



Hiouchi Local Hazard Mitigation Plan

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11136755 | August 21, 2017
Revision 1 October 10, 2017
Revision 2 November 16, 2017





Table of Contents

1.	Introduction.....	1
1.1	Purpose.....	1
1.2	Background and Scope.....	1
1.3	Hiouchi Planning Area Community Profile.....	2
1.3.1	Geographical Setting	2
1.3.2	Hiouchi History and Public Services.....	3
1.3.3	Regional Public Services.....	4
1.3.4	Water Supply	4
1.3.5	Climate.....	4
1.3.6	Geology	5
1.3.7	Soils	5
1.3.8	Demographics.....	6
2.	Planning Process	9
2.1	Planning Resource Organization	9
2.1.1	Grant Funding.....	9
2.1.2	Formation of the Planning Team and Outreach to Planning Partners	10
2.1.3	Review of Existing Regulations and Plans	12
2.2	Plan Development Chronology	14
2.3	Public Involvement.....	16
2.3.1	Strategy	16
2.3.2	Questionnaire	16
2.3.3	Initial Public Outreach.....	17
2.3.4	Public Outreach During Draft Plan	17
2.4	Mitigation Achievements Since 2011 MJHMP Development.....	18
3.	Risk and Vulnerability Assessment.....	20
3.1	Approach to Risk Assessment.....	20
3.2	Hazard Identification	21
3.2.1	Methodology	21
3.2.2	Disaster Declaration History	22
3.3	Critical Facility Inventory	24
3.4	Hazard Profiles	26
3.5	Vulnerability Assessment.....	26
3.5.1	HAZUS Assessment Tool.....	27
3.6	Earthquakes.....	27
3.6.1	Earthquake Hazard Profile	28
3.6.2	HAZUS-MH Data Sources.....	42
3.6.3	Earthquake Secondary Hazards.....	43
3.6.4	Earthquakes and Climate Change.....	43



3.6.5	Earthquake Exposure	43
3.6.6	Earthquake Vulnerability	45
3.7	Wildfire	47
3.7.1	Wildfire Hazard Profile	47
3.7.2	Wildfire Secondary Hazards	51
3.7.3	Wildfires and Climate Change	52
3.7.4	Wildfire Exposure	53
3.7.5	Wildfire Vulnerability	53
3.8	Flood	55
3.8.1	Flood Hazard Profile	56
3.8.2	Flood Secondary Hazards	57
3.8.3	Flood and Climate Change	58
3.8.4	Flood Exposure	59
3.8.5	Flood Vulnerability	59
3.9	Landslides and other Mass Movement	61
3.9.1	Landslide Hazard Profile	61
3.9.2	Landslide Secondary Hazards	62
3.9.3	Landslide and Climate Change	62
3.9.4	Landslide Exposure	63
3.9.5	Landslide Vulnerability	64
3.10	Severe Weather	65
3.10.1	Severe Weather Hazard Profile	65
3.10.2	Severe Weather Secondary Hazards	70
3.10.3	Severe Weather and Climate Change	71
3.10.4	Severe Weather Exposure	71
3.10.5	Severe Weather Vulnerability	72
3.11	Hazardous Materials Transport	73
3.11.1	Hazardous Materials Hazard Profile	73
3.11.2	Hazardous Material Transport and Climate Change	75
3.11.3	Hazardous Materials Transport Exposure	75
3.11.4	Hazardous Materials Transport Vulnerability	75
3.12	Planning Area Risk Ranking	77
3.12.1	Hazard Risk Rating	77
3.12.2	Probability of Occurrence	77
3.12.3	Impact	78
3.12.4	Property	78
3.12.5	Economy	78
3.12.6	Risk Rating and Ranking	79
4.	Mitigation Strategy	81
4.1	Goals and Objectives	81
4.1.1	Goals	81
4.2	Identification and Analysis of Mitigation Actions	82
4.3	Mitigation Action Plan	82
4.3.1	Mitigation Actions	83
4.3.2	Mitigation Action Summary and Prioritization	92



5.	Plan Adoption	95
6.	Plan Implementation and Maintenance	96
6.1	Implementation	96
6.2	Maintenance	98
6.2.1	Maintenance Schedule	98
6.3	Incorporation into Existing Planning Mechanisms	100
6.3.1	Capital Improvement Plan	101
6.3.2	Hiouchi Catastrophic Disaster Plan	101
6.3.3	Neighbors Helping Neighbors.....	101
6.3.4	Del Norte County Multi-Jurisdictional Hazard Mitigation Plan	102
6.3.5	Del Norte County Comprehensive Economic Development Strategy	102
6.3.6	Del Norte Water Resources Network	102
6.3.7	Support for Regional Planning.....	102
6.3.8	Continued Public Involvement	102
7.	REFERENCES	104

Plate Index

Plate 3-1	Earthquake Shaking Potential for California (USGS, 2016)	29
Plate 3-2	Cascadia Subduction Zone (USGS,2016)	36
Plate 3-3	Shake Map for Cascadia Subduction Zone M 9.0 (USGS,2017)	37
Plate 3-4	100-Year Probabilistic Ground Motion Map for the Hiouchi Planning Area (USGS, 2017) ..	38
Plate 3-5	500-Year Probabilistic Ground Motion Map for the Hiouchi Planning Area (California Department of Conservation, 2017)	39
Plate 3-6	NEHRP Soil Classifications in Del Norte County (Tetra Tech, 2011).....	41
Plate 3-7	Fire Hazard Severity Zones for the Hiouchi Planning area (CalFire, 2017)	51
Plate 3-8	Landslides throughout the United States (USGS,2014)	63
Plate 3-9	Average Total Monthly Precipitation for the Gasquet RS weather station (WRCC, 2017)..	67



Table Index

Table 2.1	Planning Team Members	10
Table 2.2	Plan Development Chronology/ Milestones	15
Table 2.3	Status of Previous Mitigation Plan Actions.....	19
Table 3.1	Del Norte County Disaster History, 1950 – 2017	22
Table 3.2	Hiouchi Natural Hazard Events	23
Table 3.3	Critical Facility Inventory.....	25
Table 3.4	Magnitude Classes	31
Table 3.5	Modified Mercalli Intensity Scale	32
Table 3.6	Comparison of Mercalli Scale and Peak Ground Acceleration	33
Table 3.7	NEHRP Soil Classification System.....	39
Table 3.8	Recent Earthquakes of Magnitude M5.0 or Larger Felt within Del Norte County	42
Table 3.9	Population at Risk from Wildland Fire	54
Table 3.10	Houses at Risk from Wildland fire	54
Table 3.11	Houses at Risk from Wildland fire	54
Table 3.12	Estimated Loss for the 100-year and 500-year Flood Events	60
Table 3.13	Buildings Exposed to Landslide Hazard	65
Table 3.14	Description of hailstone classifications	70
Table 3.15	Estimated Loss for Severe Weather Events.....	73
Table 3.16	Hazard Probability of Occurrence	78
Table 3.17	Hazard Impact on People	79
Table 3.18	Hazard Impact on Property	79
Table 3.19	Hazard Impact on the Economy	80
Table 3.20	Hazard Risk Rating.....	80
Table 3.21	Hazard Risk Rating.....	80
Table 4.1	Summary and Ranking of Mitigation Measures.....	93
Table 4.2	Summary and Ranking of Mitigation Measures.....	94



Figure Index

Figure 1	Vicinity Map
Figure 2	Geology Map
Figure 3	Landslide Map
Figure 4	Fault Map
Figure 5	Soils Map
Figure 6	Flood Hazard Map

Appendix Index

Appendix A	Public Outreach Supporting Documentation
Appendix B	Hazard Questionnaire and Results
Appendix C	HAZUS Model Output Results
Appendix D	LHMP Adoption Resolution
Appendix E	Planning Team Meeting Minutes



Abbreviations list for the Hiouchi LHMP

ACS - The U.S. Census American Community Survey
BLM - Bureau of Land Management
BRCSD - Big Rock Community Services District
Cal Fire - California Department of Fire
Cal OES - California Office of Emergency Services
CalTrans - California Department of Transportation
CDP - Catastrophic Disaster Plan
CEDS - Comprehensive Economic Development Strategy
CFR – Code of Federal Regulations
COOP - Cooperative Observer Program
CRWG - Cascadia Region Earthquake Workgroup
CSD- Community Services District
DMA - Disaster Mitigation Act
DNARC - Del Norte Amateur Radio Club
DNWRN Del Norte Water Resources Network
DWR - Department of Water Resources
EHS - Extremely Hazardous Substances
EOC - Emergency Operations Center
EPA - Environmental Protection Agency
FEMA - Federal Emergency Management Agency
HAZUS - Hazards U.S.
HAZUS-MH - Hazards U.S. Multi-Hazard
HMGP - Hazard Mitigation Grant Program
HSP - Hillside Stabilization Project
IBC - International Building Code
ICP - Emergency Command Post
JCEC - Josephine County Emergency Center
LAFCO - Local Agency Formation Commission
LHMP - Local Hazard Mitigation Plan
MJHMP - Multi-Jurisdictional Hazard Mitigation Planning



NASA - National Aeronautics and Space Administration
NCDC - National Climatic Data Center
NEHRP - National Earthquake Hazard Reduction Program
NFIP National Flood Insurance Program
NHN - Neighbors-Helping-Neighbors
NOAA - National Oceanic and Atmospheric Administration
NPS - National Park Service
NWS - National Weather Service
OASIS - Operational Area Satellite Information System
OSHA - U.S. Occupational Safety and Health Administration's
PGA - Peak Ground Accelerations
PHMSA - Pipeline and Hazardous Materials Safety Administration's
RFQ - Request for Qualifications
SAR - Search & Rescue
SCADA - Supervisory control and data acquisition
SRFPD - Smith River Fire Protection District
SRNRA - Smith River National Recreation Area
SWRCB - State Water Resources Control Board
USDA - United States Department of Agriculture
USGS - United States Geological Survey
WENS - Wireless Emergency Notification System
WRCC - Western Regional Climate Center
WUI - Wildland Urban Interface



1. Introduction

1.1 Purpose

Disasters often impose significant impacts on communities. They sometimes destroy or damage life, property and infrastructure, local economies, and the environment. The purpose of mitigation planning is to identify local policies and actions that can be implemented over the long term to reduce risk and future losses from hazards. This is an essential component of emergency management, along with preparedness, response and recovery.

The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) requires state and local governments to develop hazard mitigation plans as a condition for federal grant assistance. Prior to 2000, federal funding for hazard mitigation planning was limited. The DMA highlights the importance of communities planning for disasters before they occur. It emphasizes pre-disaster infrastructure mitigation planning to reduce disaster losses and the streamlining of federal disaster programs to promote mitigation.

Hiouchi's Local Hazard Mitigation Plan (LHMP) supports governance requirements of the Big Rock Community Services District (BRCS D, Big Rock CSD, or District) and outlines careful, long-term planning to be completed in anticipation of disasters to help reduce the impacts of natural hazards and increase the community's preparedness through awareness and implementation of mitigation actions. Fewer lives, homes, and businesses will be lost, and a disaster event's disruption to the community minimized. Ultimately, a community that is hazard-resilient is more likely to remain intact economically, structurally, socially and environmentally, even when disasters do occur.

1.2 Background and Scope

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies developed, prioritized, and implemented. This Plan documents the BRCS D's hazard mitigation planning process and identifies relevant hazards, vulnerabilities, and strategies the County and participating jurisdictions can use to decrease vulnerability and increase resiliency and sustainability. Several factors initiated this planning effort for the District:

- The BRCS D has significant exposure to numerous natural hazards that potentially could destroy or damage life, property and infrastructure, the local economy, and the environment.
- Limited local resources make it difficult to be preemptive regarding risk reduction initiatives. Being able to leverage federal financial assistance is paramount to successful hazard mitigation within the Planning Area.
- The District wanted to be proactive in its preparedness for the probable impacts of natural hazards.
- The District must have a LHMP in place by August 23, 2017 to retain funding for the Hillside Stabilization Project, a critical mitigation project designed to secure the District's main water storage tank facility from failure during a small-to-moderate earthquake.



Having initiated the planning process, the District was faced with choosing between preparing a plan that would cover only the community of Hiouchi or seeking out planning partners in other areas of Del Norte County with similar hazard exposures and capabilities. The former approach allows the BRCSD to complete its planning within the tight time frame needed to retain existing funding. For the purposes of this LHMP, the Hiouchi Planning Area is therefore defined as being coterminous with the legal boundaries (place of use) of the District. It is the BRCSD's intent to incorporate the information obtained during this planning process into the Del Norte County Multi-Jurisdictional Hazard Mitigation Plan when it is next published.

This LHMP was prepared pursuant to the requirements and associated guidance of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.)

Information in this Plan will be used to help guide and coordinate mitigation activities and decisions for local policymaking in the future. Proactive mitigation planning will help reduce the costs of disaster response and recovery within the Hiouchi Planning Area by protecting critical community facilities, increasing resiliency regarding natural disasters, reducing liability exposure, and minimizing potential impacts and disruptions. The Planning Area has been affected by hazards in the past, and its residents are therefore committed to reducing future impacts from such events in addition to maintaining eligibility for mitigation-related federal funding.

1.3 Hiouchi Planning Area Community Profile

The Big Rock CSD serving the community of Hiouchi is a California Special District. The planning area for the Hiouchi LHMP is the Big Rock CSD boundary, as shown in Figure 1 (Figure Appendix). The sections below provide further details on the Hiouchi Planning Area.

1.3.1 Geographical Setting

Hiouchi is centered on U.S. Highway 199 about 10 miles northeast of Crescent City. Del Norte County is the northwestern-most county in California, and is bounded to the north by Curry County, Oregon; to the east by Siskiyou County; to the south by Humboldt County, and to the west by the Pacific Ocean.

In 2010, the Big Rock CSD annexed both the Jedediah Smith Redwoods State Park and the Redwood National Park into its jurisdiction. The District's place of use now covers approximately 520 acres. A timbered hillside, set apart as a Conservation Easement in 2008, adjoins on its north side and is a part of Hiouchi Mountain. The Kalmiopsis Wilderness Area is north of Hiouchi Mountain. The heavily timbered Smith River National Recreation Area adjoins Hiouchi to the east, and the pristine Smith River defines the Township's southern boundary. U.S. Highway 199, which serves as an evacuation route for this region into Oregon's southern interior, bisects Hiouchi from west to east.



1.3.2 Hiouchi History and Public Services

The first Europeans to explore the vast California North Coast region were the Spanish who arrived by ship in the 17th and 18th centuries. This area was described by ship traveler George Vancouver in his journal in 1792. The first American to explore the region was Jedediah Smith in the early 1800s. Smith and his party of trappers were the first foot travelers to reach the area overland. The party established trade with the Native American tribes of the region, discovered Lake Earl, and established base camps in the area now known as Crescent City. In 1848, gold was discovered along the Trinity River by Major Pierson B. Reading of the U.S. Cavalry. By 1850, most of northwestern California, including the Del Norte County area, was teeming with miners (Tetra Tech, 2010).

The Big Rock CSD was formed on September 21, 1966 under California Community Services District Law to provide eight typical municipal services to the inhabitants of Hiouchi.

- Supply the inhabitants of the District with water for domestic use, irrigation, sanitation, industrial use, fire protection, and recreation;
- The collection, treatment or disposal of sewage, waste and storm water of the District and its inhabitant;
- The collection or disposal of garbage or refuse matter;
- Protection against fire;
- Public recreation by means of parks, playgrounds, swimming pools or recreational buildings;
- Street lighting;
- Mosquito abatement; and
- The equipment and maintenance of a police department or other police protection to protect and safeguard life and property.

Because insufficient revenue was available at the time to offer the entire array of public services, the District chose to limit its governance to providing water for the community. However, there are opportunities with the implementation of the LHMP to expand and enhance services within the CDS's authority to address hazards in the community. The following list identifies current District functions that could be expanded or enhanced as a result of the LHMP.

- Personnel Training Policy – Additional training can be provided to the District Directors and management staff on hazard preparedness and mitigation actions that can be taken now to reduce future damages. Additional roles and responsibilities can be defined for action necessary before and after a hazard.
- Water System Management – The District can update its capital improvement plan to focus on improvements which have dual benefits to the water system and make the system more resilient to hazards. The District can also update its operations plan to address hazards identified in the plan so there is a mechanism in place on how to operate the water system with the least disturbance to residents during a hazard event.



- Neighbors Helping Neighbors Program – The District can expand this program to enhance understanding of vulnerabilities and mitigation opportunities.
- Emergency Telephone Communications (OASIS) Policy – This policy can be updated to incorporate mitigation actions related to improving emergency communications.
- Del Norte Water Resources Network (DNWRN) – The Big Rock CSD is a member of the network of water providers, which have pledged to provide mutual assistance, stay active on communications related to state and federal regulations, and to act as an emergency notification network. The DNWRN could be expanded to have more formal agreements in place to facilitate mutual aid, communications, and emergency notifications.

1.3.3 Regional Public Services

Other public services within the Hiouchi Planning Area are provided by the County of Del Norte, including police protection by the Sheriff, centralized garbage disposal by the Solid Waste Management Authority, public road maintenance, parks and recreation, and land use planning and code enforcement. Cal Trans is responsible for U.S. Highway 199 operations and maintenance. Fire protection is provided by the Smith River Fire Protection District that operates Station #2 in Hiouchi. Many of these services can be expanded and improved to address hazard mitigation. The Big Rock CSD does not have the authority to directly make modifications to regional services. Opportunities for the District to use the information in this LHMP to contribute to regional planning is discussed further under Section 6.3.

1.3.4 Water Supply

The Big Rock CSD is licensed by the California State Water Resources Control Board (SWRCB) to divert a little over 41 million gallons of water per year from the Smith River. The BRCSO currently consumes between 16 and 20 million gallons per year, and is operating well within its annual diversion limit. The District owns and maintains two aging Redwood tanks on the mountainside above Hiouchi: a 100,000-gallon tank and a 50,000-gallon tank that collectively store 150,000 gallons of potable water. The tanks are surrounded by a densely forested Conservation Easement. The 100,000 tank rests on unstable earthen fill. The District is currently focused on a project to replace it with a 200,000-gallon bolted steel tank anchored on an ultramafic granite ledge to weather earthquakes. The sole water source for this system is the Smith River. The District charges its customers relatively moderate water-use fees, but the costs of large capital improvement projects are far beyond the District's ability to fund. It must rely upon matching federal and State grants to undertake new infrastructure developments.

The aforementioned annexations of State and federal parklands now allow the Big Rock CSD to furnish potable water to both parks as they pursue a large, joint redevelopment project and subsequently provide high quality drinking water to many more thousands of visitors every year.

1.3.5 Climate

Hiouchi's weather is warm and relatively dry in summer, with comfortably cool, wet winters. With an average elevation above Mean Sea Level of 266 feet, Hiouchi lies above the coastal fog line. The average high temperature for July is 64° F, while the average low temperature during January is 42°



F. Annual average rainfall is 68 inches, with 87 percent of that amount falling from December through April. The average year-round temperature is 68 degrees. Humidity averages between 28 and 73 percent. Prevailing winds overnight are down-canyon from the northeast, averaging 9 mph. Dangerous clear-air-mass cyclones can appear on occasion, which arise from opposing wind patterns that are compressed by the surrounding mountains.

1.3.6 Geology

Hiouchi is located at the western edge of the Klamath Mountains geomorphic province of California, less than a half mile east of its contact with the Coastal Range province. Bedrock in this area is mapped as ultramafic rocks of the Western Jurassic Belt. Hydration of these rocks since their uplift to the surface has caused partial-to-complete serpentinization (Crawford, 2016). A geologic map is attached as Figure 2 (Figure Appendix).

Landslides are prevalent in the vicinity of the site, as shown on the map attached as Figure 3 (Figure Appendix). In general, slopes in this area are considered to be susceptible to instability based upon the geomorphic setting, high annual precipitation, thin overburden layer with high clay content and the tendency of serpentinite to be weak and easily sheared.

The South Fork Fault, a low angle subduction fault, is located near the Big Rock CSD's western boundary. It defines the contact between the Klamath Mountains and Coastal Range geomorphic provinces. This fault is not considered to have moved during the Quaternary period (last 2.6 million years). The closest fault showing movement during the Quaternary period is the Bald Mountain/Big Lagoon Fault Zone located offshore approximately 15 miles west of the site. The closest "active" fault (with evidence of surface rupture during the Holocene period—the last 11,700 years) is the offshore Cascadia Subduction Zone approximately 40 miles to the west of Crescent City. A fault map is attached as Figure 4 (Figure Appendix).

1.3.7 Soils

The soils of Hiouchi reflect the geologic materials of the area, the vegetation of the area's extensive forests, high annual rainfall and resulting hydrology, and a mild climate. A soils map is included as Figure 5 (Figure Appendix). Most of the developed neighborhoods in Hiouchi are located on Bigtree-Mystery complex soils. These soils are typical within the Coastal Redwood Belt, and consist of gently sloping alluvial fans and low terraces. The vegetative overstory is dominated by redwood (*Sequoia sempervirens*). Small groups or individuals of Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), or Douglas-fir (*Pseudotsuga menziesii*) grow in scattered areas throughout the forested unit. Some grand fir (*Abies grandis*) also grows. The understory is dominated by western swordfern (*Polystichum munitum*) and includes salal (*Gaultheria shallon*), deer fern (*Blechnum spicant*), and redwood sorrel (*Oxalis oregana*). Typical soil profile includes very fine sandy loam-to-silt loam below 5 feet. Slope ranges between 2 to 9 percent (USDA, 2008).

Upper elevations in the Hiouchi Planning Area have Peacock-Wiregrass complex (also called Trailhead/Wiregrass complex) with map symbol 583. Typical soil profile is loam-to-gravelly clay loam below 3 feet. Upper elevations also include Gasquet-Walnett-Oragran complex with map symbol 761. This is extremely stony soil (20-30 percent). Typical profile ranges from stony loam to bedrock at approximately 5 feet (USDA, 2008).



1.3.8 Demographics

Understanding the demographics of the people who reside in Hiouchi is important to overall risk planning, as some portions of the population may have unique vulnerabilities, or be less able to respond or recover from a disaster. People constitute the most important asset within Hiouchi. Greater risk to hazards can be experienced, for example, by elderly people who might be more likely to be injured in a disaster and are more likely to require additional assistance after a disaster. Research has shown that economically disadvantaged households, the elderly and especially older single men, the disabled, women, children, ethnic minorities, and renters all experience (to some degree) more severe effects from disasters than does the general population.

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 a hazard event, and access to resources for post-disaster recovery. A need exists for increased awareness of these differences, as highlighted in the expired 2011 Crescent City/Del Norte County HMP.

1.3.8.1 Population

The U.S. Census American Community Survey (ACS) estimates the 2015 population of the Hiouchi Census Designated Place at 327 people. There are approximately 197 homes, 6 businesses, and one church within the Big Rock CSD's boundary. District staff members visit each water connection at least once per month to read meters, and generally estimate 3.3 individuals (aged people, adults, and children) per household over the range of 197 households, for a District-estimated population base of approximately 650 (Del Norte LAFCO, 2015) during the winter season. The tourism and recreation season elevates Hiouchi's average daily population count to over 2,000, as discussed further below.

1.3.8.2 Population Growth/ Development Trends

The BRCSD's historical records indicate a population growth rate of 50.61 percent between 1966 and 2010, almost all of which has been residential. Since then, Hiouchi has evolved into a stable resort community that has been featured in travel magazines and popular movies. The community enjoys a tourism and recreation economy that is strongly influenced by vehicular travel on U.S. Highway 199, prime seasonal steelhead and salmon fishing, and visitors to the Redwood National Park and Jedediah Smith Redwoods State Park.

ACS data from 2010 to 2015 showed that the population of Hiouchi increases and decreases year to year with no discernable growth trend. Only 6 vacant parcels currently remain within the District boundary. Unless those parcels are subdivided, which is not likely, little room exists for future growth due to steep, mountainous terrain and the Smith River that collectively surround the community.

The Redwood National Park that was annexed in 2010 attracts large numbers of tourists. Seasonal tourism and recreational activity increases the summer population of Hiouchi on any given day to over 2,000, as indicated above. The Parks are jointly pursuing an expansion project that is likely to substantially increase the summer tourism population when completed, which is anticipated within the next 5 years. The Parks merger represents the only potential for population growth. Visitors may



be less familiar with the local environment and hazards, and therefore less prepared to protect themselves during a hazard event.

1.3.8.3 Population Characteristics

Age

The 2015 ACS also provides age data for Hiouchi's residents. The median age of a resident in Hiouchi is 49.3 years, compared to the statewide median age of 36.2 years. Approximately 33% of the population is over 62, and 10% of the population is over 75. These figures indicate that Hiouchi has an older population compared to other communities in California. When evaluating mitigation actions, considerations should be given to special needs of the elderly after a hazard event.

Race

Hiouchi's population is primarily white at 87%, according to the 2015 ACS. This is followed by 6% Native American, 2% Asian, and 5% "other."

Education

Of the population base between 25 and 64 years of age, approximately 5% have not received a high school degree, 43% are high school graduates, 31% have a some college or an associate's degree, and 20% have a bachelor's degree or higher (2015 ACS).

Employment

According to the 2015 ACS, the full-term year-around civilian population over 16 includes 76 people in the work force. Employment in Hiouchi can be divided into three categories. Approximately 18% of employed people work as health care management, 29% work in firefighting prevention and other protective services, and 53% work in food preparation and service-related occupations.

1.3.8.4 Income and Housing

The median household income in Hiouchi is \$43,083, according to the 2015 ACS. This is 70% of the statewide MHI of \$61,489. According to the 2010 U.S. Census, there are approximately 166 housing units in Hiouchi (differs substantially from the District's observations). Of these, approximately 60% are owner occupied units, 25% are occupied by renters, and the remainder are vacant. This vacant stock may account for year-to-year variations in population seen in the ACS data as renters move into and out of the community.

The steady flux of new residents into Hiouchi suggests the need for continued outreach to the public concerning hazards in the Planning Area.

1.3.8.5 Disabled Populations

The 2015 ACS includes data on the disabled population of Hiouchi. This segment of the population obviously will require special assistance during a hazard event. Based on 2015 ACS data, approximately 2.1% of Hiouchi's population between the ages of 5 and 17 are disabled, 4.3% between the ages of 18 and 64 are disabled, and 10.1% of those 65 and older are disabled. The



Census does not track the types of disabilities that could affect individual needs, which can make hazard planning somewhat difficult.



2. Planning Process

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

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

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

2.1 Planning Resource Organization

The first phase in the development of the Hiouchi LHMP was to organize needed resources. During this phase the Big Rock CSD demonstrated its readiness to plan by securing Federal Emergency Management Administration (FEMA) grant funds, establishing a Planning Team, seeking technical assistance, and engaging the public to determine public perceptions of risk and support in connection with hazard mitigation. This phase also included coordination with other local, state and federal agencies involved in hazard mitigation throughout the region to ensure consistency with other planning efforts. This phase used four primary objectives to define its scope of work:

- Secure grant funding;
- Formation of a the Planning Team;
- Review existing programs; and
- Engage stakeholders and the public.

The following sections describe the activities required to meet these objectives.

2.1.1 Grant Funding

This LHMP planning effort was supplemented by a FEMA Hazard Mitigation Planning grant from the Hazard Mitigation Grant Program (HMGP) under DR-4240. The HMGP program provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance upon funding from actual disaster declarations.

The Big Rock CSD also enjoys HMGP funding under DR-1952 to complete a mitigation project to upgrade its existing 100,000-gallon redwood water storage tank. Continued funding for this project is contingent upon completion of this LHMP by August 23, 2017.



2.1.2 Formation of the Planning Team and Outreach to Planning Partners

The BRCSD served as the lead agency for completing the LHMP, as the planning area is entirely within the BRCSD boundary and the District was especially dependent upon this planning effort to complete a critical hazard mitigation project that already had begun in 2016, called the Hillside Stabilization Project (HSP). The BRCSD could not employ sufficient staff resources to effectively model potential disasters addressed by the LHMP. Therefore, the District initiated a Request for Qualifications (RFQ) process in January 2017 to acquire an “on-call consultant” that could assist with a range of services, including much-needed hazard mitigation planning. GHD Inc. was selected as the on-call consultant during the contractor selection process, and was hired in February 2017 to assist the District on an as-requested basis. Once technical assistance had been secured, a Planning Team was formed to proceed with a defined LHMP Scope of Work. Table 2.1 shows the Team’s composition.

Table 2.1 Planning Team Members

Name	Association	Role
Craig Bradford	President BRCSD Board of Directors	District Project Coordinator
Rebecca Crow	GHD Inc.	Project Manager
Dagan Short	GHD Inc.	Risk Assessment/ HAZUS Lead

Representatives from agencies involved in hazard mitigation activities, agencies with the authority to regulate development, and offices responsible for enforcing local ordinances were identified as important potential members of the planning partnership.

Planning partner organizations generally have, in part, the authority to participate in implementing mitigation strategies developed through the planning process. Planning partners in Hiouchi’s case comprised the core group that became responsible for providing input and reviewing drafts of the LHMP, thereby contributing to various mitigation strategies along with input from the public. The BRCSD was responsible for conducting public outreach sessions, considering the public’s comments for incorporation into the document, approving the LHMP in a final public forum for local adoption, and then submitting the LHMP to FEMA for approval.

The BRCSD referred to FEMA’s Local Mitigation Planning Handbook for guidance with respect to identifying appropriate agencies and organizations to consider when building its planning partner team. The completed checklist—including rationale for inclusion of local, state, federal and other agencies as potential planning partners, stakeholders, or in other roles related to the District’s LHMP planning process is included in Appendix A.

A set of two planning “kickoff” meetings were held on Friday April 28th and Thursday May 11th in Hiouchi. Potential planning partners and elected leaders of neighboring jurisdictions inside and surrounding the Hiouchi Planning Area were invited to attend by the District via either telephone call or email. A list of invited attendees including agency, name, and position is included in Appendix A. Various agencies and resident stakeholders were also invited through multiple forms of media. All metered customers in the Big Rock CSD were directly mailed the public meeting announcement. Further, the public meeting notice was posted at the Hiouchi Hamlet, where all legal notices for the community are published. The two mobile home neighborhoods had notices posted in their main



buildings that contain washing machines and park message boards. The meeting public notice was posted in the Del Norte Triplicate (evidence of posting is included in Appendix A). The public service announcement was also promoted on KCRE/ KPOD radio. Lastly, the District staff personally informed each of the 18 neighborhoods (every occupied home) inside our boundary line of the two initial outreach meetings via the District's Neighbors Helping Neighbors (NHN) Program network. The purpose of this session was to:

- Provide an overview of the Disaster Mitigation Act;
- Outline the Hiouchi work plan;
- Explain the role of regional planning partners in the planning effort; and
- Solicit planning partners.

A list of planning partner expectations was developed by the planning team and opportunities for involvement were presented at the initial outreach meetings. Comprehensive planning partner outreach materials were made available during these well-advertised sessions, included in Appendix A. Unfortunately, few of the planning partners individually solicited by the District attended either of the initial outreach sessions or contacted LHMP Project Coordinator Craig Bradford to demonstrate interest in participation.

While more generalized planning partner participation was encouraged through all four public outreach opportunities, the Planning Team did not regard direct personal involvement by all intended partners in the larger county area to be essential to development of the draft document. The principal reason for this was that the County of Del Norte is concurrently engaged in a Multi-Jurisdictional Hazard Mitigation Planning (MJHMP) effort that is scheduled for completion sometime in 2018 or 2019. The focus of attention by potential planning partners was therefore split between LHMP and MJHMP planning with an emphasis on the County's activity due to the increased number of hazards implied over the larger area and the added coastal environment and associated high probability for tsunamis. When the BRCSD's DR-4240 LHMP planning grant was awarded in October 2016, FEMA directed that Hiouchi's Plan be incorporated into the County's anticipated MJHMP as an annex. The positive outcome in that context morphed into active collaboration between Hiouchi's LHMP planners and those who were beginning to work on the County's MJHMP. The consultants who are presently involved agreed to share technical information pursuant to being able to utilize the available hazard data in a manner that would ultimately produce two mutually supportive documents. A second reason for limited planning partner participation is that Hiouchi's LHMP Planning Area is relatively small in comparison to that of the vast county area, thereby persuading the small number of available planning partners to devote more of their time to MJHMP planning activity.

The District's Board President, who has been heavily involved in developing this LHMP Project from its inception, is an experienced hazard mitigation planner. He served on the original Del Norte County Steering Committee that led to FEMA approval in 2011 of the County's first MJHMP, and he is also participating on the current County Steering Committee that will produce the new MJHMP within approximately two years. This level of continuity will ensure that Hiouchi's mitigation strategies are appropriately coordinated with countywide planning efforts.



Other agencies and general members of the public who attended Hiouchi's public outreach meetings demonstrated interest in being kept informed. They were added to a separate list of participants and highlighted as "interested parties." All were invited to provide input during the planning process, comment on the draft LHMP during the public review phase, and attend the final public meeting of the BRCSD Board of Directors/Trustees on August 17, 2017 where the final LHMP was locally adopted..

2.1.3 Review of Existing Regulations and Plans

Federal emergency management regulations require that a hazard mitigation planning process include a review and incorporation, as appropriate, of existing plans, studies, reports, and technical information (44CFR Section 201.6.b(3)). Chapter 6 summarizes laws and ordinances that could affect hazard mitigation efforts in the planning area. The following planning programs also could affect mitigation initiatives and a brief description of how each plan was considered or incorporated is also presented:

- Del Norte County Emergency Response Plan—This emergency support function plan directs emergency response actions throughout a geographic region that includes the Planning Area as a subset. The Big Rock CSD's Emergency Response Plan serves as an annex to the County's plan, which addresses recent interstate agreements with Oregon and provides emergency communications features that would benefit the Planning Area during catastrophic disasters. This document was used in the development of the community profile, identification of stakeholders, and understanding of hazard vulnerability..
- Del Norte County General Plan—Most recently amended in January 2003, this plan directs land use policy in Del Norte County. This document was used in the development of the community profile.
- Del Norte County Comprehensive Economic Development Strategy (CEDS)—The CEDS emerged from a planning process developed with broad-based community participation to address the economic problems and potential of the planning area. on a countywide basis. It identifies both local and regional agencies and their capabilities that focus upon providing assistance to small businesses for start-ups, stabilization, and expansion. The CEDS has become a useful resource for small businesses located within the Planning Area, and was used in this plan to support the community profile.
- Neighbors-Helping-Neighbors concept applied within the District's Sphere of Influence via Big Rock CSD Policy – NHN provides the District's management team with a direct link to each of the residential neighborhoods located within the Planning Area. This capability has become a pivotal District tool when managing public outreach for routine governance operations and emergency conditions, and assures emergency planning interaction between the public and District. The NHN was integrated into the plan during the outreach process to inform and gather input for the plan and will be a key mechanism in assuring continued public input on the plan implementation and maintenance. Big Rock CSD's Vision, Mission and Goals – This document was used in the development of mitigation actions for the Planning Area. Along with the District's Formation Policy issued by the State in 1966, this statement establishes the District's governance requirements in terms of quality services, timely performance, planning, and fees. The listed municipal services provide the legal basis for developing and effectively



managing a range of operational capabilities that include public safety, emergency response, asset maintenance, and proactive hazard mitigation planning. The Vision, Mission, and Goals are distributed to all water meter owners within the Planning Area at least once per year.

- Big Rock CSD's Emergency/ Disaster Response (EDRP) – The EDRP defines how the District would respond to all contingencies that could affect the Planning Area. It designates responsible personnel, the inventory of mitigation resources, establishes the role and location of a local command post if such is needed, describes “other agency” coordination, articulates response procedures, identifies public notification procedures, and specifies steps that should be taken to resume normal operations. This plan was especially useful in clarifying vulnerabilities to hazards during the LHMP development process and when expressing for public outreach purposes how important it is to develop mitigation actions.
- Big Rock CSD's Bylaws (Ordinance 2009-1) – These Bylaws provide a constitutional (legal) foundation for all District activity currently underway within the Planning Area and that could be taken in the future, whether planned or presently unplanned. This ordinance establishes rates, rules, and regulations governing actions undertaken by the District and its constituents, and it bears the force of law. Any mitigation action presumed or planned by the District's elected officials, employees, and/or contractors must be compliant with this document. It has in the past and will continue to serve as an important tool for planners when preparing hazard mitigation options.
- Big Rock CSD Ordinance 2000-1 as amended (Monthly Water Rates) – This ordinance establishes potable water allocations and rates for application throughout the Planning Area. Water is fundamental to survival in disastrous circumstances, and a great deal of concern has been expressed by residents and business owners regarding the District's ability to continue water storage and distribution operations during certain disasters listed within the LHMP. The District is currently replacing water distribution infrastructure that will affect all water consumers. The central purpose for this activity is to mitigate the catastrophic effects of an earthquake disaster, which is a prominent feature of the District's LHMP. During the public outreach phase of the LHMP planning process, this project thereby became a discussion item of some interest.
- Big Rock CSD Ordinance 2008-1 as amended (Commercial Sales of Water to Mobile Consumers; Water Theft) – To protect the District's assets in accordance with State regulations, it became necessary in 2008 for the District to specify how it would sell potable water to mobile consumers for their commercial use. In addition, this ordinance prohibits the unauthorized taking of water (water theft) from unmetered fire hydrants and other outlets, which had become an issue for the District in terms of accountability under a provision of its license to divert water from the Smith River. On a daily basis the District measures the volume, quality, and availability of its stored water assets in the Planning Area. Water rationing and public health during catastrophic disaster events are significant considerations when planning hazard mitigation actions. Discussion during the public outreach phase of the District's LHMP development process included this aspect.
- Big Rock CSD Ordinance on Backflow Prevention Devices – The District must comply with State Water Resources Control Board regulations concerning possible contamination of potable water distribution assets by non-conforming or uncontrolled water sources. For



example, every property owner who uses a groundwater well for his/her home, yet maintains a connection to a public water distribution system as a backup resource in the event of well failure, now must mount a backflow prevention device at the property's water meter to prevent contamination of the public water system. The District is required by law to ensure compliance. If the District's main water system becomes inoperative as the result of a catastrophic disaster, the District would decontaminate and utilize non-conforming or uncontrolled water resources to provide the Planning Area with potable water. This consideration is therefore included in hazard mitigation planning and was discussed during the public outreach phase.

This Special District is compliant with all pertinent regulations and guidance promulgated by the following agencies, State, and federal laws:

- California Department of Public Health
- California Water Resources Control Board
- California Department of Water Resources
- California and U.S. Environmental Protection Agencies
- U.S. Department of Homeland Security
- U.S. Army Corps of Engineers
- California Environmental Quality Act
- National Environmental Quality Act
- Federal Endangered Species Act
- Cal Fire
- California Highway Patrol
- Del Norte County Sheriff's Department
- U.S. Forest Service
- National Park Service and California State Parks
- California Government Code
- California Department of Transportation (CalTrans)
- Federal Emergency Management Administration
- Federal Communications Commission

2.2 Plan Development Chronology

Development of the Hiouchi Local Hazard Mitigation Plan included eight phases:

- Phase 1 – Project Start Up, Initial Coordination, and Coordination
- Phase 2 – Hazard Identification and Profiling
- Phase 3 – Asset Inventory and Risk Analysis



- Phase 4 – Develop Mitigation Initiatives
- Phase 5 – Prepare Draft Plan
- Phase 6 – Plan Review and Revision
- Phase 7 – Plan Adoption and Submittal
- Phase 8 – Implementation and Maintenance

Table 2.2 summarizes important milestones in the plan's development.

Table 2.2 Plan Development Chronology/ Milestones

Date	Event	Milestone	Attendance
July 2016	BRCSD submits HMP grant application to Cal OES		N/A
August 2016	Cal OES awards planning grant to BRCSD (DR-4240)	BRCSD Initiates planning process	N/A
January 2017	BRCSD approves Neighbors-Helping-Neighbors (NHN) Policy	Two (2) NHN Coordinators selected	6
January 2017	BRCSD Board Meeting	BRCSD Board Competitively selects GHD to be on-call consultant, including conducting LHMP	6
February 2017	BRCSD competitively selects GHD Inc. to facilitate LHMP development	Planning Team assembled	6
February 8, 2017	Planning Team Meeting	Layout approach to LHMP Development	3
March 2017	Planning Team identifies potential planning partners and stakeholders	Planning Area Defined	N/A
April 5, 2017	Planning Team Meeting - Cascadia Event Review with Oregon State University	Critical HAZUS data identified	4
April 25, 2017	Planning Team Meeting	Finalize initial public outreach presentation	3
April 28 and May 11, 2017	Two (2) Public Outreach meetings held to present the planning process	Public adequately informed	15
May-July 2017	Team analyzes hazards and risks	Analysis completed	N/A
June-July 2017	Mitigation Measures Developed	Draft Mitigation Action Plan	N/A
July 17, 2017	Planning Team Meeting	Finalize Draft LHMP for Public Review	3
July 13 and July 27, 2017	Two (2) Public Outreach meetings held to solicit public comments regarding the Draft LHMP	Interested stakeholders attended	10
August 11 and 14, 2017	Planning Team Meetings to consider all information received during the Public Review Period	Public comments incorporated into the Draft LHMP	3



Table 2.2 Plan Development Chronology/ Milestones

Date	Event	Milestone	Attendance
August 17, 2017	In a public meeting of its governing Board, the BRCSD proposes final local adoption of its Draft LHMP	BRCSD adopted its LHMP	N/A
August 18, 2017	District sends Final LHMP to CalOES	Deadline of August 23, 2017 met by BRCSD	N/A

2.3 Public Involvement

This section reviews the approach taken by the Big Rock CSD and its Planning Team to include the public in the LHMP development process.

