercial use of Humboldt Bay and Shelter Cove. These projects include the transformation, cleanup and development of the former LP pulp mill into the National Marine Research and Innovation Park, initiation of water trails program, Aquaculture expansion projects, possible build of an RV park and several boat launch ramp improvement projects. Presently a number of wetland restoration projects are either planned or underway. All of these that touch the bay will require development permitting and oversight by the Harbor District.

29.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 29-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Tsunami	N/A	3/33/2011	No Physical damage, Woodley Island evacuated tenants and employees of the District. Tsunami observed no damage.
Severe weather	N/A	12/31/2005	Building 14, Redwood Marine Terminal Major roof and building damage $155,000. Damage to dock facility Fields Landing Boat Yard. Damage to Breakwater Woodley Island Marina $75,000.
Severe weather	DR-1203	2/6/1998	7.75 million countywide
Earthquake	DR-942	04/25,26/1992	Magnitude 7.1, 6.6 and 6.7 within 24 hour period. Private property damage occurred, but the total value is not known. It is believed to have been quite widespread. See http://www.ngdc.noaa.gov/nndc/struts/results?eq_0=5&t=101634&s=0&d=1

Table 29-1 lists all past occurrences of natural hazards within the jurisdiction.

29.4 HAZARD RISK RANKING

TABLE 29-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Severe Weather	45
2	Earthquake	45
3	Flood	24
4	Tsunami	24
5	Landslide	24
6	Wildfire	12
7	Dam Failure	9
8	Drought	0
9	Fish Loss	0

Table 29-2 presents the ranking of the hazards of concern.

29.5 APPLICABLE REGULATIONS AND PLANS

No existing codes, ordinances, policies or plans were identified that are applicable to this hazard mitigation plan.

29.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 29-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 29-3.

29.7 HAZARD MITIGATION ACTION PLAN

TABLE 29-4.
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 HB-1—Removal of Hazardous Liquids and Materials from Retired Pulp Mill Property							
New and Existing	Severe Storm, Tsunami, Earthquake	01,02,03, 09	HBHD	$3 million	HBHD loan from Coast Seafoods, PDM, HMGP	Short Term	No
Initiative HB-2—Float Replacement Woodley Island Marina							
Existing	Severe Storm, Tsunami	01,02	HBHD	$2 million	HBHD, PDM, HMGP	Long Term	No
Initiative HB-3—Local Dredge Purchase for Sediment/Shoaling Management							
New	Severe Storm, Tsunami	01,03,04	HBHD, City of Eureka	$1.5 million	HBHD, City of Eureka, Private Dock Owner/Operators, PDM, HMGP	Long Term	No
Initiative HB-4—Installation of Floating Breakwater on East End of Woodley Island Marina							
New	Severe Storm, Flooding	01,02	HBHD	$1 million	HBHD, CA Dept. of Boating and Waterways, PDM, HMGP	Long Term	Yes
Initiative HB-5—Rebuild/Retrofit Redwood Marine Terminal Berth 2 Convert to Public Dock Facility							
New and Existing	Severe Storm, Earthquake	01,02,03	HBHD	$25 million	HBHD, EDA Funding, Tiger Grant, PDM, HMGP	Long Term	No
Initiative HB-6—Rebuild/Retrofit Redwood Marine Terminal Berth 1							
Existing	Severe Storm, Earthquake, Tsunami	01,02,03	HBHD	$50 million	HBHD, EDA funding, Tiger Grant, PDM, HMGP	Long Term	Yes
Initiative HB-7—Dike Rebuild in Preparation for Sea Level Rise							
New and Existing	Flooding, Severe Storm, Tsunami	01,02,03	HBHD	$25 million	HBHD, PDM, HMGP	Long Term	No
Initiative HB-8—Shoreline Protection/Replenishment Fields Landing Boat Yard							
Existing	Flooding, Severe Storm, Tsunami	01,02,03	HBHD	$1 million	HBHD, PDM, HMGP	Long Term	no
Initiative HB-9—Support countywide initiatives identified in Volume 1 of this plan.							
New and Existing	All Hazards	All Objectives	HBWD	Low	HBWD	Ongoing	No

Table 29-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

29.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 29-5.
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	2	High	Medium	Yes	Yes	Yes	High
2	2	Medium	High	No	Yes	No	Low
3	2	High	Medium	Yes	Yes	No	High
4	2	Medium	High	No	Yes	No	Low
5	2	Medium	High	Yes	Yes	No	Medium
6	3	Medium	High	Yes	Yes	No	Low
7	3	Medium	High	Yes	Yes	No	Medium
8	3	Medium	High	Yes	Yes	No	Medium
9	12	Medium	Low	Yes	No	Yes	High

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

Table 29-5 identifies the priority for each initiative.

29.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 29-6.
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
Flooding	HB-1, HB-4, HB-5, HB-6, HB-7, HB-8, HB-9	HB-1, HB-2, HB-6, HB-7, HB-8	HB-1, HB-7, HB-9	HB-7, HB-8	HB-9	HB-2, HB-7, HB-8
Tsunami	HB-1, HB-2, HB-4, HB-5, HB-6, HB-7, HB-8, HB-9	HB-1, HB-2, HB-6, HB-7, HB-8	HB-1, HB-7, HB-9	HB-7, HB-8	HB-9	HB-2, HB-7, HB-8
Severe Storm	HB-1, HB-5, HB-6, HB-7, HB-8, HB-9	HB-1, HB-2, HB-6, HB-7, HB-8	HB-1, HB-7, HB-9	HB-7, HB-8	HB-9	HB-2, HB-7, HB-8
Earthquake	HB-1, HB-5, HB-6, HB-9	HB-1, HB-2, HB-6, HB-7, HB-8	HB-1, HB-9		HB-9	HB-2, HB-7, HB-8
Landslide	—	—	—	—	—	—
Wildfire	HB-1, HB-5, HB-6, HB-9	HB-1, HB-6, HB-7	HB-1, HB-9		HB-9	
Dam Failure	—	—	—	—	—	—

a. See Chapter 1 for description of mitigation types.

Table 29-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

29.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 29-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
1	x			Worked with NOAHH and the Harbor Safety Committee to establish Best Practices for Earthquakes and Tsunamis. Tsunami siren installed on Woodley Island.
2	x			Building 14 at the Redwood Terminal Berth 1 removed after storm damage Jan 2013.
3	x			Breakwater at Woodley Island Marina rebuilt 2007
4	x			Pilings on the work dock were sleeved and reinforced, new decking was put on the work dock, 2009.
5	x			2011 breakwater rebuild completed Shelter Cove 2010
6		x		
7		x		
8		x		
9	x			Fields Landing berth Decking removed after storm damage

Table 29-7 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.

CHAPTER 30.
HUMBOLDT BAY MUNICIPAL WATER DISTRICT UPDATE ANNEX

30.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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30.2 JURISDICTION PROFILE

The Humboldt Bay Municipal Water District was formed on March 19, 1956 pursuant to the California Municipal Water District Act. It is a special district created to develop a regional water system to provide a reliable supply of drinking and industrial water to customers in the greater Humboldt Bay area of Humboldt County. The District's governing body is its Board of Directors which has adoptive powers. This board will assume the responsibility for the adoption and implementation of this plan. The District has 25 employees—6 at the Eureka office, 19 at the operations center near Essex, and 1 at the District's Ruth Lake facilities. Operations are primarily funded by charging costs incurred to its customers for water delivered.

The District has two separate and distinct pipeline systems—one delivers treated drinking water and the other untreated raw water. The District supplies treated drinking water on a wholesale basis to the following 7 municipal agencies: the cities of: Arcata, Eureka and Blue Lake; and the community services districts of: Fieldbrook-Glendale, Humboldt, Manila and McKinleyville. Via this wholesale relationship, the District serves water to a population of approximately 80,000. The District also directly serves treated drinking water to approximately 200 retail customers. The District supplies untreated, raw water on a wholesale basis to industrial customers located on the Samoa Peninsula for industrial purposes. Revenue generated from fees for service fund the District operations. Currently, the District does not serve any industrial customers. However, we are working diligently to market this resource.

The District's service area is the greater Humboldt Bay area, including the community of McKinleyville to the north, College of the Redwoods to the south, and the City of Blue Lake to the east. The map and legal description of the District's boundary has been attached.

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

- **Population Served—**Approximately 80,000 (via 7 wholesale municipal customers and 200 retail customers). As of 2010.
- **Land Area Served—**225,000 acres, or 350 square miles
- **Value of Area Served—**The estimated value of the area served by the jurisdiction $7,111,057,968 (Tax Year 2012).
- **Land Area Owned—**approximately 2,600 acres

- **Critical Infrastructure and Equipment Owned:**
  - R.W. Matthews Dam/Ruth Reservoir [$100,000,000]
  - Gosselin Hydro-Electric Power House [$25,000,000]
  - John Winzler Diversion, pumping, and control facilities [$7,500,000]
  - Treatment and storage facilities [$20,400,000]
  - Pipeline systems (35 miles of pipe) [$75,000,000]
- **Total Value of Critical Infrastructure and Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $227,900,000 (scheduled value for insured items only); Hundreds of millions of dollars to replace critical infrastructure.
- **Critical Facilities Owned:**
  - Eureka Office Building (Alternate EOC) [$630,000]
  - Essex Control Building (Alternate EOC) [$375,000]
  - Ruth Headquarters Building [$210,000]
  - Turbidity Reduction Facility [$10,400,000]
- **Total Value of Critical Facilities—**The total value of critical facilities owned by the jurisdiction is $12,000,000 (scheduled value for insured items only)
- **Current and Anticipated Service Trends—**Meter service growth

30.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 30-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Flood	DR-183	12/24/1964	Significant-amount unknown
Drought	EM-3023	1977	Minimal (short duration)
Earthquake	N/A	Dec 1994	$7,000
Winter storms, flooding, landslides, mud flows	DR-1044	1/9/1995	$22,500
Severe winter storms, flooding	DR-1046	3/12/1995	$97,000
Severe Weather	N/A	12/12/1995	$115,000
Severe winter storms, flooding	DR-1155	1/4/1997	$204,500
Severe winter storms, flooding	DR-1203	2/9/1998	$59,000
Flooding, severe winter storms, and landslides	M#1628	02/03/2006	$84,000

Table 30-1 lists all past occurrences of natural hazards within the jurisdiction.

30.4 HAZARD RISK RANKING

TABLE 30-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	48
2	Flood	30
3	Dam Failure	24
4	Severe Weather	22
5	Tsunami	21
6	Landslide	12
7	Wildfire	6
8	Drought	6
9	Volcano (Ash Fall)	0

Table 30-2 presents the ranking of the hazards of concern.

30.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- California Department of Public Health
- California and U.S. Environmental Protection Agencies
- Federal Energy Regulatory Commission
- Army Corp of Engineers
- California Environmental Quality Act
- Federal Endangered Species Act
- California Coastal Commission

30.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 30-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready (if applicable)	No	N/A	N/A

Classifications under various community mitigation programs are presented in Table 30-3.

30.7 HAZARD MITIGATION ACTION PLAN

Table 30-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

TABLE 30-4.
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 HBMWD-1A—Install 3 emergency interties to improve supply reliability to Cities of: Arcata, Eureka, McKinleyville CSD.							
New	Earthquake	2,3,9	HBMWD	$3.6 M	California Department of Public Health Prop 50 Drinking Water Grant	Short-term	Yes
Initiative HBMWD-1B—Replace water transmission pipeline over the Mad River which serves City of Blue Lake and Fieldbrook-Glendale CSD to improve supply reliability							
Existing	Earthquake, Flood	2,3,9	HBMWD	$3.6 M	FEMA HMGP Grant & DWR Prop 84 NCIRWMP Grant	Short - term	Yes
Initiative HBMWD-2—Acquire Emergency Response Equipment—K Rails and Traffic Plates							
New	All Hazards	4,5	HBMWD	$20,000	District Funds	Completed	Yes
Initiative HBMWD-3—Acquire Support Equipment for Emergency Operation Centers at Essex, Korblex and Eureka							
New	All Hazards	4,5	HBMWD	$25,000	District Funds	Completed	Yes

TABLE 30-4.
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 HBMWD-4—Conduct public awareness education regarding hazards affecting water supplies							
Existing	All Hazards	6,7	Humboldt County		County & participating cities & districts	Ongoing	Yes
Initiative HBMWD-5—Conduct design and feasibility studies for construction of critical infrastructure / facilities							
Existing	Earthquake, Flood, Landslide, Severe Weather, Tsunami	2,3,9	HBMWD	$250,000	District Funds	Ongoing	Yes
Initiative HBMWD-6—Replace Techite domestic water transmission pipeline on Samoa Peninsula to improve supply reliability							
Existing	Earthquake	2,3,9	HBMWD	$4 M	FEMA HMGP grant & District Funds	Short term	Yes
Initiative HBMWD-7—Replace critical isolation valves on domestic transmission system (one from Collectors 1,3 and 4 and one from Collector 2)							
Existing	Earthquake, Flood	2,3,9	HBMWD	$60,000	District Funds	Short term	No
Initiative HBMWD-8—Install cut-out disconnects on District's 12-kv electric distribution system to isolate outages & improve water supply reliability.							
New	Earthquake, Severe Weather	2,3,9	HBMWD	$3,000	District Funds	Short term	No
Initiative HBMWD-9—Install emergency supply connection to Collector system at Essex (to access raw Collector water in an emergency which damages transmission system)							
Existing	Earthquake, Flood	4,5	HBMWD	$11,000	District Funds	Short term	No
Initiative HBMWD-10—Replace Laterals and Pumps/Motors in Ranney Collector 3							
Existing	Earthquake	2,3,9	HBMWD	$1.5 M	District Funds	Short term	No
Initiative HBMWD-11—Replace Laterals and Pumps/Motors in Ranney Collectors 1,2 or 4							
Existing	Earthquake	2,3,9	HBMWD	$6 M	District Funds	Long term	No
Initiative HBMWD-12—Replace Transformers on Collectors 1,2 and 4							
Existing	Earthquake	2,3,9	HBMWD	$475,000	District Funds	Long term	No
Initiative HBMWD-13—Replace Transformers on Collectors 3							
Existing	Earthquake	2,3,9	HBMWD	$160,000	District Funds	Long term	No

TABLE 30-4.
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 HBMWD-14—Remove existing Surge Tower and replace with alternate surge protection on industrial water system on Samoa Peninsula (to protect domestic water supply)							
Existing	Earthquake, Tsunami, Severe Weather	2,3,9	HBMWD	$600,000	FEMA HMGP or District Funds	Long term	No
Initiative HBMWD-15—Replace or retrofit Mad River Slough Single Pipeline Crossing							
Existing	Earthquake, Tsunami	2,3,9	HBMWD	$2 M	FEMA HMGP or District Funds	Long term	No
Initiative HBMWD-16—Replace Logboom at R.W. Mathews Dam (Ruth Reservoir) to improve dam safety							
Existing	Dam Failure	2,3,9	HBMWD	$115,000	District Funds	Short term	No
Initiative HBMWD-17—Develop Dam Contingency Failure Plan & Implement recommended action re: notification & evacuation systems							
New	Dam Failure	3,5,6,9	HBMWD/ Trinity County / Humboldt County	$100,000	FEMA HMGP and local agency funds	Long term	No
Initiative HBMWD-18—Retrofit or replace spillway wall at R.W. Matthews Dam							
Existing	Dam Failure, Earthquake	2,3,9	HBMWD	$ 2 M	FEMA HMGP or District Funds	Long term	No
Initiative HBMWD-19—Continue to support countywide initiatives identified in this plan							
New & Existing	All Hazards	All Objectives	County	Low	District Funds	Short term Ongoing	No
Initiative HBMWD-20—Replace sand dunes covering water transmission line on Samoa Peninsula							
New	Severe Weather, Tsunami	2	HBMWD	$500,000	FEMA HMGP or District Funds	Long term	No

30.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 30-5.
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]
1A	3	High	High	Yes	Yes	No	High
1B	3	High	High	Yes	Yes	No	High
2	2	Low	Medium	No	No	Yes	Medium
3	2	Low	Medium	No	No	Yes	Medium
4	2	Medium	Medium	Yes	No	No	Low
5	3	Medium	Medium	Yes	Yes	Yes	High
6	3	High	High	Yes	Yes	Yes	High
7	3	High	Low	Yes	Yes	Yes	High
8	3	High	Low	Yes	Yes	Yes	High
9	2	High	Low	Yes	Yes	Yes	High
10	3	Medium	High	Yes	No	Yes	Low
11	3	Medium	High	Yes	No	No	Low
12	3	High	High	Yes	Yes	No	High
13	3	High	Low	Yes	Yes	Yes	High
14	3	High	High	Yes	Yes	No	Low
15	3	Low	High	No	Yes	No	High
16	3	High	Low	Yes	Yes	Yes	High
17	4	High	Medium	Yes	Yes	No	Low
18	3	High	High	No	Yes	No	High
19	12	Medium	Medium	Yes	No	No	Medium
20	1	Medium	Medium	Yes	Yes	No	Medium

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

Table 30-5 identifies the priority for each initiative.

30.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 30-6.
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	HBMWD-5, HBMWD-19	HBMWD-1A, HBMWD-1B, HBMWD-6, HBMWD-7, HBMWD-8, HBMWD-12, HBMWD-13, HBMWD-18, HBMWD-19	HBMWD-4, HBMWD-19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD-7, HBMWD-8, HBMWD-9, HBMWD10, HBMWD11, HBMWD12, HBMWD13, HBMWD14, HBMWD15, HBMWD18, HBMWD19
Flood	HBMWD-5, HBMWD-19	HBMWD-1B, HBMWD-7, HBMWD-19	HBMWD-4, HBMWD-19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD-8, HBMWD-9, HBMWD19
Severe Weather	HBMWD-5, HBMWD-19	HBMWD-8, HBMWD-19	HBMWD-4, HBMWD-19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD-8, HBMWD14, HBMWD19
Tsunami	HBMWD-5, HBMWD-19	HBMWD-19	HBMWD-4, 19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD14, HBMWD15, HBMWD19
Drought	HBMWD-19	HBMWD-19	HBMWD-4, HBMWD-19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD19
Dam Failure	HBMWD-16, HBMWD-17, HBMWD-19	HBMWD-18, HBMWD-19	HBMWD-4, HBMWD-19	HBMWD-16, HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-17, HBMWD-19	HBMWD16, HBMWD18, HBMWD19
Landslide	HBMWD-5, HBMWD-19	HBMWD-19	HBMWD-4, HBMWD-19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD19
Wildfire	HBMWD-19	HBMWD-19 HBMWD-20	HBMWD-4, HBMWD-19	HBMWD-19	HBMWD-2, HBMWD-3, HBMWD-19	HBMWD19

a. See Chapter 1 for description of mitigation types.

Table 30-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

30.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 30-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action #	Action Status: Completed	Action Status: Carry Over to Plan Update	Action Status: Removed; No Longer Feasible	Comments
1		✓		Segregated into Items 1A & 1B in Plan Update.
1A		✓		Partially completed. Construction beginning in 2013.
1B		✓		Underway.
2	✓			Completed.
3	✓			Completed.
4		✓		Partially completed. Ongoing public awareness.
5		✓		Partially completed. Various studies completed.
6		✓		Permitting process underway.

Table 30-7 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.

30.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

More detailed information concerning the impacts of Seismic, Tsunami, and Climate Change and how they will affect not only HBMWD assets and operations, but all agencies included in this plan.

CHAPTER 31.
RECLAMATION DISTRICT #768 UPDATE ANNEX

31.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

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31.2 JURISDICTION PROFILE

The Humboldt County Board of Supervisors approved a petition request (filed on March 16, 1904) to create Reclamation District #768 on May 11th, 1904. This request was recorded on August 7th, 1905. The purpose of the Reclamation District was to maintain a series of previously constructed dykes that enclosed 1,499 acres of agricultural lands and protected them from saltwater inundation from Humboldt Bay and the tidal sloughs, titled Mad River and Daniels. The District is governed by Board of Trustees with assessment funds collected on as-needed basis through the County Treasurer and placed in a separate fund designated as the "Maintenance Fund of Reclamation District #768." Funds are paid out upon warrants of the Trustees of the District.

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

- **Population Served—**less than 20 residents as of 2013, protects agriculture lands
- **Land Area Served—**1,500 acres
- **Value of Area Served—**The estimated value of the area served by the jurisdiction is approximately $2 Billion in assessed value within the service area.
- **Land Area Owned—**Levee, 4.9 mile long x 30 feet footing.
- **Critical Infrastructure and Equipment Owned:**
  - Floodgates
  - Levee
  - Fences and Gates
- **Total Value of Critical Infrastructure and Equipment—**The total value of critical infrastructure and equipment owned by the jurisdiction is $30,000,000.
- **Critical Facilities Owned:**
  - Facilities are privately owned.
- **Total Value of Critical Facilities—**Property owner's personal improvement values
- **Current and Anticipated Service Trends**—Based on the data tracked by the California Department of Finance, Unincorporated Humboldt County has experienced a relatively flat rate of growth. The overall population has increased only 4.1% since 2000 and has averaged

0.73% per year from 1990 to 2007. Considering these historical trends and future population projections produced by the state, anticipated development trends for the planning area are considered low, consisting primarily of residential development.

The current services of this district are centered on operation and maintenance of the flood protection levee system along the Mad River Slough and North Humboldt Bay. There are currently no immediate plans or needs for expansion of this system, or do the anticipated growth trends suggest a need to do so.

31.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 31-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Weather (Landslide)	N/A	3/30/2011	N/A
Tsunami	N/A	3/11/2011	N/A
Tsunami	N/A	2/27/2010	N/A
Earthquake	N/A	1/9/2010	N/A
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	N/A
Earthquake	N/A	2/26/2007	N/A
Tsunami	N/A	1/12/2007	N/A
Flooding, severe winter storms, and landslides	DR-1628	02/03/2006	$6,000,000 in district damages $20,28,206 countywide
Severe Weather (Funnel Cloud, Orick)—Levee Breach	N/A	12/07/2003	N/A
Flood	DR-183	12/24/1964	Losses in the millions, countywide

Table 31-1 lists all past occurrences of natural hazards within the jurisdiction.

31.4 HAZARD RISK RANKING

TABLE 31-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Flood	48
3	Severe Weather	42
4	Tsunami	24
5	Dam Failure	12
6	Landslide	0
7	Drought	0
8	Wildfire	0
9	Other Hazards of Concern	0

Table 31-2 presents the ranking of the hazards of concern.

31.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- Levee Reconstruction Specifications—Oscar Larson Engineers, Plan

31.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 31-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	N/A	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready (if applicable)	No	N/A	N/A

Classifications under various community mitigation programs are presented in Table 31-3.

31.7 HAZARD MITIGATION ACTION PLAN

TABLE 31-4.
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— Continue ongoing levee maintenance and flood gate upkeep. Active maintenance helps to ensure levee integrity and levees' ability to withstand impacts from hazard events such as flood, tsunami, earthquake and severe weather.							
Existing	Earthquake, Flood, Severe Weather, Tsunami	1, 2, 8, 9	District	Medium	District Funds	Short-term, Ongoing	Yes
Initiative RD-2—Levee Raising/Tsunami Ready Certification							
Existing	Flood, Severe Weather, Tsunami	1, 2, 9	District	High	District Funds	Long-term	Yes
Initiative RD-3—Levee Improvements for Storm Ready Certification							
Existing	Flood, Severe Weather Severe Weather, Tsunami	1, 2, 9	District	High	District Funds	Long-term	Yes
Initiative RD-4—Participate in the Hazard Mitigation Plan ongoing partnership to share resources and updates							
Existing	Earthquake, Flood, Severe Weather, Tsunami	7, 8, 12	District	Low	District Funds	Ongoing	No
Initiative RD-5—Support countywide initiatives identified in Volume 1 of this plan.							
New and existing	All Hazards	All Objectives	District	Low	District	Ongoing	No
Initiative RD-6— Coordinate with agency partners to identify and fund needed levee upgrades to mitigate potential damage from flood, earthquake, or tsunami. This can be accomplished via the Corps of Engineers' System Wide Improvement Framework (SWIF) initiative under the PL 8499 program.							
New and existing	Flood, Earthquake, Tsunami	1, 2, 3, 9,	District and Agency Partners	Low	District, SWIF funding	Short term/ Ongoing	No

Table 31-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan. Note: Levees are the primary infrastructure for which the Reclamation District is responsible. Actions that mitigate the impacts of earthquakes on earthen levees are limited. It is widely accepted in the field of emergency management that earthen levees will fail when significant seismic activity occurs nearby. It is also widely accepted that a poorly maintained levee will perform worse in a seismic event than a well maintained levee. Therefore, the following action plan focuses on maintenance of the levees as well developing preparedness response protocols for levee failures.

31.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 31-5.
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	4	High	Medium	Yes	No	Yes	High
RD-2	3	High	High	Yes	Yes	No	Medium
RD-3	3	High	High	Yes	Yes	No	Medium
RD-4	3	High	Low	Yes	No	Yes	High
RD-5	12	Medium	Low	Yes	No	Yes	High
RD-6	4	Medium	Low	Yes	No	Yes	High

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

Table 31-5 identifies the priority for each initiative.

31.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 31-6.
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	1, 4, 5, 6	1, 4, 6	4	1, 4	1, 5	1, 6
Flood	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 6	4	1, 2, 3, 4	1, 5	1, 6
Tsunami	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 6	4	1, 2, 3, 4	1, 5	1, 6
Severe Storm	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5	4	1, 2, 3, 4	1, 5	1, 6
Landslide	--	---	--	--	--	--
Drought	--	--	--	--	--	--
Wildfire	--	--	--	--	--	--
Dam Failure	--	---	--	--	--	--

a. See Chapter 1 for description of mitigation types.

Table 31-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

31.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 31-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
RD-1	✓			Action is ongoing. Levees and flood gates are continuously monitored and undergo maintenance when necessary. The Levee system is currently in good shape. No major work is needed.
RD-2		✓		We have a very small District but will continue to partner to see if we an obtain Tsunami Ready Certification.
RD-3		✓		We have a very small District but will continue to partner to see if we an obtain Flood Ready Certification.

Table 31-7 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.

CHAPTER 32.
SHELTER COVE RESORT IMPROVEMENT DISTRICT NO. 1 UPDATE ANNEX

32.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
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32.2 JURISDICTION PROFILE

The Resort Improvement District No. 1 (RID) is located on the Pacific coast 23 miles west of Garberville and was formed in February 1965 pursuant to the provisions of Division 11 of the Public Resources Code to provide services to Shelter Cove inhabitants including water, electric, wastewater treatment, fire and rescue protection, recreation and airport operation and maintenance. The RID is governed by a publicly elected five member Board of Directors and is staffed by 13 employees. This board will assume the responsibility for the adoption of this plan. The RID is funded by revenues generated primarily from water, electric, and wastewater rates, assessments, and property taxes. The current population of Shelter Cove is approximately 1030 with an increase of approximately 500 in the summer months in the motels and campground.

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

- **Population Served—**The Shelter Cove community has a population of approximately 693 full-time residents (2010 Census) and an approximate additional 300 part-time and/or transient residents. Major holidays can bring as many as 500-700 tourists to Shelter Cove. The general population consists of a large number of retirees.
- **Land Area Served—**The RID owns approximately 1,200 acres of land which is either greenbelt or is used to provide services or recreation. The RID serves Shelter Cove which covers a 2640 acre area. Shelter Cove has approximately 4170 private taxable lots and 176 public tax exempt lots with the remainder designated as greenbelt.
- **Value of Area Served—**Valuation based upon real property taxes is approximately $245 million. Additional land value (greenbelts, airport, etc.) is an additional approximately $22 million.
- **Land Area Owned—**The RID owns approximately 1,200 acres of land which is either greenbelt or is used to provide services or recreation. The RID serves Shelter Cove which covers a 2640 acre area. Shelter Cove has approximately 4170 private taxable lots and 176 public tax exempt lots with the remainder designated as greenbelt.
- **Critical Infrastructure and Equipment Owned:**
  - 1 NPDES Wastewater treatment plant, laboratory, chemical treatment / filtration building, power distribution / stand-power building, and associated treatment ponds/tanks

  - 9 Sewer lift stations
  - Approximately 22 miles of sewer mains
  - 1 Water treatment plant, reservoir, dam, and water intake facilities
  - 13 Water Wells
  - 11 Water storage tanks
  - 13 Booster pump stations
  - Approximately 40 miles of water mains
  - 1 Electric Power Distribution plant with 3 each 600-kW diesel stand-by generators, generator building, power equipment storage building, and 3 480-V transformers w/switching gear
  - Approximately 30 miles of electrical power lines and poles
  - 3 Firefighting Trucks and associated equipment
  - 1 Foam fast attack 4x4 P/U
  - 1 Ambulance
  - 1 Rescue boat
- **Total Value of Critical Infrastructure and Equipment—**$18,918,000, with an estimated replacement value of $42 million.
- **Critical Facilities Owned:**
  - 1 Fire station/District office
  - Power Distribution Facility
  - Wastewater Treatment Facilities and office
  - Water Treatment Facilities
  - 3400-foot Airport
- **Total Value of Critical Facilities—**$1,350,000 with an estimated replacement value of $2 million.
- **Current and Anticipated Service Trends—**The RID has been growing at a rate of approximately 25 connections per year over the last 10 years with the majority of the growth in the lower more desirable area of the Cove, and this area is connected to the sewer system as lots outside of this area rely on septic systems. Although there is anticipation for this trend to continue, the recent economic downturn has reduced the number of new connections to less than 10 per year. The RID Board of Directors recently approved a $14 million 10 year capital improvement plan that will be used to facilitate expanding the District's electric infrastructure, water source and storage capacity, water treatment and water delivery infrastructure.

32.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 32-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Wildfire	N/A	7/4/2013	Approximately 5 acres of RID greenbelt burned with smoke and heat damage to two homes immediately adjacent to the greenbelt, with total damages at approximately $100,000
Severe Weather	N/A	12/31/2005	$16,111 to RID facilities, private property damage occurred but value of damage unknown.
Severe Weather	N/A	2/25/2004	$31,500 to RID facilities, private property damage occurred but value of damage unknown.
Wildfire	N/A	9/3–10/3, 2003	(Neighboring community) King Range / Honeydew area, burning 13,668 acres.
Severe Weather	DR-1203	2/6/1998	$79,840 to RID facilities, $7.75 million countywide
Earthquake	DR-943	04/25,26/1992	Magnitude 7.1, 6.6 and 6.7 within 24 hour period. Private property damage occurred, but the total value is not known. It is believed to have been quite widespread. See http://www.ngdc.noaa.gov/nndc/struts/results?eq_0=5&t=101634&s=0&d=1
Wildfire	N/A	9/7/73–9/13/73	Although this fire (Findley) raged through the Shelter Cove Community, few homes suffered damage as firefighting efforts focused upon saving the homes, and since there were relatively fewer homes in the Cove at that time (~30), all homes were saved. 13,595 acres in the area were burned making it one of the largest fires in Humboldt County history.

Table 32-1 lists all past occurrences of natural hazards within the jurisdiction.

32.4 HAZARD RISK RANKING

TABLE 32-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Wildfire	45
3	Severe Storm	32
4	Landslide	20
5	Tsunami	12
6	Drought	8
7	Dam Failure	0
8	Flood	0
9	Volcano	0

Table 32-2 presents the ranking of the hazards of concern.

32.5 APPLICABLE REGULATIONS AND PLANS

There are no existing applicable hazard mitigation laws, codes, ordinances or policies in effect by this district that could support or enhance the mitigation initiatives identified in this annex. However, Humboldt County planning employs the following: consideration of appropriate land use designations in order to limit the populace exposed to hazardous areas; 2) assessment and conditioning of development applications according to the hazards on a site; 3) policies tailored to specific hazardous conditions; and, 4) an action program to improve overall safety conditions within the County. Furthermore, the State of California Uniform Building Code (UBC) has very strict building codes that intend to keep residents and property safe during hazard events like earthquakes, wildfires, and floods, and the Humboldt County Planning Department enforces these standards during the building application process.

32.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 32-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready	No	--	--
Firewise	No	--	--
Tsunami Ready (if applicable)	No	--	--

Classifications under various community mitigation programs are presented in Table 32-3.

32.7 HAZARD MITIGATION ACTION PLAN

TABLE 32-4.
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 RID-1—Annual power line tree trimming							
New and Existing	SW&WF	1,2,3,9	RID	$50,000 (Low)	Operating Budget	Short term Ongoing	Yes
Initiative RID-2—Building extra water storage capacity to fight fires (500,000 to 1 million gallons), (benefits exceed costs)							
New and Existing	WF	1,2,3,5,8,9	RID/BLM/ CalFire	5 million (High)	Grants, multiple agencies	Short term	Yes
Initiative RID-3—Seismic retrofits of 3 metal water storage tanks and replacement of 2 wooden tanks with metal.							
Existing	EQ&WF	1,2,3,4,5	RID	$250,000 (Medium)	Cap Ex, Grants	Short term	Yes
Initiative RID-4—Alternative Energy Systems for Sewer Treatment Plant and Water Treatment Facilities							
Existing	EQ/WF/SW	1,2,3,4,5,9	RID	$300,000 (High)	Grants, Loans	Short Term	No
Initiative RID-5—Improve Road Maintenance to increase fire break potential / ES ingress & egress							
New and Existing	WF/SW/EQ	1,2,3,4,5,8 ,9,10,11,1 2	County Public Works	$250,000 (Medium)	County Budget	Short Term	No
Initiative RID-6—Continue to support countywide initiatives identified in Volume 1, Chapter 18 of this plan.							
New and Existing	All Hazards	All Objectives	County	Low	Operating Budget	Short Term Ongoing	No

Table 32-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

32.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 32-5.
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]
RID-1	4	Medium	Low	Yes	No	Yes	High
RID-2	5	High	High	Yes	Yes	No	Medium
RID-3	5	High	Med	Yes	Yes	No	High
RID-4	6	High	High	Yes	Yes	No	High
RID-5	10	High	Med	Yes	No	Yes	Medium
RID-6	12	High	Low	Yes	No	Yes	High

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

Table 32-5 identifies the priority for each initiative.

32.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 32-6.
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	RID-6		RID-6	RID-4	RID-6	
Drought	RID-6		RID-6	RID-4	RID-6	
Earthquake	RID-6	RID-3, RID-4, RID-5	RID-6	RID-4	RID-6	
Flood	RID-6		RID-6	RID-4	RID-6	
Landslide	RID-6		RID-6	RID-4	RID-6	
Severe Weather	RID-1, RID-6	RID-4, RID-5	RID-6	RID-4	RID-6	
Tsunami	RID-6		RID-6	RID-4	RID-6	
Wildfire	RID-1, RID-2, RID-6	RID-2, RID-3, RID-4, RID-5	RID-6	RID-4	RID-6	

a. See Chapter 1 for description of mitigation types.

Table 32-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

32.10 STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 32-7.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments
2007 RID-1	✓			Completed in 2008. Vegetation cutting in greenbelt yielded new firebreak between King Range and Shelter Cove
2007 RID-2		✓		Ongoing effort; carried over as RID-1. Annual practice to protect power line coming into Shelter Cove
2007 RID-3		✓		Not started; carried over as RID-2. Modified project description - Will need to partner with adjacent agencies (BLM, Cal Fire)
2007 RID-4		✓		Ongoing effort; carried over as RID-3. Modified project description - Reduced number to the 5 tanks needing most urgent attention.
2007- RID-5	✓			Completed in 2008. Tsunami alert system completed.