2.3.1 Strategy

The Planning Team considered its public involvement strategy to be a key component in gauging local perception of the implied risks, public sensitivities concerning vulnerability, and what is required for mitigation. The concept of mitigation was introduced to the public during outreach meetings, which gave the Planning Team a measure of feedback to use when developing possible mitigation measures. The following objectives drove this process:

- Identify and involve stakeholders throughout the planning area by inviting them to participate as planning partners.
- Use a questionnaire to (a) gauge the public's perception of risk, (b) generate public support for the Big Rock CSD's role in applying hazard mitigation measures, and (c) invite public direction regarding mitigation options.
- Attempt to reach all residents and business owners in the planning area through the use of multiple media networks.

2.3.2 Questionnaire

The Planning Team developed a hazard mitigation plan questionnaire (see Appendix B) based upon similar questionnaires used to develop the 2011 Crescent City/Del Norte County Hazard Mitigation Plan. This questionnaire was used to gauge household preparedness for natural hazards and survey the extent of knowledge throughout the planning area regarding ways to reduce risks and losses from natural hazards. The questionnaire was designed to identify zones that are particularly vulnerable to one or more natural hazards. It asked 21 quantifiable questions, the answers to which assisted the Planning Team in selecting appropriate goals, objectives and mitigation strategies. Questionnaires were available to all customers of the Big Rock Community Services District, as well as Smith River Fire Protection District staff and planners associated with the National Park Service and State Parks. Only 6 surveys out of an estimated 650 delivered were returned. While a very low response rate materialized, the information obtained proved to be useful in understanding the community's overall preparedness level. This exercise especially highlighted the District's need to develop more effective mechanisms for engaging the public when planning



hazard mitigation strategies at some point in the future. The complete questionnaire and a summary of its findings can be found in Appendix B.

Key findings extrapolated from the questionnaire include the following:

- Respondents were most concerned about wildfire, earthquake, and tsunami hazards, followed by floods and severe weather
- Respondents were least concerned about drought and dam or levee failure hazards
- All respondents felt they were only somewhat prepared for a natural hazard
- Respondents ranked radio ads, television news, and informational brochures as being the most effective means of communicating hazard information

2.3.3 Initial Public Outreach

The BRCSD conducted initial public outreach meetings on April 28, 2017 and May 11, 2017. The invitee list was discussed in Section 2.1.1, and supporting information is included in Appendix A. The initial meetings provided an overview of the Disaster Mitigation Act, an outline of the BRCSD's planned scope of work pursuant to completing the LHMP prior to FEMA's deadline, a review of the regional planning partners' collective role in the planning effort, and an explanation of how planning partners would be solicited. Copies of the public meeting announcement, proof of publishing, outreach presentation, meeting sign-in sheets, and meeting photos are included in Appendix A.

Several leaders of Hiouchi's NHN Program attended the initial public outreach meeting. Discussion focused on the obvious requirement for specific information to be distributed to each home, thereby enabling emergency preparedness at the household level. The Planning Team made a point of including this information in questions from the public dealt with a range of topics, such as NHN program funding, potential mitigation measures, and post-disaster emergency relief plans. The groups in both initial outreach meetings asked what FEMA might do to assist in advance of catastrophic disasters, particularly the much-publicized Cascadia Event.

2.3.4 Public Outreach During Draft Plan

The BRCSD conducted two public outreach meetings to review the Draft LHMP on July 12th and again on July 27th 2017. The invitation list was discussed in Section 2.1.2 of this document, and supporting information is included in Appendix A. The Planning Team publicly announced both events via a single posting in the Del Norte Triplicate newspaper, at the official public posting site (Hiouchi Hamlet) located in Hiouchi, and via KPOD/KCRE Radio (Bi-Coastal Media). Individual notices were sent via e-mail and/or telephonically to the Chairman of the Del Norte County Supervisors, County's Community Development Department, the Del Norte Water Resources Network (6 community services districts, Del Norte County Farm Bureau, City of Crescent City, Crescent City Wastewater Treatment Plant, Crescent City Laboratory), Smith River Fire Protection District, National Park Service, California State Parks, California Department of Transportation, NHN Coordinators and some NHN Neighborhood Leaders, LHMP Planning Team members, Tetra Tech (consultant for Del Norte County's Multi-Jurisdictional Hazard Mitigation Plan), contractors currently serving the BRCSD (Black & Rice LLP, Richard B. Davis Surveying, Hemmingsen Construction, Certified Plumbing), interested residents of Douglas Park and Ashford Road



neighborhoods, the State Water Resources Control Board, and Del Norte County's Interfaith Fellowship Council (8 participating pastors).

At both public outreach meetings that were held to review the draft plan and invite comments, the Planning Team's presentation included an overview of the Disaster Mitigation Act, the main purposes for a Hazard Mitigation Plan, the objectives of Hiouchi's LHMP, questionnaire results, a review of critical facilities, a review of primary and secondary hazards, subsequent presentation of proposed mitigation actions, and information pursuant to commenting on the plan.

A copy of the public meeting announcement, proof of publishing, meeting sign-in sheets, and meeting photos are included at Appendix A. A similar approach to notification was taken for the draft plan review outreach meetings as was done for the initial outreach. The public announcement was sent to the distribution list included in Appendix A. All metered customers in the Big Rock CSD were directly mailed the public meeting announcement. The public meeting notice was posted at the Hiouchi Hamlet, where all legal notices for the community are published. The two mobile home neighborhoods had notices posted in their main buildings that contain washing machines and park message boards. The public service announcement was also promoted on KCRE/ KPOD radio. Lastly, the District staff personally informed each of the 18 neighborhoods (every occupied home) inside our boundary line of the two draft plan review meetings via the District's NHN Program network.

In addition to these public meetings, the District created a website (bigrockcsd.org) that makes the LHMP easily accessible to the public. Useful information connecting hazard mitigation planning by the community to emergency preparedness at the household level was presented in both public outreach meetings, which clearly has generated interest on a more personal basis. Presenters were able to take advantage of this dynamic given feedback received during the initial public outreach meetings.

2.4 Mitigation Achievements Since 2011 MJHMP Development

The mitigation actions listed in the BRCSO's annex to the 2011 Crescent City/Del Norte County Hazard Mitigation Plan listed in Table 2.3, followed by the current status of each action since the 2011 Plan was developed.



Table 2.3 Status of Previous Mitigation Plan Actions

2011 Hazard Mitigation Plan Action Measures	Status
BRCSD 1—Replace 15 wet-barrel fire hydrants with dry-barrel hydrants.	All but two hydrants are currently of dry-barrel design, and the last two wet-barrel hydrants are in remote locations where replacement is not necessary.
BRCSD 2—Replace both Redwood water storage tanks with steel tanks and increase the total capacity by 115,000 gallons.	Water storage tank replacement is underway as defined by the BRCSD's Hillside Stabilization Project (HSP). Land ownership consummated on March 3, 2017. (Project completion in 2018)
BRCSD 3—Excavate 100 feet of mountain in two locations to place new steel tanks on granite foundations.	One tank replacement (HSP) is 50% complete. Actions have been modified and are addressed in this LHMP.
BRCSD 4—Replace all aged water mains.	No progress made to date due to the absence of funding and higher work priorities. This action has been retained.
BRCSD 5—Improve road access to the District's assets and emplace flood and erosion barriers.	Improved access to the District's main tank, along with barrier emplacement, is included in the HSP. This action has been amended and retained for the remaining access road.
BRCSD 6—Purchase 0.5 acre of land and construct a secure facility to house an emergency operations center, emergency response equipment and vehicle, and a large emergency generator.	No progress made due to the absence of funding and unavailable land. This action was therefore amended. Two large emergency generators with propane fuel fields have been installed at both pump-house locations and are now operational.
BRCSD 7—Purchase two satellite telephones with a 5-year contract.	No progress made due to the lack of funding. This action was abandoned in favor of the BRCSD having been granted OASIS privileges.
BRCSD 8—Purchase a 45 kW emergency generator to power both river pumps and a 15 kW generator to operate a smaller pump between the two water storage tanks.	See BRCSD 6. The BRCSD constructed a large, secured area around the main pump house and installed a 45 kW generator fueled by an extensive propane tank field. A 30 kW generator was installed on the hillside to operate a pump that supplies water to the 50,000-gallon water storage tank from the 100,000-gallon tank. It is also fueled by propane.
BRCSD 9—Continue to support the implementation, monitoring, maintenance, and updating of the Plan	The Big Rock CSD supports countywide, all-hazards initiatives. When the County of Del Norte creates a new Multi-Jurisdictional Hazard Mitigation Plan to replace its expired Plan, the BRCSD intends to add this LHMP to the new MJHMP as the District's annex.
BRCSD 10—Support countywide initiatives identified in Volume 1	The District continually supports hazard planning and mitigation efforts across the County of Del Norte.



3. Risk and Vulnerability Assessment

3.1 Approach to Risk Assessment

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

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

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

The risk assessment contained in this LHMP follows the methodology described in the FEMA publication, “Local Mitigation Planning Handbook” (FEMA, 2013), which breaks the assessment down to a four-step process:

1. Describe Hazards: This step identifies the natural hazards that threaten the Hiouchi Planning Area and describes why some hazards have been omitted from further consideration.
2. Identify Community Assets: This step identifies assets, including people, the economy, built environment, and natural environment, at risk to hazards.
3. Analyze Risks: Once known, the risks can be accurately modeled to evaluate vulnerable assets, describe potential impacts, and estimate losses for each hazard. The purpose of the analysis is to help the community understand the greatest risks facing the Planning Area.
4. Summarize Vulnerability: The information in the previous three steps is summarized so the community can understand the most significant risks and vulnerabilities and be informed on mitigation strategies to support local decision making.

“What would happen when a natural disaster occurs in this area?” Answering this pertinent question for an established community—like Hiouchi, for instance—ultimately takes the shape of hazard mitigation planning when its residents want to know the answer. Risk assessment is the process of measuring not only the potential for loss of life, but also the probable personal injury, economic injury, and property damage that can result from natural hazards.

The hazard mitigation planning process set forth in this LHMP therefore focuses on the following elements:

- Vulnerability identification—The process of determining the impact of these events on the people, property, environment, economy and lands of a region
- Estimation of the cost of damage or cost that can be avoided through mitigation



The risk assessment for the LHMP evaluates the risk of the following natural hazards prevalent within the planning area:

- Earthquake;
- Wildland fire;
- Flooding;
- Landslide;
- Severe weather; and
- Hazardous materials.

In addition to benefiting mitigation planning, the identification of potential hazards and vulnerable assets allows emergency management personnel to establish early response priorities.

3.2 Hazard Identification

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

Hiouchi's project management team conducted a hazard identification evaluation to determine the hazards that threaten the Planning Area. This section details the methodology and results of this effort.

3.2.1 Methodology

Hazard data from the California Office of Emergency Services (Cal OES), FEMA, California Department of Water Resources, National Oceanic and Atmospheric Administration (NOAA) Oregon State University Department of Geology, 2011 Crescent City/Del Norte County Hazard Mitigation Plan, and input from the BRCSD Board and public were examined to assess the importance of identified hazards to the Planning Area.

The impacts of various hazards were measured in general terms and then focused on key criteria, such as frequency of occurrence and resulting damage, as well as property and economic damage. The natural hazards evaluated as part of this plan are those that have historically occurred or have the potential to cause significant human and/or monetary losses in the future.

The risk assessment discussed herein is organized according to a hierarchy of primary, secondary, and other hazards. Primary hazards include earthquakes, floods, and wildfires (SHMP, 2013). Those three are designated as primary hazards for the following reasons:

- They historically produced the greatest human, property, and/or monetary losses as well as economic, social, and environmental disruptions within California.
- Past major disaster events led to the adoption of statewide plans for mitigation of these hazards, including the California Earthquake Loss Reduction Plan, State Flood Hazard Mitigation Plan, and California Fire Plan.



- Together, the aforesaid three hazards have the greatest potential to cause significant losses in the Planning Area and disruptions for the future.

Secondary hazards include landslide, extreme weather and climate-related impacts that can be triggered by events involving primary hazards. Historically, secondary hazards have led to substantially less-severe losses, as have “other” and “additional” hazards in descending order of significance.

For purposes of compliance with the Disaster Mitigation Act, as further specified by Interim Final Rule 44 CFR Section 206.401(c)(2)(i) (requirements similar to the 2013 SHMP) the Hiouchi LHMP describes in some depth the primary hazards of earthquakes, floods, and wildfires. Secondary, other, and additional hazards are addressed at a reduced level of detail due to their relatively fewer impacts on communities when examined in the context of past disaster history.

3.2.2 Disaster Declaration History

One important consideration when evaluating hazards for articulation in the Hiouchi LHMP is to understand past events that triggered federal and/or state emergency or disaster declarations within the Planning Area. The project management team’s careful review of past natural hazard events documented on a regional scale helped to establish the probability of reoccurrence for each hazard. However, more specific data deriving from disaster events recorded within the Planning Area is not readily available. Table 3.1 shows the disasters that have affected Del Norte County through 1950 to 2017.

Table 3.1 Del Norte County Disaster History, 1950 – 2017

Disaster Name	Disaster Type	Disaster Number	Year	State Proclamation	Federal Declaration
California Severe Winter Storms, Flooding, Mudslides	Flood	DR-4308	2017		4/01/2017
Nickowitz Fire	Fire		2015		
Gasquet Complex	Fire		2015		
March 2011 California Tsunami	Tsunami	DR-1968	2011	3/11/2011	4/18/2011
2008 January Storms	Flood	GP 2008-01	2008	1/5/2008	
2005/06 Winter Storms	Flood	DR-1628	2005/2006		2/3/2006
State Road Damage	Road Damage	GP 2003	2003	1/1/2003	
1998 El Nino Floods	Flood	DR-1203	1998	Proclaimed	2/9/1998
1997 January Floods	Flood	DR-1155	1997	1/2/97 - 1/31/97	1/4/1997
1995 Severe Winter Storms	Flood	DR-1044	1995	1/6/95 - 3/14/95	1/13/1995
Salmon fisheries	Economic	DR-1038	1994	5/20/1994	9/20/1994
1987 Wildland Fires	Fire	GP	1987	9/10/87, 9/3/87	Not declared
1986 Storms	Flood	DR-758	1986	2/18/86- 3/12/86	2/18/1986



Table 3.1 Del Norte County Disaster History, 1950 – 2017

Disaster Name	Disaster Type	Disaster Number	Year	State Proclamation	Federal Declaration
Winter Storms	Flood	DR-677	1982	12/8/82-3/21/83	2/9/1983
1972 Continuing Storms	Flood	DR-329	1972	2/28/72, 3/28/72	4/5/1972
1970 Northern California Flooding	Flood	DR-283	1970	1/27/1970, 2/3/1970, 2/10/1970, 3/2/1970	2/16/1970
1964 Late Winter Storms	Flood	DR-183	1964	12/22/64, 12/23/64, 12/28/64, 1/5/65, & 1/14/65	12/29/1964

Damage estimates were not included in Table 3.1 above as data was only available for statewide damages for each event, not specific to Del Norte County. Damages incurred exclusively in Del Norte County or Hiouchi were not recorded for posterity.

Table 3.2 shows the Natural Hazard Events that affected the Hiouchi Planning Area.

Table 3.2 Hiouchi Natural Hazard Events

Type of Event	Date	Estimated Damage Cost
Flood	December 2008	\$1,400 in labor and administrative costs to issue and cancel boil orders to every home in Hiouchi when the Smith River rose 12 feet over the top of the CSD's wellhead. No electrical service for two days, thereby requiring the Incident Command Post to resort to communications with each residence on foot.
Wildfires	Summers 2008,* 2015**	*\$92,000 to replace pumps and valves providing water for the Signal Hill and Blue Two Fires. Lost revenue from 180,000 gallons of potable water that were used to fill fire-suppression tankers. Dangerous public health events in traffic blockades. Insurance companies subsequently cancelled local homeowners' policies, because the California DOI reclassified the region as a higher fire hazard risk. **Hiouchi is situated in the middle of several highly forested areas, and is sometimes stuck with being a front-line emergency refuge.



Table 3.2 Hiouchi Natural Hazard Events

Type of Event	Date	Estimated Damage Cost
Diesel and gasoline spills from overturned tanker, a 1.5-ton truck, and two cars	February 2008, May 2011, May 2014, March 2016	CalTrans cleanup activities 1-3 miles upriver from Hiouchi (unknown costs). BRCSD turned off its river pumps after each occurrence for periods between 24 and 36 hours. No contamination in the drinking water on each occasion due to quick reactions by the General Manager. These man-caused events translated into natural hazard mitigation considerations.
Violent cyclonic winds (clear air mass turbulence)	2008, 2010, 2011, 2014, 2016	\$12,650 damage to a barn roof when a large fir tree was sucked out of the ground and deposited upon it. Large Redwood, pine, and fir trees continually fall across U.S. Highway 199 and onto homes at various locations inside and adjacent to Hiouchi, private radio antennas have been destroyed, lights broken on homes, patio umbrellas shredded, and house and store windows broken by flying debris. This phenomenon is somewhat unique to the Hiouchi area due to mountain configurations.
Wildfire	Summer 2002	\$60,000 in ash damage to gardens, cars and windows from the Myrtle Creek Fire.
Earthquake (mild)	Fall 1998	Concrete foundation cracks in several homes.
Earthquake (moderate)	December 1985	or flash flood from massive landslide in the South Fork (Smith River) canyon 7 miles above Hiouchi.

The assessment of each of the hazards presented in this section includes a discussion of the probably of future occurrences of each hazard under exposure.

3.3 Critical Facility Inventory

Of significant concern with respect to any potential disaster event within a particular planning area are the locations/capabilities of critical emergency services. Critical facilities are often defined as strategically positioned emergency capabilities that if they become unusable or unreachable during a disaster would result in severe consequences to public safety, public health, and/or the public's general welfare. For this analysis the term, critical facilities, is broken into three categories as described below.

Class 1 Facilities are those that contribute to command, control, communications, and computer capabilities associated with managing an incident from initial response through recovery. They include the following:

- Primary and alternate Emergency Operations Centers (EOCs)
- All Dispatch Centers
- CAL FIRE
- Emergency Services Communication Infrastructure
- Primary and Alternate Computer Information Systems Infrastructure



- Major transportation corridors (U.S. Highway 199 in Hiouchi's case)

Class 2 Facilities are those that house emergency services capabilities. They include the following:

- All Police Stations
- All Fire Stations
- All Hospitals
- Airports

Class 3 Facilities are those that host key public utilities. They also might double as evacuation centers/shelters/mass prophylaxis sites, etc. Class 3 Facilities include the following:

- All schools
- Water treatment plants
- Power generation infrastructure
- Fuel pipelines
- Fiber-optic lines
- Sewage infrastructure
- Fairgrounds
- Park Facilities

To perform a useful hazard analysis of available critical facilities, each candidate facility was assigned one of the three different categories defined above and given a unique symbol. Table 3.3 shows a summary of the critical facilities located within the Hiouchi Planning Area.

Table 3.3 Critical Facility Inventory

Critical Facility Category	Facility Type	Facility Count
Class 1	Dispatch Center (first responder and amateur radio)	1
	Emergency Command Post (ICP)/ Emergency Operations Center (EOC)	1
	Communication Transmission Center (HAM radio)	1
	Transportation Corridor (U.S. Highway 199)	1
Class 2	Smith River Fire Station #2	1
	National Park Information Center	1
Class 3	Water Treatment System	1



3.4 Hazard Profiles

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

Each hazard identified during the risk assessment phase is profiled in the following sections. Input from planning team members is integrated into the sections, along with technical information provided through various data sources. The following factors are relevant to hazard profiling within the Planning Area:

- Hazard Description: General characterization of the hazard in question
- Location: Information limited to the geographic locations within the Hiouchi Planning Area that are affected by the specified hazard.
- Extent: A measurement reflecting the strength or magnitude of the hazard, depending upon the specific nature of hazard. The extent can be described in multiple ways: as a numeric value on an established scientific scale or measurement system, other measurements such as water depth and wind speed, the amount of warning time prior to the hazard, and/or the duration of the hazard event.
- Previous Occurrences: A history of previous known events in a given area is reviewed by hazard category.
- Probability of Future Events: Likelihood of a certain hazard occurring at some point in the future as defined below:
 - o Highly likely - Hazard has a strong chance of occurring within the next year and would impact approximately 50% of the community or more
 - o Likely - Hazard has a strong change of occurring within the next 5 years and would impact approximately 25% of the community or more
 - o Unlikely - Hazard does not have a strong chance of occurrence within the next 5 years and would impact less than 25% of the community.
 - o Not likely - Hazard is not anticipated to affect the community
- Influence of Climate Change on Impacts: Likelihood of a certain hazard being influenced by climate change.

3.5 Vulnerability Assessment

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

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



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

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

Once the Planning Area's hazards identified and profiled, a vulnerability assessment was conducted to describe the impact that each hazard would have on the community. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor's data);
- Statewide GIS datasets compiled by the California Office of Emergency Services to support mitigation planning;
- CALFire GIS datasets;
- FEMA's HAZUS-MH 4.0 GIS-based inventory data
- Written descriptions of inventory and risks provided by BRCSD
- Existing plans and studies
- Personal interviews with planning team members and staff from the District

3.5.1 HAZUS Assessment Tool

In 1997, FEMA developed the standardized Hazards U.S. (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. HAZUS-MH is a nationally applicable and standardized methodology that contains models for estimating potential losses from earthquakes, floods and hurricanes. HAZUS-MH was developed by FEMA and uses Geographic Information Systems (GIS) technology to estimate physical, economic and social impacts of disasters (FEMA Hazus, 2015). HAZUS-MH is used for mitigation and recovery, as well as preparedness and response. Government planners, GIS specialists, and emergency managers use Hazus-MH to estimate potential losses and then determine the most beneficial mitigation approaches to minimize them. Hazus-MH can be used in the risk assessment phase of the mitigation planning process, which is the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage (FEMA Hazus, 2015). FEMA's HAZUS MH Version 4.0 software was used to estimate the casualties, damages, and economic losses within the Planning Area for a M9.0 Cascadia Subduction Zone earthquake.

3.6 Earthquakes

An earthquake is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface



where the earthquake begins is called the hypocenter, while the location directly above it on the earth's surface is known as the "epicenter." Earthquake shaking is the result of stored energy being quickly released that otherwise would have been slowly released as the blocks slide past one another. Energy radiates outward from the fault like ripples on a pond. The resulting seismic waves shake the earth as they move through it. When the waves reach the earth's surface, they shake the ground and everything on it.

3.6.1 Earthquake Hazard Profile

General background on earthquakes relative to Hiouchi was sourced from the Crescent City/Del Norte County 2011 Hazard Mitigation Plan. Plate 3-1 shows the shaking potential for California.

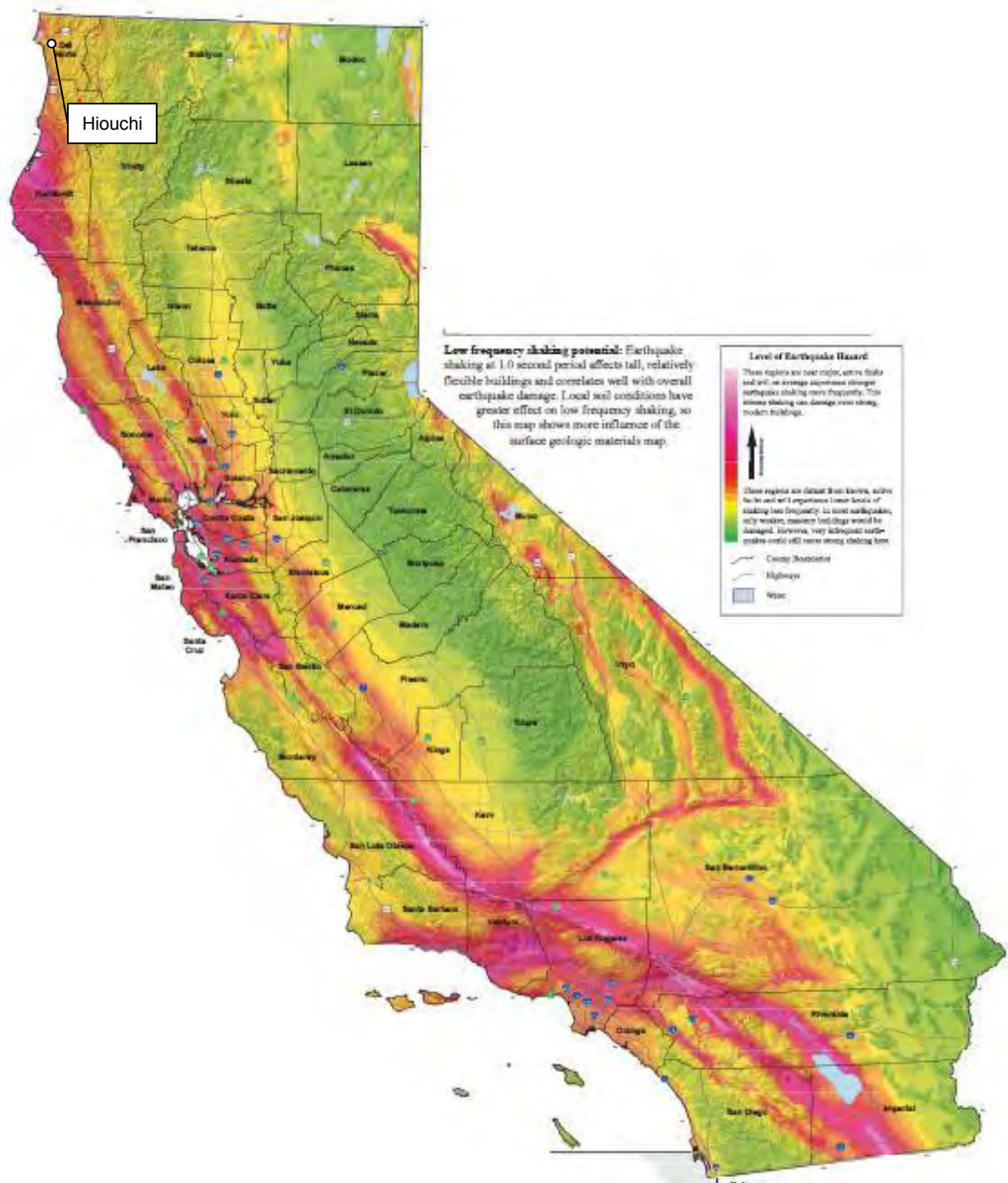


Plate 3-1 Earthquake Shaking Potential for California (USGS, 2016)



California is seismically active, because it sits on the boundary between three of the earth's tectonic plates. Most of California, everything east of the San Andreas Fault, is situated 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 Gorda Plate that contains denser rock than the North American Plate is being driven beneath it in a process known as subduction. The location where the Gorda Plate along with the Juan de Fuca Plate off the coasts of Washington and Oregon, and the Explorer Plate off British Columbia is being driven beneath the North American Plate is known as the Cascadia Subduction Zone. Lying mostly offshore, this plate interface is a giant fault approximately 750 miles long.

Faults are more likely to have future earthquakes 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 the accumulating tectonic stresses. Geologists classify faults in terms of their relative hazards. Active faults, which represent the highest hazard, are those that have ruptured all the way 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 whether or not 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, a majority of the seismic hazards are on the well-known active faults.

Earthquakes can last from a few seconds to over five minutes; they may also 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, because the shocks shake, damage, or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides or releases of hazardous material, compounding their disastrous effects.

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

Measured by magnitude or intensity scales, earthquakes are always classified according to the amount of energy released. While several scales have been defined, currently the most commonly used are the moment magnitude (M_w) and the modified Mercalli intensity. Estimates of moment magnitude roughly agree with estimates using other scales, such as the local magnitude scale (ML) commonly called the Richter magnitude scale. Table 3.4 presents a classification of earthquakes according to their magnitude. Table 3.5 compares the moment magnitude scale to the modified Mercalli intensity scale.

Another element of earthquake hazard assessment is the calculation of expected ground motion values. This involves determining the annual probability that certain ground motion accelerations will be exceeded, and 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 site classification (soil or rock type). Maps of PGA values form the basis of seismic zone maps that are included in building codes, including the International Building Code (IBC) and its predecessor the Uniform 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 (ie. single-family dwellings being the most common structure in Del Norte County). Maps of longer period spectral response components also might need to be developed to determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 3.6 lists the damage potential by PGA factors as compared to the Mercalli scale.

Table 3.4 Magnitude Classes

Magnitude Class	Magnitude (M) Range
Great	$M > 8$
Major	$7 \leq M < 7.9$
Strong	$6 \leq M < 6.9$
Moderate	$5 \leq M < 5.9$
Light	$4 \leq M < 4.9$
Minor	$3 \leq M < 3.9$
Micro	$M < 3$



Table 3.5 Modified Mercalli Intensity Scale

Intensity (Modified Mercalli)	Shaking	Description/ Damage	Magnitude (M)
I	Not felt	Not felt except by a very few under especially favorable conditions.	1.0 to 2.9
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.	3.0 to 3.9
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	4.0 to 4.9
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.	
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5.0 to 5.9
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	6.0 to 6.9
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.	
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	7.0 and higher
XI	Extreme	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	
XII	Extreme	Damage total. Lines of sight and level are distorted. Objects thrown into the air.	



Table 3.6 Comparison of Mercalli Scale and Peak Ground Acceleration

Intensity (Modified Mercalli)	Potential Damage	Estimated PGA
I	None	0.017
II-III	None	0.017
IV	None	0.014-0.039
V	Very Light	0.039-0.092
VI	None to Slight; USGS-Light	0.02-0.05
	Unreinforced Masonry-Stair Step Cracks; Damage to Chimneys; Threshold of Damage	0.04-0.08
		0.06-0.07
		0.06-0.13
VII	Slight-Moderate; USGS-Moderate	0.092-0.18
		0.05-0.10
		0.08-0.16
	Unreinforced Masonry-Significant; Cracking of parapets	0.10-0.15
VIII	Moderate-Extensive; USGS: Moderate-Heavy	0.1
		0.18-0.34
		0.10-0.20
	Unreinforced Masonry-Extensive Cracking; fall of parapets and gable ends	0.16-0.32
IX	Extensive-Complete; USGS-Heavy	0.25-0.30
		0.13-0.25
		0.2
	Structural collapse of some un-reinforced masonry buildings; walls out of plane. Damage to seismically designed structures	0.35-0.65
X	Complete ground failures; USGS- Very Heavy (X+); Structural collapse of most un-reinforced masonry buildings; notable damage to seismically designed structures; ground failure	0.20-0.50
		0.32-0.55
		0.50-0.55
		0.26-0.44

The impact of an earthquake is largely a function of the following components:

- Ground shaking (ground motion accelerations)
- Liquefaction (soil stability)
- Distance from the source (both horizontally and vertically)

To map the extent and location of areas within the Hiouchi Planning Area that should be considered vulnerable to seismic risk, the project management team utilized two principle



tools: probabilistic shake maps showing predicted ground motion and soils mapping that reflects the stability of soils in response to seismic events.

Cascadia Subduction Zone

The Cascadia Subduction Zone (CSZ) is an approximately 750-mile-long offshore fault, stretching from Northern California to Vancouver Island in Canada. Here, the set of tectonic plates to the west is sliding (subducting) beneath the North American Plate. The movement of these plates is neither constant nor smooth. The tectonic plates recently became stuck together, and stress pressure measurements are now rapidly rising according to geologists. Pressure will build up until the fault suddenly breaks catastrophically. This type of event last happened in 1700. The result was an earthquake on the order of magnitude M9.0, followed within minutes by a massive tsunami and extensive sea inundation that might have surpassed the effects of the earthquake and tsunami that struck Japan on March 11, 2011. Stresses have now been building along the CSZ for more than 300 years, and the communities of Cascadia can be certain that another great quake will again shake the region. The earthquake scenario utilized for the purposes of this LHMP is therefore a catastrophic magnitude M9.0 earthquake along the length of the entire Cascadia fault, although smaller earthquakes are also possible as the result of other geologic dynamics.

It should be noted that the earthquake scenario modeled for this LHMP does not account for aftershocks or their compounding effects. Based on historical data, modeling, and simulations, a magnitude M9.0 CSZ earthquake off the coasts of northern California, Oregon, Washington, and British Columbia would be immediately devastating. Tsunami inundation, vertical tectonic plate distortion, and ground shaking will push widespread damage inland, resulting in high numbers of potential fatalities, hospitalizations, evacuation scenarios, and destroyed buildings. The event could also trigger numerous cascading effects within the entire northern California region and surrounding states, including possible severe long-term economic impacts. Conventional response efforts and capabilities would be quickly overwhelmed.

The CSZ earthquake, resulting tsunami dynamics, and subsequent aftershocks most assuredly would cause significant disruption to critical infrastructure, such as transportation, energy, telecommunications, utility systems, and public health and medical systems. FEMA is currently preparing for large-scale disaster response demands associated with this worst-case scenario. The extraordinary levels of expected damage would likely bring regional, national, and possibly international assistance. Effective disaster response operations will require immediate life-saving and life-sustaining measures entailing unique solutions that address a range of serious impacts across northern California, Washington, Oregon, and beyond, including British Columbia, Alaska, Hawaii, and other Region IX and Region X states and territories.

Although it is somewhat possible that the CSZ could rupture section-by-section in a series of large earthquakes (each measuring magnitude M8.0 to M8.5) over a period of several years, the earthquake that many scientists and emergency planners now anticipate is modeled on the Cascadia Subduction Zone's last major quake in 1700. Current geological research suggests that the entire fault zone will rupture from end-to-end, thereby causing one great earthquake measuring magnitude M9.0 or greater. The shaking that results from such an abrupt shifting of



the earth's crust would be felt throughout the entire Pacific Northwest and is expected to persist for five to seven minutes.

The last known Cascadia Subduction Zone (CSZ) earthquake occurred January 26, 1700, which has been identified by tsunami records in Japan and paleoseismic investigations along the Pacific Coast. The estimated magnitude of the 1700 earthquake is approximately M9.0. This earthquake predates modern seismological records and is among the largest known earthquakes worldwide and the largest earthquake affecting the community of Hiouchi over the past several hundred years.

The closest analogy to this earthquake and its effects, including tsunamis, is the 2011 Japan earthquake. Earthquakes in Hiouchi, and throughout the world, occur predominantly because of plate tectonics—the relative movement of plates of oceanic and continental rocks that make up the rocky surface of the earth. Earthquakes can also occur because of volcanic activity and other geological processes.

The CSZ is a geologically complex area off the Pacific Northwest Coast from Northern California to British Columbia. In simple terms, several pieces of oceanic crust (the Juan de Fuca Plate and other smaller pieces) are being subducted (pushed under the crust) in North America. This subduction process is responsible for most of the earthquakes in the Pacific Northwest and for creating the volcanoes in the Cascades.

There are three main source regions for earthquakes that affect the community of Hiouchi. They are:

- “Interface” earthquakes on the boundary between the subducting oceanic plates and the North American plate;
- “Intraplate” earthquakes within the subducting oceanic plates, and
- “Crustal” earthquakes within the North American Plate. “Interface” earthquakes on the Cascadia Subduction Zone occur on the boundary between the subducting plate and the North American Plate and may have magnitudes up to M9.0 or perhaps M9.2, with probable return periods (the time period between earthquakes) of 300 to 500 years.

These earthquakes occur about 40 miles offshore from the Pacific Ocean Coastline. Ground shaking from such earthquakes would be the strongest near the coast, and strong ground shaking would be felt throughout Del Norte County with the level of shaking decreasing further inland from the coast.

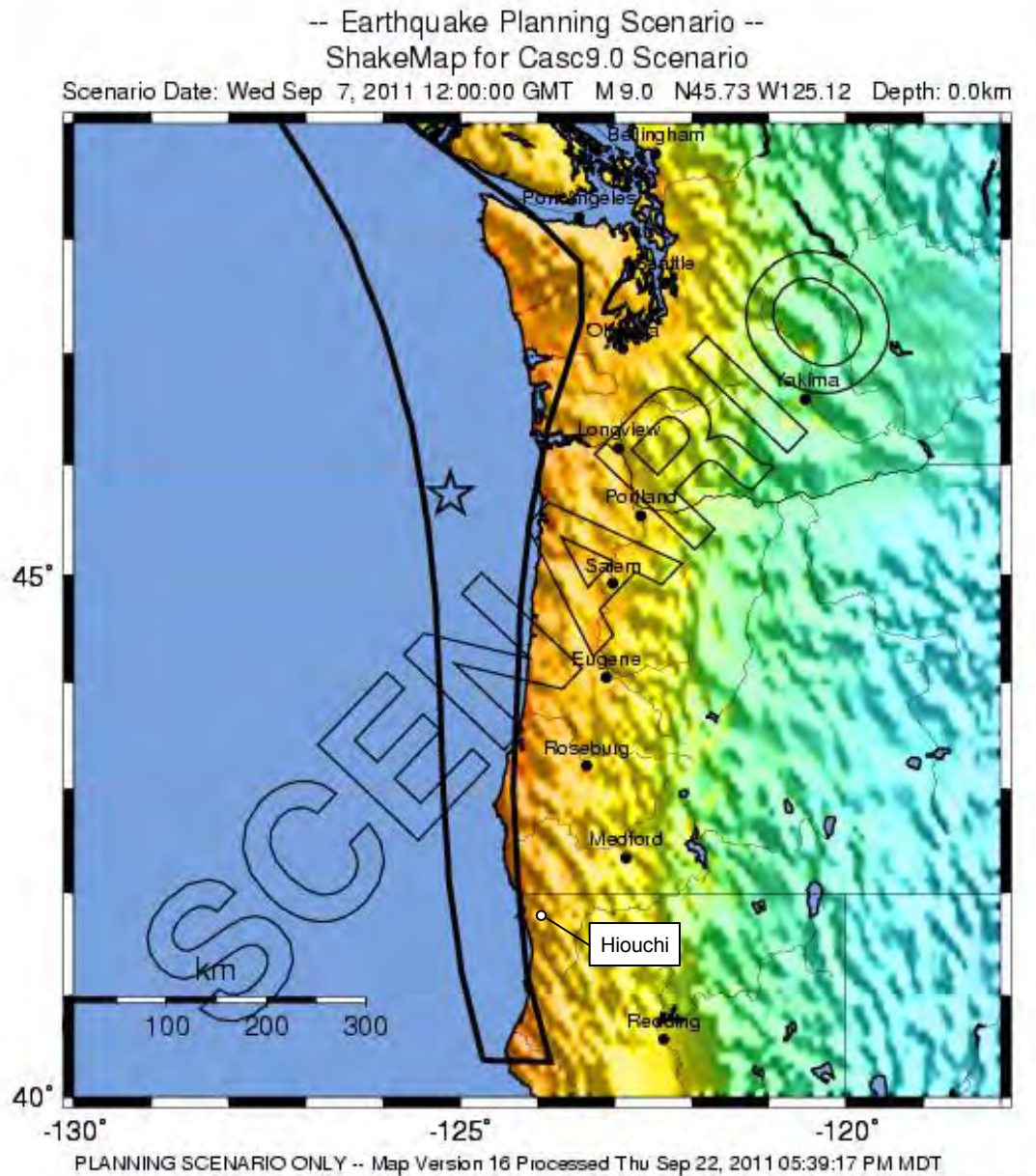
Paleoseismic investigations have identified 41 Cascadia Subduction Zone interface earthquakes over the past 10,000 years. This history corresponds to one earthquake about every 250 years. Of these 41 earthquakes, about half are M9.0 or greater that represent full rupture of the fault zone from Northern California to British Columbia. The other half of the earthquakes represents M8+ earthquakes that rupture only the southern portion of the subduction zone. The 300+ years since the last major Cascadia Subduction Zone earthquake is longer than the average of about 250 years for M8 or greater and shorter than some of the intervals between M9.0 earthquakes.

This LHMP addresses the effects of a magnitude M9.0 interface earthquake along the entire Cascadia Subduction Zone. Detailed effects of this profound threat, which include severe ground shaking, surface fault ruptures, permanent land level changes, liquefaction, landslides, and tsunami inundation, are discussed in this Section.

Graphic illustrations of the Cascadia Subduction Zone potential are displayed on the following pages. Plate 3-2 shows the Cascadia Subduction Zone fault system. Plate 3-3 presents the USGS Shake Map for California's North Coast region.



Plate 3-2 Cascadia Subduction Zone (USGS,2016)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC (%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

Plate 3-3 Shake Map for Cascadia Subduction Zone M 9.0 (USGS,2017)

Shake Maps

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

Shake Maps are expressed in terms of the 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. Plate 3-4 shows the estimated ground motion for a 100-year probabilistic earthquake, and Plate 3-5 shows the estimated ground motion for a 500-year probabilistic earthquake.

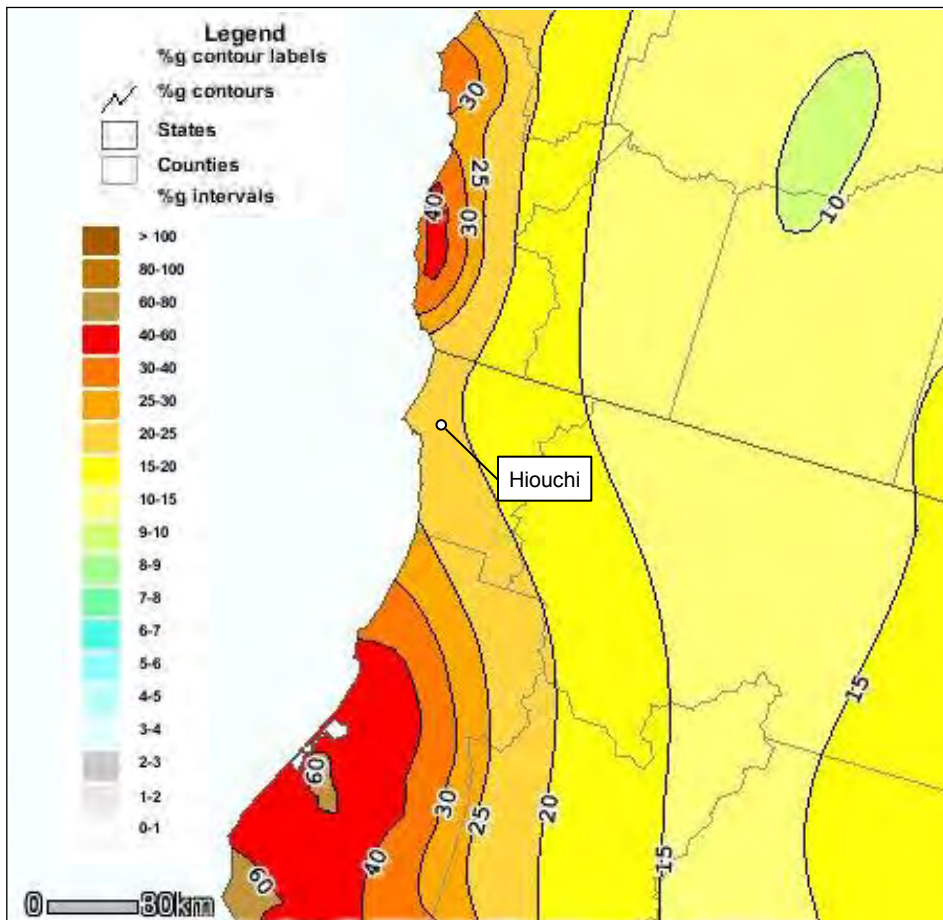


Plate 3-4 100-Year Probabilistic Ground Motion Map for the Hiouchi Planning Area (USGS, 2017)

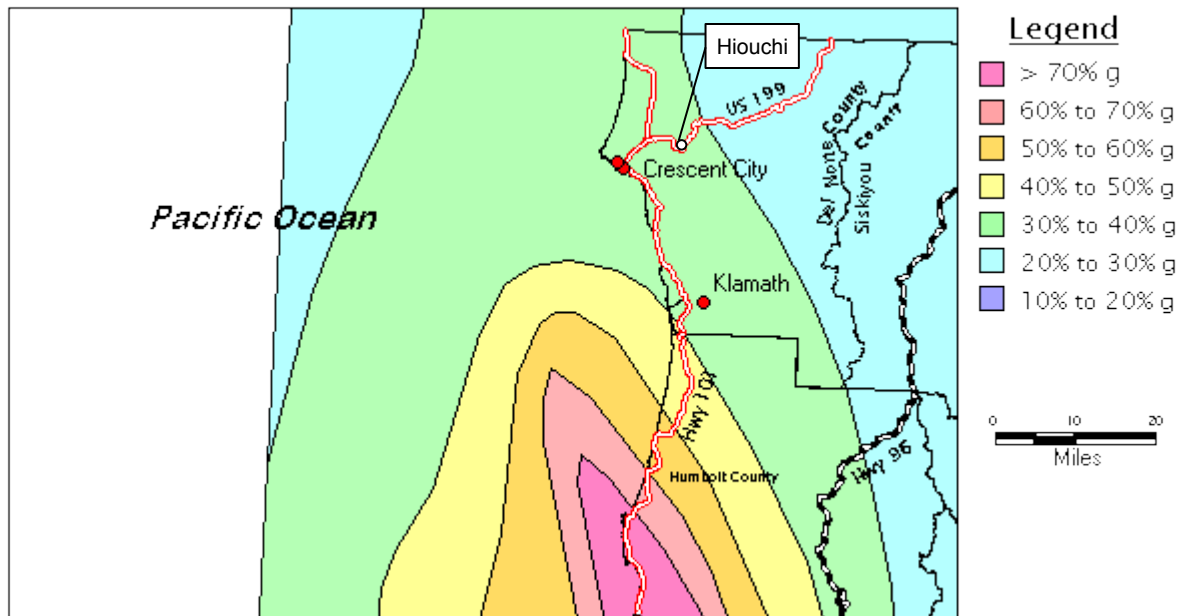


Plate 3-5 500-Year Probabilistic Ground Motion Map for the Hiouchi Planning Area (California Department of Conservation, 2017)

NEHRP Soils

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, liquefaction, and distance from the source of the quake. Liquefaction generally occurs in soft, unconsolidated sedimentary soils. A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics, so that locations potentially subject to liquefaction may be identified. Table 3.7 summarizes NEHRP soil classifications.

Table 3.7 NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity to 30 cm (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 soils requiring site-specific evaluation	

NEHRP soil types define the locations in the county that will be significantly impacted by an earthquake. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on earthquake magnitude. 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, which represents a secondary earthquake effect when soils lose their shear strength and flow or



behave as a liquid. Liquefaction damages structures that derive their support from the soil. Plate 3-6 portrays soil classifications throughout Del Norte County.

Frequency

Del Norte County is susceptible to regular earthquake activity, as evidenced by nine seismic events with a magnitude of M5.0 or higher experienced from 2000 through 2007 (see Table 3.8). The USGS has created a probabilistic hazard map based on peak ground acceleration that takes into account new information from several fault zones. The northern California area, including Del Norte County, is a moderate-risk area with a 10-percent probability factor over a 50-year period for ground shaking from a seismic event that exceeds 20 percent of gravity.

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 upon the location of the observer with respect to an earthquake's epicenter. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based upon the amplitude of the earthquake waves that are 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 Del Norte County would cause light-to-moderate damage. However, severity can increase based on proximity to the hypocenter of the event and the surrounding soil type. Soft soils abound within Del Norte County that have a high degree of vulnerability to earthquakes. The USGS estimates that at least a 0.5-percent probability exists for an earthquake of magnitude (M) 7.0 or greater occurring within 50 km of the Planning Area over the coming five years. This probability of occurrence, mixed with potentially unstable soils, could lead to an earthquake event that causes severe damage within the Planning Area.

Warning Time

Earthquake early warning systems are designed to provide a few seconds warning prior to damaging ground shaking in an earthquake. The farther an earthquake is centered from a region, the more warning time there will be. There is presently no current method to accurately determine when and where an earthquake might occur.

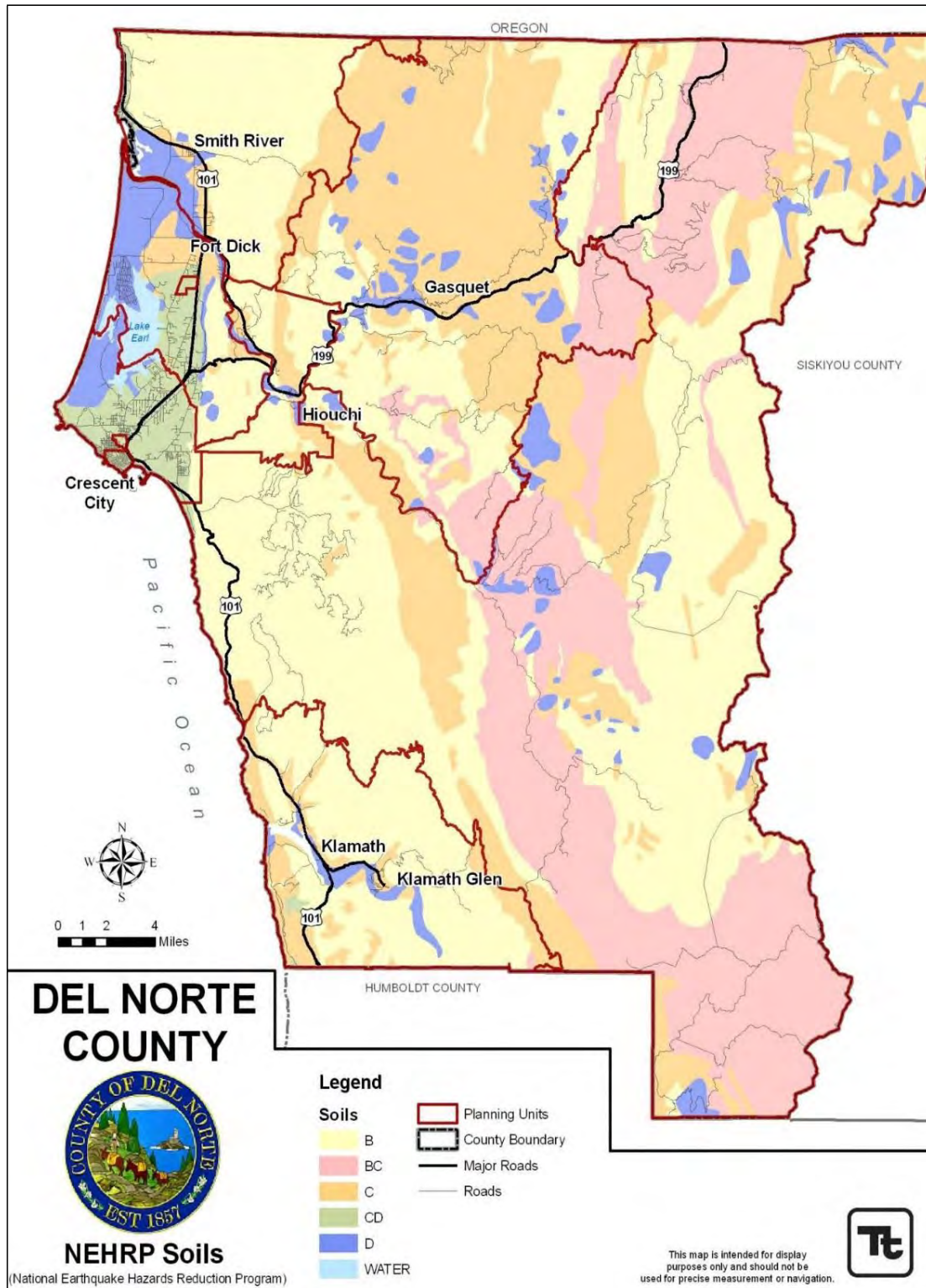


Plate 3-6 NEHRP Soil Classifications in Del Norte County (Tetra Tech, 2011)



Previous Occurrences

According to the California State Hazard Mitigation Plan, Del Norte County has been impacted by at least one recorded earthquake between 1950 and 2003 that caused sufficient damage for the California Governor to declare a state of emergency: the Cape Mendocino Earthquake on April 25, 1992, which also warranted a Presidential disaster declaration (DR-943). Table 3.8 lists seismic events with a magnitude of M5.0 or larger that were felt within the Planning Area since 2000.

Table 3.8 Recent Earthquakes of Magnitude M5.0 or Larger Felt within Del Norte County

Date	Magnitude	Epicenter Location		
		Distance	Direction	Nearest City
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 Point Mendocino

3.6.2 HAZUS-MH Data Sources

Much of the hazard data inputs for the Hazus-MH analysis were created from the 2012 Oregon Resilience Plan for Cascadia Subduction Zone Earthquakes (DOGAMI O-13-06, 2013). In conducting their vulnerability assessment, the seismic workgroup chose an earthquake scenario of magnitude M9.0 off the coast of Oregon along the subduction zone.

Hazus-MH offers two scenario methods for estimating damage from earthquake, probabilistic and deterministic. A probabilistic scenario uses U.S. Geological Survey (USGS) National Seismic Hazard Maps which are derived from seismic hazard curves calculated on a grid of sites across the US that describe the annual frequency of exceeding a set of ground motions as a result of all possible earthquake sources (USGS Earthquake Hazards Program, 2014). A deterministic scenario is based on a specific seismic event, which in this case is the CSZ “interface” magnitude M9.0 event. The preferred method used in this study was the deterministic scenario, since the CSZ event is easily the biggest seismic risk to the Planning Area.

The hazard layers derived from the work conducted in OFR O-13-06 and used in Hazus-MH were: peak ground acceleration (PGA), peak ground velocity (PGV), spectral acceleration at 1.0 second period and 0.3 second period (SA10 & SA03), permanent ground deformation (due to lateral spreading), and permanent ground deformation (due to landslide).



3.6.3 Earthquake Secondary Hazards

Earthquakes can cause a variety of secondary effects. Highly possible are 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 individual soil 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 quicksand-like 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 eventual failure can qualify as secondary risk exposure to earthquakes. Within the Del Norte County Planning Area, tsunamis can be considered secondary hazards to earthquake events.

3.6.4 Earthquakes and Climate Change

The general perception throughout the emergency management community is that the impacts of global climate change on earthquake probability are unknown. However, some scientists state that melting glaciers could induce tectonic activity. Researchers in prehistoric seismic events and volcanic activity suggest that, as ice melts and waters runs off, tremendous amounts of weight are lifted off of the earth's crust. As the newly freed crust settles back into its original, pre-glacier shape, it can cause seismic plates to slip and stimulate volcanic activity. And, in a new study, NASA and USGS scientists found that retreating glaciers in southern Alaska could be setting the stage for future earthquakes (NASA, 2004).

Another line of scientific thought is that certain secondary impacts of earthquakes could be significantly enhanced due to the impacts of climate change. Soils saturated from repetitive, isolated storms could fail prematurely during seismic activity due to increased saturation. It follows more specifically that dams, storing increased volumes of water due to changes in the hydrograph triggered by climate change could fail during seismic events. Wildland fire risks associated with earthquakes might be significantly enhanced by drought conditions triggered by climate change. The bottom line is that no models are currently available to estimate such impacts. Therefore, county and community governments are forced to utilize the best data available when they prepare local hazard mitigation plans.

3.6.5 Earthquake Exposure

The data in this section was generated using the HAZUS-MH program for earthquakes, which uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other available information to estimate potential losses. Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the violence of ground shaking, the number of buildings damaged, the number of casualties, levels of damage to transportation systems and utilities, the number of people displaced from their homes, and estimated costs for repairs and recovery.



Population

The entire population within Hiouchi's Planning Area is potentially exposed to earthquakes. Exposure ranges from disruption of daily life to risk of injury and death. The exposure depends on the severity of the earthquake, the greater the magnitude of the earthquake the greater the exposure of the community, with higher magnitude earthquakes resulting in greater chance of injury and death.

Property

According to LAFCO's Municipal Service Review for the Big Rock CSD, approximately 197 structures exist within the community of Hiouchi. The majority of these buildings support residential use. All of these buildings are considered to be exposed to the earthquake hazard.

Critical Facilities and Infrastructure

Given the existing earthquake hazard, all 7 critical facilities and infrastructure components are also exposed to the earthquake hazard. A breakdown of the numbers and types of facilities involved is presented in Table 3.3 above.

Earthquake damage often impairs communication systems when they are most needed. In Chile's Maule earthquake in 2010, landline and wireless services were disrupted for up to one week by equipment failures, structural damage to key facilities, and power outages. Unintentional jamming is another typical problem, as demonstrated during two recent earthquakes in southern California that occurred in the aftermath of a magnitude M5.5 event in Chino Hills (2008) and a magnitude M7.2 event in Baja (2010). Landline and cellular communications are easily overwhelmed when large numbers of people try to use them at the same time (CREW et.al. 2013).

Earthquake and Tsunami Refugees

The great earthquake and tsunami that struck Japan in 2011 spotlighted the challenges related to providing temporary shelter, services, and food to large numbers of displaced people. If the aforementioned Cascadia Subduction Zone earthquake occurs during the winter or early spring, as was the case during the Tohoku event, thousands will seek refuge from cold, wet conditions. Electricity generators, fuel, food, and other emergency supplies will be in high demand for a long time. If a Cascadia Event materializes during the summer tourism and recreation season visitors numbering in the thousands, who normally swell the populations of Del Norte County's coastal zone and the campgrounds within Hiouchi's LHMP Planning Area, would escalate demands for shelter and supplies beyond the ability of emergency responders to imagine (CREW et.al. 2013). The ensuing evacuation and massive disaster relief campaign via U.S. military helicopter airlift would represent the Pacific Coast's sole salvation and establish a precedent for America.

Likelihood of Future Occurrences

The future occurrence of an earthquake is likely. Earthquakes are relatively common within Hiouchi's Planning Area. That said, the countdown has begun, given the recent "freezing" of the tectonic plates, for a catastrophic Cascadia Subduction Zone earthquake. An earthquake affecting more than 50% of the population has a strong likelihood occurrence in the next 5 years.



3.6.6 Earthquake Vulnerability

The CSZ event is highly likely to produce severe ground shaking and ground failure. Because an earthquake can simultaneously affect a wide area, it is unique from other hazards within this report since every building, to some degree, will be affected by a CSZ magnitude M9.0 earthquake. HAZUS-MH damage estimates for each building are based on a formula where coefficients are multiplied to each of the five damage state percentages (none, low, moderate, extensive, and complete). This provides a loss ratio which is then multiplied to the total value resulting in a damage estimate. Once again, the damage estimates reported for earthquake are for buildings outside of the (Medium-sized) tsunami inundation zone.

In keeping with earthquake damage convention, the federal color-tagging system to represent damage states. Red-tagged buildings correspond to a HAZUS-MH damage state of complete, while yellow is the extensive damage state. The number of buildings in each damage state is based on an aggregation of probabilities and does not represent individual buildings. Essential facilities were considered non-functioning if the HAZUS-MH earthquake analysis showed that a building or complex of buildings to be at least moderately damaged (>50%).

The number of potentially displaced residents from the CSZ earthquake was based on the number of red-tagged and a percentage of yellow tagged residences that were determined in the HAZUS-MH earthquake analysis results.

Population

Within the HAZUS database, the population reported per census block was distributed amongst residential buildings, pro-rated based on the square footage. Note that due to lack of information within the assessor and census databases this distribution also includes vacation homes, which in the Planning Area makes up a significant but unknown percentage of the total residential building stock. Using this distribution the number of permanent residents that could be affected by a natural hazard scenario was estimated. For the CSZ earthquake scenario the potentially displaced residents was based on the number of residents in buildings estimated to be significantly damaged by the earthquake. The displaced resident population was modeled at 358 people. Earthquakes put the population at risk to injury and death.

Property

A key piece of the risk assessment is the Planning Area building inventory. This inventory consists of all buildings larger than 500 square feet, as determined from building footprints or tax assessor data. Census track data for Del Norte County was modified to only have building inventory for the Planning Area. The HAZUS-MH results for property are:



- Number of buildings (red tagged): 118
- Number of buildings (yellow tagged): 206
- Loss Estimate: \$64,590,000
- Loss Ratio: 31%
- Loss Estimate (Design level changed to at least moderate code): \$52,409,000
- Loss Ratio (Design level changed to at least moderate code): 21%

Critical Facilities and Infrastructure

Critical facilities were identified within the HAZUS-MH database so that they could be highlighted in the results. Critical facilities in this risk assessment include fire stations, emergency operations, and communications center. Critical facilities are important to note because these facilities play a crucial role in recovery efforts. Communities that have critical facilities which can function during and immediately after a natural disaster are more resilient than those with critical facilities that are inoperable after a disaster. There are 6 critical facilities identified in the Planning Area. All critical facilities were modeled to be affected by the CSZ earthquake event. U.S. Highway 199 would be affected by landslides and bridge failures, essentially making Hiouchi an island cut off from regional transportation routes.

Limitations in Earthquake HAZUS-MH Evaluation

There are several limitations to keep in mind when interpreting the results of this risk assessment. The following is a list of weaknesses and opportunities for improvement.

Spatial and Temporal Variability of Natural Hazard Occurrence – Flood, landslide, and wildfire are extremely unlikely to occur at one time to the fully mapped extent of the hazard zones. For instance, areas mapped in the 1% annual chance flood zone will be prone to flooding on occasion in certain watersheds during specific events, but not all at once throughout the entire county or even the entire community. The possible exception is earthquake-induced landslides, however, potential ground failure due to landslide is captured as a component of the earthquake loss estimation.

Loss Estimation for Individual Buildings – Hazus-MH is a model, not reality, which should be front-of-mind when considering the loss ratio of an individual building. Hazus-MH is not providing a site-specific analysis. Also, due to a lack of building material information, assumptions were made about the distribution of wood, steel, and un-reinforced masonry buildings. Loss estimation is most insightful when individual building results are aggregated to the community level, smoothing out the noise.

Loss Estimation Versus Exposure – One should be cautious in their interpretation of exposure results. This is due to the spatial and temporal variability of natural hazards (described above) and the inability to perform loss estimations due to the lack of Hazus-MH damage functions. Exposure is reported in terms of total building value, which could imply a total loss of the buildings in a particular hazard zone, but this is not the case. Exposure is simply a tally of the number of buildings and their value and does not make estimates about the level to which an individual building could be damaged.



Population Variability – The Planning Area is a popular vacation destination, particularly during the summer. Our estimates of potentially displaced people rely on permanent populations published in the 2010 census. As a result, we are underestimating the number of people that may be in harm's way on a summer weekend. To address this, one could use permanent occupancy rates for residential buildings in a community with few vacation rentals and apply the rate to a vacation community to estimate population for a maximum occupancy scenario.

3.7 Wildfire

3.7.1 Wildfire Hazard Profile

California is recognized as one of the most fire-prone and consequently fire-adapted landscapes in the world. The combination of complex terrain, Mediterranean climate, and productive natural plant communities, along with ample natural and human ignition sources, has created conditions for extensive wildfires. Wildland fire is an ongoing concern throughout the Hiouchi Planning Area. The fire season extends from early spring through late fall of each year during the hotter, dryer months. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, thick accumulations of vegetation, and high winds.

Forest fires burning towards the end of the dry season are typically intense, resist suppression efforts, and generally threaten lives, property, and resources. Dry conditions obviously intensify the wildfire threat. Climatic conditions can increase the potential, especially when thunderstorms course through the area producing cloud-to-ground lightning strikes. Almost every year the Pacific High Pressure System moves eastward over California and brings hot, dry weather to the region with low humidity. This "Heat Wave" can occur at any time during the dry season. Wildfires start easily during those periods and are difficult to extinguish. A wildfire can quickly escape under such conditions and create extensive damage.

Potential losses from wildfires include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Economic losses are almost inevitable during and after wildfires. Smoke and air pollution from wildfires can become a serious health hazard. In addition, catastrophic wildfires can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Wildland Urban Interface

Throughout California, communities have become increasingly focused on wildfire mitigation as residential developments continue to push farther into the foothills and mountain areas. Fire control practices appear to have affected the natural cycles of ecosystems. While wildfire risk is predominantly associated with wildland urban interface (WUI) areas, major wildfires also occur in heavily populated areas. The wildland urban interface is a general term that applies to development wherever it occurs in close proximity to landscapes that produce wildfire events.

The WUI defines community development planning in areas where grass, brush, and timber-covered lands (wildland) appear. The Hiouchi Planning Area is considered a WUI. There are two types of WUI environments. The first addresses the true urban interface where development



abruptly meets wildland. The second WUI environment refers to the wildland urban intermix. Wildland urban intermix areas are rural, low-density locations where homes are intermixed with wildlands. Wildland urban intermix communities are difficult to protect, because they typically sprawl over large geographical areas that contain wild fuels throughout. Access, structure protection, and fire control are often difficult leaving fire to run freely through the community.

WUI fires are the most damaging of all wildfires. They typically occur where naturally forested landscapes and urban developments intersect. In such cases, even small acreage fires can result in serious damage to infrastructure, built environments, loss of socio-economic values, and human injury.

WUI fires also can occur in remote areas hosting critical infrastructure easements, such as electrical transmission towers, railroads, water reservoirs, communications relay sites, and other key assets. Human impact on wildland areas has made it more difficult to protect life and property due to limited access by firefighting crews. In addition, home construction provides a new fuel load within a given wildland, thereby shifting firefighting tactics toward life safety and structure protection.

Hiouchi Wildfires

Wildland fires affect the natural landscape and collocated structures. Where human access to wildland areas exist, such as the Smith River National Recreation Area (SRNRA) located to the east of Hiouchi, the risk of fire increases due to human carelessness. That said, none of the many wildfires that burned within three miles of Hiouchi over the past 20 years was initiated out of human carelessness or purposely set by a human inside of Hiouchi's boundaries. Lightning strikes started most, if not all of them, although a few fires had unknown origins. The south face of Hiouchi Mountain has been an established Conservation Easement since 2008 where no housing sprawl is legally possible. The east side of Hiouchi is bordered by U.S. Highway 199 and the Smith River Canyon. Hiouchi's southern border ends at the Smith River's mean high water line. Its western border is defined by the Hiouchi Bridge junction with U.S. Highway 197. Wildfire threat to the community of Hiouchi is always present during the fire season from potential wildfires burning toward Hiouchi from other areas, but not from within.

The Smith River Fire Protection District staffs Fire Station #2 in Hiouchi, which would respond to any structural, vehicle, or wildfire in the Planning Area. Four principle factors sustain wildfires and allow for predictions of a given area's potential to burn. They include fuel, topography, weather, and human actions described below.

- **Fuel** – Fuel is what feeds a fire and constitutes the pivotal factor in wildfire behavior. Fuel is generally classified by type and volume. Fuel sources are diverse. They include everything from dead tree leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also considered in this category are manmade structures, such as homes and other associated combustibles. The prevailing fuel directly influences wildfire behavior, and fuel is the sole factor under human control. Certain areas in and surrounding the Hiouchi Planning area are extremely vulnerable to wildfires, mainly because of dense vegetation surrounding structures built near and within forested lands. These fuel hazards, coupled with the high potential for fire encroachment from the SRNRA, collectively increase the probability of wildfire. The steep forested south side of Hiouchi Mountain lies within the Hiouchi Planning Area and looms over the northern portions of some of Hiouchi's prime neighborhoods. The 100-acre



Conservation Easement legally prohibits casual human presence on the mountainside, which was selectively logged on three occasions since 1985. Within Hiouchi's confines, then, the most serious threat from wildfires largely emanates from wildfires burning out of control in the SRNRA, which has historically crept to within one mile of Hiouchi's northeast boundary, showering the entire community for days with burning embers and choking its residents with thick smoke. However, no homes or businesses have caught fire during those troubling experiences. Every year in April and May, Cal Fire personnel visit each home throughout the Planning Area to offer advice regarding safe setback distances between structures and vegetation. They politely recommend branch and even whole tree removal when growth falls inside of the recommended fire safe zone. Residents appreciate this public service, which has proved to be quite effective in preventing structure fires.

- **Topography:** An area's terrain and land slopes affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. Certain arrangements of vegetation across a steep hillside can also contribute to increased fire probability. The south face of Hiouchi Mountain is oriented toward the community of Hiouchi. Slope ranges from 35 to 71 degrees.
- **Weather –** Weather components such as temperature, relative humidity, wind, and lightning likewise affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating situations where fuel will ignite more readily and burn more intensely. Thus, the threat of wildfire increases dramatically during dry periods. High wind velocity is the most treacherous weather factor. The greater the wind, the faster a fire will spread, and the more intense it will burn. Winds can be significant at times in Hiouchi, sometimes approaching 90 mph and swirling in cyclonic patterns. In addition to wind speed, wind shifts can suddenly occur due to temperature changes or the interaction of wind with topographical features such as steep hillsides. Lightning also ignites wildfires, often in difficult-to-reach terrain for firefighters. For the record, no drought ever has been declared for Del Norte County. Over the 2015-16 winter, Hiouchi received 100 inches of precipitation. The 2016-17 wet season brought 150 inches of rain.
- **Human Actions –** Most wildfires are ignited by human actions, meaning acts of arson, simple carelessness, or accidents. Many fires originate in populated areas along roads and around homes, and are most often the result of arson or careless acts, such as discarding live cigarettes, operating equipment, or burning debris. National and State recreation areas that are collocated with fire hazard areas attract human activity that inherently increases the potential for wildfires.

Factors contributing to wildfire risk within the Hiouchi Planning Area include:

- Overstocked forests, severely overgrown vegetation, and lack of defensible space around structures;
- Excessive vegetation along public and private roadsides, fire engine access, and evacuation routes;
- Drought and overstocked forests with increased beetle infestation or kill in weakened and stressed trees;



- Narrow and often one-lane and/or dead-end roads complicating evacuation and emergency response, as well as private neighborhoods with only one means of ingress/egress;
- Inadequate or missing street signs on private roads and house address signs;
- Nature and high frequency of nearby area lightning ignitions; and
- Three private roads with no fire hydrant within 500 feet of all residences.

Wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape. Century old policies of fire exclusion and aggressive suppression have given way to better understanding concerning the importance fire plays in the natural cycle of certain forest ecosystems.

Cal Fire Events

Cal Fire, USDA Forest Service, Bureau of Land Management (BLM), the National Park Service (NPS), Contract Counties, and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout California. The inclusive data bank 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 greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. Cal Fire recognizes various federal, state, and local agencies that have contributed to this dataset, including USDA Forest Service Region 5, BLM, National Park Service, and numerous local agencies. Plate 3-7 shows fire hazards within the Hiouchi Planning Area (CalFire, 2017).

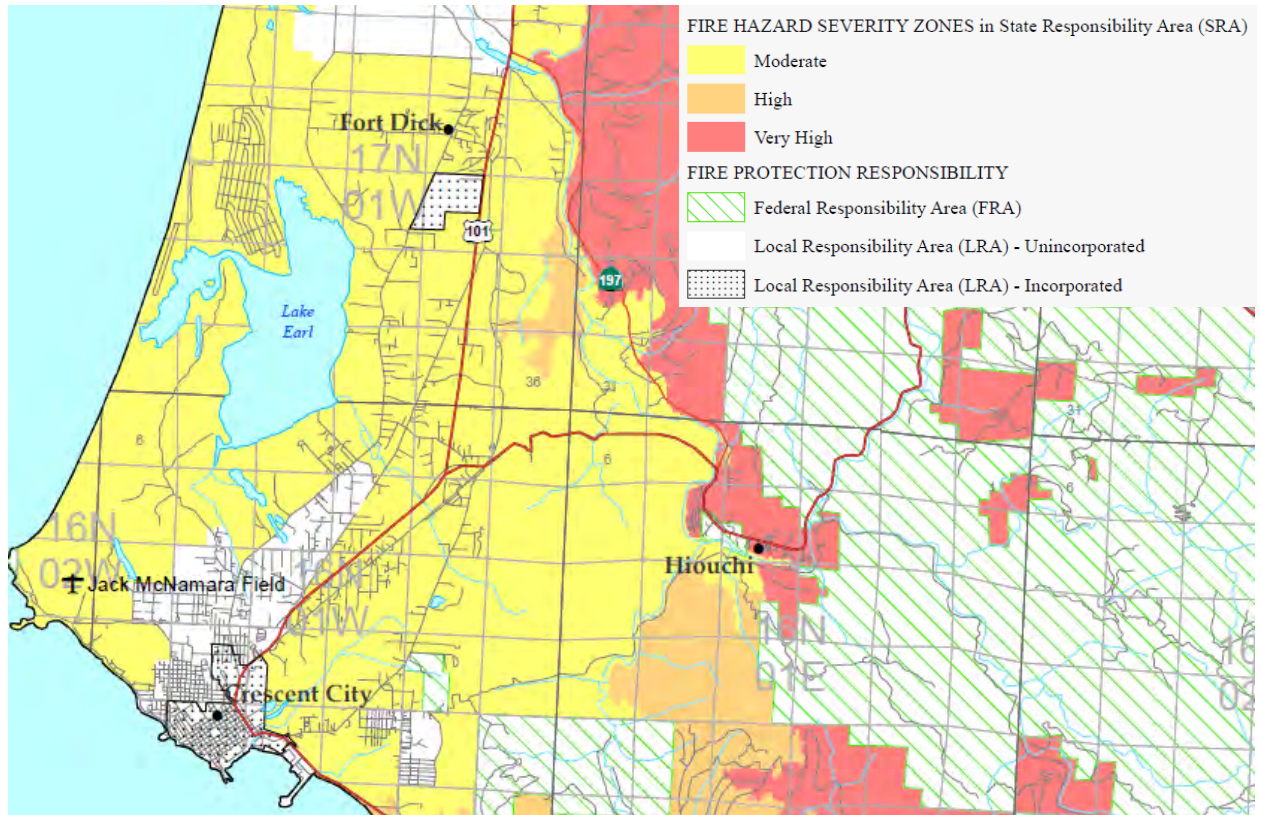


Plate 3-7 Fire Hazard Severity Zones for the Hiouchi Planning area (CalFire, 2017)

3.7.2 Wildfire Secondary Hazards

Wildland fires 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 by reducing harvestable timber and more indirect economic losses in reduced tourism. Wildland fires can cause the contamination of reservoirs, destroy transmission lines and contribute to flooding. Landslides can be a significant secondary hazard of wildland fires. Wildland fires 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 wildland fire. The following additional secondary effects are possible; rehabilitation efforts after a fire occurs can reduce but cannot eliminate them:

- **Air Quality**—Air pollution from wildland fires can affect visibility, human health, materials, vegetation, pollution rights and greenhouse gas accumulation. Quantifying impacts is difficult because there is insufficient data on the quantities of pollutants emitted during wildland fires. Models of pollutant dispersion, though increasingly sophisticated, still leave much to be desired, particularly when trying to apply them to specific events rather than to longer-term emissions. Moreover, models estimating the impacts of pollutant levels on human health have generally been geared toward examining chronic pollution levels, not episodic events such as wildland fires. Future wildland fires are predicted and levels of air pollutants can be managed



before the fire occurs. The estimated annual wildland fire air pollutant emissions are 600,000 tons from CDF and U.S. Forest Service fires. This does not include Bureau of Land Management, Bureau of Indian Affairs, National Park Service or wildland fires inside city limits. The 600,000-ton estimate is based on a 10-year average of acreage burned by vegetation type annually.

- **Damaged Fisheries**—Critical trout fisheries throughout the West and salmon and steelhead fisheries in the Pacific Northwest can suffer from increased water temperatures, sedimentation, and changes in water quality and chemistry.
- **Flooding**—Most wildland fires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This results in increased runoff generated by storm events, increasing the chance of flooding.
- **Soil Erosion**—The protective covering provided by foliage and dead organic matter is removed, leaving soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitat.
- **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. For instance, the Biscuit Fire destroyed 125,000 to 150,000 acres of spotted owl habitat.
- **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.

3.7.3 Wildfires and Climate Change

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 wildland fire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildland fire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, forest susceptibility to wildland fires 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.

Future climate scenarios project summer temperature increases between 2°C and 5°C and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildland fires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide concentration—the so-called—fertilization effect—could also contribute to more tree growth and



thus more fuel for future 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.

3.7.4 Wildfire Exposure

Population

A geographic analysis of the population exposed to wildfire risk was performed using GIS data and mapping. Population figures were cross-referenced with the map displaying degree of wildland fire threat (Plate 3-7). The populated parts of the Hiouchi Planning Area are all within a very high fire severity hazard zone, and thus the entire population is exposed to the wildfire hazard. The population could be at risk in injury or death from wildfires depending on the fire severity, warning time, and availability of evacuation routes.

Property

Property damage from wildland fires can be severe and can significantly alter entire communities. Similar to population exposure, all structures are located within a very high fire severity hazard zone (Plate 3-7). According to LAFCO's Municipal Service Review for the Big Rock CSD, approximately 197 structures exist within the community of Hiouchi. The majority of these buildings support residential use. All of these buildings are considered to be exposed to the wildfire hazard.

Critical Facilities and Infrastructure

All critical facilities within the Hiouchi Planning Area are exposed to the very high fire severity hazard.

Likelihood of Future Occurrence

The future occurrence of wildfire is highly likely in the next year. From May through October every year, the Hiouchi Planning Area faces a serious wildland fire threat. Fires will continue to occur on an annual basis surrounding the Planning Area. The threat of wildfire and potential losses are constantly increasing as tourism and recreation increase and the wildland urban interface areas develop. Due to its high fuel load and long, dry summers, the Hiouchi community continues to be at risk from wildfire.

3.7.5 Wildfire Vulnerability

Structures, above-ground infrastructure, critical facilities and natural environments are all vulnerable to the wildland fire hazard. There is currently no validated damage function available to support wildland fire mitigation planning. Except as discussed in this section, vulnerable populations, property, infrastructure and environment are assumed the same.

All residents of the county are vulnerable to wildland fire to some degree, but particular segments are more vulnerable than others. Some land uses are more vulnerable to wildland fire, such as single-family rural residential, while others are less vulnerable, such as agricultural land, gravel



mining, and cemeteries. Critical facilities that are of wood frame construction are especially vulnerable during wildland fire events.

In the event of wildland fire, there would likely be little damage to the majority of infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildland fire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access throughout the county and can isolate residents and emergency service providers needing to get to vulnerable populations or to make repairs. Wildland fire typically does not have a major direct impact on bridges. However, wildland fires 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.

Population

A geographic analysis of demographics was performed using GIS data and mapping to identify populations that may be at risk in the Planning Area to wildfire. The results of this analysis are displayed in Table 3.9. As stated under exposure, the population is at risk of injury and death from wildfires.

Table 3.9 Population at Risk from Wildland Fire

Fire Threat	Exposed Population
Moderate	554
High	72
Very High	24
Total	650

Property

Property damage from wildland fires can be severe and can significantly alter entire communities. Table 3.10 displays the number of homes exposed to the three levels of fire threat in the Planning Area. Table 3.11 shows the value of property in the Planning Area within each fire-threat area, based on Del Norte County Census Assessor values as of March 1, 2009.

Table 3.10 Houses at Risk from Wildland fire

Fire Threat	Exposed Population
Moderate	216
High	76
Very High	36
Total	328

Table 3.11 Houses at Risk from Wildland fire

Planning Area	Property Value Exposed			% of Total Assessed Value		
	Moderate Fire Threat	High Fire Threat	Very High Fire Threat	Moderate Fire Threat	High Fire Threat	Very High Fire Threat
Hiouchi	\$18,734,385	\$11,952,314	\$29,585,479	0.75%	0.48%	1.18%



Critical Facilities and Infrastructure

All critical facilities in the Planning Area are exposed to the wildland fire hazard.

Environment

Natural Resources: Natural resources are highly valued by residents of the Planning Area for their contribution to the local quality of life, and as an economic development asset that attracts tourist-related expenditures. Fire can destroy natural assets that are highly valued by the community.

Air Quality: Smoke generated by wildland fire 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 wildland fires 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 wildland fire include difficulty in breathing, odor, and reduction in visibility.

The Planning Area 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.

Agricultural and Timber Resources: Agricultural resources include rangelands, timberlands, cultivated farmlands and dairy lands. Agricultural lands are an important element of the Del Norte County identity and economy. Although fire has been used as a tool in rangeland and timber management, wildland fire can have disastrous consequences on such resources, removing them from production and necessitating lengthy restoration programs.

Cultural Resources: 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 wildland fire. 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 new cultural sites can be a benefit to archeologists and Native American groups, but can also present problems of looting and vandalism.

3.8 Flood

Flooding historically is the most frequent and costly natural hazard that occurs in the United States. Approximately 90 percent of presidentially declared disasters result from natural hazard events with flooding as a major component. Floods are among the most costly of natural disasters in terms of human hardship and economic loss on a nationwide scale. Floods can damage structures, landscapes, and utilities substantially, and also threaten human and animal safety.



3.8.1 Flood Hazard Profile

A car will float in less than two feet of moving water with the possibility of being swept downstream into deeper waters. Floods actually kill more people trapped in vehicles than they do anywhere else. People caught in floods sometimes suffer heart attacks or electrocution due to electrical equipment shorting out. Floodwaters can transport large objects downstream, which then damage or destroy stationary structures and buildings. Flooding in both populated and remote areas frequently breaks utility lines and interrupts critical services. Post-flood ground saturation often causes structural instability, collapse, or other serious damage, and objects can be buried or destroyed through sediment deposition.

Floods are generally the result of excessive precipitation, and can be classified under two categories:

- General Floods: Precipitation over a given river basin for a long period of time; and
- Flash Floods: The product of heavy localized precipitation in a short time period over a given location.

Severity of a flooding event is determined by a combination of stream and river basin topography and physical geography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing. Generally floods are usually long-term events that might last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is generated by excessive precipitation levels plus high water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by coastal storms. Urban flooding occurs where man-made development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with large storm events. However, flash flooding events can also result from accelerated snow melt due to heavy rains, a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by an ice jam. Although flash flooding most often along mountain streams, it is also common in urban areas where much of the ground is covered by impervious surfaces. Flash flood waters move at very high speeds with water height sometimes reaching 10 to 20 feet. Flash flood waters and the accompanying debris can uproot trees, roll boulders, destroy buildings, and demolish bridges and roads.