Table 32-7 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.

32.11 ADDITIONAL COMMENTS

One of the greatest wildfire threats posed to this jurisdiction would be one spreading to the community from the King Range Conservation Area. Because Humboldt County Public Works does very little to clear vegetation overgrowth (roadside and canopy) from the roads in Shelter Cove, a fire will have NO problem crossing into the community from BLM lands. Roads can serve as natural fire breaks; however, in this instance they provide a conduit for a wildfire to spread.

When there is a wildfire in adjacent public lands, agencies which battle these fires come back to Shelter Cove to fill their tanker trucks, hooking up to the closest fire hydrant, typically, to the border area. This hydrant water comes from the treated drinking water supply, and Shelter Cove has a very limited supply of water available to it due to its geographic isolation. A non-potable water storage tank situated in the border area between Shelter Cove and the King Range would enhance wildfire fighting methods by putting the water source closer to BLM lands and preserving the community's drinking water supply.

Historically, the Shelter Cove community has received very little support from Humboldt County departments, and the Shelter Cove RID staff and Board of Directors are striving to improve the relationship between us. Hazard mitigation efforts are among the first priorities where we hope to improve this relationship.

CHAPTER 33.
SOUTHERN HUMBOLDT COMMUNITY HEALTHCARE DISTRICT ANNEX

33.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact
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33.2 JURISDICTION PROFILE

The Southern Humboldt Community Healthcare District (SHCHD) operates Jerold Phelps Community Hospital (JPCH), a 17 bed critical access hospital, and the Southern Humboldt Community Clinic, a rural health clinic. The hospital started in 1949 as a doctor's home with attached clinic. In 1952 a hospital addition was completed, housing patient rooms, surgery facilities, and emergency room. 1962 brought the addition of what is currently referred to as JPCH, with an expansion of emergency care areas completed in 1982. In the 1980s, voters approved a parcel tax initiative which, at current levels, provides supplemental income to cover operating losses for the district finances in excess of one million dollars yearly.

A five member publically elected Board of Directors (BOD) provides governance oversight for district strategic direction, delegating day-to-day operations of the hospital and clinic to its employee, the CEO. The BOD will assume the responsibility for the adoption of this plan and its annexation to the Humboldt Operational Area Hazard Mitigation Plan.

Current services include acute and long term Skilled Nursing care, a rural health clinic, laboratory and blood banking services, radiology and mammography, physical therapy, and normal hospital ancillary services.

In 2013 there were >2600 emergency rooms visits, and more than 16,000 total outpatient encounters. SHCHD employs approximately 50 full time equivalents, as well as multiple contracted service workers and professionals. The nearest hospitals are 70 miles to the south, in Willits, and 51 miles to the north, in Fortuna.

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

- **Population Served—**The population served in the SHCHD is over 9400 people as of the 2010 U.S. Census. The district also serves large numbers of visitors and tourists travelling the HWY 101 corridor and a transient population, primarily during summer months.
- **Land Area Served—**SHCHD covers the same geographic area as the Southern Humboldt Unified School District, or a land area of approximately 774 square miles. Makeup is that of

steep terrain, deep river valleys, large Redwood State Parks, coastal mountain ranges and a small ocean fishing and resort community.

- **Value of Area Served—**The estimated value of the area served by the jurisdiction is approximately 1.03 Billion dollars.
- **Land Area Owned—**The Southern Humboldt Community Healthcare District owns two parcels, or approximately 1.12 acres in downtown Garberville.
- **Critical Infrastructure and Equipment Owned:**
  - Medical equipment located within the hospital and clinic facilities include: surgical, laboratory and radiology equipment. Infrastructure includes hospital utilities, information technology and communications systems, emergency generator and communication systems and other necessary patient care infrastructure.
- **Total Value of Critical Infrastructure and Equipment**—$4 million
- **Critical Facilities Owned:**
  - The Healthcare District occupies a single campus, which includes the Jerold Phelps Community Hospital and Skilled Nursing facility and the Southern Humboldt Community Clinic. Total square footage is 18,343.
- **Total Value of Critical Facilities—**District facilities were valued at an estimated $2 million dollars, in a 2010 appraisal. In the event of a total loss, replacement value could reach in excess of $35 million, based upon current requirements and in consultation with our current architect.
- **Current and Anticipated Service Trends—**Utilization of district services remains constant. Current proposed additions to district services include a visiting nurse program, ultrasound and CT scanning capabilities and modernization of radiology and mammography services. The district partners with other healthcare provider agencies in the region and plans to expand these collaborative efforts. Provision of uncompensated care promises to continue to be burdensome with a related negative impact on the financial health of the district.

33.3 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 33-1.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Flooding, severe storms & landslides	DR 1628	2/3/06	District Damage Not Available $20.2 million countywide
Severe Winter Storms	DR NA	12/17/2005	District Damage Not Available Trees and Power Lines Down throughout county. HWY 101 Closed
Flooding, severe storms	N/A	12/13/2002	District Damage Not Available
Flooding, severe storms	DR-1203	2/9/98	District Damage Not Available $7.75 million countywide
Flooding, severe storms	DR-1155	1/4/97	District Damage Not Available $35 million countywide
Flooding, Severe Storms	DR-1046	3/12/1995	District Damage Not Available $1.3 million countywide
Flooding, severe storms & landslides	DR-1044	1/9/95	District Damage Not Available
Earthquake	DR-943	4/4/1992	District Damage Not Available $48.3 million countywide
Severe storms	N/A	1989	District Damage Not Available
Flood	DR-758	20/2/86	District Damage Not Available $5 million countywide
Severe storms	N/A	1982	District Damage Not Available

Table 33-1 lists all past occurrences of natural hazards within the jurisdiction.

33.4 HAZARD RISK RANKING

TABLE 33-2.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Earthquake	54
2	Flooding	48
3	Severe Weather	48
4	Landslide	39
5	Wildfire	22
6	Tsunami	8
7	Volcano	8
8	Drought	6

Table 33-2 presents the ranking of the hazards of concern.

33.5 APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- The SHCHD is regulated by the Office of Statewide Healthcare Planning and Development (OSHPOD). Local and county ordinances apply to non-OSHPOD regulated buildings.

33.6 COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 33-3.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	N/A	
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready (if applicable)	No	N/A	N/A

Classifications under various community mitigation programs are presented in Table 33-3.

33.7 HAZARD MITIGATION ACTION PLAN

TABLE 33-4.
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 SHCHD-1—California SB1953 requires construction of new facility to meet seismic standards							
New	Earthquake, Severe weather	1,2,3,4,5	SHCHD BOD	High ($35 million+)	Bonds, Grants, Tax revenue, Community Donation	Long term	N/A
Initiative SHCHD-2—Non-structural retrofit for seismic compliance (NPC2)							
Existing	Earthquake	1,2,3,4,5	SHCHD BOD	Low	Operations	Ongoing	N/A
Initiative SHCHD-3—Structural seismic retrofit of hospital facilities to SPC2 via HAZUS reclassification							
Existing	Earthquake, Severe weather	1,2,3,4,5,	SHCHD BOD	High ($900,000)	Loan, operations	Ongoing	N/A
Initiative SHCHD-4—Generator Replacement							
Existing	Earthquake, severe weather	1,2,3,4,5,	SHCHD BOD	High ($500,000)	Loan, operations, grants, community donation	Short term	N/A
Initiative SHCHD-5—Support countywide initiatives identified in volume 1 of this plan.							
New and Existing	All Hazards	All Objectives	SHCHD	Low	SHCHD	Ongoing	N/A

Table 33-4 lists the initiatives that make up the jurisdiction's hazard mitigation plan. Note: This hazard mitigation action plan does not contain flood or wildfire mitigation initiatives because the district's infrastructure is not located in an area where there is high risk to these hazards. The hospital is well away from the flood zone and is not directly adjacent to very high wildfire hazard severity zone. Furthermore, the hospital is built to a standard that will mitigate risk to ignition from nearby wildfires.

33.8 PRIORITY OF RECOMMENDED INITIATIVES

TABLE 33-5.
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	High	High	Yes	Yes	No	Medium
2	5	High	Low	Yes	Yes	Yes	High
3	5	High	High	Yes	Yes	Yes	High
4	5	High	High	Yes	Yes	No	Medium
5	12	Medium	Low	Yes	No	Yes	High

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

Table 33-5 identifies the priority for each initiative.

33.9 ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 33-6.
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	SHCHD-1,2,3,4,5	SHCHD-1,2,3,4	5		SHCHD- 1,2,3,4, 5	SHCHD-1,2,3,4
Severe Weather	SHCHD-1,3,4,5	SHCHD- 1,3,4	5		SHCHD- 1,2,3,4,5	SHCHD-1,2,3
Wildfire	5		5		5	
Drought	5		5		5	
Landslide	5	SHCHD- 1,4	5		SHCHD- 1,4, 5	SHCHD-1,2,3
Flood	5		5		5	
Tsunami	5		5		5	

a. See Chapter 1 for description of mitigation types.

Table 33-6 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

33.10 ADDITIONAL COMMENTS

The Southern Humboldt Community Healthcare District is in a position, based upon legislative action (SB 1953), which will require closure/discontinuation of all hospital and emergency related services by 2030 without construction of a seismically upgraded and compliant facility. Funding for this replacement is not yet secured, and it is not yet clear that the community can or will support such a construction project.

Projects completed and referenced in this document have moved the district hospital facility from Seismic Performance Category 1 (SPC1) to SPC2, allowing for continued provision of service to the Southern Humboldt community and public travelling to and through the region. In order to remain a viable public safety service provider, these remaining initiatives will require significant additional funding support.

APPENDIX A.
PLANNING PARTNER EXPECTATIONS

APPENDIX A.
PLANNING PARTNER EXPECTATIONS

ACHIEVING DMA COMPLIANCE FOR ALL PLANNING PARTNERS

One of the goals of the multi-jurisdictional approach to hazard mitigation planning is to achieve compliance with the Disaster Mitigation Act (DMA) for all participating members in the planning effort. DMA compliance must be certified for each member in order to maintain eligibility for the benefits under the DMA. Whether our planning process generates ten individual plans or one large plan that has a chapter for each partner jurisdiction, the following items must be addressed by each planning partner to achieve DMA compliance:

- ✓ **Participate in the process.** It must be documented in the plan that each planning partner "participated" in the process that generated the plan. There is flexibility in defining "participation." Participation can vary based on the type of planning partner (i.e.: City or County, vs. a Special Purpose District). However, the level of participation must be defined and the extent for which this level of participation has been met for each partner must be contained in the plan context.

- ✓ **Consistency Review.** Review of existing documents pertinent to each jurisdiction to identify policies or recommendations that are not consistent with those documents reviewed in producing the "parent" plan or have policies and recommendations that complement the hazard mitigation initiatives selected (i.e.: comp plans, basin plans or hazard specific plans).

- ✓ **Action Review.** For Plan updates, a review of the strategies from your prior action plan to determine those that have been accomplished and how they were accomplished; and why those that have not been accomplished were not completed.

- ✓ **Update Localized Risk Assessment.** Personalize the Risk Assessment for each jurisdiction by removing hazards not associated with the defined jurisdictional area or redefining vulnerability based on a hazard's impact to a jurisdiction. This phase will include:
    - A ranking of the risk
    - A description of the number and type of structures at risk
    - An estimate of the potential dollar losses to vulnerable structures
    - A general description of land uses and development trends within the community, so that mitigation options can be considered in future land use decisions.

- ✓ **Capability assessment.** Each planning partner must identify and review their individual regulatory, technical and financial capabilities with regards to the implementation of hazard mitigation actions.

- ✓ **Personalize mitigation recommendations.** Identify and prioritize mitigation recommendations specific to the each jurisdiction's defined area.

- ✓ **Create an Action Plan.**

- ✓ **Incorporate Public Participation.** Each jurisdiction must present the Plan to the public for comment at least once, within two weeks prior to adoption.

- ✓ **Plan must be adopted by each jurisdiction.**

One of the benefits to multi-jurisdictional planning is the ability to pool resources. This means more than monetary resources. Resources such as staff time, meeting locations, media resources, technical expertise will all need to be utilized to generate a successful plan. In addition, these resources can be pooled such that decisions can be made by a peer group applying to the whole and thus reducing the individual level of effort of each planning partner. This will be accomplished by the formation of a steering committee made up of planning partners and other "stakeholders" within the planning area. The size and makeup of this steering committee will be determined by the planning partnership. This body will assume the decision making responsibilities on behalf of the entire partnership. This will streamline the planning process by reducing the number of meetings that will need to be attended by each planning partner. The assembled Steering Committee for this effort will meet monthly on an as needed basis as determined by the planning team, and will provide guidance and decision making during all phases of the plan's development.

With the above participation requirements in mind, each partner is expected to aid this process by being prepared to develop its section of the plan. To be an eligible planning partner in this effort, each Planning Partner shall provide the following:

A. A "Letter of Intent to participate" or Resolution to participate to the Planning Team (see exhibit A).

B. Designate a lead point of contact for this effort. This designee will be listed as the hazard mitigation point of contact for your jurisdiction in the plan.

C. Support and participate in the selection and function of the Steering Committee selected to oversee the development of this plan.

D. Provide support in the form of mailing list, possible meeting space, and public information materials, such as newsletters, newspapers or direct mailed brochures, required to implement the public involvement strategy developed by the Steering Committee.

E. Participate in the process. There will be many opportunities as this plan evolves to participate. Opportunities such as:

   a. Steering Committee meetings

   b. Public meetings or open houses

   c. Workshops/ Planning Partner specific training sessions

   d. Public review and comment periods prior to adoption

At each and every one of these opportunities, attendance will be recorded. Attendance records will be used to document participation for each planning partner. No thresholds will be established as minimum levels of participation. However, each planning partner should attempt to attend all possible meetings and events.

F. There will be one ***mandatory*** workshop that all planning partners will be required to attend. This workshop will cover the proper completion of the jurisdictional annex template which is the basis for each partner's jurisdictional chapter in the plan. Failure to have a representative at this workshop will disqualify the planning partner from participation in this effort. The schedule for this workshop will be such that all committed planning partners will be able to attend.

G. After participation in the mandatory template workshop, each partner will be required to complete their template and provide it to the planning team in the time frame established by the Steering Committee. Failure to complete your template in the required time frame may lead to disqualification from the partnership.

H. Each partner will be expected to perform a "consistency review" of all technical studies, plans, ordinances specific to hazards to determine the existence of any not consistent with the same such documents reviewed in the preparation of the County (parent) Plan. For example, if your community has a floodplain management plan that makes recommendations that are not consistent with any of the County's Basin Plans, that plan will need to be reviewed for probable incorporation into the plan for your area.

I. Each partner will be expected to review the Risk Assessment and identify hazards and vulnerabilities specific to its jurisdiction. Contract resources will provide the jurisdiction specific mapping and technical consultation to aid in this task, but the determination of risk and vulnerability will be up to each partner.

J. Each partner will be expected to review and determine if the mitigation recommendations chosen in the parent plan will meet the needs of its jurisdiction. Projects within each jurisdiction consistent with the parent plan recommendations will need to be identified and prioritized, and reviewed to determine their benefits vs. costs.

K. Each partner will be required to create its own action plan that identifies each project, who will oversee the task, how it will be financed and when it is estimated to occur.

L. Each partner will be required to sponsor at least one public meeting to present the draft plan to its constituents at least 2 weeks prior to adoption.

M. Each partner will be required to formally adopt the plan.

Templates and instructions to aid in the compilation of this information will be provided to all committed planning partners. Each partner will be expected to complete their templates in a timely manner and according to the timeline specified by the Steering Committee.

**** Note**: Once this plan is completed, and DMA compliance has been determined for each partner, maintaining that eligibility will be dependent upon each partner implementing the plan implementation-maintenance protocol identified in the plan. At a minimum, this means completing the on-going plan maintenance protocol identified in the plan. Partners that do not participate in this plan maintenance strategy may be deemed ineligible by the partnership, and thus lose their DMA eligibility.**

Exhibit A

Example Letter of Intent to Participate

Humboldt Operational Area Hazard Mitigation Planning Partnership
Tetra Tech, Inc.
1420 5th Ave. Suite 600
Seattle, WA 98101-2357

Dear Humboldt County Planning Partnership,

Please be advised that the _____ (***insert City or district name***) is committed to participating in the Humboldt Operational Area Hazard Mitigation Plan Update. As the Chief Administrative Official for this jurisdiction, I certify that I will commit all necessary resources in order to meet Partnership expectations as outlined in the "Planning Partners expectations" document provided by the planning team, in order to obtain Disaster Mitigation Act (DMA) compliance for our jurisdiction.

Mr./Ms. _____ will be the district's point of contact for this process and they can be reached at ***(insert: address, phone number and e-mail address)***.

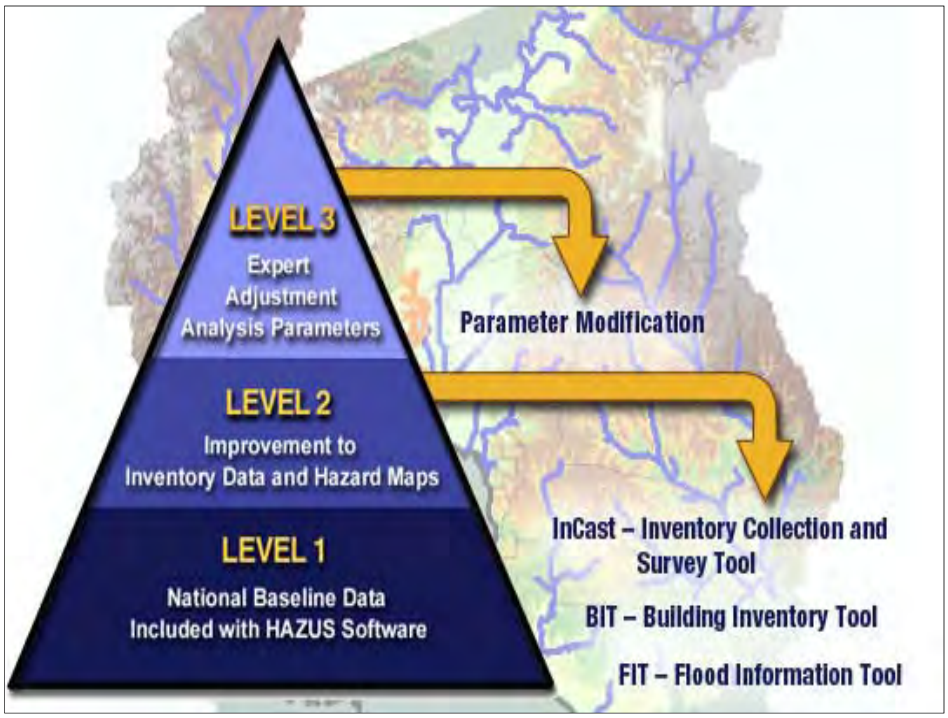
Sincerely,

_____

Exhibit B

Overview of HAZUS

Overview of HAZUS-MH (Multi-Hazard)



http://www.fema.gov/hazus/dl_mhpres.shtm**HAZUS-MH**, is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). NIBS maintains committees of wind, flood, earthquake and software experts to provide technical oversight and guidance to HAZUS-MH development. Loss estimates produced by HAZUS-MH are based on current scientific and engineering knowledge of the effects of hurricane winds, floods, and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing mitigation plans and policies, emergency preparedness, and response and recovery planning.

HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods, and earthquakes on populations. The latest release, HAZUS-MH MR1, is an updated version of HAZUS-MH that incorporates many new features which improve both the speed and functionality of the models. For information on software and hardware requirements to run HAZUS-MH MR1, see HAZUS-MH Hardware and Software Requirements.

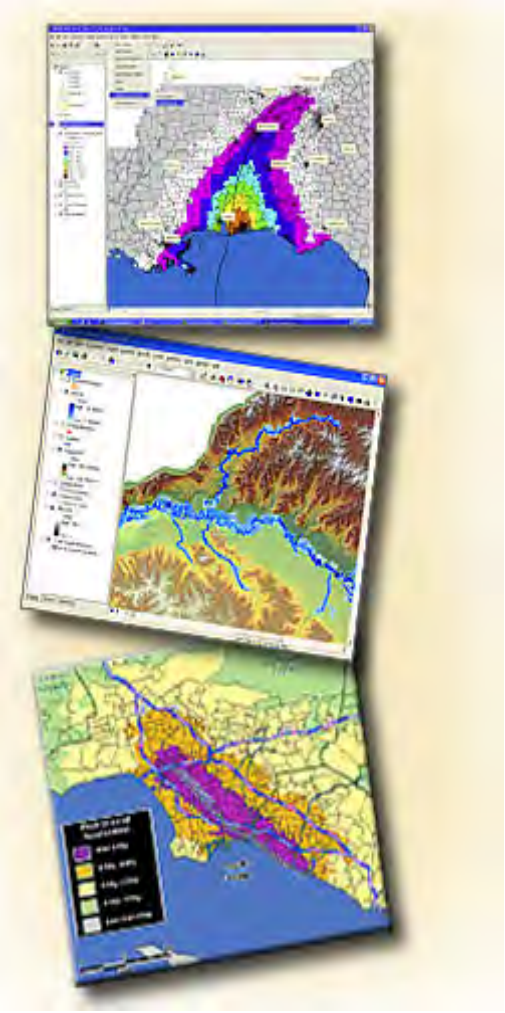
HAZUS-MH Analysis Levels

HAZUS-MH provides for three levels of analysis:

- A Level 1 analysis yields a rough estimate based on the nationwide database and is a great way to begin the risk assessment process and prioritize high-risk communities.
- A Level 2 analysis requires the input of additional or refined data and hazard maps that will produce more accurate risk and loss estimates. Assistance from local emergency management personnel, city planners, GIS

professionals, and others may be necessary for this level of analysis.

- A Level 3 analysis yields the most accurate estimate of loss and typically requires the involvement of technical experts such as structural and geotechnical engineers who can modify loss parameters based on to the specific conditions of a community. This level analysis will allow users to supply their own techniques to study special conditions such as dam breaks and tsunamis. Engineering and other expertise is needed at this level.



Three data input tools have been developed to support data collection. The Inventory Collection Tool (InCAST) helps users collect and manage local building data for more refined analyses than are possible with the national level data sets that come with HAZUS. InCAST has expanded capabilities for multi-hazard data collection. HAZUS-MH includes an enhanced Building Inventory Tool (BIT) allows users to import building data and is most useful when handling large datasets, such as tax assessor records. The Flood Information Tool (FIT) helps users manipulate flood data into the format required by the HAZUS flood model. All Three tools are included in the HAZUS-MH MR1 Application DVD.

HAZUS-MH Models

The **HAZUS-MH Hurricane Wind Model** gives users in the Atlantic and Gulf Coast regions and Hawaii the ability to estimate potential damage and loss to residential, commercial, and industrial buildings. It also allows users to estimate direct economic loss, post-storm shelter needs and building debris. In the future, the model will include the capability to estimate wind effects in island territories, storm surge, indirect economic losses, casualties, and impacts to utility and transportation lifelines and agriculture. Loss models for other severe wind hazards will be included in the future. Details about the Hurricane Wind Model.

The **HAZUS-MH Flood Model** is capable of assessing riverine and coastal flooding. It estimates potential damage to all classes of buildings, essential facilities, transportation and utility lifelines, vehicles, and agricultural crops. The model addresses building debris generation and shelter requirements. Direct losses are estimated based on physical damage to structures, contents, and building interiors. The effects of flood warning are taken into account, as are flow velocity effects. Details about the Flood Model.

The **HAZUS-MH Earthquake Model**, The HAZUS earthquake model provides loss estimates of damage and loss to buildings, essential facilities, transportation and utility lifelines, and population based on scenario or probabilistic earthquakes. The model addresses debris generation, fire-following, casualties, and shelter requirements. Direct losses are estimated based on physical damage to structures, contents, inventory, and building interiors. The earthquake model also includes the Advanced Engineering Building Module for single- and group-building mitigation analysis. Details about the Earthquake Model.

The updated earthquake model released with HAZUS-MH includes:

- The (September 2002) National Hazard Maps

- Project '02 attenuation functions
- Updated historical earthquake catalog (magnitude 5 or greater)
- Advanced Engineering Building Module for single and group building mitigation analysis

Additionally, HAZUS-MH can perform multi-hazard analysis by providing access to the average annualized loss and probabilistic results from the hurricane wind, flood, and earthquake models and combining them to provide integrated multi-hazard reports and graphs. HAZUS-MH also contains a third-party model integration capability that provides access and operational capability to a wide range of natural, man-made, and technological hazard models (nuclear and conventional blast, radiological, chemical, and biological) that will supplement the natural hazard loss estimation capability (hurricane wind, flood, and earthquake) in HAZUS-MH.

APPENDIX B.
PROCEDURES FOR LINKING TO THE HAZARD MITIGATION PLAN UPDATE

APPENDIX B.
PROCEDURES FOR LINKING TO THE HAZARD MITIGATION PLAN UPDATE

Not all eligible local governments within the Humboldt Operational Area are included in this Hazard Mitigation Plan Update. It is assumed that some or all of these non-participating local governments may choose to "link" to the Plan at some point to gain eligibility for programs under the federal Disaster Mitigation Act. In addition, some of the current partnership may not continue to meet eligibility requirements due to a lack of participation as prescribed by the plan. The following "linkage" procedures define the requirements established by the Plan's Steering Committee and all planning partners for dealing with an increase or decrease in the number of planning partners linked to this plan. It should be noted that a currently non-participating jurisdiction within the defined planning area is not obligated to link to this plan. These jurisdictions can choose to do their own "complete" plan that addresses all required elements of section 201.6 of 44 CFR.

INCREASING THE PARTNERSHIP THROUGH LINKAGE

The annual time period for the linkage process will be from February 1 to the last calendar work day of April during any year. Eligible linking jurisdictions are instructed to complete ***all*** of the following procedures during this time frame:

- The eligible jurisdiction requests a "Linkage Package" by contacting one of the Points of Contact (POC) for the plan:

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

Ms. Cybelle Immitt
Senior Planner
Humboldt County Public Works Department
1106 2nd Street
Eureka, CA 95501
Phone# : (707) 445-7491
e-mail : CImmitt@co.humboldt.ca.us

The POC will provide a linkage packages that includes:

  - Copy of Volume 1 and 2 of the plan
  - Planning partner's expectations package.
  - A sample "letter of intent" to link to the Hazard Mitigation Plan Update.
  - A Special Purpose District or City template and instructions.
  - Catalog of Hazard Mitigation Alternatives
  - A "request for technical assistance" form.
  - A copy of Section 201.6 of Chapter 44, the Code of Federal Regulations (44 CFR), which defines the federal requirements for a local hazard mitigation plan.

- The new jurisdiction will be required to review both volumes of the Hazard Mitigation Plan Update, which includes the following key components for the planning area:
  - The planning area risk assessment

  - Goals and objectives
  - Plan implementation and maintenance procedures
  - Comprehensive review of alternatives
  - Countywide initiatives.

  Once this review is complete, the jurisdiction will complete its specific annex using the template and instructions provided by the POC. Technical assistance can be provided upon request by completing the request for technical assistance (TA) form provided in the linkage package. This TA may be provided by the POC or any other resource within the Planning Partnership such as a member of the Steering Committee or a currently participating City or Special Purposes District partner. The POC will determine who will provide the TA and the possible level of TA based on resources available at the time of the request.

- The new jurisdiction will be required to develop a public involvement strategy that ensures the public's ability to participate in the plan development process. At a minimum, the new jurisdiction must make an attempt to solicit public opinion on hazard mitigation at the onset of this linkage process and a minimum of one public meeting to present their draft jurisdiction specific annex for comment, prior to adoption by the governing body. The Planning Partnership will have resources available to aid in the public involvement strategy such as the Plan website. However, it will be the new jurisdiction's responsibility to implement and document this strategy for incorporation into its annex. It should be noted that the Jurisdictional Annex templates ***do not*** include a section for the description of the public process. This is because the original partnership was covered under a uniform public involvement strategy that is described in Volume 1 of the plan. Since new partners were not addressed by that strategy, they will have to initiate a new strategy, and add a description of that strategy to their annex. For consistency, new partners are encouraged to follow the public involvement format utilized by the initial planning effort as described in Volume 1 of the plan.
- Once their public involvement strategy is completed and they have completed their template, the new jurisdiction will submit the completed package to the POC for a pre-adoption review to ensure conformance with the Regional plan format.
- The POC will review for the following:
  - Documentation of Public Involvement Strategy
  - Conformance of template entries with guidelines outlined in instructions
  - Chosen initiatives are consistent with goals, objectives and mitigation catalog of the Planning Area Hazard Mitigation Plan Update
  - A designated point of contact
  - A ranking of risk specific to the jurisdiction.

  The POC may utilize members of the Steering Committee or other resources to complete this review. All proposed linked annexes will be submitted to the Steering Committee for review and comment prior to submittal to CalEMA.

- Plans approved and accepted by the Steering Committee will be forwarded to CalEMA for review with a cover letter stating that the forwarded plan meets local approved plan standards and whether the plan is submitted with local adoption or for criteria met/plan not adopted review.

- CalEMA reviews plans for federal compliance. Non-Compliant plans are returned to the Lead agency for correction. Compliant plans are forwarded to FEMA for review with annotation as to the adoption status.
- FEMA reviews the new jurisdiction's plan in association with the approved plan to ensure DMA compliance. FEMA notifies new jurisdiction of results of review with copies to CalEMA and approved planning authority.
- New jurisdiction corrects plan shortfalls (if necessary) and resubmits to CalEMA through the approved plan lead agency.
- For plans with no shortfalls from the FEMA review that have not been adopted, the new jurisdiction governing authority adopts the plan (if not already accomplished) and forwards adoption resolution to FEMA with copies to lead agency and CalEMA.
- FEMA regional director notifies new jurisdiction governing authority of plan approval.

The new jurisdiction plan is then included with the regional plan with the commitment from the new jurisdiction to participate in the ongoing plan implementation and maintenance. The new jurisdictional plan will be valid for five years from the approval date of the Humboldt Operational Area Hazard Mitigation plan that it is linking to.

DECREASING THE PARTNERSHIP

The eligibility afforded under this process to the planning partnership can be rescinded in two ways. First, a participating planning partner can ask to be removed from the partnership. This may be done because the partner has decided to develop its own plan or has identified a different planning process for which it can gain eligibility. A partner that wishes to voluntarily leave the partnership shall inform the POC of this desire in writing. This notification can occur any time during the calendar year. A jurisdiction wishing to pursue this avenue is advised to make sure that it is eligible under the new planning effort, to avoid any period of being out of compliance with the Disaster Mitigation Act.

After receiving this notification, the POC shall immediately notify both CalEMA and FEMA in writing that the partner in question is no longer covered by the Hazard Mitigation Plan Update, and that the eligibility afforded that partner under this plan should be rescinded based on this notification.

The second way a partner can be removed from the partnership is by failure to meet the participation requirements specified in the "Planning Partner Expectations" package provided to each partner at the beginning of the process, or the plan maintenance and implementation procedures specified under chapter 7 in Volume 1 of the plan. Each partner agreed to these terms by adopting the plan.

Eligibility status of the planning partnership will be monitored by the POC. The determination of whether a partner is meeting its participation requirements will be based on the following parameters:

- Are performance period progress reports being submitted by the specified time frames?
- Are partners notifying the POC of changes in designated points of contact?
- Are the partners supporting the Steering Committee by attending designated meetings or responding to needs identified by the body?
- Are the partners continuing to be supportive as specified in the Planning Partners expectations package provided to them at the beginning of the process?

Participation in the plan does not end with plan approval. This partnership was formed on the premise that a group of planning partners would pool resources and work together to strive to reduce risk within the planning area. Failure to support this premise lessens the effectiveness of this effort. The following procedures will be followed to remove a partner due to the lack of participation:

- The POC will advise the Steering Committee of this pending action and provide evidence or justification for the action. Justification may include: multiple failures to submit progress reports, failure to attend meetings determined to be mandatory by the Steering Committee, failure to act on the partner's action plan, or inability to reach designated point of contact after a minimum of five attempts.
- The Steering Committee will review information provided by POC, and determine action by a vote. The Steering Committee will invoke the voting process established in the ground rules established during the formation of this body.
- Once the Steering Committee has approved an action, the POC will notify the planning partner of the pending action in writing via certified mail. This notification will outline the grounds for the action, and ask the partner if it is their desire to remain as a partner. This notification shall also clearly identify the ramifications of removal from the partnership. The partner will be given 30 days to respond to the notification.
- Confirmation by the partner that they no longer wish to participate or failure to respond to the notification shall trigger the procedures for voluntary removal discussed above.
- Should the partner respond that they would like to continue participation in the partnership, they must clearly articulate an action plan to address the deficiencies identified by the POC. This action plan shall be reviewed by the Steering Committee to determine whether the actions are appropriate to rescind the action. Those partners that satisfy the Steering Committee's review will remain in the partnership, and no further action is required.
- Automatic removal from the partnership will be implemented for partners where these actions have to be initiated more than once in a 5 year planning cycle.

APPENDIX C.
ANNEX INSTRUCTIONS AND TEMPLATE FOR MUNICIPALITY UPDATES

INSTRUCTIONS FOR COMPLETING MUNICIPALITY UPDATE ANNEX TEMPLATE

This document provides instructions for completing the annex template for city and county governments participating in multi-partner hazard mitigation planning. Assistance in completing the template will be available in the form of a workshop for all planning partners or one-on-one visits with each partner, depending on funding availability. Any questions on completing the template should be directed to:

Rob Flaner
Tetra Tech, Inc.
90 South Blackwood Ave.
Eagle, ID 83616
(208) 939-4391
e-mail: rflaner@msn.com

Please provide both a hard copy and digital copy of the completed template to Tetra Tech upon completion.

Associated Materials:

Along with the annex template and these instructions, you have been provided with other materials with information that is needed for completing the template. Be sure to review these materials ***before*** you begin the process of filling in the template:

- Summary-of-loss matrix for the hazard mitigation plan
- Results from the hazard mitigation plan questionnaire
- Catalog of mitigation alternatives
- Fact sheet on Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Grant Program (PDM)

A Note About Software:

The template for the municipal jurisdiction annex is a Microsoft Word document in a format that will be used in the final plan. Partners are asked to use this template so that a uniform product will be completed for each partner. Partners who do not have Microsoft Word capability may prepare the document in other formats, and the planning team will convert it to the Word format.

CHAPTER NUMBER AND TITLE

In the chapter title at the top of Page 1, type in the complete official name of your jurisdiction (The City of Metropolis, Jefferson County, etc.). At this time, also change the name in the “header” box on Page 3, using the same wording.

Note that the template is set up as Chapter “X.” Please leave all references to “X” in the template as they are. Once all templates are received, chapter numbering will be assigned for incorporation into the final plan.