Entire communities can lie underwater for days and, in some cases, weeks. The periodic flooding of lands adjacent to rivers, streams, and shorelines (land areas known as floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

The area adjacent to a channel is the floodplain. Floodplains are illustrated on inundation maps that show areas of potential flooding and water depths. In its common usage, the term floodplain most often refers to that area that is predicted to be inundated by a 100-year flood, which is the flood that



has a one-percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program. The 500-year flood is one that has a 0.2 percent chance of being equaled or exceeded in any given year. Figure 6 (Figures Appendix) shows the 100 and 500-year flood inundation maps for the Hiouchi Planning Area.

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

Health Hazards from Flooding

Certain health hazards are common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground, including dirt, oil, animal waste, and also lawn, farm and industrial chemicals.

Floodwaters also saturate the ground, which then leads to infiltration into sanitary sewer lines and septic systems. There is no centralized wastewater system in Hiouchi and properties rely on septic systems. Infiltration can lead to overloaded leach lines that can back up into low-lying areas and homes. Even when it is diluted by flood water, raw sewage is a breeding ground for such dangerous bacteria as *Escherichia coli* and other disease-causing agents.

The second type of health problem arises after most of the floodwater has dissipated. Stagnant pools can turn into breeding grounds for mosquitoes. Wet areas next to buildings that have not been properly cleaned breed mold and mildew. A building and surrounding land that have not been appropriately sanitized after a flood collectively represent a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after water inundation. When the furnace or air conditioner is turned on, sediments left in the ducts are circulated throughout the building and inhaled by the occupants. If a community's water system loses pressure, a boil order should be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The costs and labor needed to repair a flood-damaged home impose severe strain on people, especially those who are unprepared and uninsured. Moreover, a longer-term problem exists for those who realize that their home can be flooded again. The resulting stress on floodplain residents eventually take its toll in the form of aggravated physical and mental health problems.

3.8.2 Flood Secondary Hazards

The flood hazard in the Hiouchi Planning area is relative low. Typical secondary hazards such as bank erosion and landslides resulting from flood conditions are not experienced in the Planning Area.



3.8.3 Flood and Climate Change

Global climate change could trigger changes that would result in an increase in flood activity. As sea level rise, the potential for coastal flooding increases. The Planning Area is sufficiently distant from coast areas that this is not a hazard for the Planning Area. Flooding associated with changed atmospheric conditions that alter the frequency, duration and intensity of storm events, may affect the flood hazard in the Hiouchi Planning Area, which is discussed more below.

Use of historical hydrologic data has long been the standard of practice for designing and operating flood protection projects. For example historical data are used for flood forecasting models such as the National Weather Service's River Forecast System Model 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 relatively recent past (last 50 to 100 years). Paleoclimatology, which relies upon records from ice sheets, tree rings, sediment, and rocks to determine the past state of Earth's climate system, as well as other research revealing expected impacts of climate change, indicate that the historical hydrologic record cannot be used to predict expected increases in frequency and severity of extreme events such as floods and droughts. 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. California's resource managers have concluded 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.

Rising snowlines caused by climate change will allow more mountainous areas to contribute to peak storm runoff. High frequency flood events (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 wildland fires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

FEMA has traditionally used the 100-year flood event for federal flood insurance. As hydrology changes, what is currently considered a 100-year flood may occur more often, leaving many communities at greater risk. Moreover, as peak flows and precipitation change over time, climate change calls into question assumptions about future conditions being similar to those of the past. 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.



3.8.4 Flood Exposure

Population and Property

Given the steep topography within the Hiouchi Planning Area, there are no residential structures within the 100 or 500-year floodplain, as shown in Figure 6 in the Figures Appendix. New construction now must comply with the County's conservative setback regulations that prevent the erection of any structure within the 100-year floodplain. Established residences miles downstream from Hiouchi sustained serious damage from floods long ago, but are located well outside the Hiouchi Planning Area. There have been no National Flood Insurance Program structures in the Hiouchi Planning Area that have suffered repetitive damage due to floods. There is a low likelihood of injury or death resulting from flooding.

Critical Facilities and Infrastructure

Within the Hiouchi Planning Area, the sole critical facility that is potentially susceptible to damage from flooding is the municipal water system owned by the Big Rock Community Services District. The Hiouchi community receives its drinking water from a deep wellhead that lies 100 feet horizontally from the mean high water mark on the north side of the Smith River. Both submersible pumps inside the wellhead are permanently immersed in river water. They direct groundwater "underflow" to the District's water storage tanks on Hiouchi Mountain, which then distribute water via gravity flow to the residents, businesses, and National Park Service in Hiouchi. The wellhead is tightly sealed. Every year during the winter season, the river level increases in height and sometimes covers the wellhead by several feet. The pumps nevertheless continue to operate during those periods without any sign of failure. A large flood event is unlikely to contaminate the community's water supply, which if contaminated would require disinfection and possibly shutting down the water system for up to several days.

Likelihood of Future Occurrences

The future occurrence of flooding affecting Hiouchi is unlikely. High water elevations will continue to recur within the Hiouchi Planning area along the Smith River. However, there is limited exposure within the 100 and 500-year floodplain to the resident population of Hiouchi. Visitors to the area during the winter season might indeed be at risk if they choose to camp near the Smith River with motor homes, trailers, or in tents. The highest risk in that regard would apply to those who visit the Jedidiah Smith Redwoods State Park or the Redwood National Park, which is limited to a small population in comparison to the community.

3.8.5 Flood Vulnerability

Flood vulnerability was evaluated by overlaying the 100-year and 500-year recurrence event footprints with an aerial photo of the community in a GIS-based environment. Visual assessment was used to estimate the number of homes and associated population affected.

Population and Property

The flood hazard analysis showed there were no structures located in the 100-year flood plain and only one home partially located within the 500-year flood plain. Thus it is estimated that one household or approximately 3 to 4 people (based on District estimate of 3.3 people per household)



are vulnerable to the 500-year flood event. It is not likely that the population is vulnerable to injury or death from a flood hazard.

Losses to the one structure affected were estimated based on estimated flood depth and a review of depth damage functions from USACE American River Watershed Project, Folsom Dam Modifications and Folsom Dam Raise Project Final Economic Reevaluation Report (DWR, 2012). As only a portion of the structure is within the 500-year floodplain a half of foot of flooding was estimated to cause damage equal to 15% of the structure replacement value and content damage was estimated at 40% of the building replacement value. The building replacement value was estimated at \$160 per square foot for the 3,500 square foot house. The analysis is summarized in Table 3.12.

Table 3.12 Estimated Loss for the 100-year and 500-year Flood Events

Estimated Flood Losses					
Buildings		Contents		Total	
100-year	500-year	100-year	500-year	100-year	500-year
\$0	\$55,650	\$0	\$148,400	\$0	\$204,050

Topographic conditions and development trends in Hiouchi do not indicate a major concern about development in identified flood risk areas. Del Norte County, who issues building permits for Hiouchi, participates in the National Flood Insurance Program (NFIP), and is considered to be in good standing based on program compliance. As a participant in the NFIP, the County has agreed to regulate new development that occurs within the mapped floodplain according to standards that equal or exceed those specified under 44CFR Section 60.3. These will ensure that any development allowed to occur in the floodplain will be constructed such that the flood risk exposure is eliminated or significantly reduced.

Critical Facilities and Infrastructure

Roads that are blocked or damaged can prevent access throughout the Planning Area and can isolate residents and emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris from floods also can cause isolation. 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. Underground utilities can also be damaged during flood events. Thus it is critical to identify which infrastructure is exposed to flooding to determine what is vulnerable and who may be at risk if that infrastructure is damaged.

U.S. Highway 199 is the main thorough fair through the planning area. Portions of U.S. Highway 199 are built above the flood level and with some road locations acting as levees to prevent flooding. Still, in certain events portions of U.S. Highway 199 may be blocked or damaged by flooding, preventing access to many areas.

U.S. Highway 199 within the Hiouchi Planning Area is not within the flood hazard zone. And thus potential down time of this route due to flooding was not analyzed in this LHMP. Previous modelling



in the 2011 Crescent City/ Del Norte County Hazard Mitigation Poland estimated up to 530 days to restore functionality after a 100-year event and up to 540 days to restore the Highway to full functionality under a 500-year event.

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

3.9 Landslides and other Mass Movement

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation, which is driven by gravity. Landslides can be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, volcanic eruptions, and changes in groundwater levels.

3.9.1 Landslide Hazard Profile

The types of landslides occurring within the Hiouchi Planning Area are rock falls, rock topple, slides, and flows. Rock falls are defined as rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along a distinct surface of rupture that separates the slide material from the more stable underlying material. Mudflows, sometimes referred to as mudslides, mudflows, lahars or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, thereby changing the soil into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way. As flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt, and tend to exacerbate the effects of flooding that often accompany such events. In areas burned by forest and brush fires, a lower threshold of precipitation can initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

Wherever they might occur, landslides are able to damage or destroy roads, railroads, pipelines, electrical and telephone lines, mines, oil wells, buildings, canals, sewers, bridges, dams, seaports, airports, forests, parks, and farms. Among the most destructive types of debris flow are those that accompany volcanic eruptions. A spectacular example within the United States was a massive



debris flow resulting from the 1980 eruptions of Mount St. Helens, Washington. Areas near the bases of many volcanoes in the Cascade Mountain Range of California, Oregon and Washington are at risk from the same types of flow during future volcanic eruptions.

Areas that are generally prone to landslide hazards include previous landslide locations, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas typically regarded as being safe from landslides are those that have not moved in the past, relatively flat-lying areas away from sudden changes in slope, and areas at the top of a hill or along ridges that are set back from the tops of slopes.

Within the United States it is estimated that landslides cause up to \$2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year. Plate 3-8 delineates areas where large numbers of landslides have occurred and areas that are susceptible to landslides within in the United States (map layer published in U.S. Geological Survey Professional Paper 1183).

3.9.2 Landslide Secondary Hazards

Landslides can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay emergency response or 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 on slopes or slopes supporting poles can be knocked over, resulting in possible losses to power and communication lines. This, in turn, creates communication and power isolation. 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.

3.9.3 Landslide and Climate Change

Climate change has and will continue to impact storm patterns in California. This changing of the hydrograph means that the probability of more frequent, intense storms with varying duration will increase. Increase in global temperature will also affect the snowpack and its ability to hold and store water. Additionally, warming temperatures will increase the occurrence and duration of droughts, which will increase the probability of wildland fire, which impacts the vegetation that helps to support steep slopes. All of these factors working in unison would increase the probability for landslide occurrences within the planning area.

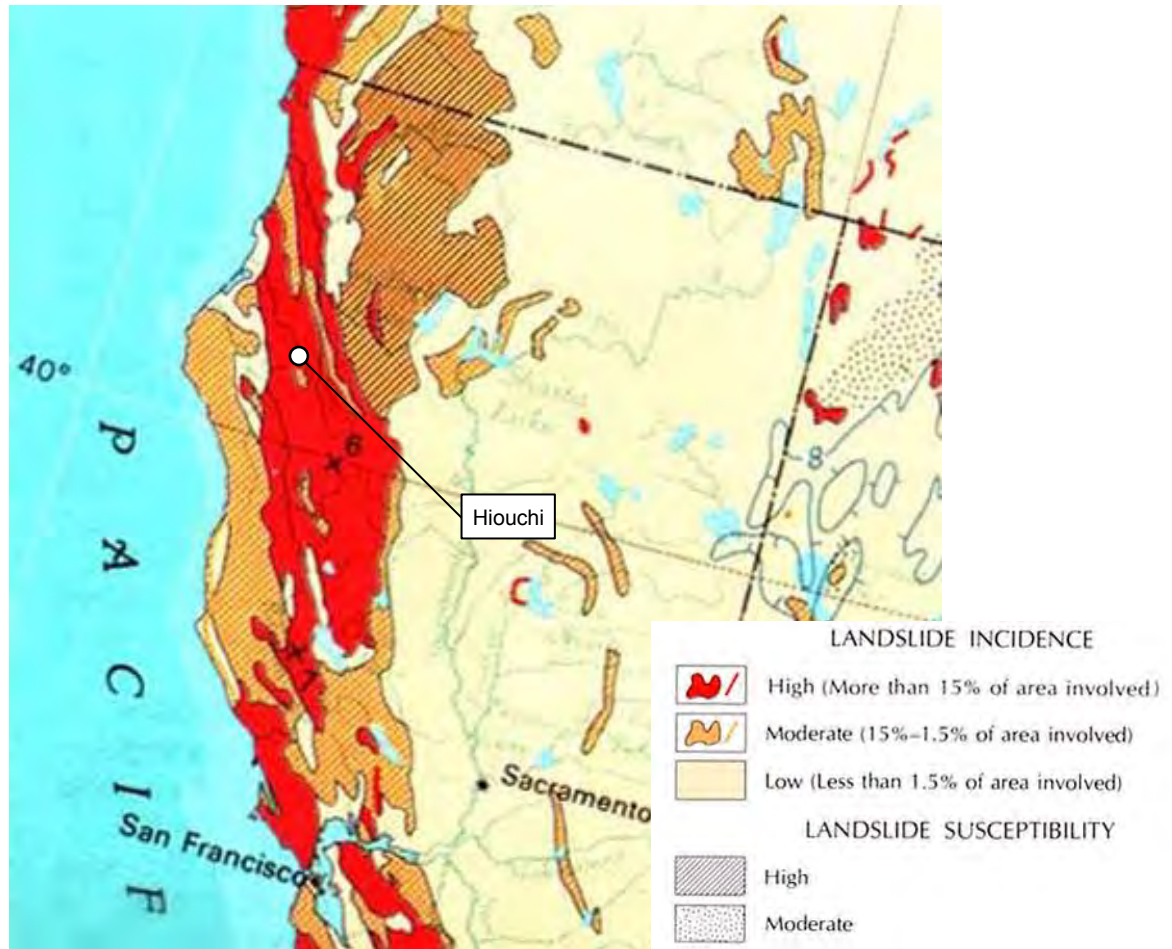


Plate 3-8 Landslides throughout the United States (USGS,2014)

3.9.4 Landslide Exposure

The Hiouchi Planning Area has experienced numerous landslides over the years, many impacting U.S. Highway 199. Figure 3 (Figures Appendix) shows the potential for landslides surrounding the Hiouchi Planning Area.

Population

The entire population of Hiouchi is considered vulnerable to landslides as there is the potential to close roads and limit access into and out of the community. There is a limited exposure to injury and death due to a landslide as most of the community is outside the path of historical landslides.

Property

According to LAFCO's Municipal Service Review for the Big Rock CSD, approximately 197 structures exist within the community of Hiouchi. The structures potentially exposed to landslides are those along the banks of the Smith River and those north of Highway 199 in elevations above approximately 200 feet in elevations as shown in Figure 3 (Figures Appendix).



Critical Facilities and Infrastructure

The Critical Facilities exposed to Landslides include the District's two water storage tanks and potentially the intake facilities on the Smith River. The District is planning for the retrofit/ replacement of the two water storage tanks. The District's intake facilities could be impacts in an upstream landside causes water quality issues, however damage to the actual intake infrastructure is not anticipated.

Likelihood of Future Occurrence.

The future occurrence of landslides is highly likely. Landslides' are prevalent in the Hiouchi Area as shown is Figure 3 (Figures Appendix). In general, the slopes in this area are considered to be susceptible to instability based on the geomorphic setting, high annual precipitation, thin overburden layer with high clay content and the tendency of serpentinite to be weak and easily sheared (Crawford, 2016). The population of Hiouchi can expect to be affected by landslides on an annual basis.

3.9.5 Landslide Vulnerability

Since State Route 199 is the principal supply route to the planning area, landslides that impact this travel corridor can have severe economic impact on the community of Hiouchi. Landslides are 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 groundwater flow, these dormant sites are more vulnerable to construction-triggered sliding than adjacent undisturbed material.

Population

Due to the nature of census block group data, it is difficult to determine demographics of populations vulnerable to mass movements. In general, all persons exposed to landslides hazards are also vulnerable. Due to the fact that many man-made structures are built on "view property" atop or below bluffs and on steep slopes subject to mass movement, there is a risk of injury and death along these "view properties."

Property

Past history of property damage due to failing coastal bluffs and river frontage property indicates the willingness of people to ignore signs of potential disaster in order to possess aesthetically desirable land. Although complete historical documentation of the mass movement threat in the county is lacking, the effects of slide and flow activity seen during the winter storms of 2005-06 serve as proof that a significant vulnerability to such hazards exists. Countywide, the millions of dollars in damage attributable to mass movement during those storms affected private property and public infrastructure and facilities.

HAZUS-MH does not address the landslide hazard. Loss estimations for the landslide hazard are not based on modeling utilizing 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 3.13 shows the general building stock loss estimates in steep slope areas.

Table 3.13 Buildings Exposed to Landslide Hazard

Building Count	Assessed Value	10% Damage	30% Damage	50% Damage
32	\$14,592,000	\$1,459,200	\$4,377,600	\$7,296,000

Critical Facilities and Infrastructure

Two critical facilities (US Highway 199 and water tank for the community's water system) are exposed to the landslide hazard. 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 the 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.

3.10 Severe Weather

3.10.1 Severe Weather Hazard Profile

The term, severe weather, specifically classifies any destructive weather event. However, it applies in a more general sense to the Hiouchi Planning Area where localized storms throughout the winter season bring heavy rain, hail, snow, lightning, and strong winds. The National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) has been tracking severe weather since 1950. Its Storm Events Database contains information regarding the following weather categories: weather events from 1993 to current (except from 6/1993-7/1993) and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 214 severe weather events that occurred in Del Norte County between January 1, 1950, and December 31, 2014.

At any single moment the entire County could be affected by one or more of the severe weather events listed above. However, various sections of the County might experience no impacts from a severe weather event that affects only the Hiouchi Planning Area. Stated another way, all areas in Del Norte County are prone to severe weather dynamics, but not all might be affected at the same time.



Hiouchi Severe Weather

While all of the aforementioned weather events are generally experienced within the Hiouchi Planning Area on an annual frequency, they rarely have the potential to be classified as emergencies, and some are relatively unlikely to occur. The National Weather Service will make announcements for severe weather watches or warnings over radio and television stations. A weather watch is posted when weather conditions indicate the possibility of severe weather. A warning is issued when weather patterns indicate that severe weather is approaching. Residents should be aware of the types of adverse weather conditions that have been experienced within the Hiouchi Planning Area in the past, and then plan accordingly. One of the mitigation actions that could help residents stay in touch with weather conditions is by participating collectively as a Storm Ready County. This National Weather Service (NWS) designation features an educational component, as well as a system to notify the public of adverse weather. Del Norte County currently employs Wireless Emergency Notification System (WENS) to notify residents via cell phone text messages and e-mail of impending foul weather conditions.

Heavy Rain and Thunderstorms

Thunderstorms are generated by rapid, upward movements of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 feet. When the rising air in such cases reaches a level where it cools past dew point, water droplets and ice form and begin to fall the long distance through the clouds towards the earth's surface. Falling droplets collide with each other and grow larger. Sometimes these frozen droplets melt before hitting the ground. When the droplets remain frozen, we categorize the event as a "hail storm." The descending mass creates an extensive downdraft of air that spreads out at the earth's surface. Counter-opposing air masses inside a thunderstorm spawn "wind shears" during this process, which frame a particularly dangerous scenario for aircraft that try to fly through such violent developments. In addition, shears generate electromagnetic force as they slide past each other in opposing directions, thereby giving rise to cloud-to-cloud, cloud-to-air, cloud-to-ground, and ground-to-cloud lightning events. Strong winds always accompany such dynamic developments. Thunderstorms therefore create dangerous conditions for aircraft, structures, vehicles, and people. They always should be taken seriously on their own merit, but sometimes also generate tornados. Mitigation comes in such practices as thunderstorm avoidance, maintaining thunderstorm and tornado shelters, installing ground-based lightning management systems (e.g., lightning rods), and hardening electricity utility systems.

Short-term, heavy storms can cause flooding along their paths that can lead to localized drainage issues. Worse yet, the combination of water-saturated ground conditions and very high winds can uproot large trees.

According to the Western Regional Climate Center (WRCC), annual precipitation just 7 miles northeast of the Hiouchi Planning Area (Town of Gasquet) averages 66 inches per year. The highest recorded annual precipitation at that location was 144.06 inches in 1983; the highest recorded precipitation for a 24-hour period was 12.91 inches on October 13, 1983. Two accurate measuring systems in Hiouchi that report to the BRCSD (Shepard & Bradford) recorded 150.2 inches of precipitation between November 1, 2016 and April 30, 2017. The lowest recorded annual



precipitation was 47.27 inches in 1976. Although the State of California declared a statewide drought starting in January 2015 (rescinded by the State Water Resources Control Board for California's northwestern counties in May 2016), Del Norte County has not suffered drought conditions in recorded history.

The National Weather Service's (NWS) Cooperative Observer Program (COOP) is the nation's largest and oldest weather network. Operations of the COOP program, include data acquisition, training, and station management, are managed by the NWS. Eight COOP weather stations exist in Del Norte County. Average total monthly precipitation data from the Gasquet RS weather station (closest COOP station to the Hiouchi Planning Area) is reflected in Plate 3-10.

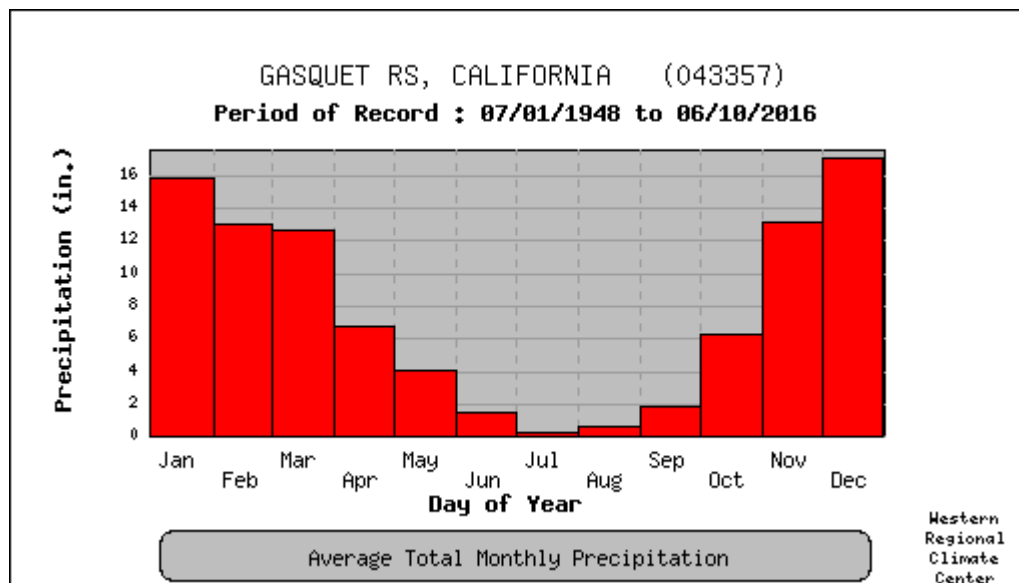


Plate 3-9 Average Total Monthly Precipitation for the Gasquet RS weather station (WRCC, 2017)

Overall, severe weather can impact the Hiouchi Planning Area in a variety of ways. Impacts in this location typically include at least communication and power failures, which can lead to the following outcomes:

Economic impacts

Businesses closed

Loss of agriculture

Damage to infrastructure, inventory, and business opportunities

Costs of recovery and repair



Social impacts

- Loss of life
- Increased violence/chaos
- Increased medical requirements
- Strain on resources
- Communications issues/breakdown

Severe Winter Storms

Maximum winter season vulnerability within the Hiouchi Planning Area occurs during the months of December, January, and February. Ice and snow storms are possible, although not likely. Temperatures can drop below freezing for several days, and snow can accumulate rapidly and cause blizzard-like conditions during a rare storm. Problems associated with ice and snow might be exacerbated if conditions persist. Significant ice events are defined by the National Weather Association as accumulations of $\frac{1}{4}$ inch or more. Significant amounts of ice/snow can pull down trees and utility lines, resulting in a loss of power and communications interruptions and walking and driving become dangerous.

According to the NWS, extreme cold and freezing often accompany a winter storm. Prolonged exposure to the cold can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities and municipal water systems.

Blizzard conditions occasionally inconvenience Del Norte County, especially at the higher elevations in the Gasquet and Big Flat areas. Described by NWS, a blizzard occurs when winds of at least 35 miles per hour are present with snow falling for at least three hours. Severe winter storms in those locations bring blowing snow and icy conditions to create low visibility and treacherous roads. Snowfall is rare in the Hiouchi Planning Area, but the community experiences icy roads several times throughout each winter. The Del Norte County Road and Bridge Department manages snow removal efforts; however, any storm of record will require more specialized equipment and manpower to keep access to the Planning Area open.

High Winds

A high wind event is a severe weather condition that can occur anytime throughout the year. The NWS describes high winds below 7,000 feet as winds that are sustained for speeds of at least 40 miles per hour, lasting for at least 1 hour, or winds of 58 miles per hour or greater for any duration. Above 7,000 feet, the criteria for a strong wind storm is sustained 58 miles per hour winds and/or gusts of 75 miles per hour or greater.

High wind events can knock down trees and power lines. In extreme cases they transport debris through the air in a manner that damages structures, personal and public property, and causes injury to people and animals. Although they are not officially recorded within the Hiouchi Planning Area, high wind events are common.



Microbursts

According to the NWS, a microburst is a convective downdraft with an affected outflow area of less than 2.5 miles wide and peak winds lasting less than 5 minutes. The events are difficult to predict with standard weather instruments, and might include dangerous horizontal/vertical wind shears. Microbursts can adversely affect aircraft performance, especially during takeoff and landing, cause property damage, and produce effects similar to those listed above in the high winds and severe weather categories. These events are rare within the Hiouchi Planning Area.

Drought

A drought occurs when less than normal amounts of moisture are available to satisfy a region's usual water consumption level. NWS states drought is a moisture deficiency that results in adverse impacts on people, animals, or vegetation over a sizeable area. A drought condition can be caused naturally or by human influence. With California's irregular climate, it is often difficult to predict when water shortages will develop.

Four types of drought have been defined:

- Meteorological is when actual precipitation is less than expected.
- Hydrological is based upon precipitation shortfall effects on stream flows as well as reservoir, lake, and groundwater levels.
- Agricultural drought is when soil moisture deficiencies are relative to water demands of plant life.
- Socioeconomic drought occurs when the demand for water is greater than the supply due to a weather related supply shortfall.

According to the local United States Department of Agriculture (USDA) office, the most recent drought experienced by Del Norte County occurred in 2013 and 2015. In 2015, snowpack across the State was only 48% of the average. In both years, the USDA officially declared drought disasters. The USDA disaster declaration was requested by the governor. To qualify, a minimum of 30% of production loss of at least one crop in the County must have occurred. When the USDA declares a drought, small businesses can meet criteria to apply for low-interest Economic Injury Disaster Loans. The driest period on record in Del Norte County history was 1973. The total precipitation during that time was 24.6 inches, whereas the average annual precipitation in Del Norte County is 66 inches. Interestingly, drought determination for Del Norte County was reversed by the State Water Resources Control Board In May 2016, and water management in California went from the "one shoe fits all" approach to that of regional management (See "Heavy Rain and Thunderstorms" above).

Lightning

Lightning is a natural event that can occur whenever a thunderstorm develops with a given area. It is a visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between the cloud and the ground, or between the ground and a cloud (see "Thunderstorms" above). People and animals can be injured, killed, or



property damaged by a lightning strike. Strike episodes are possible several miles from their clouds of origin.

When lightning approaches people are advised to seek shelter immediately. If finding shelter is unfeasible, people are advised to crouch low to the ground and make themselves as small as possible, away from trees and tall objects. Water conducts electricity, therefore remaining clear of puddles and swimming pools is critical. Lightning can present a hazard even if an individual is inside a building. It is recommended that a person avoid electrical appliances, windows, bathtubs full of water, and even landline telephones during lightning events.

Since 1968, three human fatalities, one dog fatality, and at least two cases of human injury have been recorded in Del Norte County as the result of lightning strikes.

Hail

Hail is frozen rain. It is most common in California from November through March. While most of the storms produce hail in the higher mountain elevations (see “Heavy Rain and Thunderstorms” above), the Hiouchi Planning Area experiences a few severe hailstorms every year at an average elevation of 250 feet above Mean Sea Level. Property damage and injury are often products of such storms. Table 3.14 describes hailstone classifications:

Table 3.14 Description of hailstone classifications

Description	Diameter (inches)
Pea	0.25
Marble or Mothball	0.50
Penny or Dime	0.75
Nickel	0.88
Quarter	1.00
Half Dollar	1.25
Ping Pong Bal	1.50
Golf Ball	1.75
Hen's Egg	2.00
Tennis Ball	2.50
Baseball	2.75
Tea Cup	3.00

Between 1950 and 2008 in Del Norte County, nine documented storms produced penny, dime-size ($\frac{3}{4}$ inch in diameter), or greater hailstones.

3.10.2 Severe Weather 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.

3.10.3 Severe Weather and Climate Change

Effects on precipitation patterns due to climate change are pivotal considerations for hazard mitigation planning. Climatological effects seem to be more exaggerated every year. Specifically, new weather patterns are noticeably different in this region from those experienced over past decades. The BRCS D acknowledges the key role severe weather considerations must play when its Board of Directors/Trustees attempts to predict how weather within the Hiouchi Planning Area will adjust the catastrophic disaster planning process that is scheduled to follow publication of this LHMP.

3.10.4 Severe Weather Exposure

Population

The entire population within Hiouchi's Planning Area is potentially exposed to severe weather. The risk of injury or death from severe weather is low, given the low historic rate of incidents and that severe weather can be predicted and planned for better than other hazards, such as earthquakes and landslides.

Property

According to LAFCO's Municipal Service Review for the Big Rock CSD, approximately 197 structures exist within the community of Hiouchi. The majority of these buildings support residential use. All of these buildings are considered to be exposed to the severe weather hazard.

Critical Facilities and Infrastructure

All critical facilities are exposed to severe weather. The most common problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, leaving large areas isolated. Consequently, phone, water and sewer systems may not function. Roads may become impassable due to landslides.

Likelihood of Future Occurrence.

The future occurrence of severe weather is highly likely. The Hiouchi Planning Area experiences severe weather annually to varying degrees of severity in the past and will likely experience similar patterns in the future.



3.10.5 Severe Weather Vulnerability

For the state hazard mitigation plan, factors used to determine which counties are most vulnerable to future non-flood, severe storms are how often severe storm events occur, expressed as a percentage of recurrence per year. Data on the frequency of severe storm events was obtained from the National Oceanic and Atmospheric Administration, whose database covers all severe weather events declared by the National Weather Service (NWS) from 1958 to 2005. The following are general conclusions about Del Norte County's vulnerability to severe weather:

- Areas considered most vulnerable to high winds are those most affected by downed trees and loss of power and those with a high wind recurrence rate of 100 percent, meaning the county experiences at least one damaging high wind event every year. The severe wind event of December 2005 resulted in the loss of power to hundreds of homes in Del Norte County as well as many state and county buildings.
- The NWS defines a winter storm as having significant snowfall, ice, and/or freezing rain. In non-mountainous areas, heavy snowfall is 4 inches or more in a 12-hour period, or 6 or more inches in a 24-hour period; in mountainous areas heavy snowfall is 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period. In Del Norte County, severe winter storms generally consist of rain and wind events, not snow and ice.
- The Planning Area is not considered vulnerable to a tornado event.
- The Planning Area's vulnerability to flooding.

Population

Particularly vulnerable populations to severe weather hazards 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. There is a risk of injury or death to the population vulnerable to severe weather.

Property

All property is vulnerable during severe weather events, but structures 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. Also, 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.

There are no generally accepted damage function values for estimating damage from severe storm events. For the purposes of this risk assessment, a rough damage function was established by comparing reported damage from the 2005-2006 winter storms to assessed building values. Using this approach, it was estimated that the average damage from this event was 25 percent of the total assessed value for building structures; it is assumed that severe weather will not damage contents, so the loss ratio is applied only to the value of the structure. To estimate vulnerability, this ratio was applied to the building stock for each planning unit, as summarized in Table 3.15.



Table 3.15 Estimated Loss for Severe Weather Events

Assessed Building Structure Value	Estimated Damage
\$14,592,000	\$3,648,000

Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures, most of which are associated with secondary hazards. Landslides that block roads are caused by heavy prolonged rains. High winds can cause significant damage to trees and power lines, with obstructing debris blocking roads, incapacitating transportation, isolating population, and disrupting ingress and egress. Snowstorms at higher elevations can 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 and prolonged storms can have negative economic impacts for an entire region.

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 both electricity and communication for households. Loss of electricity and phone connection would result in isolation because some residents will be unable to call for assistance.

Environment

The environment vulnerable to the severe weather hazard is the same as the environment exposed to the hazard.

3.11 Hazardous Materials Transport

3.11.1 Hazardous Materials Hazard Profile

According to the U.S. Environmental Protection Act, a hazardous material is any item or agent (biological, chemical, physical) with the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in any form; gas, solid, or liquid. Environmental and atmospheric conditions can influence hazardous materials if they are uncontained. The U.S. Occupational Safety and Health Administration's (OSHA) definition of a hazardous material includes any substance or chemical that constitutes a "health hazard" or "physical hazard," including: chemicals that are carcinogens, toxic agents, irritants, corrosives, or sensitizers; agents that act upon the hematopoietic system; agents that damage the lungs, skin, eyes, or mucous membranes; chemicals that are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals that, in the course of normal handling or storage, might produce or release dusts, gases, fumes, vapors, mists or smoke.

The Environmental Protection Agency (EPA) incorporates the aforementioned OSHA definition, and adds any item or chemical that can cause harm to people, plants, or animals when released by



spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment. The EPA maintains a list of 366 chemicals that are considered extremely hazardous substances (EHS). This list was developed under the Superfund Amendments and Reauthorization Act.

The presence of EHSs in amounts in excess of a threshold planning quantity requires that certain emergency planning activities be conducted. A release or spill of bulk hazardous materials could result in fire, explosion, toxic cloud or direct contamination of water, people, and property. Effects might involve a local site or many square miles.

Health problems might be immediate, such as corrosive effects on skin and lungs, or be gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material.

Accidents involving the transportation of hazardous materials could be just as catastrophic as accidents involving stored chemicals. Possibly more so, in fact, since the location of a transportation accident is not predictable. The U.S. Department of Transportation divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major hazardous property such as radioactivity, flammability, etc. These hazard classes include:

Class 1—Explosives

Class 2—Compressed Gases

Class 3—Flammable Liquids

Class 4—Flammable Solids; Spontaneously Combustible Materials; Dangers When Wet Materials/Water-Reactive Substances

Class 5—Oxidizing Substances and Organic Peroxides

Class 6—Toxic Substances and Infectious Substances

Class 7—Radioactive Materials

Class 8—Corrosives

Class 9—Miscellaneous Hazardous Materials/Products, Substances, or Organisms

Much of the hazardous materials transported through Del Norte County are carried by truck on the highway system. The County of Del Norte has not quantified the amount of hazardous materials that are transported through the area en route to adjoining counties or states. Highways collectively constitute a major threat due to the myriad chemicals and hazardous substances, including radioactive materials that are transported via vehicle and truck. U.S. Highway 199 that passes through the Hiouchi Planning Area is a corridor of concern.

The United States Department of Transportation Pipeline and Hazardous Materials Safety Administration's (PHMSA) Office of Hazardous Materials Safety performs a range of functions to support safe transportation of hazardous materials. One of these functions is to track hazardous materials incidents in the United States. This database was searched for hazardous materials incidents in the Hiouchi Planning Area, and none were found.



3.11.2 Hazardous Material Transport and Climate Change

Changes in weather patterns, precipitation events, and winter weather conditions share the potential to increase the possibility of an accident involving hazardous materials by increasing poor road conditions and limiting visibility.

3.11.3 Hazardous Materials Transport Exposure

Population

The entire population within Hiouchi's Planning Area is potentially exposed to Hazardous Materials Transport exposure. The risk of injury and death is low, given the impacts of exposure are limited to the Highway 199 corridor.

Property

According to LAFCO's Municipal Service Review for the Big Rock CSD, approximately 197 structures exist within the community of Hiouchi. The majority of these buildings support residential use. All of these buildings are considered to be exposed to the Hazardous Materials Transport Exposure.

Critical Facilities and Infrastructure

Two critical facilities (US Highway 199 and water system) are potentially exposed to the release of hazardous materials. A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from hazardous materials should be done to determine if they could withstand impacts of being exposed to hazardous materials.

Likelihood of Future Occurrence

The future occurrence of hazard materials transport hazards are likely. While the Hiouchi Planning Area has not experienced an accident involving hazardous materials transportation, U.S. Highway 199 serves as a key artery connecting southern Oregon with California. Any hazardous materials conveyance via U.S. Highway 199 would have to pass through the Planning Area. Historically hazardous materials spills have occurred every 2 to 3 years along Highway 199, and thus a spill within the next 5 years has a strong chance of occurring that would affect 50% or more of the community.

3.11.4 Hazardous Materials Transport Vulnerability

Hazardous materials may include hundreds of substances that pose a significant risk to humans. These substances may be highly toxic, reactive, corrosive, flammable, radioactive, or infectious. Numerous Federal, State, and local agencies including the U.S. Environmental Protection Agency (EPA), U.S. Department of Transportation, National Fire Protection Association, FEMA, U.S. Army, and International Maritime Organization regulate hazardous materials.

Hazardous material releases may occur from any of the following:

- Fixed site facilities (such as storage facilities, warehouses, wastewater treatment plants, swimming pools, dry cleaners, automotive sales/repair, gas stations, etc.)



- Highway and rail transportation (such as tanker trucks, chemical trucks, railroad tankers)
- Air transportation (such as cargo packages)
- Pipeline transportation (liquid petroleum, natural gas, and other chemicals)

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

On behalf of several Federal agencies including the EPA and the U.S. Department of Transportation, the National Response Center serves as the point of contact for reporting oil, chemical, radiological, biological, and etiological discharges into the environment within the United States.

HAZUS-MH does not address the hazardous material hazard and therefore loss estimates were not developed.

Population

Due to the nature of census block group data, it is difficult to determine demographics of populations vulnerable to Hazardous Materials. Due to Planning Area's slowly increasing population density and the fact that State Route 199 is the main transportation artery through the Planning Area there is a risk of injury and death.

There are no EPA regulated facilities within Planning Area limits that are permitted as hazardous waste handlers. Generally, the small, fixed facilities (drycleaners, auto body shops, etc.) have varying uses of hazardous chemicals, but in general do not pose a significant risk to the Planning Area. Based on previous occurrences, the likelihood of a small oil or chemical spill occurring is only once every two to three years.

Therefore, a hazardous material event would have the highest potential to occur along State Route 199. The trucks that use these transportation arteries commonly carry a variety of hazardous materials, including gasoline, other crude oil derivatives, and other chemicals known to cause human health problems.

Comprehensive information on the probability and magnitude of hazardous material events across all types of sources (such as fixed facilities or transport vehicles) is not available. Wide variations among the characteristics of hazardous material sources and among the materials themselves make such an evaluation difficult. It can be stated that a hazardous materials spill is likely along Highway 199, but that the vulnerability to injury or death is low.



Property

Potential property damaged from a Hazardous Materials spill would most likely be located along the State Route 199 corridor.

Critical Facilities and Infrastructure

One critical facility is exposed to the hazardous material hazard, State Route 199. A more in-depth analysis of the mitigation measures taken by the Critical Facilities to prevent damage from hazardous materials should be done to determine if they could withstand impacts from a hazardous material spill.

Several types of infrastructure are exposed to hazardous material hazard, including transportation, water and sewer, and power infrastructure. At this time all infrastructure and transportation corridors identified as exposed to the hazardous material hazard are considered vulnerable until more information becomes available.

Environment

Environmental problems as a result of hazardous materials can be numerous. Hazardous materials can enter into streams and significantly impact fish and wildlife habitat, as well as affecting water quality. The environment vulnerable to hazardous materials hazard is the same as the environment exposed to the hazard.

3.12 Planning Area Risk Ranking

3.12.1 Hazard Risk Rating

In order to determine the impact of each hazard, a risk ranking of the hazards was performed to determine the probability of occurrence for each hazard. Quantitative ranking of the risks creates a consistent methodology for evaluating the impact to the Hiouchi Planning Area.

3.12.2 Probability of Occurrence

The probability of occurrence of a hazard event is usually based on past events that occurred in the Planning Area and potential forecasts for the future. Probability factors used to determine the risk rating of each hazard were assigned based on frequency of 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)

Table 3.16 lists the probability of occurrence for each hazard assessed in this LHMP.