HAZARD MITIGATION PLAN POINT OF CONTACT

Please provide the name, title, mailing address, telephone number, and e-mail address for the primary point of contact for your jurisdiction. This should be the person responsible for monitoring, evaluating and updating the annex for your jurisdiction. This person should also be the principle liaison between your jurisdiction and the Steering Committee overseeing development of this plan.

In addition, designate an alternate point of contact. This would be a person to contact should the primary point of contact be unavailable or no longer employed by the jurisdiction.

JURISDICTION PROFILE

Provide information specific to your jurisdiction as indicated, in a style similar to the example provided in the box at right. This should be information that was not provided in the overall mitigation plan document. For population data, use the most current population figure for your jurisdiction based on an official means of tracking (e.g., the U.S. Census or state office of financial management).

JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

Chronological List of Hazard Events

In Table X-1, list in chronological order (most recent first) any natural hazard event that has caused damage to your jurisdiction since 1975. Include the date of the event and the estimated dollar amount of damage it caused. Please refer to the summary of natural hazard events within risk assessment of the overall hazard mitigation plan. Potential sources of damage information include:

- Preliminary damage estimates your jurisdiction filed with the county or state
- Insurance claims data
- Newspaper archives
- Other plans/documents that deal with emergency management (safety element of a comprehensive plan, emergency response plan, etc.)
- Citizen input.

Repetitive Loss Properties

A repetitive loss property is any property for which FEMA has paid two or more flood insurance claims in excess of $1,000 in any rolling 10-year period since 1978. In the space provided in the text for Section X.3, indicate the number of any FEMA-identified Repetitive Flood Loss properties in your

Example Jurisdiction Profile:

- **Date of Incorporation**—1858
- **Current Population**—17,289 as of July 2006
- **Population Growth—**Based on the data tracked by the California Department of Finance, Arcata has experienced a relatively flat rate of growth. The overall population has increased only 3.4% since 2000 and has averaged 0.74% per year from 1990 to 2007
- **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**—The Arcata area was settled during the California gold rush in the 1850s as a supply center for miners. As the gold rush died down, timber and fishing became the area's major economic resource. 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.
- **Climate**—Arcata'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 summer. 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 59ºF. 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 six 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**—Anticipated development levels for Arcata are low to moderate, consisting primarily of residential development. The majority of recent development has been infill. Residentially, there has been a focus on affordable housing and a push for more secondary mother-in-law units on properties.

  The City of Arcata adopted its general plan in July 2000. The plan focuses on issues of the greatest concern to the community. City actions, such as those relating to land use allocations, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with such a plan. Future growth and development in the City will be managed as identified in the general plan.

jurisdiction (your technical assistance provider will be able to help you confirm this information). If you have none, indicate “none” in the space provided.

Next, indicate the number (if any) of repetitive loss structures in your jurisdiction that have been mitigated. Mitigated for this exercise means that flood protection has been provided to the structure. If you do not know the answer to this question, the planning team will provide it for you.

HAZARD RISK RANKING

The risk ranking performed for the overall planning area is presented in the risk assessment section of the overall hazard mitigation plan. However, each jurisdiction has differing degrees of risk exposure and vulnerability and therefore needs to rank risk for its own area, using the same methodology as used for the overall planning area. The risk-ranking exercise assesses two variables for each hazard: its probability of occurrence; and its potential impact on people, property and the economy. A detailed discussion of the concepts associated with risk ranking is provided in the overall hazard mitigation plan. The instructions below outline steps for assessing risk in your jurisdiction to develop results that are to be included in the template.

Determine Probability of Occurrence for Each Hazard

A probability factor is assigned based on how often a hazard is likely to occur. In Table 1, list the probability of occurrence for each hazard as it pertains to your jurisdiction, along with its probability factor, as follows:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor = 2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor = 1)
- None—If there is no exposure to a hazard, there is no probability of occurrence (Probability Factor = 0)

TABLE 1.
HAZARD PROBABILITY OF OCCURRENCE

Hazard Type	Probability	Probability Factor

The probability of occurrence of a hazard event is generally based on past hazard events in an area. For example, if your jurisdiction has experienced two damaging floods in the last 25 years, the probability of occurrence is high for flooding and scores a 3 under this category. If your jurisdiction has experienced no damage from landslides in the last 100 years, your probability of occurrence for landslide is low, and scores a 1 under this category.

Determine Potential Impacts of Each Hazard

The impact of each hazard was divided into three categories: impacts on people, impacts on property, and impacts on the economy. These categories were also assigned weighted values. Impact on people was assigned a weighting factor of 3, impact on property was assigned a weighting factor of 2 and impact on the economy was assigned a weighting factor of 1. Steps to assess each type of impact are described below.

Impacts on People

To assess impacts on people, values are assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. In Table 2, list the potential impact of each hazard on people in your jurisdiction, along with its impact factor, as follows:

- High Impact—50% or more of the population is exposed to a hazard (Impact Factor = 3)
- Medium Impact—25% to 49% of the population is exposed to a hazard (Impact Factor = 2)
- Low Impact—25% or less of the population is exposed to the hazard (Impact Factor = 1)
- No impact—None of the population is exposed to a hazard (Impact Factor = 0)

TABLE 2.
HAZARD IMPACT ON PEOPLE

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 3)

Impacts on Property

To assess impacts on property, values are assigned based on the percentage of the total ***property value exposed*** to the hazard event. In Table 3, enter the cost estimates for potential damage to exposed structures, taken from the “Summary of Loss” matrix provided with these instructions.

TABLE 3.
COST ESTIMATES FOR POTENTIAL DAMAGE TO STRUCTURES

Hazard type	Estimate of Potential Dollar Losses to Exposed Structures

In Table 4, list the potential impact of each hazard on property in your jurisdiction, along with its impact factor. Determine impact based on damage estimates from Table 3, as follows:

- High Impact—30% or more of the total assessed property value is exposed to a hazard (Impact Factor = 3)
- Medium Impact—15% to 29% of the total assessed property value is exposed to a hazard (Impact Factor = 2)
- Low Impact—14% or less of the total assessed property value is exposed to the hazard (Impact Factor = 1)
- No impact—None of the total assessed property value is exposed to a hazard (Impact Factor = 0)

TABLE 4.
HAZARD IMPACT ON PROPERTY

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 2)

Impacts on the Economy

To assess impacts on the economy, values are assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total assessed value of property in the county. For some hazards, such as wildland fire, landslide and severe weather, vulnerability is the same as exposure due to the lack of loss estimation tools specific to those hazards. In Table 5, list the potential impact of each hazard on the economy in your jurisdiction, along with its impact factor, as follows:

- High Impact—Estimated loss from the hazard is 20% or more of the total assessed property value (Impact Factor = 3)
- Medium Impact—Estimated loss from the hazard is 10% to 19% of the total assessed property value (Impact Factor = 2)
- Low Impact—Estimated loss from the hazard is 8% or less of the total assessed property value (Impact Factor = 1)
- No impact—No loss is estimated from the hazard (Impact Factor = 0)

TABLE 5.
HAZARD IMPACT ON THE ECONOMY

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 1)

Determine Risk Rating for Each Hazard

A risk rating for each hazard is determined by multiplying the assigned probability factor by the sum of the weighted impact factors for people, property and the economy:

- Risk Rating = Probability Factor x Weighted Impact Factor {people + property + economy}

Using the results developed in Tables 1, 2, 4 and 5, complete Table 6 to calculate a risk rating for each hazard of concern.

TABLE 6. HAZARD RISK RATING			
Hazard Type	Probability Factor (P)	Sum of Weighted Impact Factors on People, Property & Economy (I)	Risk Rating (P x I)

Complete Risk Ranking in Template

Once Table 6 has been completed above, complete Table X-2 in your template. The hazard with the highest risk rating in Table 6 should be listed at the top of Table X-2 and given a rank of 1; the hazard with the second highest rating should be listed second with a rank of 2; and so on. Two hazards with equal risk ratings should be given the same rank.

It is important to note that this exercise should not override your subjective assessment of relative risk based on your knowledge of the history of natural hazard events in your jurisdiction. If this risk ranking exercise generates results other that what you know based on substantiated data and documentation, you may alter the ranking based on this knowledge. If this is the case, please note this fact in the comments at the end of the template. Remember, one of the purposes of this exercise is to support the selection and prioritization of initiatives in your plan. If you identify an initiative with a high priority that mitigates the risk of a hazard you have ranked low, that project will not be competitive in the grant arena.

CAPABILITY ASSESSMENT

Legal and Regulatory Capability

Describe the legal authorities available to your jurisdiction and/or enabling legislation at the state level affecting planning and land management tools that can support hazard mitigation initiatives. In Table X-3, indicate “Yes” or “No” for each listed code, ordinance, requirement or planning document in each of the following columns:

- Local Authority—Enter “Yes” if your jurisdiction has prepared or adopted the identified item; otherwise, enter “No.” If yes, then enter the code or ordinance number and its date of adoption in the comments column.
- State or Federal Prohibitions—Enter “Yes” if there are any state or federal regulations or laws that would prohibit local implementation of the identified item; otherwise, enter “No.”
- Other Regulatory Authority—Enter “Yes” if there are any regulations that may impact your initiative that are enforced or administered by another agency (e.g., a state agency or special purpose district); otherwise, enter “No.”

- State Mandated—Enter “Yes” if state laws or other requirements enable or require the listed item to be implemented at the local level; otherwise, enter “No.”

Administrative and Technical Capability

This section requires you to take inventory of the staff/personnel resources available to your jurisdiction to help with hazard mitigation planning and implementation of specific mitigation actions.

Complete Table X-4 by indicating whether your jurisdiction has access to each of the listed personnel resources. Enter “Yes” or “No” in the column labeled “Available?”. If yes, then enter the department and position title in the right-hand column.

Financial Resources

Identify what financial resources (other than the Hazard Mitigation Grant Program and the Pre-Disaster Mitigation Grant Program) are available to your jurisdiction for implementing mitigation initiatives.

Complete Table X-5 by indicating whether each of the listed financial resources is accessible to your jurisdiction. Enter “Yes” if the resource is fully accessible to your jurisdiction. Enter “No” if there are limitations or prerequisites that may hinder your eligibility for this resource.

Community Mitigation Related Classifications

Complete Table X-6 to indicate your jurisdiction’s participation in various national programs related to natural hazard mitigation. For each program enter “Yes” or “No” in the second column to indicate whether your jurisdiction participates. If yes, then enter the classification that your jurisdiction has earned under the program in the third column and the date on which that classification was issued in the fourth column; enter “N/A” in these columns if your jurisdiction is not participating.

HAZARD MITIGATION ACTION PLAN

Action Plan Matrix

Identify the initiatives your jurisdiction would like to pursue with this plan. Refer to the mitigation catalog for mitigation options you might want to consider. Be sure to consider the following factors in your selection of initiatives:

- Select initiatives that are consistent with the overall goals, objectives and guiding principles of the hazard mitigation plan.
- Identify projects where benefits exceed costs.
- Include any project that your jurisdiction has committed to pursuing regardless of grant eligibility.
- Know what is and is not grant-eligible under the HMGP and PDM (see fact sheet provided). Listing HMGP or PDM as a potential funding source for an ineligible project will be a red flag when this plan goes through review. If you have projects that are not HMGP or PDM grant eligible, but do mitigate part or all of the hazard and may be eligible for other grant programs sponsored by other agencies, include them in this section.
- Although you should identify at least one initiative for your highest ranked risk, a hazard-specific project is not required for every hazard. If you have not identified an earthquake related project, and an earthquake occurs that causes damage in your jurisdiction, you are not discounted from HMGP project grant eligibility.

Complete Table X-7 for all the initiatives you have identified:

- Enter the initiative number and description.
- Indicate whether the initiative mitigates hazards for new or existing assets.
- Identify the specific hazards the initiative will mitigate.
- Identify by number the mitigation plan objectives that the initiative addresses. These have been provided in the Steering Committee meeting minutes that were forwarded to you in the past.
- Indicate who will be the lead in administering the project. This will most likely be your governing body.
- Identify funding sources for the project. If it is a grant, include the funding sources for the cost share. Refer to your fiscal capability assessment (Table X-5) to identify possible sources of funding.
- Indicate the time line as "short term" (1 to 5 years) or "long term" (5 years or greater).
- Enter "Yes" or "No" to indicate whether this initiative was included in the previous version of this hazard mitigation plan.

Wording Your Initiative Descriptions:

Descriptions of your initiatives need not provide great detail. That will come when you apply for a project grant. Provide enough information to identify the project's scope and impact. The following are typical descriptions for an action plan initiative:

- **Initiative 1—**Address Repetitive Loss properties. Through targeted mitigation, acquire, relocate or retrofit the five repetitive loss structures in the County as funding opportunities become available.
- **Initiative 2—**Perform a non-structural, seismic retrofit of City Hall.
- **Initiative 3—**Acquire floodplain property in the Smith subdivision.
- **Initiative 4—**Enhance the County flood warning capability by joining the NOAA "Storm Ready" program.

Technical assistance will be available to your jurisdiction in completing this section during the technical assistance visit.

Prioritization of Mitigation Initiatives

Complete the information in Table X-8 as follows:

- Initiative #—Indicate the initiative number from Table X-7.
- # of Objectives Met—Enter the number of objectives the initiative will meet.
- Benefits—Enter "High," "Medium" or "Low" as follows:
  - High: Project will have an immediate impact on the reduction of risk exposure to life and property.
  - Medium: Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
  - Low: Long-term benefits of the project are difficult to quantify in the short term.
- Costs—Enter "High," "Medium" or "Low" as follows:
  - High: Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.
  - Medium: Could budget for under existing work-plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.

  - Low: Possible to fund under existing budget. Project is part of, or can be part of an existing ongoing program.

  If you know the estimated cost of a project because it is part of an existing, ongoing program, indicate the amount.

- Do Benefits Exceed the Cost?—Enter "Yes" or "No." This is a qualitative assessment. Enter "Yes" if the benefit rating (high, medium or low) is the same as or higher than the cost rating (high benefit/high cost; high benefit/medium cost; medium benefit/low cost; etc.). Enter "No" if the benefit rating is lower than the cost rating (medium benefit/high cost, low benefit/medium cost; etc.)
- Is the Project Grant-Eligible?—Enter "Yes" or "No." Refer to the fact sheet on HMGP and PDM.
- Can Project Be Funded Under Existing Program Budgets?—Enter "Yes" or "No." In other words, is this initiative currently budgeted for, or would it require a new budget authorization or funding from another source such as grants?
- Priority—Enter "High," "Medium" or "Low" as follows:
  - High: Project meets multiple plan objectives, benefits exceed cost, funding is secured under existing programs, or is grant eligible, and project can be completed in 1 to 5 years (i.e., short term project) once funded.
  - Medium: Project meets at least 1 plan objective, benefits exceed costs, requires special funding authorization under existing programs, grant eligibility is questionable, and project can be completed in 1 to 5 years once funded.
  - Low: Project will mitigate the risk of a hazard, benefits exceed costs, funding has not been secured, project is not grant eligible, and time line for completion is long term (5 to 10 years).

This prioritization is a simple review to determine that the initiatives you have identified meet one of the primary objectives of the Disaster Mitigation Act. It is not the detailed benefit/cost analysis required for HMGP/PDM project grants. The prioritization will identify any projects whose probable benefits will not exceed the probable costs.

Analysis of Mitigation Actions

Complete Table X-9 summarizing the mitigation actions by hazard of concern and the following six mitigation types:

- Prevention—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- Property Protection—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- Public Education and Awareness—Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.

- Natural Resource Protection—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- Emergency Services—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- Structural Projects—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.

This exercise demonstrates that the jurisdiction has selected a comprehensive range of actions.

STATUS OF PREVIOUS PLAN INITIATIVES

In this section, provide a status report of actions recommended in your previous hazard mitigation plan. You must be able to reconcile your original action plan to meet FEMA requirements for plan updates. Enter all the recommended actions from your previous plan in Table X-10 and put an X in one of the following three columns for each action to indicate its status:

- **Completed**—If the action has been completed, place a check mark in this column and enter a brief explanation in the "Comments" column (e.g., "Action #WC31 was completed by the Public Works Department on 3/12/2009"). Ongoing actions, such as annual outreach projects or maintenance activities, should also be indicated as "Completed," with a statement about the ongoing nature of the action provided in the "Comments" column (e.g., "Ongoing action, implemented annually by Community Development Department").
- **Carry Over to Plan Update**—If you did not complete an action and want to carry it over to your updated action plan, place a check mark in this column, and enter an explanatory statement in the comment section (e.g., "Action carried over as Action #WC14 in updated action plan").
- **Removed; No Longer Feasible**—If you want to remove an action because you have determined that it is no longer feasible, place a check mark in this column. "No longer feasible" means that you have determined that you do not have the capability to implement the action or that the action does not serve the best interest of your jurisdiction. Lack of funding does not mean that it is no longer feasible, unless the sole source of funding for an action is no longer available. Place a comment in the comment section explaining why the action is no longer feasible (e.g., "Action no longer considered feasible due to lack of political support to complete it.:)

FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

In this section, identify any future studies, analyses, reports, or surveys your jurisdiction needs to better understand its vulnerability to identified or currently unidentified risks. These could be needs based on federal or state agency mandates such as EPA's Bio-terrorism assessment requirement for water districts.

ADDITIONAL COMMENTS

Use this section to add any additional information pertinent to hazard mitigation and your jurisdiction not covered in this template.

CHAPTER __.
__MUNICIPALITY NAME__ UPDATE ANNEX

HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Name, Title
Organization
Street Address
City, State ZIP
Telephone: _____
e-mail Address: _____

Alternate Point of Contact

Name, Title
Organization
Street Address
City, State ZIP
Telephone: _____
e-mail Address: _____

JURISDICTION PROFILE

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

- **Date of Incorporation—**To Be Completed
- **Current Population—**To Be Completed
- **Population Growth—**To Be Completed
- **Location and Description—**To Be Completed
- **Brief History—**To Be Completed
- **Climate—**To Be Completed
- **Governing Body Format—**To Be Completed
- **Development Trends—**To Be Completed

ENERGY PROFILE

Local Energy Supply

Energy for government operations is provided as follows:

- Electricity—To Be Completed
- Propane—To Be Completed
- Liquid Fuel—To Be Completed
- Natural Gas—To Be Completed

Local Energy Demand

Government operations use three primary energy sources: electricity, liquid fuels (gasoline, diesel, and kerosene), and propane. Each is described below.

Electricity

Describe electricity consumption for individual municipal facilities or categories of facilities (e.g., city hall, police facility, utility plant, street lights), in kilowatt-hours and/or percentage of total for the jurisdiction.

Indicate municipal facilities with the highest consumption by month or season (e.g., city hall was the largest electricity consumer in winter; the police facility is the largest consumer in summer).

Describe electricity consumption for public and private users jurisdiction-wide (e.g., residential, commercial, public sector), in kilowatt-hours and/or percentage of total for the jurisdiction.

Liquid Fuels

Describe liquid fuel consumption for individual municipal facilities or categories of facilities (e.g., city hall, police facility, utility plant, street lights), in gallons and/or percentage of total for the jurisdiction. Indicate month or season of peak usage.

The aggregate consumption of the three liquid fuels during _____ was as follows:

- Gasoline: _____
- Diesel fuel: _____
- Kerosene: _____

Propane

Describe propane consumption for individual municipal facilities or categories of facilities (e.g., city hall, police facility, utility plant, street lights), in gallons and/or percentage of total for the jurisdiction. Indicate month or season of peak usage.

Agreements and Contracts

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

- To Be Completed
- To Be Completed
- To Be Completed

Community Key Assets Energy Profile

TABLE 33-7.
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: _____										
Key Asset #2: _____										
Key Asset #3: _____										
Key Asset #4: _____										
Key Asset #5: _____										
Key Asset #6: _____										
Key Asset #7: _____										

__Municipality Name__ has identified _____ key assets for its energy profile:

- _____
- _____
- _____

Table 33-7 summarizes the energy profile for each key asset.

Key Asset Energy Consumption and Backup Generator Analysis

TABLE 33-8.
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: _____								
Generator Capacity Analysis: _____								
Key Asset #2: _____								
Generator Capacity Analysis: _____								
Key Asset #3: _____								
Generator Capacity Analysis: _____								
Key Asset #4: _____								
Generator Capacity Analysis: _____								
Key Asset #5: _____								
Generator Capacity Analysis: _____								
Key Asset #6: _____								
Generator Capacity Analysis: _____								
Key Asset #7: _____								
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 33-8 shows key asset energy consumption and results of a generator/fuel backup analysis.

JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 33-9.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment

Table 33-9 lists all past occurrences of natural hazards within the jurisdiction. Repetitive loss records are as follows:

- Number of FEMA Identified Repetitive Flood Loss Properties: _____
- Number of FEMA Identified Severe Repetitive Loss Properties
- Number of Repetitive Flood Loss/Severe Repetitive Loss Properties that have been mitigated: _____

HAZARD RISK RANKING

TABLE 33-10.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1		
2		
3		
4		
5		
6		
7		
8		
9		

Table 33-10 presents the ranking of the hazards of concern.

CAPABILITY ASSESSMENT

Legal and Regulatory Capability

TABLE 33-11.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Codes, Ordinances & Requirements					
Building Code					
Zoning					
Subdivisions					
Stormwater Management					
Post Disaster Recovery					
Real Estate Disclosure					
Growth Management					
Site Plan Review					
Public Health and Safety					
Environmental Protection					
Energy Code					*2010 or 2012?*
Planning Documents					
General or Comprehensive Plan					*Equipped to provide linkage to this mitigation plan?*
Floodplain or Basin Plan					
Stormwater Plan					
Capital Improvement Plan					*Types of capital facilities addressed:* *Updated how often:*
Habitat Conservation Plan					
Economic Development Plan					
Shoreline Management Plan					
Community Wildfire Protection Plan					
General Plan Energy Conservation Element or Energy Specific Plan					*Last Updated?*
Climate Action Plan or Climate Adaptation Strategy					

TABLE 33-11.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Response/Recovery Planning					
Comprehensive Emergency Management Plan					
Threat and Hazard Identification and Risk Assessment					
Terrorism Plan					
Post-Disaster Recovery Plan					
Continuity of Operations Plan					
Public Health Plans					

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 33-11.

Administrative and Technical Capability

TABLE 33-12.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices		
Engineers or professionals trained in building or infrastructure construction practices		
Planners or engineers with an understanding of natural hazards		
Planners or engineers with an understanding of energy resilience or alternative energy technology		
Staff with training in benefit/cost analysis		
Surveyors		
Personnel skilled or trained in GIS applications		
Scientist familiar with natural hazards in local area		
Emergency manager		
Grant writers		

The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 33-12.

Fiscal Capability

TABLE 33-13. FISCAL CAPABILITY	
Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	
Capital Improvements Project Funding	
Authority to Levy Taxes for Specific Purposes	
User Fees for Water, Sewer, Gas or Electric Service	
Incur Debt through General Obligation Bonds	
Incur Debt through Special Tax Bonds	
Incur Debt through Private Activity Bonds	
Withhold Public Expenditures in Hazard-Prone Areas	
State Sponsored Grant Programs	
Development Impact Fees for Homebuyers or Developers	
Other	

The assessment of the jurisdiction's fiscal capabilities is presented in Table 33-13.

National Flood Insurance Program Compliance

TABLE 33-14. NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE	
What department is responsible for floodplain management in your community?	
Who is your community's floodplain administrator (department/position)?	
Do you have any certified floodplain managers on staff in your community?	
What is the date of adoption of your flood damage prevention ordinance?	
When was the most recent community assistance visit or community assistance contact?	
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.	
Do your flood hazard maps adequately address the flood risk in your community? (If no, please state why)	
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?	

Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 33-14.

Energy Resilience Capability

TABLE 33-15. ENERGY RESILIENCE CAPABILITIES	
Does your community have an Energy Assurance Plan coordinator? If so, who (department/position)?	
Have you performed an energy assurance gap analysis for your community?	
Have you completed a vulnerability assessment of power sources to each key asset?	
Do you have a contingency plan for providing energy to your community's key assets during an energy disruption?	
Are emergency backup generators tested on a regular basis?	
Are multiple persons trained in the operation and maintenance of emergency backup generators?	
Have you established a working relationship with your community's energy service providers?	
Have you explored alternative energy technologies (wind, solar, micro-grid, etc.) to support community energy resiliency?	
Have you conducted an energy efficiency analysis of jurisdiction owned buildings?	

Energy resiliency capabilities are presented in Table 33-15.

Community Mitigation Program Classifications

TABLE 33-16.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No	--	--
Building Code Effectiveness Grading Schedule			
Public Protection			
Storm Ready			
Firewise			
Tsunami Ready (if applicable)			

Classifications under various community mitigation programs are presented in Table 33-16.

HAZARD MITIGATION ACTION PLAN

TABLE 33-17.
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 #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							

Table 33-17 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

PRIORITY OF RECOMMENDED INITIATIVES

TABLE 33-18.
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. See Chapter 1 for definitions of high, medium and low priorities.

Table 33-18 identifies the priority for each initiative.

ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 33-19.
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						
Drought						
Earthquake						
Fish Losses						
Flood						
Landslide						
Severe Weather						
Tsunami						
Wildfire						

a. See Chapter 1 for description of mitigation types.

Table 33-19 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 33-20.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments

Table 33-20 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.

FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Insert text, if any; Delete section if not used

ADDITIONAL COMMENTS

Insert text, if any; Delete section if not used

Insert __Municipality Name__ Maps

APPENDIX D.
ANNEX INSTRUCTIONS AND TEMPLATE FOR SPECIAL-PURPOSE DISTRICTS

INSTRUCTIONS FOR COMPLETING SPECIAL-PURPOSE DISTRICT ANNEX TEMPLATE

This document provides instructions for completing the annex template for special-purpose districts participating in multi-partner hazard mitigation planning. Assistance in completing the template will be available in the form of a workshop for all planning partners or one-on-one visits with each partner, depending on funding availability. Any questions on completing the template should be directed to:

Rob Flaner
Tetra Tech, Inc.
90 South Blackwood Ave.
Eagle, ID 83616
(208) 939-4391
e-mail: rflaner@msn.com

Please provide both a hard copy and digital copy of the completed template to Tetra Tech upon completion.

Associated Materials:

Along with the annex template and these instructions, you have been provided with other materials with information that is needed for completing the template. Be sure to review these materials ***before*** you begin the process of filling in the template:

- Summary-of-loss matrix for the hazard mitigation plan
- Results from the hazard mitigation plan questionnaire
- Catalog of mitigation alternatives
- Fact sheet on Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Grant Program (PDM)

A Note About Software:

The template for the special-purpose district annex is a Microsoft Word document in a format that will be used in the final plan. Partners are asked to use this template so that a uniform product will be completed for each partner. Partners who do not have Microsoft Word capability may prepare the document in other formats, and the planning team will convert it to the Word format.

CHAPTER NUMBER AND TITLE

In the chapter title at the top of Page 1, type in the complete official name of your jurisdiction (West County Fire Protection District #1, Burgville Flood Protection District, etc.). At this time, also change the name in the “header” box on Page 3, using the same wording.

Note that the template is set up as Chapter “X.” Please leave all references to “X” in the template as they are. Once all templates are received, chapter numbering will be assigned for incorporation into the final plan.

HAZARD MITIGATION PLAN POINT OF CONTACT

Please provide the name, title, mailing address, telephone number, and e-mail address for the primary point of contact for your jurisdiction. This should be the person responsible for monitoring, evaluating and updating the annex for your jurisdiction. This person should also be the principle liaison between your jurisdiction and the Steering Committee overseeing development of this plan.

In addition, designate an alternate point of contact. This would be a person to contact should the primary point of contact be unavailable or no longer employed by the jurisdiction.

JURISDICTION PROFILE

Narrative Profile

Please provide a brief summary to profile your jurisdiction. Include the purpose of the jurisdiction, the date of inception, the type of organization, the number of employees, the mode of operation (i.e., how operations are funded), the type of governing body, and who has adoptive authority. Describe who the jurisdiction's customers are (if applicable, include number of users or subscribers). Include a geographical description of the service area.

Provide information in a style similar to the example provided in the box at right. This should be information that was not provided in the overall mitigation plan document.

Example Jurisdiction Narrative Profile:

Humboldt Community Services District is a special-purpose district created in 1952 to provide water, sewer, and street lighting to the unincorporated area surrounding the City of Eureka known as Pine Hill & Cutten. The District's designated service areas expanded throughout the years to include other unincorporated areas of Humboldt County known as Myrtletown, Humboldt Hill, Fields Landing, King Salmon, and Freshwater. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan; the General Manager will oversee its implementation. As of April 30, 2007, the District serves 7,305 water connections and 6,108 sewer connections, with a current staff of 21. Funding comes primarily through rates and revenue bonds..

Summary Information

Complete the bulleted list of summary information as follows:

- **Population Served—**List the estimated population that your jurisdiction provides services to. If you do not know this number directly, create an estimate (e.g., the number of service connections times the average household size for the service area based on Census data).
- **Land Area Served—**Enter the service area of your jurisdiction in acres or square miles.
- **Value of Area Served—**Enter the approximate assessed value of your service area. If you do not have this information, the County should be able to provide a number using the County Assessor's database.
- **Land Area Owned—**Enter the area of property owned by the jurisdiction in acres or square miles.
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction—**List all infrastructure and equipment that is critical to your jurisdiction's operations and is located in a natural hazard risk zone. Briefly describe the item and give its estimated replacement-cost value. Examples are as follows:
  - Fire Districts—Apparatus and equipment housed in a facility that is located in a natural hazard risk zone. This is the equipment that is essential for you to deliver services to this area should a natural hazard occur. It is not necessary to provide a detailed inventory of each engine and truck and its contents. A summary will suffice, such as "5 Engines, 2 ladders, and their contents." Do not list reserve equipment.
  - Dike/Flood Control Districts—Miles of levees, pump stations, retention/detention ponds, tide gates, miles of ditches, etc., within natural hazard risk zones.
  - Water Districts—Total length of pipe (it is not necessary to specify size and type), pump stations, treatment facilities, dams and reservoirs, within natural hazard risk zones.

  - Public Utility Districts—Miles of power line (above ground and underground), generators, power generating sub-stations, miles of pipeline, etc., within natural hazard risk zones.
  - School Districts—Anything within natural hazard risk zones, besides school buildings, that is critical for you to operate (e.g., school buses if you own a fleet of school buses).
- **Total Value of Critical Infrastructure/Equipment—**Enter total replacement-cost value of the critical infrastructure and equipment listed above.
- **List of Critical Facilities Owned by the Jurisdiction—**List all buildings and other facilities that are critical to your jurisdiction's operations and are located in a natural hazard risk zone. Briefly describe the facility and give its estimated replacement-cost value.
- **Total Value of Critical Facilities—**Enter total replacement-cost value of the critical facilities listed above.
- **Current and Anticipated Service Trends—**Enter a brief description on how your jurisdiction's services are projected to expand in the foreseeable future and why. Note any identified capital improvements needed to meet the projected expansion. Examples are as follows:
  - For a Fire District: Portions of the jurisdiction have experienced a 13 percent growth over the last five years. Land use designations allow for an increase in light commercial and residential land uses within the service area. This increase in density of land uses will represent an increase in population and thus a projected increase in call volume. Our District is experiencing an average annual increase in call volume of 13 percent.
  - For Dike/Drainage/Flood Control District: Portions of the jurisdiction have experienced a 13 percent growth over the last five years. Land use designations allow for an increase in light commercial and residential land uses within the service area. This increase in density of land use will result in an increase in impermeable surface within our service area and thus increase the demand on control facilities.
  - For a Water District: Portions of the jurisdiction have experienced a 13 percent growth over the last five years. Land use designations allow for an increase in light commercial and residential land uses within the service area. This increase in density of land use will represent an increase in the number of housing units within the service area and thus represent an expansion of the district's delivery network.

Boundary Map

Maps that illustrate the service area boundary for all special-purpose district partners will be provided at the workshop. Please confirm that the boundaries reflected on the maps are current and accurate for your jurisdiction. In the box for this section, include a reference to the map that includes your jurisdiction's boundaries.

JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

In Table X-1, list in chronological order (most recent first) any natural hazard event that has caused damage to your jurisdiction since 1975. Include the date of the event and the estimated dollar amount of damage it caused. Please refer to the summary of natural hazard events within risk assessment of the overall hazard mitigation plan. Potential sources of damage information include:

- Preliminary damage estimates your jurisdiction filed with the county or state
- Insurance claims data

- Newspaper archives
- Other plans/documents that deal with emergency management (safety element of a comprehensive plan, emergency response plan, etc.)
- Citizen input.

HAZARD RISK RANKING

The risk ranking performed for the overall planning area is presented in the risk assessment section of the overall hazard mitigation plan. However, each jurisdiction has differing degrees of risk exposure and vulnerability and therefore needs to rank risk for its own area, using the same methodology as used for the overall planning area. The risk-ranking exercise assesses two variables for each hazard: its probability of occurrence; and its potential impact on people, property and operations. A detailed discussion of the concepts associated with risk ranking is provided in the overall hazard mitigation plan. The instructions below outline steps for assessing risk in your jurisdiction to develop results that are to be included in the template.

Determine Probability of Occurrence for Each Hazard

A probability factor is assigned based on how often a hazard is likely to occur. In Table 1, list the probability of occurrence for each hazard as it pertains to your jurisdiction, along with its probability factor, as follows:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor = 2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor = 1)
- None—If there is no exposure to a hazard, there is no probability of occurrence (Probability Factor = 0)

TABLE 1.
HAZARD PROBABILITY OF OCCURRENCE

Hazard Type	Probability	Probability Factor

The probability of occurrence of a hazard event is generally based on past hazard events in an area. For example, if your jurisdiction has experienced two damaging floods in the last 25 years, the probability of occurrence is high for flooding and scores a 3 under this category. If your jurisdiction has experienced no damage from landslides in the last 100 years, your probability of occurrence for landslide is low, and scores a 1 under this category.

Determine Potential Impacts of Each Hazard

The impact of each hazard was divided into three categories: impacts on people, impacts on property, and impacts on your jurisdiction's operations. These categories were also assigned weighted values. Impact on people was assigned a weighting factor of 3, impact on property was assigned a weighting factor of 2 and impact on operations was assigned a weighting factor of 1. Steps to assess each type of impact are described below.

Impacts on People

To assess impacts on people, values are assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. In Table 2, list the potential impact of each hazard on people in your jurisdiction, along with its impact factor, as follows:

- High Impact—50% or more of the population is exposed to a hazard (Impact Factor = 3)
- Medium Impact—25% to 49% of the population is exposed to a hazard (Impact Factor = 2)
- Low Impact—25% or less of the population is exposed to the hazard (Impact Factor = 1)
- No impact—None of the population is exposed to a hazard (Impact Factor = 0)

TABLE 2.
HAZARD IMPACT ON PEOPLE

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 3)

Impacts on Property

To assess impacts on property, values are assigned based on the percentage of the total ***value of buildings, equipment and infrastructure that is exposed*** to the hazard event. In Table 3, enter the cost estimates for potential damage to the jurisdiction's exposed buildings, equipment and infrastructure , taken from the "Summary of Loss" matrix provided with these instructions.