Table 3.16 Hazard Probability of Occurrence

Hazard Event	Probability	Probability Factor
Earthquake	High	3
Wildland Fire	High	3
Flood	Medium	2
Landslide	High	3
Severe Weather	High	3
Hazardous Materials	Medium	2

3.12.3 Impact

The potential impact associated with each hazard was divided into three categories: impacts on people, property, or the economy. Numerical impact factors for no, low, medium, or high impact were assigned as follows:

People—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, merely because they live in a hazard zone, will be equally impacted when a hazard event occurs. Impact factors were assigned 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)

3.12.4 Property

Values were assigned based on the percentage of the total property value exposed to the hazard event.

- **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)

3.12.5 Economy

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 regarding each hazard in comparison to the total assessed value of property in the county. It should be noted that for some of



the hazards such as wildland fire, 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 exposure estimates were generated for earthquake hazards using the HAZUS-MH loss estimation tool.

- **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)

Impacts related to each hazard category were also assigned a weighting factor: 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 3.17, Table 3.18, and Table 3.19 summarize the impacts for each hazard.

3.12.6 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 the economy. The results are summarized in Table 3.20. Based on these ratings, a hazard ranking and a priority of high, medium, or low was assigned to each hazard, as summarized in Table 3.21.

Table 3.17 Hazard Impact on People

Hazard Event	Impact	Impact Factor	Mult by Weighting Factor of 3
Earthquake	High	3	9
Wildland Fire	Medium	2	6
Flood	Low	1	3
Landslide	High	3	9
Severe Weather	High	3	9
Hazardous Materials	Medium	2	6

Table 3.18 Hazard Impact on Property

Hazard Event	Impact	Impact Factor	Mult by Weighting Factor of 2
Earthquake	High	3	6
Wildland Fire	Medium	3	6
Flood	Medium	2	4
Landslide	Low	1	2
Severe Weather	High	3	6
Hazardous Materials	Medium	2	4



Table 3.19 Hazard Impact on the Economy

Hazard Event	Impact	Impact Factor	Mult by Weighting Factor of 1
Earthquake	High	3	3
Wildland Fire	Medium	2	2
Flood	Low	1	1
Landslide	Low	1	1
Severe Weather	High	3	3
Hazardous Materials	Medium	2	2

Table 3.20 Hazard Risk Rating

Hazard Event	Probability Factor	Sum of Weighted Impact Factors	Total (Probability x Impact)
Earthquake	3	9+6+3=18	54
Wildland Fire	3	6+6+2=14	42
Flood	2	3+4+1=8	16
Landslide	3	9+2+1=12	36
Severe Weather	3	9+6+3=18	54
Hazardous Materials	2	6+4+2=12	24

Table 3.21 Hazard Risk Rating

Hazard Ranking	Hazard Event	Priority
1	Earthquake	High
2	Severe Weather	High
3	Wildland Fire	High
4	Landslide	Medium
5	Hazardous Materials	Medium
6	Flood	Medium



4. Mitigation Strategy

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for the Hiouchi Local Hazard Mitigation Plan. It describes how the BRCSD met the Phase 4 – Develop Mitigation Initiatives from the 8-step planning process.

4.1 Goals and Objectives

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The Planning Team reviewed the results of the hazard identification and vulnerability assessment to develop draft goals. The analysis of the risk assessment identified areas where improvements could be made and provided the framework for the collaborative efforts of the Planning Team and planning partners to develop planning goals, objectives, and the mitigation strategy for the Hiouchi Planning Area.

Goals were developed as broad-based public policy statements that are intended to capture the basic needs of the community, including government, commercial, public, and private entities. Similar to other planning efforts, goals are stated herein without regard to implementation cost, schedule, and means. Goals are defined before considering how to accomplish them to ensure that they are not dependent upon the means of achievement.

4.1.1 Goals

Goal 1: Minimize risk and the vulnerability of Hiouchi and surrounding Planning Area to the impacts of natural hazards, and protect lives and reduce damages/losses to property, the economy, public health and safety, and the environment.

Goal 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts.

Goal 3: Improve public awareness, education, and preparedness for all hazards.

Goal 4: Increase the Hiouchi Planning Area's capabilities to mitigate losses and become prepared for responses to and recovery from disaster events.

Goal 5: Maintain FEMA eligibility and position the BRCSD for grant funding.



4.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 3.4 was evaluated. Only those hazards that were determined to be a priority hazard were considered further in the development of hazard-specific mitigation actions.

The priority Hazards are:

- Earthquake
- Wildfire
- Flood
- Landslides
- Severe Weather
- Hazardous Materials

Once the hazards priority had been established for development of specific mitigation actions, the Planning Team and planning partners jointly evaluated viable mitigation options that support identified goals. The following considerations reflect general mitigation categories that were referenced from the community rating system to frame options for action:

- Prevention (required to be evaluated)
- Property protection
- Structural projects
- Natural resource protection
- Emergency services
- Public information

Lists of possible mitigation actions were taken from several sources including the expired 2011 Crescent City/Del Norte County Hazard Mitigation Plan that catalogued mitigation alternatives by hazard and EPA's Guide on Hazard Mitigation for Natural Disasters for Water and Wastewater Utilities (EPA, 2016).

4.3 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.



This action plan was developed considering previous mitigation strategies contained in the BRCSD's Annex Plan and general mitigation actions taken from the 2011 Crescent City/Del Norte County Hazard Mitigation Plan. Input from the Project Management Team and feedback provided by the general public during four Public Outreach meetings proved to be vital in this case. An action plan was developed to reduce the risks to and vulnerabilities of people, property, infrastructure, and natural resources to future disasters. The action plan summarizes who is responsible for implementing each of the prioritized actions, as well as when and how actions will be implemented. Each action summary provides discussion and a benefit-cost review, the latter of which was designed to satisfy regulatory provisions of the Disaster Mitigation Act.

The Project Management Team and BRCSD Board of Directors/Trustees realize that new needs and priorities might arise at some future point as the result of an actual disaster or other circumstance. The District therefore reserves the right to support new actions, when deemed necessary, as long as they conform to the approved overall goals of this LHMP. Further, it should be clarified that actions presented in this Mitigation Action Plan are subject to further review and refinement; analyses of alternatives; and possible reprioritization in view of funding availability or other valid considerations. The Big Rock CSD is not obligated by this document to implement any or all of these projects. Rather, this mitigation strategy represents the desires of the community and associated neighborhoods included within the Hiouchi Planning Area to mitigate risks to the interests and vulnerabilities from identified hazards.

4.3.1 Mitigation Actions

The following section details mitigation actions,. Each mitigation action addresses certain hazards, provides background regarding the associated issues, suggests project benefits, assigns implementation responsibility, estimates cost, identifies potential funding sources, and proposes a completion schedule.

BRCSD 1—Replace the 100,000-gallon Redwood water storage tank with a bolted steel tank mounted on a granite shelf, and increase its working capacity to 200,000 gallons in order to accommodate new water service obligations. Upgrade the existing SCADA (Supervisory Control And Data Acquisition) system. Retain the existing on-site 30 kW generator and propane fuel field. Concurrently stabilize a section of Hiouchi Mountain that is threatened by catastrophic seismic activity, and add an emergency communications capability. Improve vehicle access to the site. Acquire ownership of 6.83 acres to secure all hillside facilities and the access point against terrorism/vandalism.

Hazards Addressed: Wildfire, Earthquake, Landslide, Severe Weather, Hazardous Materials

Issue/Background: The District's 100,000-gallon water storage tank is located on a steep hillside with grades of 35% near the toe of the hill north of town and between 50% to 70% at and above the water tank. The tank was constructed in 1971 in accordance with California Building Code that did not specify mandatory requirements at the time. Construction of the tank, foundation and pad was completed prior to the 1975 lateral force requirement additions and the amendment of the Uniform Building Code in 1994 that included seismic safety provisions. In addition to the reduced code standards that defined the tank installation project in 1971, the tank site itself now presents a serious hazard to the community. The mountainside upon which the tank is constructed is quite steep and unstable. To place the tank on level ground, it was constructed on a built-up fill prism.



The prism sits on top of approximately ten (10) to fifteen (15) feet of loosely consolidated material, which is underlain by ultramafic rock. Significant water seeps from the hillside above the tank are eroding the soils around the tank foundation to the extent that the fill prism would break loose from its rock base and slide down the hillside in a magnitude M5.5 earthquake-generated landslide, carrying with it the entire facility that includes the storage tank, pump house, generator and propane fuel field, antenna tower, cyclone fencing, and pipeline infrastructure. This area often experiences severe storms that can bring 18 inches of rain over three days contributing to extensive erosion and accelerated deterioration of the tank pad's stability.

Increased storage tank volume is needed based on an engineering evaluations of the water system that demonstrated the need for additional storage to support fire protection and emergency supplies should the District's intake system fail (GHD, 2016). In addition, the District annexed the Jedediah Smith Redwoods State Park and Redwood National Park into its jurisdiction in 2010. The two parks are currently merging their resources into one entity via a major redevelopment project that will attract another 20,000 visitors every year to Hiouchi. They have asked the District for a permanent water connection, which will require more than 2 million gallons of water per year plus increased water storage capability. A fire hydrant will be installed to mitigate the threat of fire inside the consolidated park system. The current Hillside Stabilization Plan (HSP) accommodates these requests.

Benefits: This mitigation action will result in a project (HSP) to install a 200,000-gallon replacement water storage tank on a new pedestal that is tied to bedrock, protected by a retaining wall, and constructed to modern seismic standards. The HSP will mitigate the risk that the tank, supporting pedestal, associated pipeline and valve infrastructure, and hillside mixed with trees and granite rocks will slide off of Hiouchi Mountain causing extensive damage to a populated neighborhood and potential loss of life.

Implementation: The Big Rock CSD's Board has the lead for implementation of this mitigation action, and would be responsible for approving contracts for the design and construction of the new tank.

Estimated Cost : \$2.9 million

Potential Funding: Grants through FEMA, DWR, and SWRCB

Schedule: Complete Construction by November 2018

BRCSD 2—Install a complete emergency communications system along with a 70-ft antenna tower for emergency HF/VHF/UHF and Simplex communications. The tower will feature a microwave antenna to perform SCADA operations.

Hazards Addressed: Wildfire, Earthquake, Flood, Landslide, Severe Weather, Hazardous Materials

Issue/Background: The first problem is that reliable SCADA system operations on an around-the-clock basis are dependent upon uninterrupted, line-of-sight microwave communication between the Big Rock CSD's main pump house on the north bank of the Smith River and both water storage tank facilities located on the south side of Hiouchi Mountain. These critical communication nodes are about 0.7 mile distant from each other. Tall forest trees growing even taller in-between those



locations are beginning to interrupt the microwave connection, thereby causing an average loss of 120,000 gallons of potable water per month due to tank fill signals not reaching the pumping facility. Environmental constraints make it impossible for the District to remove the problematic trees or connect the sites with electrical lines. This steadily worsening situation is unacceptable to the residents of Hiouchi, the Special District, and the State Water Resources Control Board (SWRCB) that regulates the BRCSD's municipal water system via a permanent license. The proposed 70-foot antenna tower is the sole and best solution at this juncture, for it would remain effective for decades to come.

The second issue is that tall mountains surround the somewhat isolated Hiouchi Planning Area thereby narrowing the range of disaster mitigation possibilities for some hazards. During hazard events anywhere, effective communications typically prove to be indispensable for efficient and effective emergency responses, resource management, and positive outcomes. Certain potential hazards would render the existing communications systems between Hiouchi and the Crescent City area ineffective, especially during and after a Cascadia Event that most likely would neutralize all communications nodes inside the Pacific Coastal Zone. Exclusive reliance upon OASIS for disaster relief would be unwise in the context of worst-case planning. A catastrophic disaster event in Del Norte County, for instance, could neutralize the fixed OASIS terminal at the Emergency Operations Center in Crescent City.

The Planning Team and the BRCSD's Board of Directors/Trustees agreed that a reliable backup emergency communications option via the Camp 6 repeater and a backup relationship with the Josephine County Emergency Center (JCEC) to the east of Del Norte County would be a sensible plan of action. If U.S. Highways 101 and 199 are impassible as the result of bridge and/or Last Chance Grade failures, OASIS Transportable Units could not be utilized in Del Norte County unless they were delivered by Army National Guard CH-47 helicopter. Landline communications systems can be swamped by excessive customer use during serious emergencies, lost altogether due to power failures, and interrupted for long periods when telephone poles and lines fail. The Hiouchi Planning Area experienced nearly all of those predicaments over the past few years. Even during a moderate earthquake, serious hazard vulnerability can stem from electricity loss and communications breakdowns. Continuity in governance relies heavily upon dependable communications capabilities, which is a FEMA teaching point for public officials during workshops and seminars. Last, Del Norte County's Tactical Interoperable Communications Plan is dependent upon either line-of-sight radio communications from transmitter station to receiver station or a repeater antenna placed high above the transmitter and receiver stations that are attempting to communicate with each other.

Del Norte County's repeater array located on Red Mountain currently serves as the region's hub for first-responder communications. All repeaters at that location must be removed by 2019. FEMA (Cal OES) is reportedly considering only one alternative at this juncture, which is Rogers Peak in Humboldt County just east of Big Lagoon at 2,779 feet. Search and Rescue (SAR) topography radio frequency engineering software indicates that, absent line-of-sight capability, the communities of Gasquet, Hiouchi, and Smith River would not be able to communicate with any type of repeater placed on Rogers Peak. A satisfactory alternative to Red Mountain's repeaters therefore does not yet exist. However, placement of the proposed 70-foot antenna tower on Hiouchi Mountain would indeed facilitate connection with an existing and fully operational Del Norte Amateur Radio Club



(DNARC) repeater located at Camp 6 above Gasquet. (The site is owned by the State of California and managed by the California Highway Patrol.)

The JCEC that coordinates all SAR activities in southern Oregon is able to communicate through Camp 6, thereby giving the Hiouchi Planning Area the option of utilizing a highly effective SAR network when needed and an extensive HAM communications network that would expand Hiouchi's emergency reach throughout the western United States and provide the District with options to communicate directly with California's Northern Operations Center in Redding and also California's Office of Emergency Services Warning Center at Mather in a worst-case scenario. The stand-alone antenna tower can endure significant seismic and wind forces; support transmissions and reception from antenna arrays mounted at the top of the tower well above surrounding treetops; offer a range of communications capabilities via HF, VHF, and UHF amateur and "first-responder" frequency bands; integrate a repeater system that links with a repeater at Camp 6; and operate off of the conventional power grid via a 30 kW electrical generator system (see BRCS D 1) equipped with an ample propane fuel supply.

Benefits: This state-of-the-art emergency communications system featuring extensive amateur (HAM) radio capabilities would link Hiouchi directly to the Josephine County Emergency Center in Merlin, Oregon, Del Norte County's Emergency Operations Center in Crescent City, the Northern Operations Center in Redding, and FEMA's (Cal OES) command center at Mather, California. Del Norte County's Search and Rescue Team would enjoy access to the BRCS D's communications system, thereby providing the Team with enhanced operational capabilities in remote mountainous areas of this county. HAM radios have been used since the early 1900s to support civilian and military emergency operations.

Implementation: The District is currently working with the JCEC in Merlin (Oregon), and actively participating in monthly emergency communications exercises with the Southern Oregon Amateur Radio Club, Pelican Bay Amateur Radio Club (Oregon), and Del Norte Amateur Radio Club to develop the appropriate system requirements and operations protocols for its own emergency preparedness needs.

Estimated Cost: \$110,000

Potential Funding: Local budgets, grant funds

Schedule: Merge project into the HSP (see BRCS D 1)

BRCS D 3—Replace the 50,000-gallon Redwood water tank with a bolted steel tank mounted on ultramafic granite and increase total capacity to 100,000 gallons. Secure against threats of vandalism/terrorism

Hazards Addressed: Wildfire, Earthquake, Severe Weather, Hazardous Materials

Issue/Background: The District's engineering evaluation of the water system showed the need for approximately 350,000 gallons of storage to support daily variations in demand, fire protection, and emergency supplies should the District's intake system fail. (GHD, 2016).

Benefits: Improves the District's ability to provide water for fighting fires and increases supplies for emergency conditions that shut down the District's source water production.



Implementation: The District has the lead for implementation of mitigation action, and would be responsible for issuing contracts for the design and construction of the new tank.

Estimated Cost: \$1.5 million

Potential Funding: SWRCB Grant, DWR Grant or HMGP

Schedule: Next five years

BRCSD 4—Improve road access to the District’s assets and emplace flood and erosion barriers.

Hazards Addressed: Wildfire, Earthquake, Flood, Landslide, Severe Weather, Hazardous Materials

Issue/Background: The BRCSD owns and manages several remote facilities that are critical to the safe and healthy operations of the District. They require daily attention.

Benefits: Prevent existing road and trail thoroughfares from hindering rapid responses during disasters. Road improvements and installation of flood/erosion barriers would mitigate damage caused by winter water runoff. Facilitate access during wet winter conditions. Enable security measures to be applied along asset access routes in accordance with U.S. Department of Homeland Security Guidelines for public water systems in rural areas.

Implementation: The District has the lead for the mitigation action. Its Board of Directors/Trustees is eager to work with other public agencies as necessary for implementation.

Estimated Cost: \$850,000

Potential Funding: SWRCB Grant or HMGP

Schedule: Next five years

BRCSD 5—Upgrade the existing SCADA system.

Hazards Addressed: Wildfire, Earthquake, Flood, Landslide, Severe Weather, Hazardous Materials

Issue/Background: The existing SCADA system does not provide the functionality needed to control the system from remote locations, which can place the community at risk from health and safety standpoints especially when the BRCSD’s managers are not able to access the mountainside during inclement weather. During the winter of 2016/2017, for instance, Hiouchi experienced 150 inches of precipitation that caused extensive persistent erosion of unpaved surfaces leading to limited access to water storage tanks, pumps, and emergency generator assets controlled by the aged and design-limited SCADA system. In addition, problems are mounting as the SCADA system continues to degrade. A remote control capability, design improvements, modern performance sensors that link to a secure website, and fault reporting nodes should be added and/or modernized to prevent water loss, improve system efficiencies, increase water system management effectiveness, and ensure system security.



Benefits: Improves the partially degraded system's abilities to manage and secure water storage and distribution assets.

Implementation: The District has the lead for implementation of mitigation action, and would be responsible for issuing contracts for the design and installation of the upgraded SCADA system.

Estimated Cost: \$500,000

Potential Funding: SWRCB Grant or HMGP

Schedule: Next 5 years

BRCSD 6—Purchase a ¾-ton 4WD replacement vehicle for operations staff that is equipped with VHF/UHF radio.

Hazards Addressed: Wildfire, Earthquake, Flood, Landslide, Severe Weather, Hazardous Materials

Issue/Background: The BRCSD's water distribution, treatment, and storage assets are spread over 1.44 square miles of sometimes steep, mountainous terrain served by unimproved access roads. During a hazard event road disruption is expected. Roads in Hiouchi and the adjoining mountains are typically unusable by traditional vehicles, especially during flooding. Such would be the anticipated situation after a Cascadia Earthquake Event, for example. The District must have the ability to reach infrastructure for repairs, maintenance, inspections, frequent meter reading, and general systems operations at all times. Emergency management must be conducted from the subject vehicle.

Benefits: The 4WD can carry heavy loads and serve during emergencies as a mobile command post able of communicating while enabling responsibility for directing regional disaster response teams.

Implementation: The District has the lead for implementation of this mitigation action.

Estimated Cost: \$85,000

Potential Funding: District funds, HMGP

Schedule: Next 2 years

BRCSD 7—Purchase two satellite telephones with a 5-year service contract.

Hazards Addressed: Wildfire, Earthquake, Flood, Landslide, Severe Weather, Hazardous Materials

Issue/Background: During a hazard event, disruption of roads is expected. At times, roads in Hiouchi are unusable by all but 4WD vehicles. Electricity and telephone lines are often inoperative. All of the hazards listed above can present impasses to managers who need to communicate for immediate assistance. In addition, District personnel can find themselves in remote places where line-of-sight communications are impossible. The only communication resort in such extenuating circumstances is via satellite telephone.



Benefits: Communicate while mobile with regional disaster response teams.

Implementation: The District has the lead for implementation of this mitigation action

Estimated Cost: \$80,000

Potential Funding: District funds, HMGP

Schedule: Next 2 years

BRCS D 8— Replace all aged water mains, including resilient features, to reduce damage during hazard events.

Hazards Addressed: Earthquake, Severe Weather

Issue/Background: Pipelines subjected to significant displacement can develop leaks or breaks. These may be caused by ground deformation, friction wear by sharp rocks, or by strong ground shaking (CalOES, 2013). The District's AC (asbestos-concrete) water mains are over 47 years old and reaching the end of their useful life, estimated at 50 years. Older pipes and those constructed with inferior technologies are more vulnerable to breaks and leaks due to minor earthquakes and severe weather events, potentially leaving portions of the community without potable water. Typical mitigation measures to counter this vulnerability include (a) assessing siting requirements and installing flexible couplings during the pipeline replacement process, (b) replacing thrust blocks on pipeline junctions that have greater than 45-degree offsets, and (c) substitution of entire pipeline sections with newer and stronger pipes. The District needs to replace approximately 2.8 miles of pipe, along with the associated valves, corporation boxes, and pressure reducers. The potential benefits of earthquake-proof water pipelines, such as those used in Japan for the past 40 years, more recently have been proposed for installation in San Francisco (SHMP, 2013). The challenges associated with providing drinkable water in the aftermath of a Cascadia Earthquake Event argues in favor of a similar mitigation strategy for Hiouchi.

Benefits: Avoid loss of water service.

Implementation: The District has the lead for implementation of this mitigation action

Estimated Cost: \$7.2 million

Potential Funding: Grants SWRCB or HMGP

Schedule: On-going

BRCS D 9— Support countywide initiatives identified in Del Norte County's MJHMP.

Hazards Addressed: All Hazards

Issue/Background: A coordinated, countywide approach to hazard mitigation is without question the most effective strategy pursuant to reducing vulnerabilities throughout the area. In early 2016, the BRCS D created and led the Del Norte Water Resources Network with membership of all 6 CSDs in the county, the incorporated City of Crescent City, the Crescent City Laboratory, the Crescent City Wastewater Treatment Plant, and the Del Norte County Farm Bureau. The District continues to chair this important collaborative effort that offers mutual assistance to its members at



all hours of each day. The BRCSD intends to merge back into the County of Del Norte's Multi-Jurisdictional Hazard Mitigation Plan that is presently starting its long journey toward MJHMP reconstruction.

Benefits: Supports coordinated planning across Del Norte County

Implementation: The District will incorporate revisions to its stated Mitigation Actions as needed during the County's republication of the Hazard Mitigation Plan, to which the District will attach its annex.

Estimated Cost: \$2,500

Potential Funding: District Funds

Schedule: On-going

BRCSD 10— Develop a Big Rock CSD Catastrophic Disaster Plan addressing prevention, protection, response, recovery, and mitigation.

Hazards Addressed: All Hazards

Issue/Background: A Catastrophic Disaster Plan is required to anticipate and manage hazards as they develop. The BRCSD's NHN Program initiative will be exercised as previously discussed to maintain community interest in emergency preparedness, provide adequate training, develop localized experience levels, provide an opportunity for feedback on hazard mitigation planning, and enable the community to perfect its emergency management procedures pursuant to hazard mitigation. Disaster recovery processes will be emphasized.

Benefits: Inspired community involvement would enhance the survival of all residents within the District's sphere of influence.

Implementation: The BRCSD intends to collaborate with the County's Emergency Services Team to incorporate the County's planning considerations into the District's plan.

Estimated Cost: \$3,000

Potential Funding: District Funds

Schedule: On-going

BRCSD 11— Enhance District and Public Education and Mitigation Awareness for Natural Hazards.

Hazards Addressed: All Hazards

Issue/Background: Mitigation for disasters prior to their occurrence and preparedness are key to survival under exigent conditions, especially in a violent situation such as the Cascadia Earthquake Event that threatens to isolate the community of Hiouchi if the surrounding bridges collapse. An earthquake of that magnitude can destroy homes, injure residents and cause sickness, food becomes scarce, and criminal activity develops. Assistance from afar would bring the necessary relief by helicopter, such as survival essentials, medications, evacuation as a matter of last resort, etc. Neighborhoods must be able to deal with such exigencies and work together for the benefit of



all. Panic can be minimized when a community is prepared, strong leadership is present, and neighborhood support teams are well organized and trained. Additional education on actions community members can take to protect themselves and their property during a hazard event is needed. All of the District's Neighborhood Leaders need to be educated, trained and equipped to provide mitigation ideas to lessen the effects of hazards as well as how to effectively deal with each hazard listed in this LHMP.

Benefits: Heightened community understanding of disaster mitigation options and preparedness resources to reduce the impacts of natural disasters.

Implementation: The District intends to collaborate with the County's Emergency Services Team to improve the public's understanding of home based mitigation actions. The NHN Program will be used to provide resources to homeowners on mitigation opportunities and to solicit feedback on the LHMP through neighborhood leaders which will provide neighborhood feedback to the Big Rock CSD Board on plan implementation.

Estimated Cost: \$30,000

Potential Funding: HMGP grants, District funds

Schedule: On-going

BRCS D 12— Support Smith River Fire Protection District, Fire Station No. 2 with structural seismic upgrades and installation of emergency preparedness equipment.

Hazards Addressed: All Hazards

Issue/Background: Fire Station No. 2 is situated in the middle of Hiouchi on U.S. Highway 199. In addition to providing firefighting capabilities for the general area, it also serves as the Hiouchi's assembly hall for public meetings of the District's Board of Directors/Trustees. The firehouse building is situated on two acres of land owned by the National Park Service (NPS). The Smith River Fire Protection District (SRFPD) owns and occupies the building at the pleasure of the NPS. In emergency situations of any nature, the District uses the firehouse and host property as an Incident Command Post. The building does not have an alternate electricity source. The District hopes to strengthen the building with seismic retrofits to mitigate earthquake damage, subsequently equip the firehouse office with a HAM radio system, and locate two large CONEX buildings behind the firehouse for an emergency generator, vital emergency supplies, and propane fuel for the generator.

Benefits: Enhance the District's capability to manage all emergencies implied by the hazards listed in this LHMP.

Implementation: The District has acquired informal permission from the NPS and the SRFPD to proceed with this proposed plan.

Estimated Cost: \$165,000

Potential Funding: HMPG grants

Schedule: On-going



4.3.2 Mitigation Action Summary and Prioritization

Mitigation actions were evaluated relative to Big Rock CSD's Bylaws, Operations Plan, Vision, Mission and Goals and the input received during the initial public outreach District Board Meetings, and Neighbor's Helping Neighbor's leader feedback. The mitigation action were prioritized by the Planning Team based on the three criteria listed below, in consideration of the inputs presented above.

- Public Safety: This is the most important priority for any government agency to prevent loss of life and injury, and thus was given the highest importance with a weight of 2 when ranking mitigation actions.
- Public Health: Second only to public safety, public health is a constitutional imperative for all public officials, and was given a weight of 1 Public health considerations include property protection, regional access, and communication protection.
- Benefits Relative to Costs: It is important to prioritize actions that result in the greatest benefit for the costs spent. Insofar as benefits are qualitatively described for all actions and costs were estimated where possible this category was qualitatively assessed, and was given a weight of 1.

A score was assigned for each criteria for each mitigation action based on the judgement of the planning team in considerations of the relevant Big Rock bylaws, Each mitigation action was assigned a score between 3 and 0 for the three prioritization criteria with scores defined as follows:

- Criteria score of 3: The mitigation action is highly effective and feasible in addressing the criteria and is estimated to have a high benefit to cost ratio.
- Criteria score of 2: The mitigation action is effective in addressing the criteria, is feasible, and has a cost benefit ratio estimated close to 1.
- Criteria score of 1: The mitigation action has a low level of effectiveness, but is feasible, and has a low benefit to cost ratio.
- Criteria Score of 0: The mitigation action has not benefits relative to the criteria or is not feasible.



Table 4.1 Summary and Ranking of Mitigation Measures

Mitigation Action (weight)	Public Safety (2)	Public Health (1)	Benefits vs. Costs (1)	Score	Ranking	Priority
BRCSD 1—Replace the 100,000-gallon Redwood water storage tank	3	3	3	12	1	High
BRCSD 2—Install a complete emergency communications system	2	3	3	10	2	High
BRCSD 3—Replace the 50,000-gallon Redwood water tank	2	2	2	8	6	Medium
BRCSD 4—Improve road access to the District's assets	2	3	2	9	5	High
BRCSD 5—Upgrade the existing SCADA system	2	3	3	10	3	High
BRCSD 6—Purchase a VHF/UHF radio equipped ¾-ton 4WD replacement vehicle	2	3	3	10	4	High
BRCSD 7—Purchase two satellite telephones	1	3	3	8	7	Medium
BRCSD 8—Replace all aged water mains	1	1	1	4	12	Medium
BRCSD 9—Support countywide initiatives	1	1	1	4	11	Low
BRCSD 10—Develop a Big Rock CSD Catastrophic Disaster Plan	2	1	3	8	8	Medium
BRCSD 11— Enhance District and Public Education and Mitigation Awareness for Natural Hazards	2	1	1	6	9	Medium
BRCSD 12— Support SRFPD, Fire Station No. 2 with structural seismic upgrades and installation of emergency preparedness equipment	1	2	1	5	10	Medium



Table 4.2 Summary and Ranking of Mitigation Measures

Mitigation Action	Priority	Ranking
BRCS D 1—Replace the 100,000-gallon Redwood water storage tank with a bolted steel tank mounted on a granite shelf, and increase its working capacity to 200,000 gallons in order to accommodate new water service obligations. Upgrade the existing SCADA system. Retain the existing on-site 30 kW generator and propane fuel field. Concurrently stabilize a section of Hiouchi Mountain that is threatened by catastrophic seismic activity, and add an emergency communications capability. Improve vehicle access to the site. Acquire ownership of 6.83 acres to secure all hillside facilities and the access point against terrorism/vandalism.	High	1
BRCS D 2—Install a complete emergency communications system along with a 70-ft antenna tower for emergency HF/VHF/UHF and Simplex communications. The tower will feature a microwave antenna to perform SCADA operations.	High	2
BRCS D 3—Replace the 50,000-gallon Redwood water tank with a bolted steel tank mounted on ultramafic granite and increase total capacity to 100,000 gallons. Secure against threats of vandalism/terrorism.	Medium	6
BRCS D 4—Improve road access to the District’s assets and emplace flood and erosion barriers.	High	5
BRCS D 5—Upgrade the existing SCADA system.	High	3
BRCS D 6—Purchase a ¾-ton 4WD replacement vehicle for operations staff that is equipped with VHF/UHF radio.	High	4
BRCS D 7—Purchase two satellite telephones with a 5-year service contract.	Medium	7
BRCS D 8—Replace all aged water mains, including resilient features, to reduce damage during hazard events.	Medium	12
BRCS D 9—Support countywide initiatives identified in Del Norte County’s MJHMP.	Low	11
BRCS D 10—Develop a Big Rock CSD Catastrophic Disaster Plan addressing prevention, protection, response, recovery, and mitigation.	Medium	8
BRCS D 11— Enhance Public Education and Mitigation Awareness for of Natural Hazards. and Public Understanding of Disaster Preparedness.	Medium	9
BRCS D 12— Support Smith River Fire Protection District, Fire Station No. 2 with structural seismic upgrades installation of emergency preparedness equipment.	Medium	10



5. Plan Adoption

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan.

The purposes for formally adopting this LHMP at the local level is to document BRCSD approval and support, raise public awareness of the Plan's contents while emphasizing the gravity of its implications, and to formalize implementation. The BRCSD's governing body adopted this LHMP by unanimously approving an enacting resolution on August 17, 2017. A copy of the executed resolution is included in Appendix D, Big Rock CSD Adoption Resolution.



6. Plan Implementation and Maintenance

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and subsequent maintenance of this LHMP are critical to the achievement of hazard mitigation planning goals within the Hiouchi Planning Area. This section presents the BRCS D's strategy for implementation and maintenance, and outlines methods and the schedule for monitoring, updating, and evaluating the Plan. Also discussed are (a) how the District intends to incorporate its stand-alone LHMP into the recently initiated Del Norte County/City of Crescent City Multi-Jurisdictional Hazard Mitigation Plan development process and (b) the approach that the District's Board of Directors/Trustees intends to follow in promoting continued public involvement.

Chapter 2 (Planning Process) contains information regarding the implementation status of mitigation actions taken by the Big Rock CSD since the previous (now expired) Crescent City/ Del Norte County Hazard Mitigation Plan was adopted on February 15, 2011. The following section includes similar information concerning the implementation and maintenance process associated with this LHMP.

6.1 Implementation

Once Hiouchi's LHMP is adopted, the Big Rock CSD's Board of Directors/Trustees must decide which action(s) to engage, when it should do so, and in what priority order. Two factors will contribute to these decisions: (a) the priority assigned to each action during the initial planning process and (b) funding availability.

Hazard mitigation in any municipality or neighborhood is most productive when it is thoughtfully undertaken as a priority objective by public officials who are committed to exercising responsible governance, no matter how large or small the associated community. Implementation is most appropriately assigned to managers and employees, and is typically driven by productivity measurement and reporting results.

The District plan to continue enhanced training and system testing so that the community knows what to do in response to a hazard. The community includes volunteers for the Fire Station located in Hiouchi, who are frequently engaged in continuation training. Amateur radio training is conducted every Tuesday evening to tune radio equipment and test radio communications effectiveness in a regional context. The District tests its two, large propane-fueled electricity generators every month to mitigate the possibility of losing water service during power losses. On a daily basis, the District also tests its water distribution system for water quality to mitigate the occurrence of certain health issues. Structural and non-structural strengthening advice is a responsibility of the County of Del Norte. Effective defensible space and fire-resistant building materials instruction is provided throughout the Planning Area by Cal Fire every year. Improved drainage and drought-resistant landscaping is the responsibility of each homeowner to pursue from advisories issued by the County Code Enforcement Office and also the local U.S. Department of Agriculture office. All of



these activities are designed to mitigate hazards, reduce loss of life and property, and lessen the impacts of disasters.

The District's most troubling weakness is the fragile nature of its management team at the top level. If the current Board President leaves, the management system would collapse. As part of training to keep the District able to perform the mitigation actions in the LHMP, it will be important to recruit engaged community members with leadership capabilities onto the Big Rock CSD Board and to provide them with the training necessary to support the District's hazard mitigation efforts.

A second vulnerability is the Big Rock CSD's inadequate revenue source. Otherwise, this single jurisdiction's existing authorities and policies are in effect quite adequate. Its programs and resources are somewhat limited by the truncated availability of grant funding. As the age of the District's infrastructure approaches 50 years, it is imperative that all of the community's old pipelines, valves, meters, storage tanks, pumps, SCADA system, and computers be replaced. Since 2005, the District steadily has been doing so. It has replaced its two submersible pumps, a hillside pump, some pipelines and valves, and a large utility vehicle over the past six years. The two aforementioned electrical generators were recently installed, along with extensive propane fuel fields that collectively could provide potable water to consumers for several months with tight conservation measures in place. In a catastrophic disaster that causes the isolation of this community for a long time, Hiouchi could survive if helicopter support were available to respond to urgent medical needs. The District's goals at this juncture have been harmonized to provide a bright future for Hiouchi for the coming 60 years. Its Hillside Stabilization Project is central to this theme.

The District also plans to simulate a listed disaster on a semi-annual basis, exercise the community's applicable emergency plans to mitigate the effects of the target hazard(s), compare actual results to intended results, and take responsible action(s) to implement the appropriate adjustments, including feedback into this LHMP and emergency plans. Properly trained volunteers who seek to mitigate hazards in the public domain always should serve in accordance with the law and with at least majority consent of their duly elected public representatives.

An important implementation mechanism for the District is incorporation of LHMP mitigations actions and underlying principles into subordinate plans and mechanisms. The District plans to incorporate the risk and vulnerability assessments and mitigation actions into a Catastrophic Disaster Plan, Continuity of Governance Plan, and a Emergency/ Disaster Response Plan.

With special emphasis on the newly formed Hiouchi Planning Area, the BRCSD Board planted an important seed when it approved a NHN policy that is specifically tailored for local implementation. The Board took the critical first step when it appointed two very capable Hiouchi residents to assume a partner leadership role as NHN Coordinators. They immediately stepped up to the plate by holding an energetic public NHN Outreach meeting that was designed to recruit NHN Leaders for each of 23 neighborhoods. Volunteer participation has been growing in numbers since then, thereby expanding public interest as new Neighborhood Leaders begin to focus on the critical needs of their neighbors. The results of this LHMP will be used to enhance the District's NHN Program as it conducts neighborhood training regarding emergency plans, stockpiling critical food and medical supplies as residents prepare for disaster conditions, and performing first aid. The County of Del Norte has been helpful in this regard, for growing numbers of Hiouchi's residents are enrolling in



Certified Emergency Response Training. While this activity grew at its own pace, the Big Rock CSD and GHD Inc. formally initiated the LHMP planning process that raced in parallel with the NHN formation process. The community began to feel this energy and understand the significance of emergency preparedness with an eye toward hazard mitigation. In essence, the greater community of Hiouchi had given birth to the LHMP implementation process even before its LHMP document officially had been drafted. Community residents are starting to swirl around their neighborhood leaders as (a) lists of critical household needs are developed and (b) while the BRCSD steadily moved toward publication and adoption of this LHMP on August 17, 2017. The community is already anticipating being involved in developing Hiouchi's Catastrophic Disaster Plan (CDP). The CDP will provide more detail than this LHMP with respect to specific measures and actions to be taken under varying hazard conditions.

The District does not have a sufficient revenue source for hiring staff other than its contract bookkeeper, part-time general manager, and two part-time laborers. The President of the Board of Directors/Trustees is an experienced city manager who voluntarily performs the equivalent work of nine different city employees and the position of elected mayor in a "strong city manager" form of government. The District's principal revenue source derives from pumping, storing, treating, and distributing potable water to about 650 residents. Once per year it receives a very small property tax distribution from the County. The District's capital reserve is only \$385,000, which could be spent over one week's time repairing a main pipeline fracture in the middle of U.S. Insofar as the Planning Area is located in a mountainous area within a region stalled by a disadvantaged economy and negative population growth, the District is not able to appreciably increase its water use rates without overstressing its residents and businesses. The District therefore relies upon matching grant sources as it struggles to provide a future for its constituents. Successful mitigation implementation revolves around the development of funding opportunities to pay for mitigation actions. The District works with its District Engineer to identify such funding opportunities as special pre- and post-disaster funds, Earthquake State Assistance Program grants and loans, the National Earthquake Technical Assistance Program, state and federal earmarked funds, California State Proposition grants, benefit assessments and other grant programs that can serve or support multi-objective projects. The BRCSD has successfully applied to FEMA for Hazard Mitigation Grant Program (HMGP) funding, and will continue to look for HGMP project opportunities that align with local mitigation actions. This Plan will establish firm ground in as the District applies for grants to mitigate hazards that occur with relative frequency in comparison to other areas.

6.2 Maintenance

Maintenance of the Hiouchi LHMP consists of an ongoing effort to evaluate plan implementation and to update the Plan as progress, setbacks, or changes in circumstances are recognized.

6.2.1 Maintenance Schedule

The Big Rock CSD is responsible for monitoring and evaluating the implementation and effectiveness of the LHMP and initiating plan reviews and consulting with other participating jurisdictions. The sections below review the District's processes for monitoring, evaluating, and updating the LHMP.



6.2.1.1 Plan Implementation Monitoring

The District Board of Directors intends to review the LHMP Mitigation Actions on a quarterly basis at regularly scheduled Board Meetings to monitor implementation of the plan over time. Such will provide opportunities to track the progress of action items and publicly discuss potential upcoming funding opportunities. The Big Rock CSD Board President and General Manager will be responsible for monitoring progress, and will provide a written status update memo the on progress of each Mitigation Action once at quarter at the regularly scheduled Board meetings, which will then be documented in the meeting minutes.

6.2.1.2 Plan Effectiveness Evaluation

The District Board of Directors intends to evaluate the effectiveness of the LHMP and future Del Norte County MJHMP on an annual basis. The annual mitigation plan evaluation will occur within the first three months of the calendar year to prepare the District for potential FEMA funding opportunities and the summer construction season. The Big Rock CSD Board President and General Manager will be responsible for developing an effectiveness summary to evaluate progress toward the plan goals. The list below includes the plan goals and what will be covered in the effectiveness summary.

Goal 1: Minimize risk and the vulnerability of Hiouchi and surrounding Planning Area to the impacts of natural hazards, and protect lives and reduce damages/losses to property, the economy, public health and safety, and the environment:

- Evaluate progress on developing the Catastrophic Disaster Plan and implementation of provisions with the plan.
- Evaluate number of Board Meetings where hazard mitigation was discussed and number of feedback comments on mitigation planning provided to the Board by stakeholders and the public.
- Calculate the percentage of Mitigation Actions completed.



Goal 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts.

- Evaluate the completion status of Mitigation Actions 1, 3, 4, 5, and 8 and list barriers and opportunities for those actions not implemented.
- Evaluate potential new facilities that may need protection.

Goal 3: Improve public awareness, education, and preparedness for all hazards.

- Evaluate the effectiveness of the NHN Program, including the number of meetings held, number of preparedness exercises completed, and number of active neighborhood leads.
- Evaluate the completion status of Mitigation Actions 9, 10, and 11 and list barriers and opportunities for those actions not implemented.

Goal 4: Increase the Hiouchi Planning Area's capabilities to mitigate losses and become prepared for responses to and recovery from disaster events.

- Evaluate the completion status of Mitigation Actions 2, 6, and 7, and 12 and list barriers and opportunities for those actions not implemented.

Goal 5: Maintain FEMA eligibility and position the BRCSD for grant funding.

- Evaluate upcoming mitigation action funding opportunities and those which could be submitted to FEMA's mitigation funding programs.

6.2.1.3 Plan Update Process

For keeping the LHMP updated, the BRCSD Board of Directors intends to fold the Hiouchi LHMP back into the Del Norte County's MJHMP with a Big Rock CSD Annex. The next Del Norte County MJHMP effort is being led by Del Norte County Emergency Services Department and should be completed by late 2018 or 2019. The incorporation of the LHMP into the Del Norte MJHMP will provide an opportunity to adjust mitigation actions based on stakeholder input through Board meetings or the NHN Program if necessary if new information is presented. The forthcoming County MJHMP and aforementioned Annex will address the human hazard, meaning threats from terrorism/vandalism. The plan would then be updated again by Del Norte County Emergency Services Department within 5 years of the expiration of the Del Norte County MJHMP, anticipated to be initiated in 2022.

6.3 Incorporation into Existing Planning Mechanisms

The hierarchy of civic planning starts with the "big picture" that articulates the driving vision at hand, mission of the governing agency, and general goals that serve the best interests of the host community. This LHMP serves as the big picture document that provides the data, analysis, and maps that can be integrated into other plans to inform policies and decision making. The general planning direction taken by a governing body usually reflects the personality of its constituents as the subsequent planning processes produce objectives, recommend actions to achieve objectives, identify challenges, provide solutions to the challenges, and then define specific actions for resolving or mitigating embedded issues. The process works progressively downward via subordinate plans as details give rise to greater definition. The paragraphs below provide



information on which planning mechanisms will obtain information from the LHMP and what information will be integrated into each of the planning mechanisms.

6.3.1 Capital Improvement Plan

Information contained in the Plan will serve as a primary District resource for updating its Capital Improvement Plan. The District does not have a sufficient revenue source for hiring staff other than its contract bookkeeper, part-time general manager, and two part-time subordinate laborers. The District's principal revenue source derives from pumping, storing, treating, and distributing potable water to about 650 residents. Once per year it receives a very small property tax distribution from the County. The District's capital reserve is only \$385,000 as of August 2017, which could be spent over one week's time repairing a main pipeline fracture in the middle of U.S. Highway 199 that functions as Hiouchi's main thoroughfare. Insofar as the Planning Area is located in a mountainous area within a region stalled by a disadvantaged economy and negative population growth, the District is not able to appreciably increase its water use rates without overstressing its residents and businesses. The District therefore relies upon matching grant sources as it struggles to provide a future for its constituents. The LHMP will provide information on needed capital improvements to protect the District's infrastructure. The LHMP risk assessment will provide data to the district on siting new facilities to avoid high risk areas. Lastly the LHMP establishes needs, mitigations, and priorities that will be used as the District applies for grants to mitigate disasters that occur with relative frequency in comparison to other areas.

6.3.2 Hiouchi Catastrophic Disaster Plan

This LHMP frames potential disasters for the Hiouchi Planning Area and provides sufficient information for the Big Rock CSD and its planning partners to produce a Catastrophic Disaster Plan that develops a number of specific actions that must be taken to mitigate trouble. As the hierarchy of plans unfolds, important elements of each are incorporated into other plans along the way and "networked" among a number of agencies. The catastrophic disaster plan will include a communications plan. A sustained and effective communications capability is a priority policy objective for the District. It currently uses an array of radio, telephonic, website, satellite, newsletter, and amateur radio technologies to stay in touch with community residents. The aforementioned proposed antenna tower mitigation action will allow the District to mount antennas covering a range of HF, VHF, and UHF frequencies that would enable local emergency managers during catastrophic disasters to communicate with repeaters in southern Oregon that link to FEMA and State command centers. The information on community vulnerabilities will be critical information used in the development of the Catastrophic Disaster Plan for Hiouchi.

6.3.3 Neighbors Helping Neighbors

The District recently adopted the NHN Program to give its Board of Directors/Trustees and management team the ability to immediately connect with every neighborhood in the community before, during, and after emergencies. It also provides an effective means to communicate with all residents on important routine matters. This LHMP identifies the vulnerabilities of the community of Hiouchi. This information will be by the NHN Program, to assist the community in developing



mitigation strategies to reduce risk. Especially important in Hiouchi is information on earthquakes and wildfires, identified as two of the highest probability occurrences in the planning area.

6.3.4 Del Norte County Multi-Jurisdictional Hazard Mitigation Plan

Portions of this LHMP will find their way into the County's MJHMP as previously indicated. This LHMP will be incorporated directly as the Big Rock CSD's Annex to the MJHMP. The earthquake analysis of the Cascadia event in this LHMP will be provided to Del Norte County for use in the risk and vulnerability assessments in the County MJHMP.

6.3.5 Del Norte County Comprehensive Economic Development Strategy

The CEDS identifies both local and regional agencies and their capabilities that focus upon providing assistance to small businesses for start-ups, stabilization, and expansion. The CEDS can be used as a resource for local businesses upgrading facilities to mitigation for hazards.

6.3.6 Del Norte Water Resources Network

The District currently actively chairs the DNWRN featuring membership of all 6 operational community services districts throughout the county, the incorporated City of Crescent City, the Crescent City Wastewater Treatment Plant, the Crescent City Laboratory (water quality services), the Redwood National Park (National Park Service) located within the community, and the Del Norte County Farm Bureau. The District will use the LHMP to put into perspective the hazard challenges facing Hiouchi and how the network can help mitigate damages before and after a hazard event.

6.3.7 Support for Regional Planning

Fire protection, police protection, building and property-related municipal services, road maintenance, community development planning, zoning, conservation management, information technology, land management, park maintenance, etc. are provided by other government agencies. The District coordinates intimately with the supporting agencies who provide these services in Hiouchi. The information in this LHMP will be used by the District when called upon to comment on updates or changes that agencies may proposed. For example during the public review of general plan changes or amendments, the District can rely on this LHMP to evaluation land use or zoning changes that may impact community vulnerability. In dealing with Caltrans, the District will use this LHMP to show the vital services that Highway 199 provides to the community and the vulnerabilities the District should consider when commenting on project documents for Highway 199 and other regional access routes.

6.3.8 Continued Public Involvement

Continued public involvement is important to successful implementation of this LHMP. The Plan development process provided several opportunities to solicit participation and input from stakeholders and seek public comment and feedback. Two of the LHMP mitigation actions are focused on continued public involvement.



Through action BRCSD 10, the District will involve the public in the development of the Big Rock CSD Catastrophic Disaster Plan. Involvement will include working through the Neighbors Helping Neighbor's program and neighborhood leaders to encourage community members to provide input on the development of the Plan.

Through action BRCSD 11, the District will continue public education and awareness of natural disasters and public understanding on disaster preparedness. Hazard planning is a regular topic at the Big Rock CSD's monthly Board meeting and the public is invited and encouraged to attend these meetings. Additionally through regular Neighbors Helping Neighbors program, leaders will be tasked with obtaining feedback on mitigation planning and emergency preparedness for the Big Rock CSD Board of Directors which can be used during the next plan update.

The overall public involvement process will include continued public and stakeholder networking through attendance at designated meetings, web postings, press releases to local media, and through hazard mitigation exercises implemented through the Neighbors Helping Neighbors program. The Neighbors Helping Neighbors program is the key feedback mechanism for gathering input which will be used for the next plan update.



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Appendices

Figures Appendix

Figures Appendix

Figure 1 Vicinity Map

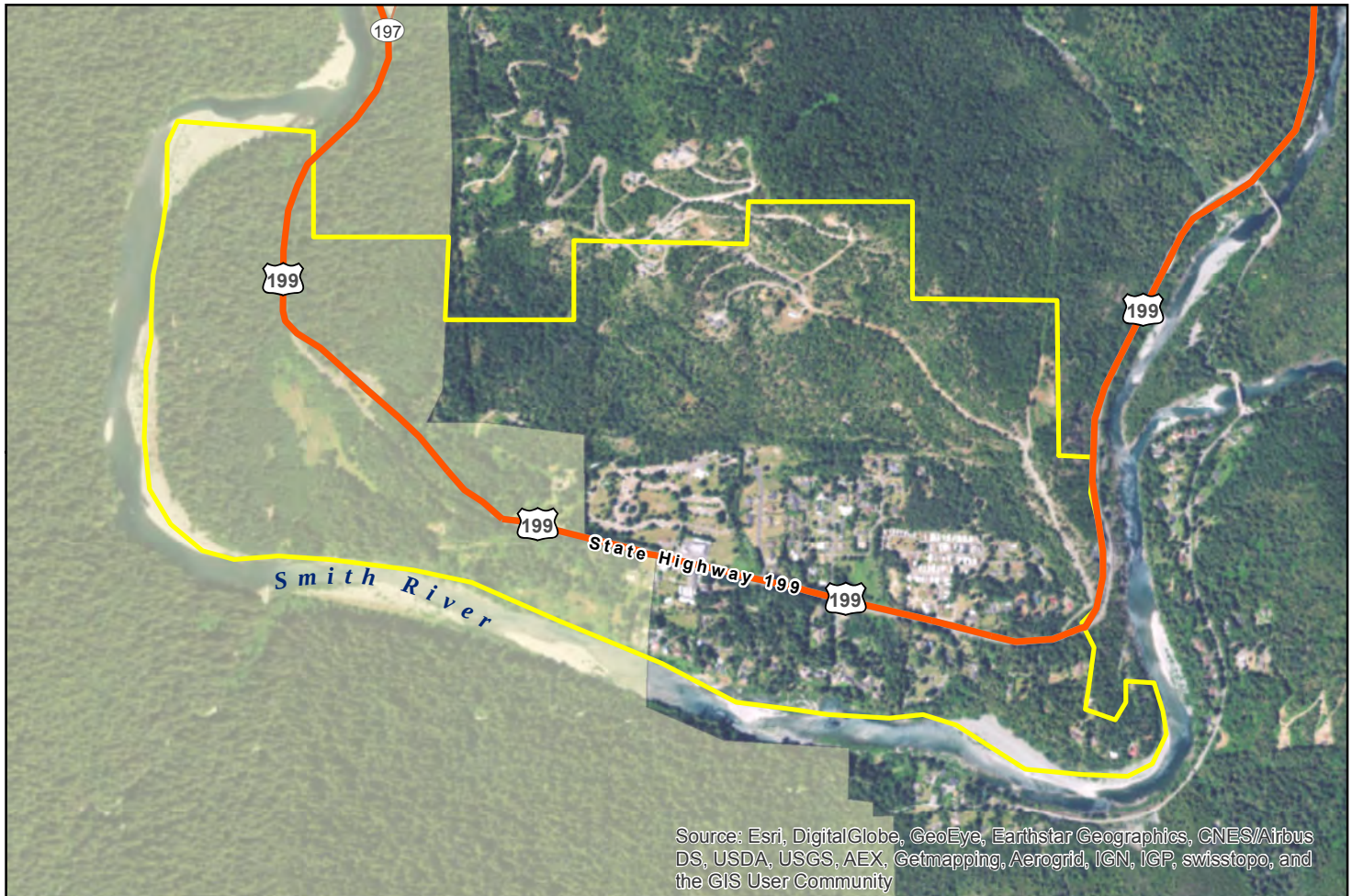
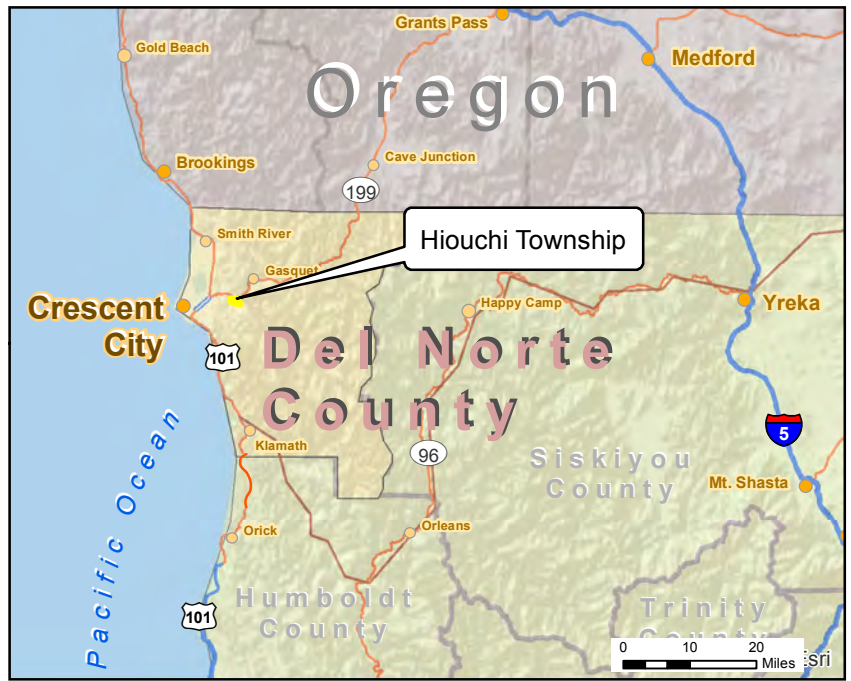
Figure 2 Geology Map

Figure 3 Landslide Map

Figure 4 Fault Map

Figure 5 Soils Map

Figure 6 Flood Hazard Map



- Big Rock CSD Boundary
- Jeddiah Smith Redwood State and National Park
- Freeway
- Highway
- Del Norte County

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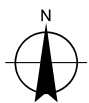
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Horizontal Datum: North American 1983

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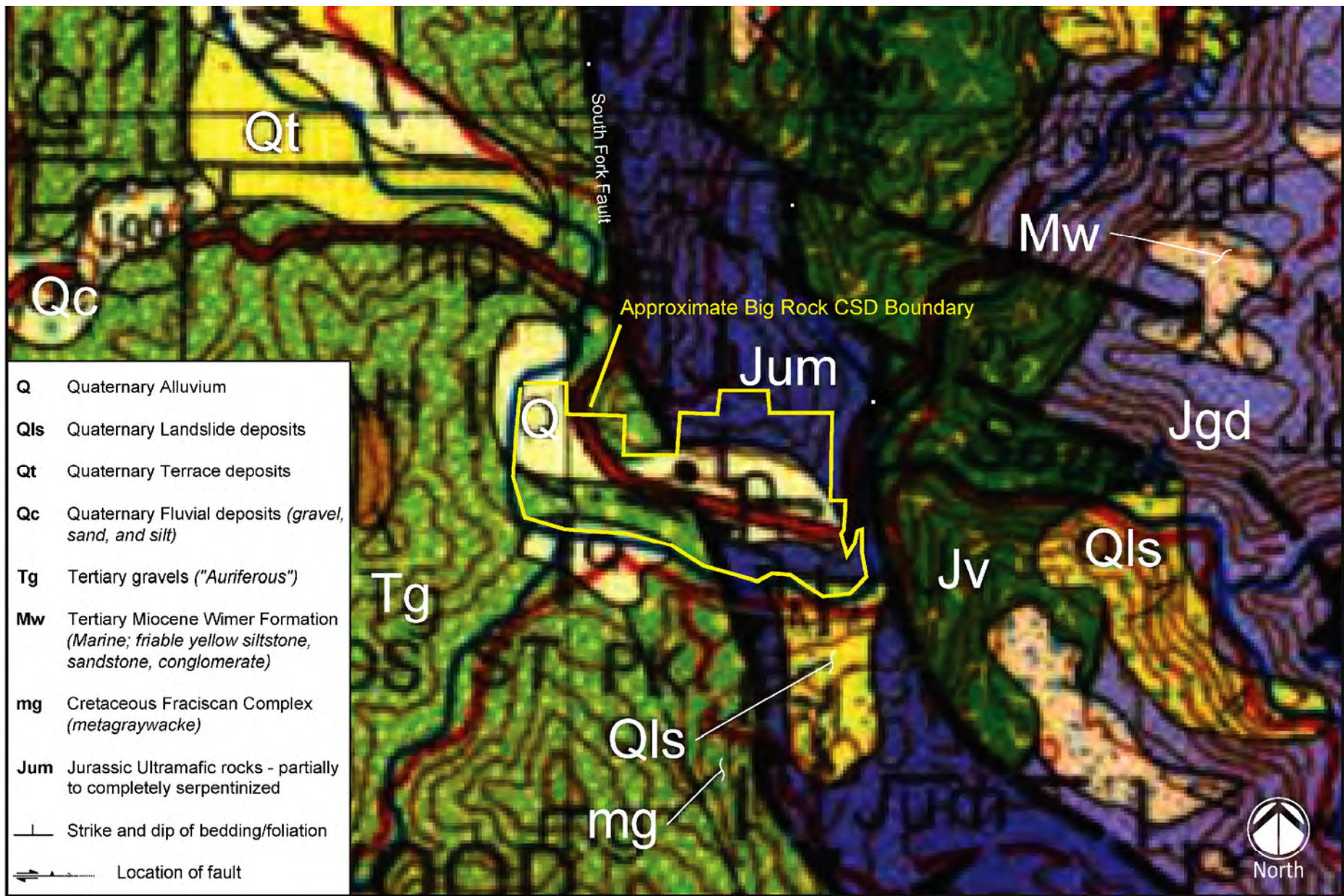


Big Rock Community Services District
Hiouchi Local Hazard Mitigation Plan

Job Number 8411228
Revision A
Date 17 Jul 2017

Vicinity Map

Figure 1



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Original figure modified from Figure 2, BRCS
Water Tank Replacement Project Geotechnical
Report, Crawford & Associates, Inc., April 2016



Big Rock Community Services District
Hiouchi Local Hazard Mitigation Plan

Job Number 11136755

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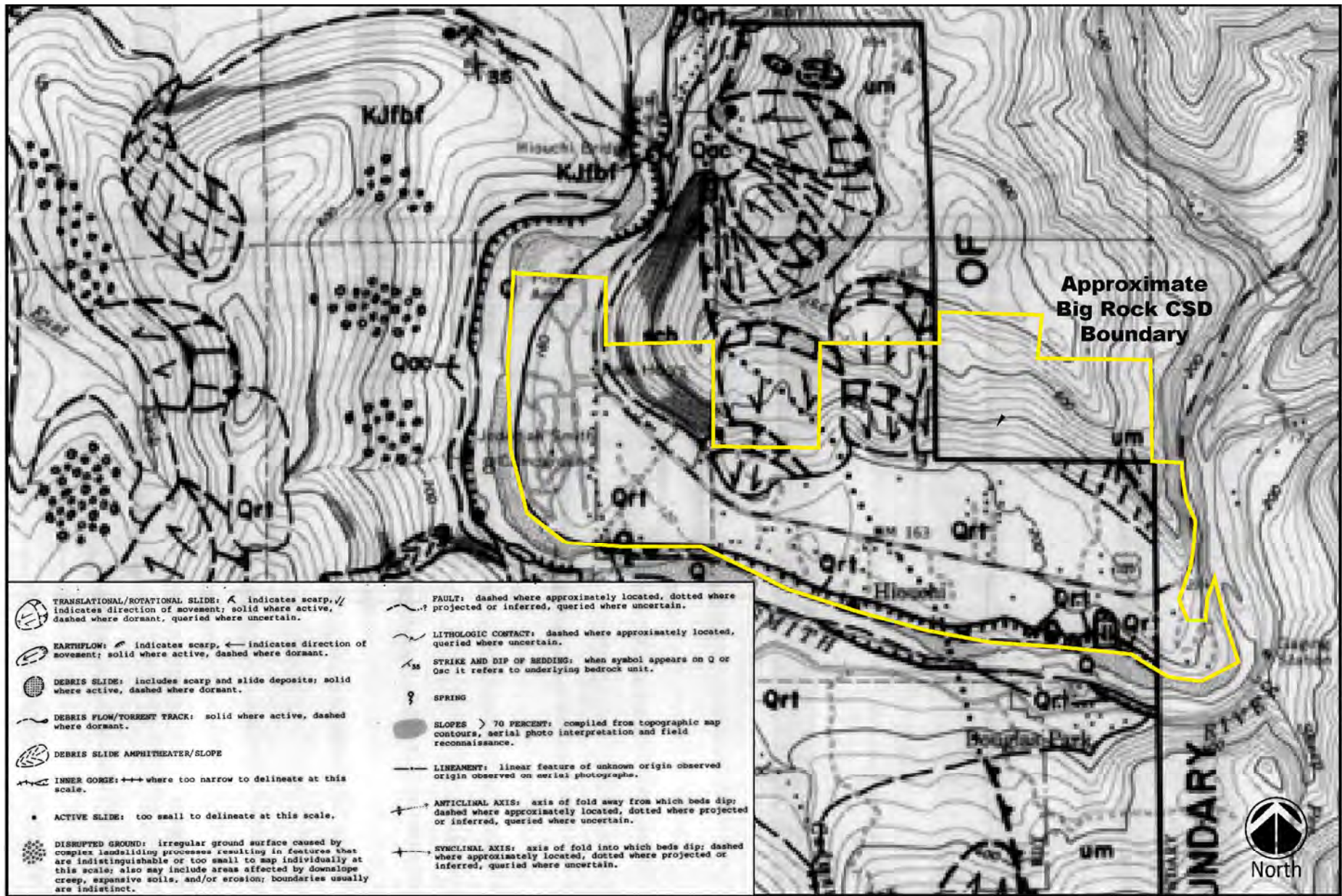
Geology Map Figure 2

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Data source: Regional Geologic Map, Weed Quadrangle (D.L. Wagner & G.J. Saucedo, 1987); CSD Boundary: digitized by GHD, 2016. Created by:ashows



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Original figure modified from Figure 3, BRCSO
Water Tank Replacement Project Geotechnical
Report, Crawford & Associates, Inc., April 2016



Big Rock Community Services District
Hiouchi Local Hazard Mitigation Plan

Job Number 11136755

Map Projection: Lambert Conformal Conic
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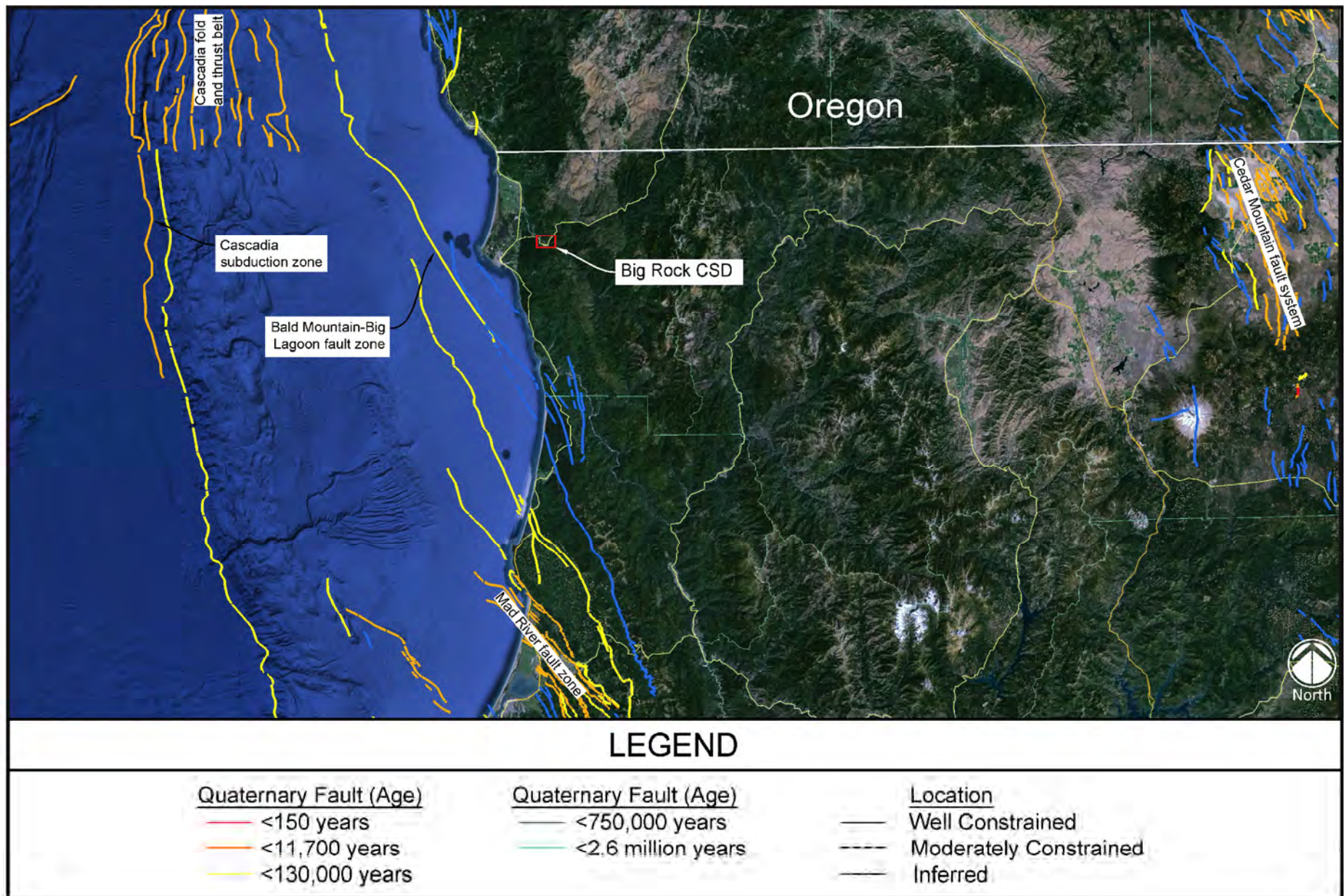
Landslide Map **Figure 3**

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Data source: Geology and Geomorphic Features Related to Landsliding, Hiouchi 7.5' Quadrangle (OFR 83-04, C.W. Davenport, 1983); CSD Boundary: digitized by GHD, 2016. Created by:ashows



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Original figure modified from Figure 4, BRCSD
Water Tank Replacement Project Geotechnical
Report, Crawford & Associates, Inc., April 2016



Big Rock Community Services District
Hiouchi Local Hazard Mitigation Plan

Job Number | 11136755

Map Projection: Lambert Conformal Conic
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Grid: NAD 1983 StatePlane California 1 FIPS 0401 Feet

Fault Map

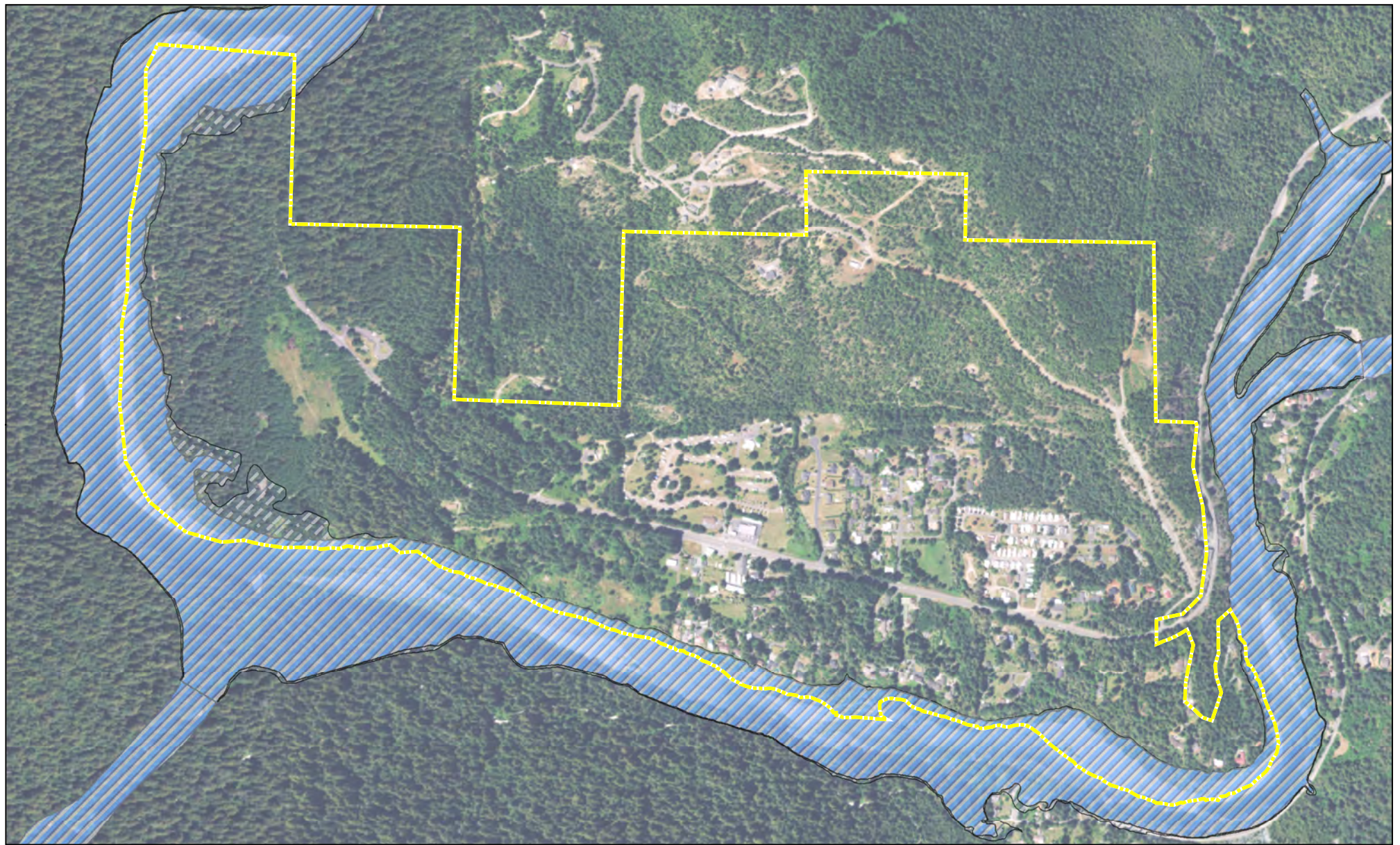
Figure 4

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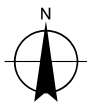
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Data source: USGS Fault Activity Map Overlay; CSD Boundary: digitized by GHD, 2016. Created by:ashows



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Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



 Big Rock Community Services District Boundary

Flood Hazard Areas

 1 Percent Annual Chance of Flood
 0.2 Percent Annual Chance of Flood



Big Rock Community Services District
Hiouchi Local Hazard Mitigation Plan

Job Number	11136755
Revision	A
Date	12 Jul 2017

FEMA DFIRM Flood Hazard Areas

Figure 6

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Data source: NAIP Orthoimagery, 2014. Disadvantaged Communities: California Department of Water Resources, 2016. CSD Boundary: digitized by GHD, 2016. Created by: rscrow

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Appendix A

Public Outreach Supporting Documentation

Appendix A Public Outreach

Possible Planning Partners – List of all possible planning partners considered

Public Notification List – List of all Agencies/ People contacted to participate in the Hiouchi LHMP planning process

Planning Partner Expectations – Document provided to attendees at the Initial Public Outreach Meetings and provided to the agencies on the public notification list

Initial Outreach Materials

- Public Meeting Announcement
- Proof of Publication in the local paper
- Presentation
- Sign in Sheets
- Meeting Photos

Draft LHMP Outreach Materials

- Public Meeting Announcement
- Proof of Publication in the local paper
- Presentation
- Sign in Sheets
- Meeting Photos

Interested Parties List

Possible Planning Partners

Agencies Considered as Planning Partners and Stakeholders Hiouchi Local Hazard Mitigation Plan						
Partner Organization	Relevant Agency to BRCSD	Contacted to be a Planning Partner?	Contact	Phone	Address	email
Local Agencies						
Building Code Enforcement	Building Inspection Division of the Community Development Department Del Norte County	Not Contacted - Responsibilities fall under Community Development Department	David Thompson, County Building Official	(707) 464-7253	981 H Street, Suite 110, Crescent City, CA 95531	
City Management/County Administration	Del Norte County	Not Contacted - Community Development Department considered representative	Jay Sarina, County Administrative Officer	(707) 464-7214	982 H Street, Suite 210, Crescent City, CA 95531	administration@co.del-norte.ca.us
Emergency Management	Neighbors Helping Neighbors Del Norte County	Contacted	Cindy Henderson, County of Del Norte Emergency Services Manager	(707) 954-8775		chenderson@co.del-norte.ca.us
Fire Department/District	Smith River Fire Protection District	Contacted	Fire Chief-Notice	(707) 487-5621	PO Box 187 Smith River, CA 95567	smithriverfireprotectiondistrict@smithriverfire.com
Floodplain Administration	See Public Works - Local Agencies	Not Contacted - Responsibilities fall under Community Development				
Geographic Information Systems	N/A	Not Contacted - Responsibilities fall under Community Development				
Parks and Recreation	Parks Department Del Norte County	Not Contacted - Responsibilities fall under Community Development	Ed Fulton, Parks & Building Maintenance Superintendent	(707) 464-7230	983 H Street, Suite 250, Crescent City, CA 95531	
Planning/Community Development	Community Development Department Del Norte County	Contacted	Heidi Kunstal, Director	(707) 464-7254	981 H Street, Suite 110, Crescent City, CA 95531	hkunstal@co.del-norte.ca.us
Public Works	Engineering and Survey Division under the Community Development Department Del Norte County	Not Contacted - Responsibilities fall under Community Development	James Barnts, PE, County Engineer	(707) 464-7229	981 H Street, Suite 110, Crescent City, CA 95531	jbarnts@co.del-norte.ca.us
Stormwater Management	See Public Works - Local Agencies	Not Contacted - Responsibilities fall under Community Development				
Transportation (Roads and Bridges)	Roads Division under the Community Development Department Del Norte County	Not Contacted - only 1 county road in Hiouchi, no bridges	Jeff Daniels, Roads Superintendent	(707) 464-7238	500 E. Cooper Avenue, Crescent City, CA 95531	jdaniels@co.del-norte.ca.us
Transportation (Roads and Bridges)	Del Norte Local Transportation Commission	Not Contacted - only 1 county road in Hiouchi, no bridges	Tamara Leighton	(707) 465-3878		tamera@dnltc.org

Partner Organization	Relevant Agency to BRCSD	Contacted to be a Planning Partner?	Contact	Phone	Address	email
City Council/Board of Commissioners	Big Rock CSD Board of Directors	Contacted	Craig Bradford, President	(707) 218-7560	PO Box 453, Crescent City, CA 95531	craigsbradford@gmail.com
Planning Commission	Under Community Development Department Del Norte County	Contacted				
Regional/Metropolitan Planning Organization(s)	N/A	N/A				
City/County Attorney's Office	BRCSD Attorney, BLACK & RICE LLP	Contacted	Robert Black	BLACK & RICE LLP	710 H Street, Crescent City, CA 95531	rblack@attyblack.com
City/County Attorney's Office	County Counsel, Del Norte County	Contacted	Elizabeth Cable, County Counsel			
Economic Development Agency	Del Norte Economic Development Corporation	Not Contacted Defunct Organization		(707) 464-2169	882 H Street, Crescent City, CA 95531	loanadmin@dnedc.com
Local Emergency Planning Committee	Community Emergency Response Teams (CERT)	Contacted	Cindy Henderson, County of Del Norte Emergency Services Manager	(707) 954-8775		chenderson@co.del-norte.ca.us
Police/Sheriff's Department	Sheriff's Office Del Norte County	Not Contacted - Due to previously stated no interest in project.	Erik Apperson, Sheriff	(707) 464-4191	650 Fifth Street, Crescent City, CA 95531	
Sanitation Department	N/A	N/A				
Tax Assessor's Office	Del Norte County Assessor	Not Contacted - No role in project	Jennifer Perry Assessor	(707) 464-7200	981 H Street, Suite 120, Crescent City, CA 95531	
Special Districts and Authorities						
Airport, Seaport Authorities	Border Coast Regional Airport Authority	Not Contacted - No role in project	Matthew Leitner, Airport Director	(707) 464-7288	150 Dale Rupert Road, Crescent City, CA 95531	
Fire Control District	See Fire Department Local Agencies	N/A				
Flood Control District	See Public Works - Local Agencies	N/A				
School District(s)	Del Norte County Unified School District	N/A - No schools in Hiouchi	Jeff Harris, Superintendent	(707) 464-0200	301 W. Washington Blvd. Crescent City, CA 95531	
Transit Authority	See Transportation - Local Agencies	N/A				
Utility Districts	N/A	N/A				
Non-Governmental Organizations						
American Red Cross	Red Cross California Northwest	N/A - No Local Office		(707) 577-7600	Santa Rosa	
Chamber of Commerce	Crescent City/ Del Norte County Chamber of Commerce	Not Contacted - No role in project	Jeff Parmer, Executive Director	(707) 464-3174	1001 Front Street, Crescent City, CA 95531	

Partner Organization	Relevant Agency to BRCSD	Contacted to be a Planning Partner?	Contact	Phone	Address	email
Community/Faith-Based Organizations	Del Norte Interfaith Fellowship Council	Contacted	Craig Bradford, Executive Secretary	(707) 218-7560	PO Box 453, Crescent City, CA 95531	craigsbradford@gmail.com
Environmental Organizations	Smith River Alliance	Contacted	Grant D. Werschull, Executive Director		P.O. Box 2129Crescent City, CA 95531	
Homeowners Associations						
Neighborhood/Community Organizations	Local Neighbors helping Neighbors	NHN Coordinators Contacted				
Neighborhood/Community Organizations	Josephine County Emergency Center, Merlin OR	Contacted	Joe Stodola			
Utility Companies	Pacific Power/ US Cellular	Not Contacted				
State Agencies						
State Emergency Management Agency	California Governor's Office of Emergency Services (Cal OES)	Contacted	Joe Petersen, Senior Emergency Services Coordinator	(916) 845-8172		joe.petersen@caloes.ca.gov
State Dam Safety	N/A	N/A				
State Department of Transportation	Caltrans	Contacted	Karen Sanders		190 Price Mall Circle, Crescent City	
State Fire and Forestry Agency	California Department of Forestry & Fire Protection	Not Contact - Went through local fire distrit	Allen Robertson		P.O. Box 944246, Sacramento, CA 94244-2460	
State Geological Survey	N/A	N/A				
State Water Resources Agency	Division of Drinking Water	Contacted	Barry Sutter		364 Knollcrest Drive, Suite 101 Redding, CA 96002	Barry.Sutter@waterboards.ca.gov
State National Flood Insurance Program Coordinator	N/A	N/A				
State Planning Office	See State Emergency Management Agency	N/A				
State Parks	California State Parks	Contacted	David Boemer, Superintendent, Redwood Coast Sector; Connie Battles - Office Assistant	(707)465-7301	1111 Second Street, Crescent City, CA 95531	
Federal Agencies						
Federal Emergency Management Agency	See Cal OES					
Land Management Agencies (USFS/NPS/BLM)	Klamath National Forsest		Jeff Marszal, Happy Camp-Oak Knoll District Ranger	(530) 493-2243	63822 Highway 96 P.O. Box 377 Happy Camp, CA 96039-0377	
National Weather Service	N/A					
US Army Corps of Engineers	N/A					
US Department of Housing and Urban Development	N/A					
US Department of Transportation	N/A					

Partner Organization	Relevant Agency to BRCSD	Contacted to be a Planning Partner?	Contact	Phone	Address	email
US Environmental Protection Agency	N/A					
US Geological Survey	N/A					
Other						
Tribal Officials	Tolowa Dee-ni’ Nation	Not Contacted			140 Rowdy Creek Road Smith River, CA 95567	
	Elk Valley Rancheria	Not Contacted			2332 Howland Hill Rd. Crescent City, CA 95531	
	Yurok Tribe	Not Contacted	Peggy O'Neal, Planning Director	(707) 482-1350	190 Klamath Blvd. P.O. Box 1027 Klamath, CA 95548	poneill@yuroktribe.nsn.us
Colleges/Universities	N/A					
Land Developers and Real Estate Agencies						
Major Employers and Businesses	Hiouchi Café	Contacted	Joy Parkes			
Major Employers and Businesses	Hiouchi Hamlet	Contacted	Mike Finley			
Major Employers and Businesses	Gas Station	Contacted	Mike Finley			
Major Employers and Businesses	Community Fellowship Church	Contacted	Steve Perez, Pastor			
Neighboring Jurisdictions	Gasquet CSD	Contacted	Mark Dodd			
Neighboring Jurisdictions	City of Crescent City	Contacted	Eric Weir, Public Works Director			
Neighboring Jurisdictions	Smith River CSD	Contacted	Chris Vaughn, General Manager			general.manager@srwater.net

Public Notification List

**Agencies/ People Contacted about Public Meeting and Noticed about Draft Plan
Hiouchi Local Hazard Mitigation Plan**

Relevant Agency to BRCSD	Contact
Neighbors Helping Neighbors Del Norte County	Cindy Henderson, County of Del Norte Emergency Services Manager
Smith River Fire Protection District	Fire Chief-Notice
Community Development Department Del Norte County	Heidi Kunstal, Director
Big Rock CSD Board of Directors	Craig Bradford, President
BRCSD Attorney, BLACK & RICE LLP	Robert Black
County Counsel, Del Norte County	Elizabeth Cable, County Counsel
Community Emergency Response Teams (CERT)	Cindy Henderson, County of Del Norte Emergency Services Manager
Del Norte Interfaith Fellowship Council	Craig Bradford, Executive Secretary
Smith River Alliance	Grant D. Werschull, Executive Director
Josephine County Emergency Center, Merlin OR	Joe Stodola, Communications Coordinator Josephine County OR
California Governor's Office of Emergency Services (Cal OES)	Joe Petersen, Senior Emergency Services Coordinator
Caltrans	Karen Sanders, Caltrans Senior Engineer Del Norte County
Division of Drinking Water	Barry Sutter
California State Parks	David Boemer, Superintendent, Redwood Coast Sector; Connie Battles - Office Assistant
Hiouchi Café	Joy Parkes, Manager
Hiouchi Hamlet	Mike Finley, Owner/ Operator
Gas Station	Mike Finley, Owner/ Operator
Community Fellowship Church	Steve Perez, Pastor
Gasquet CSD	Mark Dodd, Gasquest CSD Board Chairman
City of Crescent City	Eric Weir, Public Works Director
Smith River CSD	Chris Vaughn, General Manager
BRCSD Residents	Notices for both sets of public meetings were mailed to all customers of the BRCSD
Del Norte Triplicate	Public Notice Posted in the Paper
Interest List from Public Meetings	Sent email link to Draft Plan
Local KPOD/ KCRE Radio Bil Coastal Media	Sent meeting public announcements for community broadcast

Planning Partner Expectations

PLANNING PARTNER EXPECTATIONS

ACHIEVING DMA COMPLIANCE FOR ALL PLANNING PARTNERS

One of the goals of Hiouchi's approach to hazard mitigation planning is to achieve compliance with the Disaster Mitigation Act (DMA). It is the intent for Hiouchi to eventually fold back into the Multi-jurisdictional Del Norte County Hazard Mitigation Plan. As part of Hiouchi's Local Hazard Mitigation Plan (LHMP) development, we are required to include plan stakeholders in the planning process and allow for participation in the plan development. Stakeholders include those affected by the plan, those who have facilities that may be affected by the plan, community members, and agencies that have development authority over Hiouchi. To achieve the best LHMP for Hiouchi and implement the easiest transition back into a Multi-jurisdictional Del Norte County Hazard Mitigation Plan, Hiouchi is inviting stakeholders to be part of the project planning team. The following items are included expectations for each planning partner:

- **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. 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 Hiouchi to identify policies or recommendations that complement the hazard mitigation initiatives selected.
- **Action Review.** Review of the strategies from the 2011 Multi-jurisdictional Crescent City/Del Norte County Hazard Mitigation 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 defining vulnerability based on a hazard's impact to Hiouchi. 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.