TABLE 3.
COST ESTIMATES FOR POTENTIAL DAMAGE TO STRUCTURES

Hazard type	Estimate of Potential Dollar Losses to Jurisdiction-Owned Facilities Exposed to the Hazard

In Table 4, list the potential impact of each hazard on property in your jurisdiction, along with its impact factor. Determine impact based on damage estimates from Table 3, as follows:

- High Impact—50% or more of the total assessed property value of facilities, equipment and infrastructure is exposed to a hazard (Impact Factor = 3)
- Medium Impact—25% to 49% of the total assessed property value of facilities, equipment and infrastructure is exposed to a hazard (Impact Factor = 2)
- Low Impact—24% or less of the total assessed property value of facilities, equipment and infrastructure is exposed to the hazard (Impact Factor = 1)
- No impact—None of the total assessed property value of facilities, equipment and infrastructure is exposed to a hazard (Impact Factor = 0)

TABLE 4.
HAZARD IMPACT ON PROPERTY

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 2)

Impacts on the Jurisdiction's Operations

Impact on operations is assessed based on estimates of ***how long it will take your jurisdiction to become 100-percent operable*** after a hazard event. The estimated functional downtime for critical facilities has been estimated for most hazards within the planning area. In Table 5, list the potential impact of each hazard on the operations of your jurisdiction, along with its impact factor, as follows:

- High = functional downtime of 365 days or more (Impact Factor = 3)
- Medium = Functional downtime of 180 to 364 days (Impact Factor = 2)
- Low = Functional downtime of 180 days or less (Impact Factor = 1)
- No Impact = No functional downtime is estimated from the hazard (Impact Factor = 0)

TABLE 5.
HAZARD IMPACT ON OPERATIONS

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 1)

You will need to consult the risk assessment for this task. The critical facilities exposed to each hazard have been identified, and the impacts on operability have been estimated for most of the hazards within the planning area. If the functional downtime component has not been provided for a hazard in the risk assessment, consider the impact on operability of that hazard to be low.

Determine Risk Rating for Each Hazard

A risk rating for each hazard is determined by multiplying the assigned probability factor by the sum of the weighted impact factors for people, property and operations:

- Risk Rating = Probability Factor x Weighted Impact Factor {people + property + operations}

Using the results developed in Tables 1, 2, 4 and 5, complete Table 6 to calculate a risk rating for each hazard of concern.

TABLE 6.
HAZARD RISK RATING

Hazard Type	Probability Factor (P)	Sum of Weighted Impact Factors on People, Property & Operations (I)	Risk Rating (P x I)

Complete Risk Ranking in Template

Once Table 6 has been completed above, complete Table X-2 in your template. The hazard with the highest risk rating in Table 6 should be listed at the top of Table X-2 and given a rank of 1; the hazard with the second highest rating should be listed second with a rank of 2; and so on. Two hazards with equal risk ratings should be given the same rank.

It is important to note that this exercise should not override your subjective assessment of relative risk based on your knowledge of the history of natural hazard events in your jurisdiction. If this risk ranking exercise generates results other that what you know based on substantiated data and documentation, you may alter the ranking based on this knowledge. If this is the case, please note this fact in the comments at the end of the template. Remember, one of the purposes of this exercise is to support the selection and prioritization of initiatives in your plan. If you identify an initiative with a high priority that mitigates the risk of a hazard you have ranked low, that project will not be competitive in the grant arena.

APPLICABLE REGULATIONS AND PLAN

List any federal, state, local or district laws, ordinances, codes and policies that govern your jurisdiction that include elements addressing hazard mitigation. Describe how these laws may support or conflict with the mitigation strategies of this plan. List any other plans, studies or other documents that address hazard mitigation issues for your jurisdiction. Note whether the documents could have a positive or a negative impact on the mitigation strategies of this plan. “None applicable” is a possible answer for this section.

CLASSIFICATION IN HAZARD MITIGATION PROGRAMS

Complete Table X-3 to indicate your jurisdiction’s participation in various national programs related to natural hazard mitigation. For each program enter “Yes” or “No” in the second column to indicate whether your jurisdiction participates. If yes, then enter the classification that your jurisdiction has earned under the program in the third column and the date on which that classification was issued in the fourth column; enter “N/A” in these columns if your jurisdiction is not participating.

HAZARD MITIGATION ACTION PLAN

Action Plan Matrix

Identify the initiatives your jurisdiction would like to pursue with this plan. Refer to the mitigation catalog for mitigation options you might want to consider. Be sure to consider the following factors in your selection of initiatives:

- Select initiatives that are consistent with the overall goals, objectives and guiding principles of the hazard mitigation plan.
- Identify projects where benefits exceed costs.
- Include any project that your jurisdiction has committed to pursuing regardless of grant eligibility.
- Know what is and is not grant-eligible under the HMGP and PDM (see fact sheet provided). Listing HMGP or PDM as a potential funding source for an ineligible project will be a red flag when this plan goes through review. If you have projects that are not HMGP or PDM grant eligible, but do mitigate part or all of the hazard and may be eligible for other grant programs sponsored by other agencies, include them in this section.
- Although you should identify at least one initiative for your highest ranked risk, a hazard-specific project is not required for every hazard. If you have not identified an earthquake related project, and an earthquake occurs that causes damage in your jurisdiction, you are not discounted from HMGP project grant eligibility.

Complete Table X-4 for all the initiatives you have identified:

- Enter the initiative number and description.
- Indicate whether the initiative mitigates hazards for new or existing assets.
- Identify the specific hazards the initiative will mitigate.
- Identify by number the mitigation plan objectives that the initiative addresses. These have been provided in the Steering Committee meeting minutes that were forwarded to you in the past.
- Indicate who will be the lead in administering the project. This will most likely be your governing body.
- Identify funding sources for the project. If it is a grant, include the funding sources for the cost share.
- Indicate the time line as “short term” (1 to 5 years) or “long term” (5 years or greater).

Technical assistance will be available to your jurisdiction in completing this section during the technical assistance visit.

Wording Your Initiative Descriptions:

Descriptions of your initiatives need not provide great detail. That will come when you apply for a project grant. Provide enough information to identify the project’s scope and impact. The following are typical descriptions for an action plan initiative:

- **Initiative 1—**Address Repetitive Loss properties. Through targeted mitigation, acquire, relocate or retrofit the five repetitive loss structures in the County as funding opportunities become available.
- **Initiative 2—**Perform a non-structural, seismic retrofit of City Hall.
- **Initiative 3—**Acquire floodplain property in the Smith subdivision.
- **Initiative 4—**Enhance the County flood warning capability by joining the NOAA “Storm Ready” program.

Prioritization of Mitigation Initiatives

Complete the information in Table X-5 as follows:

- Initiative #—Indicate the initiative number from Table X-4.
- # of Objectives Met—Enter the number of objectives the initiative will meet.
- Benefits—Enter "High," "Medium" or "Low" as follows:
  - High: Project will have an immediate impact on the reduction of risk exposure to life and property.
  - Medium: Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
  - Low: Long-term benefits of the project are difficult to quantify in the short term.
- Costs—Enter "High," "Medium" or "Low" as follows:
  - High: Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.
  - Medium: Could budget for under existing work-plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
  - Low: Possible to fund under existing budget. Project is part of, or can be part of an existing ongoing program.

  If you know the estimated cost of a project because it is part of an existing, ongoing program, indicate the amount.
- Do Benefits Exceed the Cost?—Enter "Yes" or "No." This is a qualitative assessment. Enter "Yes" if the benefit rating (high, medium or low) is the same as or higher than the cost rating (high benefit/high cost; high benefit/medium cost; medium benefit/low cost; etc.). Enter "No" if the benefit rating is lower than the cost rating (medium benefit/high cost, low benefit/medium cost; etc.)
- Is the Project Grant-Eligible?—Enter "Yes" or "No." Refer to the fact sheet on HMGP and PDM.
- Can Project Be Funded Under Existing Program Budgets?—Enter "Yes" or "No." In other words, is this initiative currently budgeted for, or would it require a new budget authorization or funding from another source such as grants?
- Priority—Enter "High," "Medium" or "Low" as follows:
  - High: Project meets multiple plan objectives, benefits exceed cost, funding is secured under existing programs, or is grant eligible, and project can be completed in 1 to 5 years (i.e., short term project) once funded.
  - Medium: Project meets at least 1 plan objective, benefits exceed costs, requires special funding authorization under existing programs, grant eligibility is questionable, and project can be completed in 1 to 5 years once funded.
  - Low: Project will mitigate the risk of a hazard, benefits exceed costs, funding has not been secured, project is not grant eligible, and time line for completion is long term (5 to 10 years).

This prioritization is a simple review to determine that the initiatives you have identified meet one of the primary objectives of the Disaster Mitigation Act. It is not the detailed benefit/cost analysis required for

HMGP/PDM project grants. The prioritization will identify any projects whose probable benefits will not exceed the probable costs.

Analysis of Mitigation Actions

Complete Table X-6 summarizing the mitigation actions by hazard of concern and the following six mitigation types:

- Prevention—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- Property Protection—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- Public Education and Awareness—Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- Natural Resource Protection—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- Emergency Services—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- Structural Projects—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.

This exercise demonstrates that the jurisdiction has selected a comprehensive range of actions.

FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

In this section, identify any future studies, analyses, reports, or surveys your jurisdiction needs to better understand its vulnerability to identified or currently unidentified risks. These could be needs based on federal or state agency mandates such as EPA’s Bio-terrorism assessment requirement for water districts.

ADDITIONAL COMMENTS

Use this section to add any additional information pertinent to hazard mitigation and your jurisdiction not covered in this template.

CHAPTER __.
__DISTRICT NAME__ ANNEX

HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Name, Title
Organization
Street Address
City, State ZIP
Telephone: _____
e-mail Address: _____

Alternate Point of Contact

Name, Title
Organization
Street Address
City, State ZIP
Telephone: _____
e-mail Address: _____

JURISDICTION PROFILE

Insert Narrative Profile Information, per Instructions

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

- **Population Served—**To Be Completed
- **Land Area Served—**To Be Completed
- **Value of Area Served—**To Be Completed
- **Land Area Owned—**To Be Completed
- **Critical Infrastructure and Equipment Owned:**
  - To Be Completed
  - To Be Completed
  - To Be Completed
- **Total Value of Critical Infrastructure and Equipment—**To Be Completed
- **Critical Facilities Owned:**
  - To Be Completed
  - To Be Completed
  - To Be Completed
- **Total Value of Critical Facilities—**To Be Completed
- **Current and Anticipated Service Trends—**To Be Completed

JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 33-21.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment

Table 33-21 lists all past occurrences of natural hazards within the jurisdiction.

HAZARD RISK RANKING

TABLE 33-22.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1		
2		
3		
4		
5		
6		
7		
8		
9		

Table 33-22 presents the ranking of the hazards of concern.

APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- To Be Completed
- To Be Completed
- To Be Completed
- To Be Completed

COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 33-23.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready			
Firewise			
Tsunami Ready (if applicable)			

Classifications under various community mitigation programs are presented in Table 33-23.

HAZARD MITIGATION ACTION PLAN

TABLE 33-24.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards Mitigated	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline
Initiative #—Description						
Initiative #—Description						
Initiative #—Description						
Initiative #—Description						
Initiative #—Description						
Initiative #—Description						
Initiative #—Description						
Initiative #—Description						

Table 33-24 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

PRIORITY OF RECOMMENDED INITIATIVES

TABLE 33-25.
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. See Chapter 1 for definitions of high, medium and low priorities.

Table 33-25 identifies the priority for each initiative.

ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 33-26.
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						
Drought						
Earthquake						
Fish Losses						
Flood						
Landslide						
Severe Weather						
Tsunami						
Wildfire						

a. See Chapter 1 for description of mitigation types.

Table 33-26 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Insert text, if any; Delete section if not used

ADDITIONAL COMMENTS

Insert text, if any; Delete section if not used

APPENDIX E.
ANNEX INSTRUCTIONS AND TEMPLATE FOR SPECIAL-PURPOSE DISTRICT UPDATES

INSTRUCTIONS FOR COMPLETING SPECIAL-PURPOSE DISTRICT UPDATE ANNEX TEMPLATE

This document provides instructions for completing the annex template for special-purpose districts participating in multi-partner hazard mitigation planning. Assistance in completing the template will be available in the form of a workshop for all planning partners or one-on-one visits with each partner, depending on funding availability. Any questions on completing the template should be directed to:

Rob Flaner
Tetra Tech, Inc.
90 South Blackwood Ave.
Eagle, ID 83616
(208) 939-4391
e-mail: rflaner@msn.com

Please provide both a hard copy and digital copy of the completed template to Tetra Tech upon completion.

Associated Materials:

Along with the annex template and these instructions, you have been provided with other materials with information that is needed for completing the template. Be sure to review these materials ***before*** you begin the process of filling in the template:

- Summary-of-loss matrix for the hazard mitigation plan
- Results from the hazard mitigation plan questionnaire
- Catalog of mitigation alternatives
- Fact sheet on Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Grant Program (PDM)

A Note About Software:

The template for the special-purpose district annex is a Microsoft Word document in a format that will be used in the final plan. Partners are asked to use this template so that a uniform product will be completed for each partner. Partners who do not have Microsoft Word capability may prepare the document in other formats, and the planning team will convert it to the Word format.

CHAPTER NUMBER AND TITLE

In the chapter title at the top of Page 1, type in the complete official name of your jurisdiction (West County Fire Protection District #1, Burgville Flood Protection District, etc.). At this time, also change the name in the “header” box on Page 3, using the same wording.

Note that the template is set up as Chapter “X.” Please leave all references to “X” in the template as they are. Once all templates are received, chapter numbering will be assigned for incorporation into the final plan.

HAZARD MITIGATION PLAN POINT OF CONTACT

Please provide the name, title, mailing address, telephone number, and e-mail address for the primary point of contact for your jurisdiction. This should be the person responsible for monitoring, evaluating and updating the annex for your jurisdiction. This person should also be the principle liaison between your jurisdiction and the Steering Committee overseeing development of this plan.

In addition, designate an alternate point of contact. This would be a person to contact should the primary point of contact be unavailable or no longer employed by the jurisdiction.

JURISDICTION PROFILE

Narrative Profile

Please provide a brief summary to profile your jurisdiction. Include the purpose of the jurisdiction, the date of inception, the type of organization, the number of employees, the mode of operation (i.e., how operations are funded), the type of governing body, and who has adoptive authority. Describe who the jurisdiction's customers are (if applicable, include number of users or subscribers). Include a geographical description of the service area.

Provide information in a style similar to the example provided in the box at right. This should be information that was not provided in the overall mitigation plan document.

Example Jurisdiction Narrative Profile:

Humboldt Community Services District is a special-purpose district created in 1952 to provide water, sewer, and street lighting to the unincorporated area surrounding the City of Eureka known as Pine Hill & Cutten. The District's designated service areas expanded throughout the years to include other unincorporated areas of Humboldt County known as Myrtletown, Humboldt Hill, Fields Landing, King Salmon, and Freshwater. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan; the General Manager will oversee its implementation. As of April 30, 2007, the District serves 7,305 water connections and 6,108 sewer connections, with a current staff of 21. Funding comes primarily through rates and revenue bonds..

Summary Information

Complete the bulleted list of summary information as follows:

- **Population Served—**List the estimated population that your jurisdiction provides services to. If you do not know this number directly, create an estimate (e.g., the number of service connections times the average household size for the service area based on Census data).
- **Land Area Served—**Enter the service area of your jurisdiction in acres or square miles.
- **Value of Area Served—**Enter the approximate assessed value of your service area. If you do not have this information, the County should be able to provide a number using the County Assessor's database.
- **Land Area Owned—**Enter the area of property owned by the jurisdiction in acres or square miles.
- **List of Critical Infrastructure/Equipment Owned by the Jurisdiction—**List all infrastructure and equipment that is critical to your jurisdiction's operations and is located in a natural hazard risk zone. Briefly describe the item and give its estimated replacement-cost value. Examples are as follows:
  - Fire Districts—Apparatus and equipment housed in a facility that is located in a natural hazard risk zone. This is the equipment that is essential for you to deliver services to this area should a natural hazard occur. It is not necessary to provide a detailed inventory of each engine and truck and its contents. A summary will suffice, such as "5 Engines, 2 ladders, and their contents." Do not list reserve equipment.
  - Dike/Flood Control Districts—Miles of levees, pump stations, retention/detention ponds, tide gates, miles of ditches, etc., within natural hazard risk zones.
  - Water Districts—Total length of pipe (it is not necessary to specify size and type), pump stations, treatment facilities, dams and reservoirs, within natural hazard risk zones.

  - Public Utility Districts—Miles of power line (above ground and underground), generators, power generating sub-stations, miles of pipeline, etc., within natural hazard risk zones.
  - School Districts—Anything within natural hazard risk zones, besides school buildings, that is critical for you to operate (e.g., school buses if you own a fleet of school buses).
- **Total Value of Critical Infrastructure/Equipment—**Enter total replacement-cost value of the critical infrastructure and equipment listed above.
- **List of Critical Facilities Owned by the Jurisdiction—**List all buildings and other facilities that are critical to your jurisdiction's operations and are located in a natural hazard risk zone. Briefly describe the facility and give its estimated replacement-cost value.
- **Total Value of Critical Facilities—**Enter total replacement-cost value of the critical facilities listed above.
- **Current and Anticipated Service Trends—**Enter a brief description on how your jurisdiction's services are projected to expand in the foreseeable future and why. Note any identified capital improvements needed to meet the projected expansion. Examples are as follows:
  - For a Fire District: Portions of the jurisdiction have experienced a 13 percent growth over the last five years. Land use designations allow for an increase in light commercial and residential land uses within the service area. This increase in density of land uses will represent an increase in population and thus a projected increase in call volume. Our District is experiencing an average annual increase in call volume of 13 percent.
  - For Dike/Drainage/Flood Control District: Portions of the jurisdiction have experienced a 13 percent growth over the last five years. Land use designations allow for an increase in light commercial and residential land uses within the service area. This increase in density of land use will result in an increase in impermeable surface within our service area and thus increase the demand on control facilities.
  - For a Water District: Portions of the jurisdiction have experienced a 13 percent growth over the last five years. Land use designations allow for an increase in light commercial and residential land uses within the service area. This increase in density of land use will represent an increase in the number of housing units within the service area and thus represent an expansion of the district's delivery network.