With the above participation requirements in mind, each partner is expected to aid this process by being prepared to provide input on the development 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” 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. 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 Planning Team.
- D. Participate in the process. There will be many opportunities as this plan evolves to participate. Opportunities such as:
 - a. Public meetings or open houses
 - b. Workshops/ Planning Partner specific training sessions
 - c. 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 meetings and events.

- E. Each partner will be expected to perform a “consistency review” of technical studies, plans, ordinances specific to hazards to determine the existence of any not consistent with the same such documents.

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.

Exhibit A
Example Letter of Intent to Participate

Hiouchi Hazard Mitigation Planning Team

C/O Rebecca Crow, GHD Inc.
718 Third Street
Eureka, CA 95501

Dear Hiouchi Hazard Mitigation Planning Team,

Please be advised that the _____ (*insert City or district name*) is committed to participating in the Hiouchi Local Hazard Mitigation Plan. As the Chief Administrative Official for this jurisdiction, I certify that I will commit 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

Name/ Title

Agency

Address

Phone number

E-mail address

Sincerely,

Exhibit B

Hiouchi LHMP Planning Team Contact information

Name	Representing	Address	Phone	e-mail
Craig Bradford	Big Rock CSD	P.O. Box 453 Crescent City, CA 95531	707-458-9933	craigbradford@gmail.com
Rebecca Crow	GHD Inc.	718 Third Street Eureka, CA 95501	707-443-8326	rebecca.crow@ghd.com
Dagan Short	GHD Inc.	718 Third Street Eureka, CA 95501	707-443-8326	Dagan.short@ghd.com

Exhibit C

Overview of HAZUS

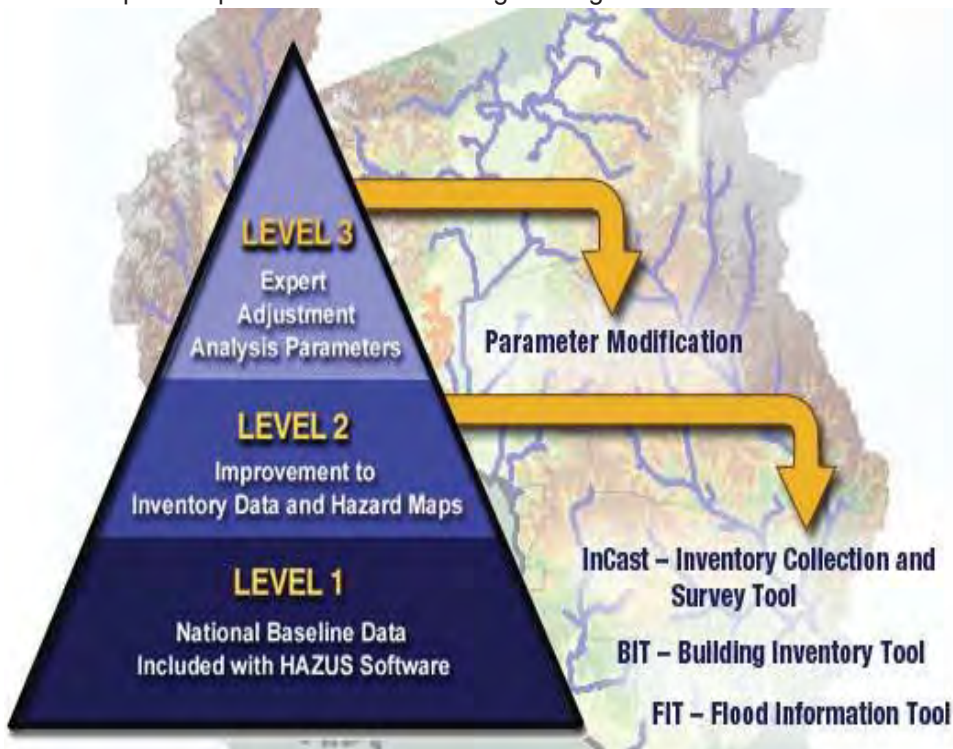
Overview of HAZUS-MH (Multi-Hazard)

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



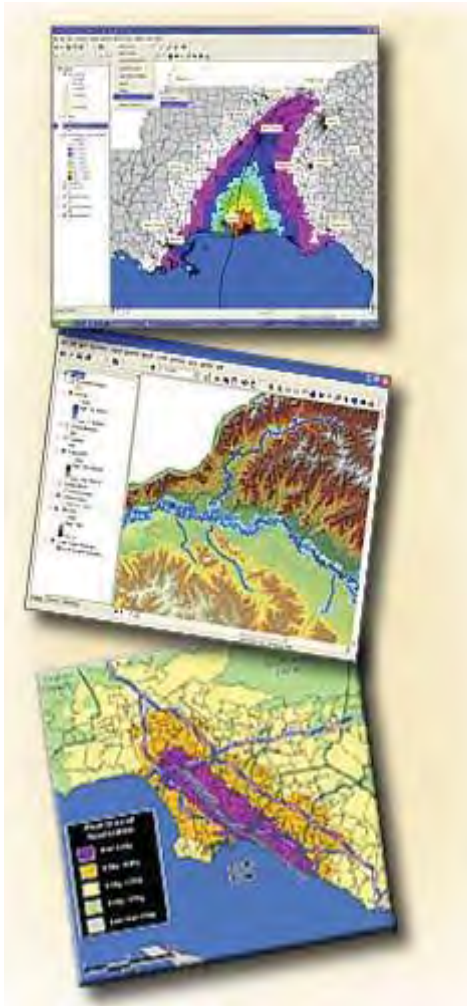
of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods, and earthquakes on populations. The latest release, HAZUS-MH MR1, is an updated version of HAZUS-MH that incorporates many new features which improve both the 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 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.

Initial Outreach Materials

- Public Meeting Announcement
- Proof of Publication in the local paper
- Presentation
- Sign in Sheets
- Meeting Photos

**BIG ROCK
COMMUNITY SERVICES DISTRICT**

P.O. Box 453
Crescent City, CA 95531
464-7769

April 20, 2017

**PUBLIC SERVICE ANNOUNCEMENT
Local Hazard Mitigation Plan**

The *Big Rock Community Services District* has taken steps with the *Federal Emergency Management Administration* (FEMA) and acquired a grant to publish a Local Hazard Mitigation Plan (LHMP) for the *Town of Hiouchi*. An LHMP identifies the hazards faced by a specific community, assesses vulnerability, and then focuses upon specific actions that can be taken to reduce the associated risks. Hazards can include wildfires, flooding, earthquakes, and any other situation that might adversely affect a population center. The Federal Disaster Mitigation Act of 2000 outlines procedures whereby cities and special districts can develop their own LHMPs. In many areas of the State, such actually can be a requirement for certain pre-and post-disaster funding by the *California Office of Emergency Services* and FEMA.

The first of two public outreach meetings with the *Big Rock CSD's* Hazard Mitigation Planning Committee will be held on **Friday, April 28th at 4:00 p.m.** in Hiouchi's new *Community Fellowship Church*. During this presentation the Committee will review the LHMP development process, discuss current risks and potential mitigation strategies, evaluate past disasters in the area and related emergency declarations, and gather sufficient input from the community to prepare the document for FEMA approval. The second public meeting will be held on **Thursday, May 11th at 6:00 p.m.** in Hiouchi's *Community Fellowship Church*.

All residents of Hiouchi, business owners, municipal officials, and interested parties from neighbouring communities are welcome to attend. Whether or not you are able to be present, please forward any ideas or concerns to Craig Bradford, the *Big Rock CSD's* Board President, at craigsbradford@gmail.com.

Preparation of this LHMP is funded by FEMA under contract with the *Big Rock Community Service District*, and has been designed as a collaborative planning process with the express goal of involving the entire community.

BIG ROCK COMMUNITY SERVICES DISTRICT

P.O. Box 453
Crescent City, CA 95531
464-7769

PUBLIC SERVICE ANNOUNCEMENT
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Preparation of this LHMP is funded by FEMA under contract with the *BIG Rock Community Service District*, and has been designed as a collaborative planning process with the express goal of involving the entire community.

Publish: April 25, 2017 Ad # 71155330

Ad shown is not actual print size



Hiouchi Local Hazard Mitigation Plan



PUBLIC OUTREACH

Public Input and Planning Partner Kick-Off Meeting

Craig Bradford| Big Rock CSD Board President
Rebecca Crow| GHD
Dagan Short| GHD

May 11, 2017

Today's Discussion

- Meeting Ground Rules
- The Planning Team
- The Disaster Mitigation Act
- FEMA requirements for Hazard Mitigation Plan (HMP) update
- Our work plan to complete the update
- Planning Partner expectations



The Planning Team

- Big Rock CSD awarded Hazard Mitigation Funds under Disaster Grant to fund this effort
 - 75% of this cost is federal, 25% is local
 - Local contribution will be "in-kind"
- GHD Inc. has been awarded the contract to facilitate this plan update process.
- The Planning Team Includes:
 - ✓ **Craig Bradford** District Project Manager
 - ✓ **Rebecca Crow**, GHD (Lead Project Planner)
 - ✓ **Dagan Short**, GHD (Risk Assessment/HAZUS lead)

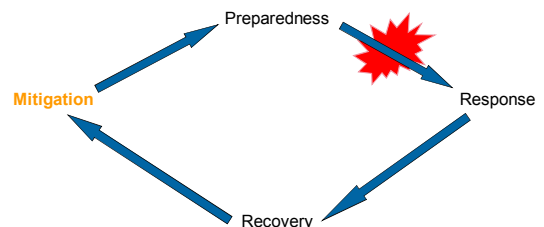


So why are you here?

- You live in Hiouchi
- You are an interested member of the public
- You all have been identified as a potential stakeholder in hazard mitigation
 - So what does it mean to be a stakeholder?
 - You can benefit by being a planning partner
 - Your facilities can benefit
 - Your constituents can benefit
 - Your agency has authority over development in Hiouchi



What is Mitigation?



"Sustained action taken to reduce or eliminate long-term risk to life and property" (Prevention)



What is the Disaster Mitigation Act (DMA)?

Federal legislation that establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP)



Provisions of the DMA

- Encourages and rewards local and state pre-disaster planning
- Promotes sustainability
- Seeks to strengthen statewide hazard mitigation through encouraging the integration of State and local planning
- Results in faster more efficient allocation of funding and more effective risk reduction projects



Benefits of Hazard Mitigation Plans

- Establish / maintain eligibility for grant funds
- Preparedness: pro-active vs. reactive
- Sustainability
- Key element in effective emergency management
- Can set the course for response and recovery to impacts from natural disasters
- Requires commitment and support from both the political faction and the Community of Hiouchi



Response to the DMA in Del Norte County and Hiouchi

- Initial HMP for Del Norte County was completed in 2009-2011
- Multi-jurisdictional effort provided DMA eligibility to 5 governing agencies within the Del Norte Operational Area.
- FEMA approved the plan on 2/16/2011
- The Plan officially expired on 2/16/2016
- Del Norte County Local Governments are not currently eligible for Disaster Mitigation Funds



LHMP Required

- Section 201.6 44CFR states that approved local HMP's must be updated at least every 5 years to remain eligible for Hazard Mitigation Grant Funding
- Effective plans are those that remain relevant, which requires them to be reviewed and enhanced regularly.
- Maintaining an established HMP creates opportunities to integrate with other planning processes, and plans of adjacent jurisdictions.
- Hiouchi must complete a Local Hazard Mitigation Plan by August 23, 2017 to retain funds for the Hillside Stabilization Project



Need for Single Jurisdiction Hazard Mitigation Plan

This planning approach provides the following benefits:

- Reduces effort to complete LHMP
- In compliance with Big Rock CSD's extraordinary circumstances 12-month extension for Disaster Mitigation Funds
- Allows Big Rock CSD's Hillside Stabilization Project to maintain grant funding from FEMA
- Allows for Big Rock to fold back into the larger Del Norte County multi-jurisdictional Hazard Mitigation Plan process at a later date

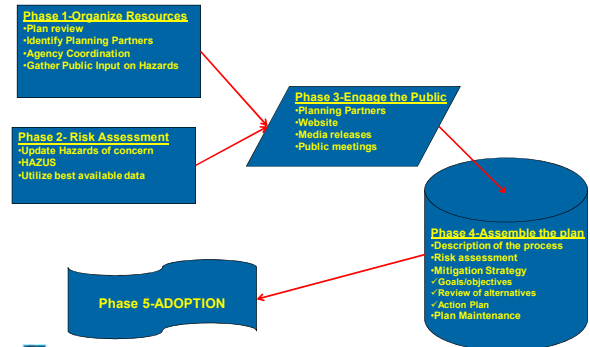


The Work Plan

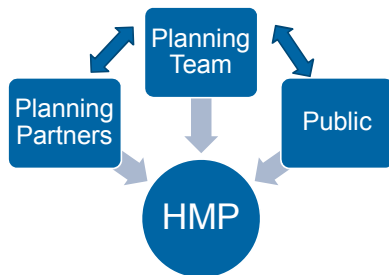
- Primary objectives:
 - Program compliance for Big Rock CSD
 - Support future grant applications within the planning area
 - Provide information that can be used in future Del Norte County Hazard Mitigation Planning
- Approach: Follow the steps prescribed by FEMA for Mitigation Planning
- Scope of work has five (5) principal phases.



Phases of Plan Development



Planning Participant Organization



LHMP Risk Assessment

What would happen if a natural disaster occurred in Hiouchi?

- Hazard identification—The systematic use of all available information to determine what types of disasters may affect a jurisdiction, how often these events can occur, and the potential severity of their consequences.
- Vulnerability identification—The process of determining the impact of these events on the people, property, environment, economy and lands of a region
- Estimation of the cost of damage or cost that can be avoided through mitigation.



LHMP Hazards

Primary Hazards

- Earthquake
- Flooding
- Wildland fire

Secondary Hazards

- Severe weather
- Landslides
- Tsunami



Planning Partner Identification

- Planning Partners
 - Stakeholders
 - Strive for multi-disciplinary representation
 - Local/ Regional Government Organizations
 - Residents
 - Emergency Management Teams (i.e. Neighbors Helping Neighbors)
 - Inform the Planning Team and provide your input
- Meet periodically based on need during plan development (estimated 3 meetings May, June, and July)



Planning Partner Expectations

If you would like to participate, submit a Letter of intent

Expectations

- Participate in process
- Support Planning Team
- Develop mitigation strategy
- Develop action plan

(Please Refer to Handout)



So What's Next?

- Risk Assessment (May/ June 2017)
 - Hazard Identification
 - Vulnerability Analysis
- Develop Mitigation Measures (June 2017)
- Develop LHMP (June/ July 2017)
- Public Meetings (July 2017)
- Submit Final LHMP to FEMA (August 23, 2017)



QUESTIONS



www.ghd.com



HIOUCHI Local Hazard Mitigation Plan

Public Meeting April 28, 2017 4:00 pm
Community Fellowship Church

Name	Email	would you like to get email updates on the Hazard Plan?
Rebecca Crow	rebecca.crow@ghd.com	Yes
RONALD STREETER	STreeter_94@yahoo.com	YES
MARSINAH MURAKAMI	marsinahmurakami@yahoo.com	YES
Sharon Bradford	deerbrick@hotmail.com	yes
Mike Raley	hiouchi2@gmail.com	Yes
MIKE & Kim WYLIE	mdwinca@juno.com	YES
STEVE PEREZ	Hofco@hofmaic.com	YES
HANK AKIN	joeakin@charter.net	YES
Roger Long	Hiouchi groups.com	YES
Craig Strong	cstrong0246@gmail.com	NO
Susan Ajimine	srajininedds@yahoo.com	Yes
DAGAN SHORT	dagan.short@ghd.com	Yes
Craig Bradford	craigbradford@gmail.com	Yes



HIIOUCHI LOCAL HAZARD MITIGATION PLAN

PUBLIC MEETING MAY 11, 2017 6:00 PM
COMMUNITY FELLOWSHIP CHURCH

NAME	EMAIL	WOULD YOU LIKE TO GET EMAIL UPDATES ON THE HAZARD PLAN?
------	-------	---

Ethan Kuykendall	Kuykendall167@gmail.com	yes
STEVE PEREZ	hefeca@hotmail.com	yes
Art Aten		no
Mike Finley	hiiouchi2c@msn.com	Yes
MIKE & Kim WYLIE	mdwinco@suno.com	YES
CHARLES SWENSON	CHARLESWENSON@CHARTER.NET	YES
Rebecca Crow	rebecca.crow@ghd.com	
Craig Bradford		
DAGAN SHURT	dagan.shurt@ghd.com	

Photos from the April 28 and May 11 Initial Public Outreach Meetings







Draft LHMP Outreach Materials

- Public Meeting Announcement
- Proof of Publication in the local paper
- Presentation
- Sign in Sheets
- Meeting Photos

BIG ROCK COMMUNITY SERVICES DISTRICT

P.O. Box 453
Crescent City, CA 95531
464-7769

Public Meeting Announcement July 7, 2017

Contact: Craig Bradford, Big Rock CSD Board President, 707-218-7560,
craigsbradford@gmail.com

PUBLIC INVITED TO PARTICIPATE IN DEVELOPMENT OF THE HIOUCHI LOCAL HAZARD MITIGATION PLAN

The *Big Rock Community Services District* (BRCS D) is in the process of developing a Local Hazard Mitigation Plan (LHMP) for the *Town of Hiouchi* under the guidance and with grant funding from the *Federal Emergency Management Agency* (FEMA). An LHMP identifies the hazards faced by a specific community, assesses vulnerability, and then focuses upon specific actions that can be taken to reduce the associated risks. Hazards include wildfires, flooding, earthquakes, and other natural disasters.

The Big Rock Community Services District led initial outreach meetings describing the LHMP planning process in April and May of 2017. The BRCS D is holding a second set of public meetings for the public and interested stakeholders over the next month to provide details on the hazards identified in the Hiouchi LHMP and proposed action to mitigate risks.

Two separate (duplicate) meetings will be held to provide the details on the LHMP development process and receive input from stakeholders and the public. The first public meeting will be held on **Thursday July 13th at 4:00 p.m.** at the *Hiouchi Community Fellowship Church*, 105 Sunkist Lane, Hiouchi, CA. The second meeting is set to take place on **Thursday July 27th at 6:00 p.m.** at the *Hiouchi Community Fellowship Church*, 105 Sunkist Lane, Hiouchi, CA.

All residents of Hiouchi, business owners, municipal officials, and interested parties from neighboring communities are invited and welcome to attend. Whether or not you are able to be present, please forward any ideas or concerns to Craig Bradford, the BRCS D's Board President, as craigsbradford@gmail.com.

Affidavit of Publication

STATE OF CALIFORNIA, COUNTY OF DEL NORTE

I, **Patricia E Miller**, a citizen of the United States and a resident of the county aforesaid; I am over the age of eighteen years, and not party to or interested in the above-entitled matter. I am the principal clerk of the printer of

The Triplicate

a daily newspaper of general circulation, printed and published in the City of Crescent City, County of Del Norte, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Del Norte, State of California, under the date of March 21, 1952, case number 7594; that the notice of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published and not in any supplement thereof on the following dates, to-wit:

Acct Name: BIG ROCK COMMUNITY SERVICE

Legal Description: BIG ROCK COMMUNITY SERVICES DISTRICT

P.O. Box 453

Crescent City, CA 95531

464-7769

04/25/2017

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Crescent City, California, this 28 day of April, 2017.

Patricia E Miller
Signature

AFFIDAVIT OF PUBLICATION

Filed _____

By _____

From the Office of _____

Attorney for _____

991

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BIG ROCK COMMUNITY SERVICES DISTRICT

P.O. Box 453
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Preparation of this LHMP is funded by FEMA under contract with the *BIG Rock Community Service District*, and has been designed as a collaborative planning process with the express goal of involving the entire community.

Publish: April 25, 2017 Ad # 71155330

Date: 4/21/17

Time: 4:43 PM

Ad ID: 71155330



Del Norte TRIPPLICATE

312 H Street, Crescent City, CA 95531
707-464-2141

Acct: 71311

Name: BIG ROCK COMMUNITY

Phone: 707-464-7769

Address: PO BOX 453

Receipt No:

E-Mail:

Client:

City: CRESCENT CITY

State: CA

Zip: 95531-

Ad Name: 71155330D

Reply Request:

Input Operator: PMILLERA

PO #

Start: Tuesday, April 25, 2017

Issues: 1

Stopdate: Tuesday, April 25, 2017

Classification: 991 - Public Notices

Rate: 7CSMLG

Pay Type: BL

Copy Line: BIG ROCK COMMUNITY

Rep: Miller, Patricia

Colors ☐ C ☐ M ☐ Y

Editions: TRIP/

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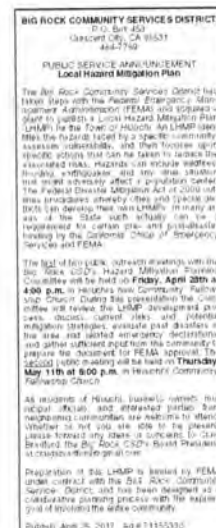
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Columns ...	2.0
Ad Price:	\$123.63
Other Charges:	2.5

Ad Total: \$126.13

Total Payments..... 0.00

Total Amount Due: \$126.13



Ad shown is not actual print size

We appreciate your business!



Hiouchi Local Hazard Mitigation Plan

The Planning Team

- Big Rock CSD awarded Hazard Mitigation Funds under Disaster Grant to fund this effort
 - 75% of this cost is federal, 25% is local
 - Local contribution will be "in-kind"
- GHD Inc. has been awarded the contract to facilitate this plan update process.
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 - ✓ **Craig Bradford** District Project Manager
 - ✓ **Rebecca Crow**, GHD (Lead Project Planner)
 - ✓ **Dagan Short**, GHD (Risk Assessment/HAZUS lead)



PUBLIC OUTREACH

Mitigation Strategy Public Input Meeting

Craig Bradford| Big Rock CSD Board President
Rebecca Crow| GHD
Dagan Short| GHD

July 27, 2017

So why are you here?

- You live in Hiouchi
- You are an interested member of the public
- You all have been identified as a potential stakeholder in hazard mitigation
 - So what does it mean to be a stakeholder?
 - You can benefit by being a planning partner
 - Your facilities can benefit
 - Your constituents can benefit
 - Your agency has authority over development in Hiouchi



Today's Discussion

- The Planning Team
- The Disaster Mitigation Act
- Planning Process
- Hazard Risk Assessment
- Mitigation Strategy Review and Input
- Individual Disaster Preparedness
- Next Steps



What is the Disaster Mitigation Act (DMA)?

Federal legislation that establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP).

The DMA:

- Encourages and rewards local and state pre-disaster planning
- Promotes sustainability
- Strengthens statewide hazard mitigation through encouraging the integration of State and local planning
- Provides for faster more efficient allocation of funding and more effective risk reduction projects



Why is a LHMP Required?

- Section 201.6 44CFR states that approved local HMP's must be updated at least every 5 years to remain eligible for Hazard Mitigation Grant Funding
- Effective plans are those that remain relevant, which requires them to be reviewed and enhanced regularly.
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- Hiouchi must complete a Local Hazard Mitigation Plan by August 23, 2017 to retain funds for the Hillside Stabilization Project



LHMP Risk Assessment

What would happen if a natural disaster occurred in Hiouchi?

- Hazard identification—The systematic use of all available information to determine what types of disasters may affect a jurisdiction, how often these events can occur, and the potential severity of their consequences.
- Vulnerability identification—The process of determining the impact of these events on the people, property, environment, economy and lands of a region



The Planning Process

District personnel applied for and received a FEMA planning grant (75% Federal)

- ✓ Established a Planning Team
- ✓ Reached out to stakeholders and potential planning partners
- ✓ Assessed Risk to 6 Hazards of Concern
- ✓ Engaged the Public
- ✓ Identified goals, objectives and actions
- ✓ Identified a plan maintenance strategy

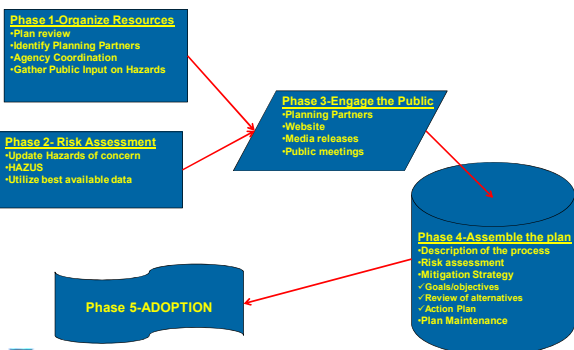


The Planning Area

The planning area for the effort encompasses the Service Boundary of the Big Rock Community Services District



Phases of Plan Development



LHMP Hazards

Primary Hazards

- Earthquake
- Flooding
- Wildland Fire

Secondary Hazards

- Severe Weather
- Landslides
- Hazardous Materials

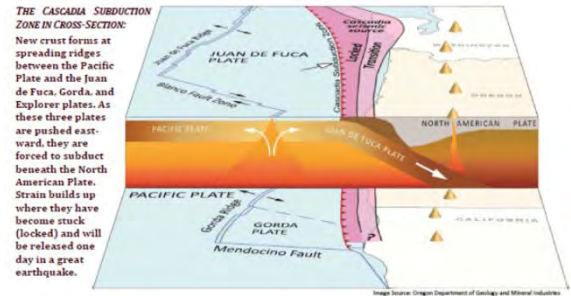


District Owned Critical Facilities

- 100,000 Gallon Redwood Water Storage Tank
- 50,000 Gallon Redwood Water Storage Tank
- Water Treatment Facility
- 4.2 Miles of Water Main (8, 6, and 4-inch pipelines)
- Transmission and distribution pipelines (6.9 miles of 2-inch lines)
- Water intake System
 - 2 Submersible 10 hp Single-phase Pumps
 - 3 Deeply Submersed Collection Galleries
 - Heavy Overhead Lift
- Main and Hillside Pump Houses



Earthquake Faults

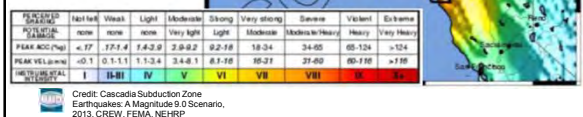


Hiouchi Critical Facilities

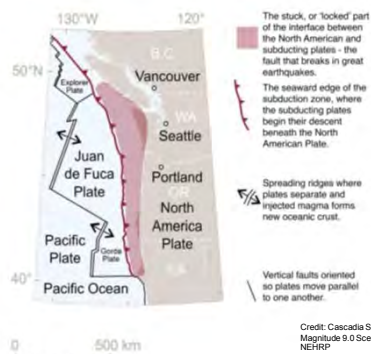
- Hiouchi Hamlet/ Chevron Station
- Highway 199
- Smith River Fire Protection District Fire Station No. 2



Earthquake Planning Scenario for 9.0 Magnitude Cascadia Event



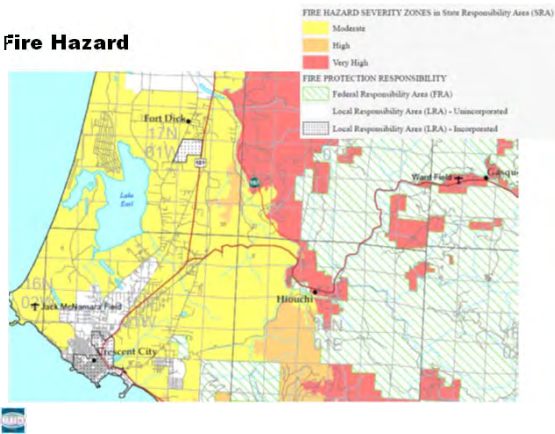
Earthquake Faults



Flood Hazard



Fire Hazard



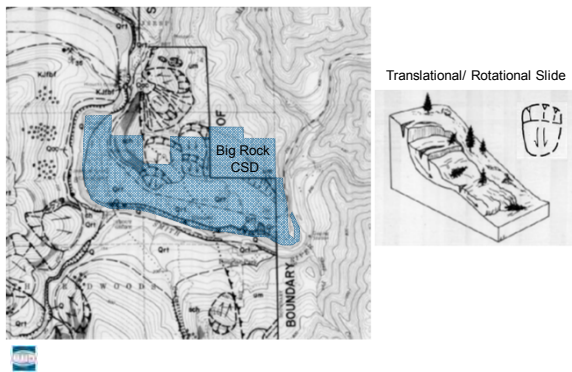
Hazardous Materials Hazard

A **hazardous material** is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors and can include:

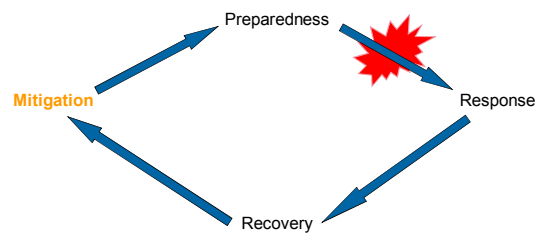
- Petroleum (gasoline, oil, etc)
- Cleaning solvents
- Pesticides, herbicides, and rodenticides
- Fertilizers
- Aerosols



Landslide Hazard



What is Mitigation?



"Sustained action taken to reduce or eliminate long-term risk to life and property" (Prevention)

Severe Weather Hazard

- Extreme temperature (hot or cold)
- Precipitation
- High wind



Hazard Mitigation Action Plan Draft Goals

- Goal 1: Minimize risk and vulnerability of Hiouchi and surrounding areas to the impacts of natural hazards and protect lives and reduce damages and losses to property, economy, public health and safety, and the environment.
- Goal 2: Provide protection for critical facilities, infrastructure, utilities and services from hazard impacts.
- Goal 3: Improve public awareness, education, and preparedness for all hazards.
- Goal 4: Increase communities' capabilities to mitigate losses and to be prepared for respond to, and recover from a disaster event.
- Goal 5: Maintain FEMA Eligibility/Position the communities for grant funding.

Currently Proposed Hazard Mitigation Actions

Mitigation Actions	Hazards Addressed
Replace the 100,000-gallon Redwood water storage tank with a bolted steel tank mounted on a granite shelf, and increase the working capacity to 200,000 gallons to accommodate water service to the community. Acquire ownership of 6.83 acres to secure facilities	All Hazards
Install a complete emergency communications system with 70-ft antenna tower and a 30 kW generator with propane field for emergency HF/VHF/UHF, and Simplex communications. The tower will include a microwave antenna to perform SCADA operations	All Hazards
Replace the 50,000-gallon Redwood water tank with a bolted steel tank mounted on ultramafic granite and increase total capacity to 100,000 gallons. Secure against threats of vandalism/terrorism	All Hazards
Improve road access to the District's assets and emplace flood and erosion barriers	All Hazards

Personal Emergency Preparedness – Survey Results

Have Stored or Stocked up On	Responses	Other Preparations	Responses
Food	3	Prepared a disaster supply kit	2
Water	2	Received First Aid/CPR training	4
Flashlight(s)	3	Made a fire escape plan	2
Batteries	3	Discussed utility shutoffs	2
Battery-powered radio	2	Smoke detector on each level of house	4
Medical supplies (First aid kit)	3	Developed a reconnection plan	1
Fire extinguisher	3		



Currently Proposed Hazard Mitigation Actions

Mitigation Actions	Hazards Addressed
Upgrade the existing SCADA system	All Hazards
Purchase a ¾-ton 4WD replacement vehicle for staff that is equipped with VHF/UHF radio	All Hazards
Purchase two satellite telephones with a 5-year service contract	Earthquake, Severe Weather
Replace all aged water mains, including resilient features, to reduce damage during hazard events	All Hazards
Support countywide initiatives identified in Del Norte County's MJHMP	All Hazards



Personal Emergency Preparedness Resources

How can I prepare myself and my family in case of an emergency?

1. Develop an Emergency Communication Plan
2. Create an Emergency Supply Kit
3. Become familiar with the Hazards in your community
4. Know your neighbors
5. Prepare!



Currently Proposed Hazard Mitigation Actions

Mitigation Actions	Hazards Addressed
Develop a Big Rock CSD Catastrophic Disaster Plan addressing prevention, protection, response, recovery, and mitigation	All Hazards
Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	All Hazards
Support Smith River Fire Protection District, Fire Station No. 2 with structural seismic upgrades and installation of emergency preparedness equipment	All Hazards



Emergency Communication Plan

Create an emergency communications plan and build an emergency kit to ensure you and your family are prepared for hazards.

Your family may not be together if a disaster strikes, so it is important to think about the following situations and plan just in case. Consider the following questions when making a plan:

- How will my family/household get emergency alerts and warnings?
- How will my family/household get to safe locations for relevant emergencies?
- How will my family/household get in touch if cell phone, internet, or landline doesn't work?
- How will I let loved ones know I am safe?
- How will family/household get to a meeting place after the emergency?



Emergency Supply Kit

Recommended Items to Include in a Basic Emergency Supply Kit:

- Water, one gallon of water per person per day for at least three days, for drinking and sanitation
- Food, at least a three-day supply of non-perishable food
- Battery-powered or hand crank radio and a NOAA Weather Radio with tone alert and extra batteries for both
- Flashlight and extra batteries
- First aid kit
- Whistle to signal for help
- Dust mask, to help filter contaminated air and plastic sheeting and duct tape to shelter-in-place
- Moist towelettes, garbage bags and plastic ties for personal sanitation
- Wrench or pliers to turn off utilities
- Can opener for food (if kit contains canned food) Local maps



Preparing for Wildfire Hazards

There are several simple steps that can be taken to prepare for wildfire hazards which include:

- Regularly clean the roof and gutters.
- Maintain an area approximately 30' away from your home that is free of anything that will burn, such as wood piles, dried leaves, newspapers and other brush.
- Connect garden hoses long enough to reach any area of the home and fill garbage cans, tubs, or other large containers with water.
- Review your homeowner's insurance policy and also prepare/update a list of your home's contents.
- Know evacuation routes
- Stay in communication



Become Familiar with the Hazards in Your Community

- Research and understand mitigation measures you can implement at home to address earthquakes, floods and wildfire.
- Link to emergency notification system to be aware of potential hazards



- Receive alerts from the National Weather Service for up to five locations.
- Get safety reminders, road tips to survive natural disasters, and customize your emergency checklist.
- Locate open shelters and where to take your pets in disaster (as per the plan).
- Upload and share your disaster plans to help first responders.



Preparing for Earthquakes

At a minimum, you should be prepared to be isolated and on your own for at least seven days and nights. There will likely be the loss of utilities after a disaster. It is possible the power will be out, water may be scarce, gas lines may break, phones and cell towers could become inoperable, roads might be impassable, etc. Your only source of news may well be the car radio, assuming your local radio station has a working generator. There might not be medical assistance for days. To begin preparing your home and family:

- Identify potential hazards in your home and begin to fix them.
- Create a disaster-preparedness plan.
- Identify your building's potential weaknesses and begin to fix them.
- Protect yourself during earthquake shaking.
- After the quake, check for injuries and damage.
- When safe, continue to follow your disaster-preparedness plan.



Preparing for Flood Hazards

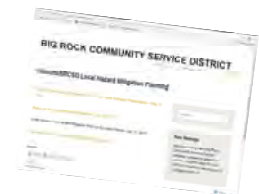
There are small flood proofing measures that you can take to help prevent, or minimize the impact of flooding to your home and its contents. A few examples include:

- Elevate your furnace, water heater and electric panel in your home, if you live in a high flood risk area.
- Install "check valves" to prevent flood water from backing up into the drains of your home.
- When practical, homeowners can construct barriers (such as sandbagging) to stop floodwater from entering your home.
- Seal walls in your basement with waterproofing compounds.



For More Information

Please visit the BRCSD Website at:
<http://www.bigrockcsd.org>



Community Resources Page Includes:

- Initial Outreach Meeting Presentation
- BRCSD Neighbors Helping Neighbors Policy
- Emergency Preparedness Resources
- Draft Local Hazard Mitigation Plan



So What's Next?

- Draft Plan available July 17 – August 16th for review
- Comments due to BRCSD by August 16th
- BRCSD considers public comments and adopts LHMP – August 17th
- Submit Final LHMP to FEMA by August 23, 2017



QUESTIONS



www.ghd.com



Big Rock Community Services District
Local Hazard Mitigation Plan
Public Meeting
July 27, 2017

Hiouchi Community Fellowship Hall

<u>Name</u>	<u>email</u>	<u>Hiouchi Resident?</u>
Rebecca Crow	rebecca.crow@ghd.com	NO
MIKE WYLIE	mdwinca@Juno.com	YES
Art Aten		yes
Alan Porteous	Alan_Porteous@MSN.COM	yes
CHARLIS SWINSON	1316 ROCK	
Sharon Blalock		YES
Carrie Crist	ccrist@cklorte.k12.ca	yes
Ricardo		Property owner for now
Gl King		YES
DAGAN SHORT	dagan.short@ghd.com	NO



Hiouchi Local Hazard Mitigation Plan
Mitigation Strategy Public Input / Outreach Meeting
July 12, 2017 4:00 pm
Hiouchi Community Fellowship Church

Name	Email	Receive Email updates	Hiouchi Resident (Y/N)
Rebecca Crow	rebecca.crow@ghd.com	✓	N
Dagan Short	dagan.short@ghd.com	✓	N
CHARLES SWENSON	CHARLESWENSON@CHARTER	✓	Y
Steve Perez	Hcfcc@hotmail.com	✓	Y (Church Pastor)
Craig Bradford	craigbradford@gmail.com	✓	Y

Photos from the July 13 and July 27, 2017
Draft LHMP Public Outreach Meetings







Interested Parties List

Interested Parties List

Hiouchi LHMP

<u>First</u>	<u>Last</u>	<u>Email</u>
Ronald	Streeter	streeter_94@yahoo.com
Marsinah	Murakami	marsinahmurakami@yahoo.com
Sharon	Bradford	deerbrick@hotmail.com
Mike	Finley	hiouchi2@msn.com
Mike & Kim	Wylie	mdwinca@juno.com
Steve	Perez	hcfcc@hotmail.com
Hank	Akin	joeakin@charter.net
Roger	Long	hiouchigramps@msn.com
Susan	Ajimine	skajiminedds@yahoo.com
Ethan	KuyKendall	KuyKendall67@gmail.com
Charles	Swenson	charleswenson@charter.net

Appendix B

Hazard Questionnaire and Results

Appendix B Hazard Questionnaire and Results

Hazard Questionnaire Results

Hazard Questionnaire

Appendix B Hiouchi Local Hazard Mitigation Plan Questionnaire Results

The Hiouchi Local Hazard Mitigation Plan questionnaire was distributed at both initial public outreach meetings on April 28, 2017 and May 11, 2017 and made available at the local grocery/convenience store. (Any mailed out separately?). The results are presented below.

NATURAL HAZARD INFORMATION

1. Please indicate where you live in Del Norte County:

Hiouchi: 4 of 6 respondents

Crescent City: 2 of 6 respondents

2. Do you work in Hiouchi

Yes: 2 of 6 respondents

No: 4 of 6 respondents

3. In the past 10 years have you or has someone in your household experienced a natural disaster within Del Norte County such as: earthquake, flood, landslide, severe windstorm, wildfire, or other natural disaster?

Yes: 3 of 6 respondents

No: 3 of 6 respondents

a) If yes to question #3, which of the following types of natural hazard events have you or someone in your household experienced? (Please check all that apply) If you answered no to question #3, please move on to question #4.

- Flood – 1 respondent
- Earthquake – 2 respondents
- Wildfire – 2 respondent
- Fish losses (loss of income or subsistence) – 1 respondent
- Tsunami – 1 respondent
- Severe Weather – 1 respondent
- Other (please specify) – 1 respondent
 - Spills of various chemical/ paint into the River from Truck traffic/ Wrecks on Hwy 199.

b) If yes to question #3, did you or someone in your household sustain any personal injury or property damage from experiencing the natural disaster identified above? Please explain:

Only one respondent claimed damage for roof replacement.

4. How concerned are you personally about the following natural hazards impacting your community and/or the greater Del Norte County area. Number of responses per category are included in the table below, not all respondents rated each hazard.

Natural Hazard	Not Concerned	Somewhat Concerned	Concerned	Very concerned	Extremely Concerned
Drought	2	1	2		
Flood		1	3	2	
Landslide	1	1	3		
Wildfire			2	2	2
Tsunami		1	2	2	1
Earthquake		1	1	2	1
Dam or Levee Failure	3	1	1		
Severe Weather (Wind, Lightening, Winter Storm)		3		2	
Fish Losses	2	2	1		
Other Please Specify: _____	One respondent was extremely concerned about being cut off from supplies, Another respondent was extremely concerned about chemical spills into the River and contamination of the water supply.				

5. Do you consider yourself prepared for the probable impacts from natural hazard events that may occur within your community and/or the greater Del Norte County area?

Yes: 2 out of 6 respondents (includes one hand written response – somewhat prepared)

No: 4 out of 6 respondents

- a) If yes to question #5, where did you learn about being prepared for a disaster? (Please check all that apply) If you answered no to question #5, please move on to question #5.b)

- Emergency preparedness information from a government source – 2 respondents
- Personal experience. Have experienced one or more natural hazard events – 2 respondents
- Locally provided news or other media information – 1 respondent
- Schools and other educational institutions – 1 respondent
- Meetings or trainings offered by volunteer organizations – 2 respondents
- Other (please specify): None listed by respondents

- b) Please rank how prepared you feel you and your household are for the probable impacts of natural hazard events likely to occur within Del Norte County. Rank on a scale of 1 to 5, with 5 representing the most prepared.

Not at all Prepared	Somewhat Prepared	Adequately Prepared	Well Prepared	Very Well Prepared
	6			

- c) What steps, if any, have you or someone in your household taken to prepare for a natural disaster? (Check all that apply)

Have Stored or Stocked up On	Responses
Food	3
Water	2
Flashlight(s)	3
Batteries	3
Battery-powered radio	2
Medical supplies (First aid kit)	3
Fire extinguisher	3

Other Preparations	Responses
Prepared a disaster supply kit	2
Received First Aid/CPR training	4
Made a fire escape plan	2
Discussed utility shutoffs	2
Smoke detector on each level of house	4
Developed a reconnection plan	1

6. Information on the impacts of and how to prepare for a natural disaster can be disseminated to the public in various ways. Of the methods described below, which would be most effective in helping you make your home safer and better able to withstand the impact of natural hazard events?

(Please rank 1-5, 1 being “most effective”, 5 being “least effective”). If no ranking was provided by respondents only a check mark, the rating was assigned a value of 3.

Media	Respondent Rankings					
Newspaper	4			1	4	3
Informational Brochures				2	2	
Public Meetings		3	3	5	4	3
Workshops	2	3	3	5	2	
Radio News	3	3		2	5	3
Radio Ads				1	2	
Television				4	5	
Television News				1	2	
Public Awareness timeframe			3	3		
Outdoor Advertisements				2		
Internet		3		3		
Academic Institutions				3		
Fire Department/Rescue	3			5		
Church	3			2		
Chamber of Commerce				1		
Public Library				5		
Books				2		
Schools	3			5		

- a) To the best of your knowledge, is your property located in a designated floodplain?

Yes: 0 of 6 respondents

No: 4 of 6 respondents

Not sure: 2 of 6 respondents

- b) To the best of your knowledge, is your property located in close proximity (< 1 mile) to an earthquake fault line?

Yes: 1 of 6 respondents

No: 2 of 6 respondents

Not sure: 3 of 6 respondents

7. Do you have flood insurance?

Yes: 0 of 6 respondents

No: 6 of 6 respondents

8. Do you have earthquake insurance?

Yes: 1 of 6 respondents

No: 5 of 6 respondents

9. How aware do you feel you are about the possible consequences of the Cascadia earthquake event? Rank on a scale of 1 to 5, with 5 representing the most prepared.

Not at all Aware	Somewhat Aware	Adequately Aware	Well Aware	Very Well Aware
1	2	1	2	

NATURAL HAZARD MITIGATION

10. Did you consider the impact that the possible occurrence of a natural disaster would have on your home before you purchased/moved in to your home?

Yes: 0 of 6 respondents

No: 6 of 6 respondents

11. Was the presence of a natural hazard risk zone (i.e. flood zone, urban wild land interface) disclosed to you by a Real Estate Agent, Seller or landlord before you purchased/moved into your home?

Yes: 1 of 6 respondents

No: 5 of 6 respondents

12. Would the disclosure of this type of information influence your decision to purchase/move into a home?

Yes: 3 of 6 respondents

No: 3 of 6 respondents

13. Would you be willing to spend money on your current home to retrofit it from the impacts of future possible natural disasters within Hiouchi? (Examples of retrofitting are: Elevating a flood prone home, bolting a foundation for seismic impacts, or replacing a combustible roof covering with non-combustible roofing).

Yes: 4 of 6 respondents

No: 0 of 6 respondents

Maybe: 1 of 6 respondents

14. How much money would you be willing to spend to better protect your home and family from the impacts of natural disasters?
- \$5,000 or above: 1 of 6 respondents
 - \$2,500 to \$4,999: 2 of 6 respondents
 - \$100 to \$499: 1 of 6 respondents
 - Don't know: 1 of 6 respondents
 - Other – one responded indicated money spent as needed and as can be afforded.
15. Which of the following incentives would help to encourage you to spend money to retrofit your home from the possible impacts of natural disasters (Please check all that apply)
- Building permit fee waiver: 1 respondent
 - Insurance premium discount: 3 respondents
 - Mortgage discount: 1 respondent
 - Property tax break or incentive: 2 respondents
 - Low interest rate loan: 3 respondents
 - Grant funding that requires a "cost-share": 1 respondent
 - None: 2 respondents
16. If your property were located in a designated "high hazard" area, or had received repetitive damages from a natural hazard event, would you consider a "buyout" or relocation offered by a public agency?
- Yes: 3 of 6 respondents
No: 1 of 6 respondents
Not Sure: 2 of 6 respondents

GENERAL HOUSEHOLD INFORMATION

The following information will aid the Planning Team in determining the hazard mitigation needs of Hiouchi by providing important demographic information that can be used to quantify answers provided in this questionnaire. The answers provided in this section will be treated as confidential and will be used solely for the preparation of this plan and will not be provided to any other group or interest. All answers in this section are optional.

17. Please indicate your age range:
- 18 to 29: 0 respondents
 - 30 to 39: 0 respondents
 - 40 to 49: 1 respondents
 - 50 to 59: 0 respondents
 - 60 or over: 5 respondents

18. 18) Gender:

Male: 4 of 6 respondents

Female: 2 of 6 respondents

19. Please indicate your highest level of education:

Some College/Trade School: 5 of out 6 respondents

Other: 1 out of 6 respondents (DDS, MPH)

20. How long have you lived in Del Norte County?

10 to 19 years: 1 out of 6 respondents

20 years or more: 5 out of 6 respondents

21. Do you have access to the Internet or "World Wide Web"?

Yes: 5 out of 6 respondents

No: 1 out of 6 respondents

22. Other Comments:

"I want to study ham radio and be a part of the community protection and safety"

"We need fast/ accurate communications between CalTrans, CHP, County, and BRCSD"

5) Do you consider yourself prepared for the probable impacts from natural hazard events that may occur within your community and/or the greater Del Norte County area?

☐ Yes ☐ No

5.a) If yes to question #5, where did you learn about being prepared for a disaster? *(Please check all that apply)*
(If you answered no to question #5, please move on to question #5.b)

☐ Emergency preparedness information from a government source

(e.g., federal, state, or local emergency management)

☐ Personal experience. Have experienced one or more natural hazard events.

☐ Locally provided news or other media information

☐ Schools and other educational institutions

☐ Meetings or trainings offered by volunteer organizations (Red Cross, etc.)

☐ Other (please specify): _____

5.b) Please rank how prepared you feel you and your household are for the probable impacts of natural hazard events likely to occur within Del Norte County. Rank on a scale of 1 to 5, with 5 representing the most prepared.

☐ 1 Not at all prepared ☐ 2 Somewhat prepared ☐ 3 Adequately prepared ☐ 4 Well prepared ☐ 5 Very Well prepared

5.c) What steps, if any, have you or someone in your household taken to prepare for a natural disaster?
(Check all that apply)

Have stored or stocked up on:

☐ Food

☐ Water

☐ Flashlight(s)

☐ Batteries

☐ Battery-powered radio

☐ Medical supplies (First aid kit)

☐ Fire extinguisher

☐ Prepared a disaster supply kit

☐ Received First Aid/CPR training

☐ Discussed utility shutoffs

☐ Made a fire escape plan

☐ Smoke detector on each level of the house

☐ Developed a reconnection plan (Where to go/ who to call)

☐ Other (please explain): _____

6) Information on the impacts of and how to prepare for a natural disaster can be disseminated to the public in various ways. Of the methods described below, which would be most effective in helping you make your home safer and better able to withstand the impact of natural hazard events?

(Please rank 1-5, 1 being “most effective”, 5 being “least effective”).

Printed Media

___ Newspaper

___ Informational Brochures

Public Forums

___ Public Meetings

___ Workshops

Radio

___ Radio News

___ Radio Ads

Television

___ TV News

___ TV Ads

Other Methods

___ Public Awareness timeframe (i.e. Flood awareness week, Winter storm preparedness month)

___ Outdoor Advertisements

___ Internet

___ Academic Institutions

___ Fire Department/Rescue

___ Church

___ Chamber of Commerce

___ Public Library

___ Books

___ Schools

___ Other (please Specify): _____

6a.) To the best of your knowledge, is your property located in a designated floodplain?

☐ Yes

☐ No

☐ Not sure

6b.) To the best of your knowledge, is your property located in close proximity (< 1 mile) to an earthquake fault line?

☐ Yes

☐ No

☐ Not sure

7) Do you have flood insurance?

☐ Yes ☐ No

8) Do you have earthquake insurance?

☐ Yes ☐ No

9) How aware do you feel you are about the possible consequences of the Cascadia earthquake event? Rank on a scale of 1 to 5, with 5 representing the most prepared.

☐ 1 Not at all aware ☐ 2 Somewhat aware ☐ 3 Adequately aware ☐ 4 Well aware ☐ 5 Very Well aware

NATURAL HAZARD MITIGATION

The term mitigation means to make something become less harsh or severe; to alleviate. Mitigation activities are those types of actions you can take to protect your home and property from natural hazard events such as floods, fires and earthquakes.

The purpose of the Hiouchi Local Hazard Mitigation Plan is to create mitigation strategies for multiple hazards that will aid Hiouchi’s agencies and the community in protecting life and property from the impacts of future natural disasters. The following section will attempt to determine the level of knowledge Hiouchi citizens have about their options to protect their property from natural disasters.

10) Did you consider the impact that the possible occurrence of a natural disaster would have on your home before you purchased/moved in to your home?

☐ Yes

☐ No

11) Was the presence of a natural hazard risk zone (i.e. flood zone, urban wild land interface) disclosed to you by a Real Estate Agent, Seller or landlord before you purchased/moved into your home?

☐ Yes

☐ No

12) Would the disclosure of this type of information influence your decision to purchase/move into a home?

☐ Yes

☐ No

13) Would you be willing to spend money on your current home to retrofit it from the impacts of future possible natural disasters within Hiouchi? *(Examples of retrofitting are: Elevating a flood prone home, bolting a foundation for seismic impacts, or replacing a combustible roof covering with non-combustible roofing).*

☐ Yes

☐ No

☐ Maybe *(If you answered no, please skip to question #14)*

14) How much money would you be willing to spend to better protect your home and family from the impacts of natural disasters?

☐ \$5,000 or above

☐ Less than \$100

☐ \$2,500 to \$4,999

☐ Nothing

☐ \$1,000 to \$2,499

☐ Don’t know

☐ \$500 to \$999

☐ Other *(Please specify)*

☐ \$100 to \$499

15) Which of the following incentives would help to encourage you to spend money to retrofit your home from the possible impacts of natural disasters *(Please check all that apply)*

☐ Building permit fee waiver

☐ Insurance premium discount

☐ Mortgage discount

☐ Property tax break or incentive

☐ Low interest rate loan

☐ Grant funding that requires a “cost-share”

☐ None

☐ Other (please specify) _____

16) If your property were located in a designated “high hazard” area, or had received repetitive damages from a natural hazard event, would you consider a “buyout” or relocation offered by a public agency?

☐ Yes

☐ No

GENERAL HOUSEHOLD INFORMATION

The following information will aid the Planning Team in determining the hazard mitigation needs of Hiouchi by providing important demographic information that can be used to quantify answers provided in this questionnaire. The answers provided in this section will be treated as confidential and will be used solely for the preparation of this plan and will not be provided to any other group or interest. All answers in this section are optional.

17) Please indicate your age range:

- ☐ 18 to 29
- ☐ 50 to 59
- ☐ 30 to 39
- ☐ 60 or over
- ☐ 40 to 49

18) Gender:

- ☐ Male
- ☐ Female

19) Please indicate your highest level of education:

- ☐ Grade school/no schooling
- ☐ College Degree
- ☐ Some High School
- ☐ Post Graduate degree
- ☐ High School Graduate/GED
- ☐ Other _____
- ☐ Some College/Trade School

20) How long have you lived in Del Norte County?

- ☐ Less than 1 year
- ☐ 10 to 19 years
- ☐ 1 to 4 years
- ☐ 20 years or more
- ☐ 5 to 9 years

21.) Do you have access to the Internet or “World Wide Web”?

- ☐ Yes
- ☐ No

21.) Other Comments:

NOTE: If someone has not arranged to receive this from you, please mail this to:
Big Rock Community Services District
P.O. Box 453,
Crescent City, CA 95531

Thank you for your time and effort in completing this questionnaire. Your input to this important process is invaluable, and will help direct future disaster planning in our community.

Please complete and return as soon as possible, but no later than May 26, 2017

Hiouchi Local Hazard Mitigation Plan Questionnaire

The Big Rock Community Services District is working to develop a Local Hazard Mitigation Plan for the community of Hiouchi. 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 21 questions plus an opportunity for any additional comments at the end. The survey should take less than 5 minutes to complete and is anonymous.

The Big Rock Community Services District serving Hiouchi thanks you for taking the time to participate in this information gathering process.

Please complete and return as soon as possible, but no later than May 26, 2017

NOTE: If someone has not arranged to receive this from you, please mail this to:
Big Rock Community Services District, P.O. Box 453, Crescent City, CA 95531

NATURAL HAZARD INFORMATION

1) Please indicate where you live in Del Norte County:

- ☐ Hiouchi
- ☐ Klamath
- ☐ Crescent City
- ☐ Gasquet
- ☐ Smith River
- ☐ Other Unincorporated Area (Please Specify:_____)

2) Do you work in Hiouchi

- ☐ Yes
- ☐ No

3) In the past 10 years have you or has someone in your household experienced a natural disaster within Del Norte County such as: earthquake, flood, landslide, severe windstorm, wildfire, or other natural disaster?

- ☐ Yes
- ☐ No

3.a) If yes to question #3, which of the following types of natural hazard events have you or someone in your household experienced? (Please check all that apply) If you answered no to question #3, please move on to question #4.

- ☐ Flood
- ☐ Landslide
- ☐ Earthquake
- ☐ Wildfire
- ☐ Fish losses (loss of income or subsistence)
- ☐ Tsunami
- ☐ Severe Weather
- ☐ Other (please specify)_____

3.b) If yes to question #3, did you or someone in your household sustain any personal injury or property damage from experiencing the natural disaster identified above?

Please explain: _____

4) How concerned are you personally about the following natural hazards impacting your community and/or the greater Del Norte County area. (Please check the corresponding number for each hazard).

Natural Hazard	Not Concerned	Somewhat Concerned	Concerned	Very concerned	Extremely Concerned
Drought	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Flood	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Landslide	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Wildfire	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Tsunami	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Earthquake	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Dam or Levee Failure	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Severe Weather (Wind, Lightning, Winter Storm)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Fish Losses	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Other Please Specify:	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Appendix C

HAZUS Model Output Results

Hazus-MH: Earthquake Global Risk Report

Region Name	BRCSD
Earthquake Scenario:	Cascadia M9.0
Print Date:	August 21, 2017

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory,

Table of Contents

Section	Page #
General Description of the Region	3
Building and Lifeline Inventory	4
Building Inventory	
Critical Facility Inventory	
Transportation and Utility Lifeline Inventory	
Earthquake Scenario Parameters	6
Direct Earthquake Damage	7
Buildings Damage	
Critical Facilities Damage	
Transportation and Utility Lifeline Damage	
Induced Earthquake Damage	11
Debris Generation	
Social Impact	12
Shelter Requirements	
Casualties	
Economic Loss	13
Building Losses	
Transportation and Utility Lifeline Losses	
Appendix A: County Listing for the Region	
Appendix B: Regional Population and Building Value Data	

General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 805.83 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 3,655 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 2 thousand buildings in the region with a total building replacement value (excluding contents) of 334 (millions of dollars). Approximately 93.00 % of the buildings (and 81.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 481 and 1,006 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2 thousand buildings in the region which have an aggregate total replacement value of 334 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 60% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 0 schools, 1 fire stations, 0 police stations and 3 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 0 dams identified within the inventory. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 0 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 1,487.00 (millions of dollars). This inventory includes over 131 kilometers of highways, 15 bridges, 310 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

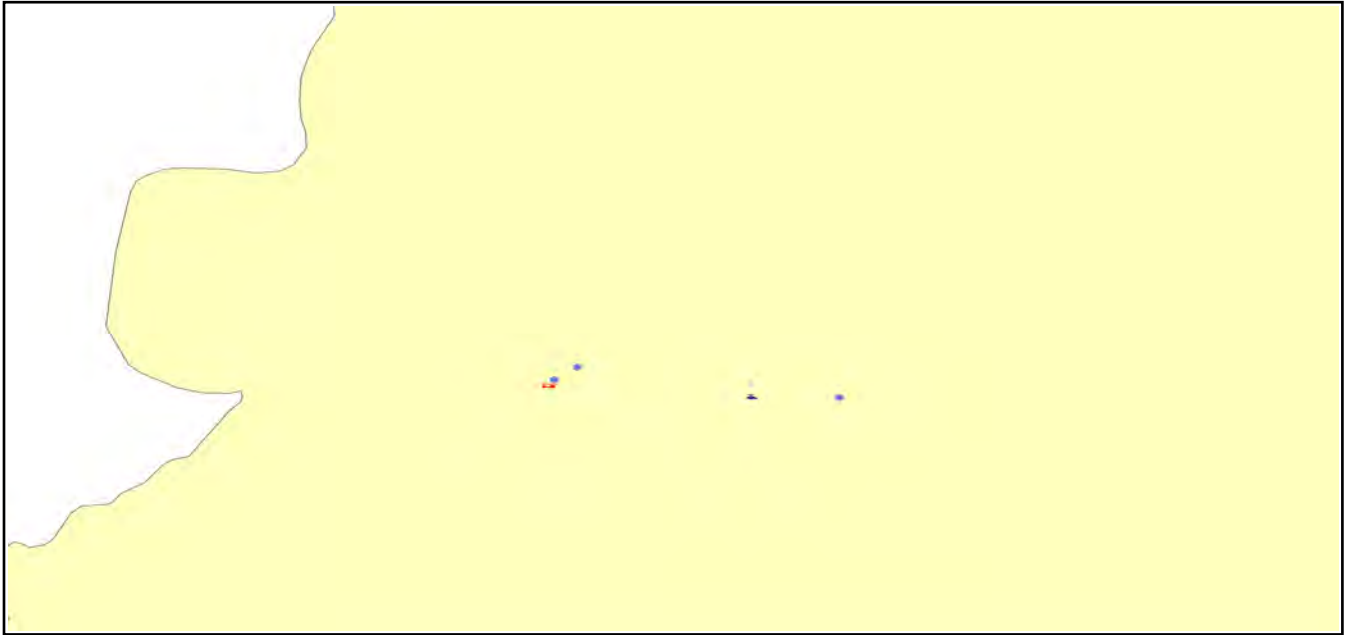
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	15	34.00
	Segments	7	439.80
	Tunnels	1	7.70
	Subtotal		481.40
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		0.00
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		0.00
Bus	Facilities	0	0.00
	Subtotal		0.00
Ferry	Facilities	0	0.00
	Subtotal		0.00
Port	Facilities	0	0.00
	Subtotal		0.00
Airport	Facilities	0	0.00
	Runways	0	0.00
	Subtotal		0.00
Total			481.40

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	3.10
	Facilities	1	750.00
	Pipelines	0	0.00
	Subtotal		753.10
Waste Water	Distribution Lines	NA	1.90
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		1.90
Natural Gas	Distribution Lines	NA	1.20
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		1.20
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		0.00
Electrical Power	Facilities	0	0.00
	Subtotal		0.00
Communication	Facilities	1	250.00
	Subtotal		250.00
	Total		1,006.20

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Cascadia M9.0
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	9.00
Depth (km)	30.00
Rupture Length (Km)	645.65
Rupture Orientation (degrees)	0.00
Attenuation Function	Cascadia - Subduction / Interface (2008)

Building Damage

Building Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage categories by General Occupancy Type

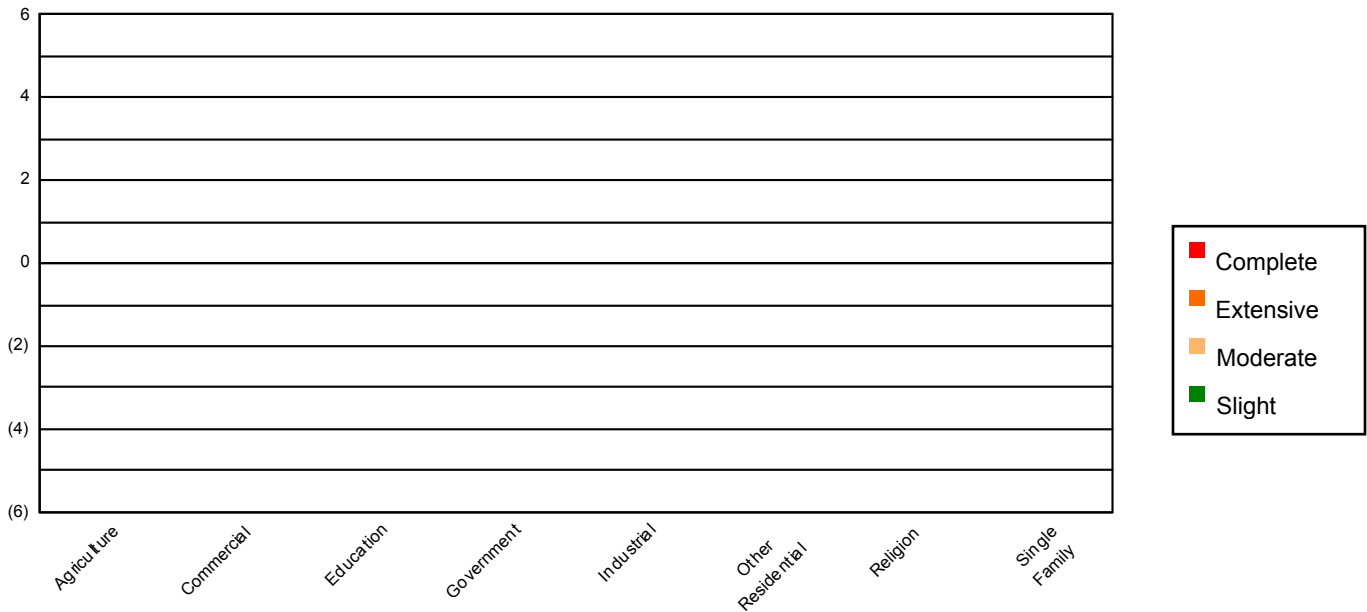


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	16	0.80	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	80	4.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	4	0.20	0	0.00	0	0.00	0	0.00	0	0.00
Government	7	0.35	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	18	0.90	0	0.00	0	0.00	0	0.00	0	0.00
Other Residential	713	35.63	0	0.00	0	0.00	0	0.00	0	0.00
Religion	11	0.55	0	0.00	0	0.00	0	0.00	0	0.00
Single Family	1,152	57.57	0	0.00	0	0.00	0	0.00	0	0.00
Total	2,001		0		0		0		0	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1,191	59.54	0	0.00	0	0.00	0	0.00	0	0.00
Steel	30	1.50	0	0.00	0	0.00	0	0.00	0	0.00
Concrete	25	1.23	0	0.00	0	0.00	0	0.00	0	0.00
Precast	18	0.90	0	0.00	0	0.00	0	0.00	0	0.00
RM	40	2.02	0	0.00	0	0.00	0	0.00	0	0.00
URM	8	0.39	0	0.00	0	0.00	0	0.00	0	0.00
MH	689	34.42	0	0.00	0	0.00	0	0.00	0	0.00
Total	2,001		0		0		0		0	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	0	0	0	0
EOCs	3	0	0	3
PoliceStations	0	0	0	0
FireStations	1	0	0	1

Transportation Lifeline Damage

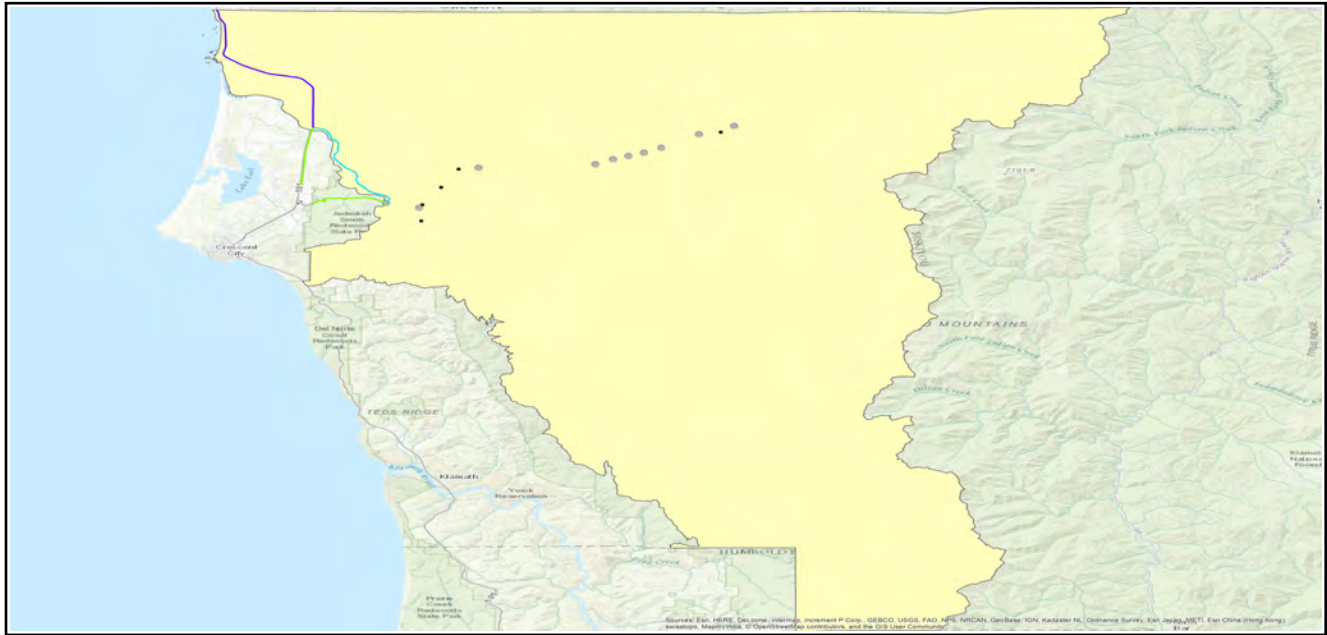


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	7	0	0	7	7
	Bridges	15	0	0	15	15
	Tunnels	1	0	0	1	1
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	1	0	0	1	1
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	1	0	0	1	1

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	155	0	0
Waste Water	93	0	0
Natural Gas	62	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

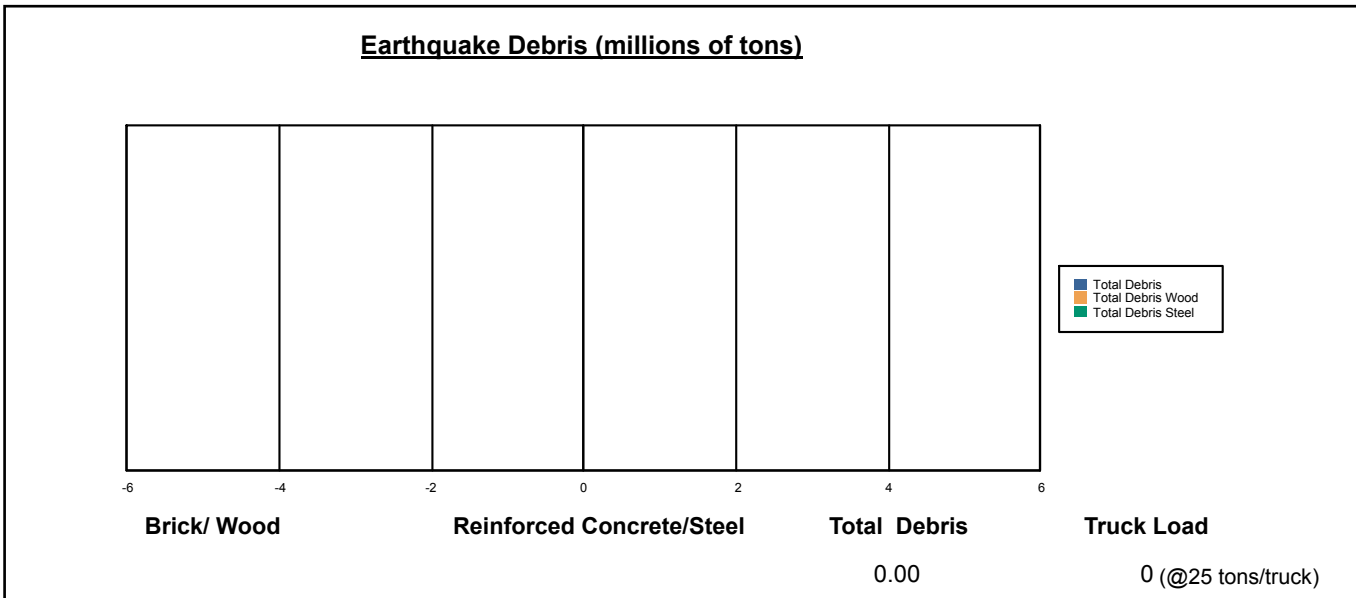
	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	1,564	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 0.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.



Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 3,655) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced
households as a
result of the

0

Persons seeking
temporary public
shelter

0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

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

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	0	0	0	0
2 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	0	0	0	0
5 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	0	0	0	0

Economic Loss

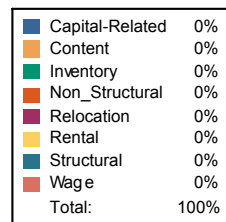
The total economic loss estimated for the earthquake is 0.00 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of

The total building-related losses were 0.00 (millions of dollars); 0 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 0 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type (\$ millions)



Earthquake Losses by Occupancy Type (\$ millions)

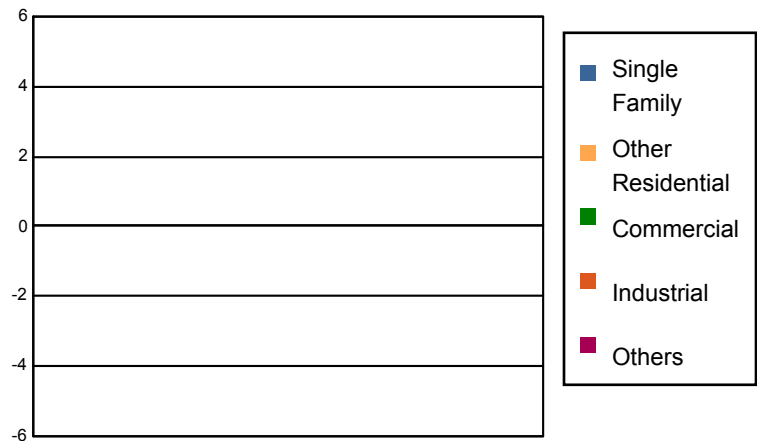


Table 11: Building-Related Economic Loss Estimates
(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.00	0.00	0.00	0.00	0.00
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00
Capital Stock Losses							
	Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Non_Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00
	Total	0.00	0.00	0.00	0.00	0.00	0.00

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	439.76	\$0.00	0.00
	Bridges	33.99	\$0.00	0.00
	Tunnels	7.69	\$0.00	0.00
	Subtotal	481	0.00	
Railways	Segments	0.00	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	0	0.00	
Light Rail	Segments	0.00	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	0	0.00	
Bus	Facilities	0.00	\$0.00	0.00
	Subtotal	0	0.00	
Ferry	Facilities	0.00	\$0.00	0.00
	Subtotal	0	0.00	
Port	Facilities	0.00	\$0.00	0.00
	Subtotal	0	0.00	
Airport	Facilities	0.00	\$0.00	0.00
	Runways	0.00	\$0.00	0.00
	Subtotal	0	0.00	
	Total	481.40	0.00	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	\$0.00	0.00
	Facilities	750.00	\$0.00	0.00
	Distribution Lines	3.10	\$0.00	0.00
	Subtotal	753.10	\$0.00	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	1.90	\$0.00	0.00
	Subtotal	1.86	\$0.00	
Natural Gas	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	1.20	\$0.00	0.00
	Subtotal	1.24	\$0.00	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Electrical Power	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Communication	Facilities	250.00	\$0.00	0.00
	Subtotal	250.00	\$0.00	
	Total	1,006.20	\$0.00	

Appendix A: County Listing for the Region

Del Norte, CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California	Del Norte	3,655	270	64	334
Total State		3,655	270	64	334
Total Region		3,655	270	64	334

Appendix D

Big Rock CSD LHMP Adoption Resolution

**BIG ROCK
COMMUNITY SERVICES DISTRICT**

P.O. Box 453
Crescent City, CA 95531
(707) 464-7769

AUTHORIZING RESOLUTION

RESOLUTION NO: 2017-3

WHEREAS the *Big Rock Community Services District* prepared a Local Hazard Mitigation Plan (LHMP) for the community of Hiouchi pursuant to identifying and mitigating all potential hazards that threaten the area within the Special District's jurisdiction (Planning Area),

RESOLVED BY THE Board of Directors/Trustees of the *Big Rock Community Services District*, as follows:

The Hiouchi LHMP, dated August 17, 2017, is hereby adopted for submission to the *Federal Emergency Management Administration* (FEMA) via the *California Governor's Office of Emergency Services*.

The Project Coordinator, Craig Bradford or his designee, is designated to provide the assurances, certifications, and commitments requested by FEMA concerning this LHMP and the associated Planning Area, including any amendments or changes thereto.

PASSED AND ADOPTED by the Board Members of the *Big Rock Community Services District* on this 17th day of August 2017 by the following polled vote:

AYES: Bradford, Porteous, Swenson, Finley, Aten

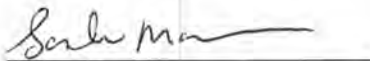
NOES: None

ABSENT: None



Craig Bradford, President
Board of Directors/Trustees

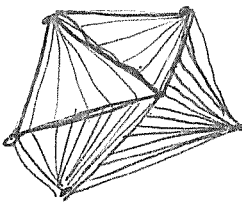
I do hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the *Big Rock Community Services District* Board of Directors/Trustees on August 17, 2017.



Sandy Moreno
Secretary to the Board

Appendix E

Planning Team Meeting Minutes



2/8/2017 Craig Bradford, Dagen Short, Rebecca Crow
Big Rock CSD # LHMP

Craig requested bio from Dagen for BRCSB Board

[REDACTED]

[REDACTED]

[REDACTED]

term up 2018 @ BRCSB

[REDACTED]

CSDA

16103 - No fees charged from one agency to another

Challenge - Need a place to meet / office

- Holt Transportation - Lakeview Dr. Dagen has an office option

- Dagen F.V. in options

id
FERMA May 2014
Wood Field
meeting

LHMP

9.2

identify all disasters + Cascadia event

Catastrophic disaster plan - details supply needs

SOSAS plans - can see anything in ocean -

↳ reused along tectonic plates - plates are frozen - pressure building up
- eminent threat

CH 47 - Heavy Helicopter to deliver supplies

Cascadia Event

- University of Oregon data
- FEMA data

Tectonic wide time probability } Craig has data
100-300 ft
wake up volcanos

after only communities left standing

Gasquet & Hronchi

Ward Field Point of Distribution

Develop list for Catastrophic Disaster Plan
of needed supplies

developed
by
Neighbors
helping
Neighbors
Program

MOA - Nat'l Parks, State Parks

Steve
prokop

Bruce Silver - Acting Superintendent

Erect Radio Tower

Hamm Operators - Communications of last resort

- ionospheric skip & no back repeaters

2019 - existing repeaters need to be removed due to cultural
deadline resource issues

④ MSR get to Daguerre

CHMP

Best info Cascadia



2/8/2017

need to still have the process need to have things on board during process

P.2

In-kind \$ - who is FEMA Contract mgt - Craig to FU
- need to negotiate how to acct to
for Craig's time ~~for account for~~
on the project

- Narrative
- Eng & Modeling
- Presentation of Final Docs
- Public Interaction? - 2 req'd public reviews

Need electronic files - Key!

- Word files
- Hertz model files

Need data

Stakeholders

- NPS / State Parks
- Smith River FPD
- NMFS

Draft - Submit to FEMA notify public (min 30 days)
~~notifications~~
Final Draft - Submit final to FEMA (min 45 days)

Need to create a Critical timeline schedule
Critical pathway

Due date → 44 CFR 201.6



Agenda

25 April 2017

Project	Hiouchi LHMP	From	Rebecca Crow
Subject	Plannign Team Outreach Preparation Meeting	Tel	707-267-2244
Venue/Date/Time	GHD/ April 25, 2017/ 1:30 pm	Job No	11136755
Copies to			
Attendees	Craig Bradford, BRCSD President; Dagan Short, GHD, Rebecca Crow, GHD	Apologies	

Agenda	Action	Leader
Review Status of LHMP Planning Process		
Review Outreach to Planning Partners		
Review Public Questionnaire		
Review Public Presentation		
Final Logistics for Public Presentation		



4/25/2017 - Hionchi LHMP

bradfordstflk@gmail.com
email presentation

leave @ 12:30 Friday 4/28

Dagan Short, Craig Bradford, Rebecca

Hionchi LHMP vs. County Plan - advertised as ^{single} local vs multi jurisd

County
RFQ

fold back in

County RFQ mis-states type of plan & hazards

GHD unlikely to propose due to possible lawsuits

Craig concern about different analyses for
Cascadia event/other hazards

RFQ - when due? when questions due?

FO Stay in communication

Outreach - See Craig's email

- Sent to everyone who has an interest

- Sent to all water customers

- Questions on Cascadia

Presentation

- Collect info & let public know we are
developing plan-

- Information Collection!!! only - people want to know
how to deal?

- Have not done any modeling / damage assessment

- let public know why

- who stakeholders

- why plan being developed?

- What are disasters? list what hazards

The plan will cover

- Could put more info resources on a slide

discuss in
generalities

- point out don't meet Aug 23rd deadline - lose \$

- please help us.

Lay out
intent

Start up
invocation
- rules of
decision

A) Dagen has not heard back from Dan Cox - balance data needs with
we need to move out
if nothing by 4/28 - alt. approach

Website

- purchase domain name
- generic web provider / host
- Secured socket layer? Not needed ~~3~~ No security key

(automated
as possible)

General
Info
page

Meeting
notes

Contact

Documents