Boundary Map

Maps that illustrate the service area boundary for all special-purpose district partners will be provided at the workshop. Please confirm that the boundaries reflected on the maps are current and accurate for your jurisdiction. In the box for this section, include a reference to the map that includes your jurisdiction's boundaries.

JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

In Table X-1, list in chronological order (most recent first) any natural hazard event that has caused damage to your jurisdiction since 1975. Include the date of the event and the estimated dollar amount of damage it caused. Please refer to the summary of natural hazard events within risk assessment of the overall hazard mitigation plan. Potential sources of damage information include:

- Preliminary damage estimates your jurisdiction filed with the county or state
- Insurance claims data

- Newspaper archives
- Other plans/documents that deal with emergency management (safety element of a comprehensive plan, emergency response plan, etc.)
- Citizen input.

HAZARD RISK RANKING

The risk ranking performed for the overall planning area is presented in the risk assessment section of the overall hazard mitigation plan. However, each jurisdiction has differing degrees of risk exposure and vulnerability and therefore needs to rank risk for its own area, using the same methodology as used for the overall planning area. The risk-ranking exercise assesses two variables for each hazard: its probability of occurrence; and its potential impact on people, property and operations. A detailed discussion of the concepts associated with risk ranking is provided in the overall hazard mitigation plan. The instructions below outline steps for assessing risk in your jurisdiction to develop results that are to be included in the template.

Determine Probability of Occurrence for Each Hazard

A probability factor is assigned based on how often a hazard is likely to occur. In Table 1, list the probability of occurrence for each hazard as it pertains to your jurisdiction, along with its probability factor, as follows:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor = 2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor = 1)
- None—If there is no exposure to a hazard, there is no probability of occurrence (Probability Factor = 0)

TABLE 1.
HAZARD PROBABILITY OF OCCURRENCE

Hazard Type	Probability	Probability Factor

The probability of occurrence of a hazard event is generally based on past hazard events in an area. For example, if your jurisdiction has experienced two damaging floods in the last 25 years, the probability of occurrence is high for flooding and scores a 3 under this category. If your jurisdiction has experienced no damage from landslides in the last 100 years, your probability of occurrence for landslide is low, and scores a 1 under this category.

Determine Potential Impacts of Each Hazard

The impact of each hazard was divided into three categories: impacts on people, impacts on property, and impacts on your jurisdiction's operations. These categories were also assigned weighted values. Impact on people was assigned a weighting factor of 3, impact on property was assigned a weighting factor of 2 and impact on operations was assigned a weighting factor of 1. Steps to assess each type of impact are described below.

Impacts on People

To assess impacts on people, values are assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. In Table 2, list the potential impact of each hazard on people in your jurisdiction, along with its impact factor, as follows:

- High Impact—50% or more of the population is exposed to a hazard (Impact Factor = 3)
- Medium Impact—25% to 49% of the population is exposed to a hazard (Impact Factor = 2)
- Low Impact—25% or less of the population is exposed to the hazard (Impact Factor = 1)
- No impact—None of the population is exposed to a hazard (Impact Factor = 0)

TABLE 2.
HAZARD IMPACT ON PEOPLE

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 3)

Impacts on Property

To assess impacts on property, values are assigned based on the percentage of the total ***value of buildings, equipment and infrastructure that is exposed*** to the hazard event. In Table 3, enter the cost estimates for potential damage to the jurisdiction's exposed buildings, equipment and infrastructure , taken from the "Summary of Loss" matrix provided with these instructions.

TABLE 3.
COST ESTIMATES FOR POTENTIAL DAMAGE TO STRUCTURES

Hazard type	Estimate of Potential Dollar Losses to Jurisdiction-Owned Facilities Exposed to the Hazard

In Table 4, list the potential impact of each hazard on property in your jurisdiction, along with its impact factor. Determine impact based on damage estimates from Table 3, as follows:

- High Impact—50% or more of the total assessed property value of facilities, equipment and infrastructure is exposed to a hazard (Impact Factor = 3)
- Medium Impact—25% to 49% of the total assessed property value of facilities, equipment and infrastructure is exposed to a hazard (Impact Factor = 2)
- Low Impact—24% or less of the total assessed property value of facilities, equipment and infrastructure is exposed to the hazard (Impact Factor = 1)
- No impact—None of the total assessed property value of facilities, equipment and infrastructure is exposed to a hazard (Impact Factor = 0)

TABLE 4.
HAZARD IMPACT ON PROPERTY

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 2)

Impacts on the Jurisdiction's Operations

Impact on operations is assessed based on estimates of ***how long it will take your jurisdiction to become 100-percent operable*** after a hazard event. The estimated functional downtime for critical facilities has been estimated for most hazards within the planning area. In Table 5, list the potential impact of each hazard on the operations of your jurisdiction, along with its impact factor, as follows:

- High = functional downtime of 365 days or more (Impact Factor = 3)
- Medium = Functional downtime of 180 to 364 days (Impact Factor = 2)
- Low = Functional downtime of 180 days or less (Impact Factor = 1)
- No Impact = No functional downtime is estimated from the hazard (Impact Factor = 0)

TABLE 5.
HAZARD IMPACT ON OPERATIONS

Hazard Type	Impact	Impact Factor	Weighted Impact Factor (Unweighted Factor x 1)

You will need to consult the risk assessment for this task. The critical facilities exposed to each hazard have been identified, and the impacts on operability have been estimated for most of the hazards within the planning area. If the functional downtime component has not been provided for a hazard in the risk assessment, consider the impact on operability of that hazard to be low.

Determine Risk Rating for Each Hazard

A risk rating for each hazard is determined by multiplying the assigned probability factor by the sum of the weighted impact factors for people, property and operations:

- Risk Rating = Probability Factor x Weighted Impact Factor {people + property + operations}

Using the results developed in Tables 1, 2, 4 and 5, complete Table 6 to calculate a risk rating for each hazard of concern.

TABLE 6.
HAZARD RISK RATING

Hazard Type	Probability Factor (P)	Sum of Weighted Impact Factors on People, Property & Operations (I)	Risk Rating (P x I)

Complete Risk Ranking in Template

Once Table 6 has been completed above, complete Table X-2 in your template. The hazard with the highest risk rating in Table 6 should be listed at the top of Table X-2 and given a rank of 1; the hazard with the second highest rating should be listed second with a rank of 2; and so on. Two hazards with equal risk ratings should be given the same rank.

It is important to note that this exercise should not override your subjective assessment of relative risk based on your knowledge of the history of natural hazard events in your jurisdiction. If this risk ranking exercise generates results other that what you know based on substantiated data and documentation, you may alter the ranking based on this knowledge. If this is the case, please note this fact in the comments at the end of the template. Remember, one of the purposes of this exercise is to support the selection and prioritization of initiatives in your plan. If you identify an initiative with a high priority that mitigates the risk of a hazard you have ranked low, that project will not be competitive in the grant arena.

APPLICABLE REGULATIONS AND PLAN

List any federal, state, local or district laws, ordinances, codes and policies that govern your jurisdiction that include elements addressing hazard mitigation. Describe how these laws may support or conflict with the mitigation strategies of this plan. List any other plans, studies or other documents that address hazard mitigation issues for your jurisdiction. Note whether the documents could have a positive or a negative impact on the mitigation strategies of this plan. “None applicable” is a possible answer for this section.

CLASSIFICATION IN HAZARD MITIGATION PROGRAMS

Complete Table X-3 to indicate your jurisdiction’s participation in various national programs related to natural hazard mitigation. For each program enter “Yes” or “No” in the second column to indicate whether your jurisdiction participates. If yes, then enter the classification that your jurisdiction has earned under the program in the third column and the date on which that classification was issued in the fourth column; enter “N/A” in these columns if your jurisdiction is not participating.

HAZARD MITIGATION ACTION PLAN

Action Plan Matrix

Identify the initiatives your jurisdiction would like to pursue with this plan. Refer to the mitigation catalog for mitigation options you might want to consider. Be sure to consider the following factors in your selection of initiatives:

- Select initiatives that are consistent with the overall goals, objectives and guiding principles of the hazard mitigation plan.
- Identify projects where benefits exceed costs.
- Include any project that your jurisdiction has committed to pursuing regardless of grant eligibility.
- Know what is and is not grant-eligible under the HMGP and PDM (see fact sheet provided). Listing HMGP or PDM as a potential funding source for an ineligible project will be a red flag when this plan goes through review. If you have projects that are not HMGP or PDM grant eligible, but do mitigate part or all of the hazard and may be eligible for other grant programs sponsored by other agencies, include them in this section.
- Although you should identify at least one initiative for your highest ranked risk, a hazard-specific project is not required for every hazard. If you have not identified an earthquake related project, and an earthquake occurs that causes damage in your jurisdiction, you are not discounted from HMGP project grant eligibility.

Complete Table X-4 for all the initiatives you have identified:

- Enter the initiative number and description.
- Indicate whether the initiative mitigates hazards for new or existing assets.
- Identify the specific hazards the initiative will mitigate.
- Identify by number the mitigation plan objectives that the initiative addresses. These have been provided in the Steering Committee meeting minutes that were forwarded to you in the past.
- Indicate who will be the lead in administering the project. This will most likely be your governing body.
- Identify funding sources for the project. If it is a grant, include the funding sources for the cost share.
- Indicate the time line as “short term” (1 to 5 years) or “long term” (5 years or greater).
- Enter “Yes” or “No” to indicate whether this initiative was included in the previous version of this hazard mitigation plan.

Wording Your Initiative Descriptions:

Descriptions of your initiatives need not provide great detail. That will come when you apply for a project grant. Provide enough information to identify the project’s scope and impact. The following are typical descriptions for an action plan initiative:

- **Initiative 1—**Address Repetitive Loss properties. Through targeted mitigation, acquire, relocate or retrofit the five repetitive loss structures in the County as funding opportunities become available.
- **Initiative 2—**Perform a non-structural, seismic retrofit of City Hall.
- **Initiative 3—**Acquire floodplain property in the Smith subdivision.
- **Initiative 4—**Enhance the County flood warning capability by joining the NOAA “Storm Ready” program.

Technical assistance will be available to your jurisdiction in completing this section during the technical assistance visit.

Prioritization of Mitigation Initiatives

Complete the information in Table X-5 as follows:

- Initiative #—Indicate the initiative number from Table X-4.
- # of Objectives Met—Enter the number of objectives the initiative will meet.
- Benefits—Enter "High," "Medium" or "Low" as follows:
  - High: Project will have an immediate impact on the reduction of risk exposure to life and property.
  - Medium: Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
  - Low: Long-term benefits of the project are difficult to quantify in the short term.
- Costs—Enter "High," "Medium" or "Low" as follows:
  - High: Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.
  - Medium: Could budget for under existing work-plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
  - Low: Possible to fund under existing budget. Project is part of, or can be part of an existing ongoing program.

  If you know the estimated cost of a project because it is part of an existing, ongoing program, indicate the amount.
- Do Benefits Exceed the Cost?—Enter "Yes" or "No." This is a qualitative assessment. Enter "Yes" if the benefit rating (high, medium or low) is the same as or higher than the cost rating (high benefit/high cost; high benefit/medium cost; medium benefit/low cost; etc.). Enter "No" if the benefit rating is lower than the cost rating (medium benefit/high cost, low benefit/medium cost; etc.)
- Is the Project Grant-Eligible?—Enter "Yes" or "No." Refer to the fact sheet on HMGP and PDM.
- Can Project Be Funded Under Existing Program Budgets?—Enter "Yes" or "No." In other words, is this initiative currently budgeted for, or would it require a new budget authorization or funding from another source such as grants?
- Priority—Enter "High," "Medium" or "Low" as follows:
  - High: Project meets multiple plan objectives, benefits exceed cost, funding is secured under existing programs, or is grant eligible, and project can be completed in 1 to 5 years (i.e., short term project) once funded.
  - Medium: Project meets at least 1 plan objective, benefits exceed costs, requires special funding authorization under existing programs, grant eligibility is questionable, and project can be completed in 1 to 5 years once funded.

  - Low: Project will mitigate the risk of a hazard, benefits exceed costs, funding has not been secured, project is not grant eligible, and time line for completion is long term (5 to 10 years).

This prioritization is a simple review to determine that the initiatives you have identified meet one of the primary objectives of the Disaster Mitigation Act. It is not the detailed benefit/cost analysis required for HMGP/PDM project grants. The prioritization will identify any projects whose probable benefits will not exceed the probable costs.

Analysis of Mitigation Actions

Complete Table X-6 summarizing the mitigation actions by hazard of concern and the following six mitigation types:

- Prevention—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- Property Protection—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- Public Education and Awareness—Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- Natural Resource Protection—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- Emergency Services—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- Structural Projects—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.

This exercise demonstrates that the jurisdiction has selected a comprehensive range of actions.

STATUS OF PREVIOUS PLAN INITIATIVES

In this section, provide a status report of actions recommended in your previous hazard mitigation plan. You must be able to reconcile your original action plan to meet FEMA requirements for plan updates. Enter all the recommended actions from your previous plan in Table X-10 and put an X in one of the following three columns for each action to indicate its status:

- **Completed**—If the action has been completed, place a check mark in this column and enter a brief explanation in the “Comments” column (e.g., “Action #WC31 was completed by the Public Works Department on 3/12/2009”). Ongoing actions, such as annual outreach projects or maintenance activities, should also be indicated as “Completed,” with a statement about the ongoing nature of the action provided in the “Comments” column (e.g., “Ongoing action, implemented annually by Community Development Department”).

- **Carry Over to Plan Update**—If you did not complete an action and want to carry it over to your updated action plan, place a check mark in this column, and enter an explanatory statement in the comment section (e.g., "Action carried over as Action #WC14 in updated action plan").
- **Removed; No Longer Feasible**—If you want to remove an action because you have determined that it is no longer feasible, place a check mark in this column. "No longer feasible" means that you have determined that you do not have the capability to implement the action or that the action does not serve the best interest of your jurisdiction. Lack of funding does not mean that it is no longer feasible, unless the sole source of funding for an action is no longer available. Place a comment in the comment section explaining why the action is no longer feasible (e.g., "Action no longer considered feasible due to lack of political support to complete it.:)

FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

In this section, identify any future studies, analyses, reports, or surveys your jurisdiction needs to better understand its vulnerability to identified or currently unidentified risks. These could be needs based on federal or state agency mandates such as EPA's Bio-terrorism assessment requirement for water districts.

ADDITIONAL COMMENTS

Use this section to add any additional information pertinent to hazard mitigation and your jurisdiction not covered in this template.

CHAPTER __.
__DISTRICT NAME__ UPDATE ANNEX

HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

Name, Title
Organization
Street Address
City, State ZIP
Telephone: _____
e-mail Address: _____

Alternate Point of Contact

Name, Title
Organization
Street Address
City, State ZIP
Telephone: _____
e-mail Address: _____

JURISDICTION PROFILE

Insert Narrative Profile Information, per Instructions

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

- **Population Served—**To Be Completed
- **Land Area Served—**To Be Completed
- **Value of Area Served—**To Be Completed
- **Land Area Owned—**To Be Completed
- **Critical Infrastructure and Equipment Owned:**
  - To Be Completed
  - To Be Completed
  - To Be Completed
- **Total Value of Critical Infrastructure and Equipment—**To Be Completed
- **Critical Facilities Owned:**
  - To Be Completed
  - To Be Completed
  - To Be Completed
- **Total Value of Critical Facilities—**To Be Completed
- **Current and Anticipated Service Trends—**To Be Completed

JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

TABLE 33-27.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment

Table 33-27 lists all past occurrences of natural hazards within the jurisdiction.

HAZARD RISK RANKING

TABLE 33-28.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1		
2		
3		
4		
5		
6		
7		
8		
9		

Table 33-28 presents the ranking of the hazards of concern.

APPLICABLE REGULATIONS AND PLANS

The following existing codes, ordinances, policies or plans are applicable to this hazard mitigation plan:

- To Be Completed
- To Be Completed
- To Be Completed
- To Be Completed

COMMUNITY MITIGATION PROGRAM CLASSIFICATIONS

TABLE 33-29.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Public Protection	No	--	--
Storm Ready			
Firewise			
Tsunami Ready (if applicable)			

Classifications under various community mitigation programs are presented in Table 33-29.

HAZARD MITIGATION ACTION PLAN

TABLE 33-30.
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 #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							
Initiative #—Description							

Table 33-30 lists the initiatives that make up the jurisdiction's hazard mitigation plan.

PRIORITY OF RECOMMENDED INITIATIVES

TABLE 33-31.
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. See Chapter 1 for definitions of high, medium and low priorities.

Table 33-31 identifies the priority for each initiative.

ANALYSIS OF RECOMMENDED INITIATIVES

TABLE 33-32.
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						
Drought						
Earthquake						
Fish Losses						
Flood						
Landslide						
Severe Weather						
Tsunami						
Wildfire						

a. See Chapter 1 for description of mitigation types.

Table 33-32 summarizes the mitigation initiatives by hazard of concern and the six mitigation types.

STATUS OF PREVIOUS PLAN INITIATIVES

TABLE 33-33.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

	Action Status			
Action #	Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Comments

Table 33-33 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.

FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

Insert text, if any; Delete section if not used

ADDITIONAL COMMENTS

Insert text, if any; Delete section if not used