ALAMEDA COUNTY COMMUNITY DEVELOPMENT AGENCY
PLANNING DEPARTMENT

STAFF REPORT

TO Members of the Alameda County Planning Commission
RE Safety Element
HEARING DATE September 17, 2012

GENERAL INFORMATION

The following is an overview of the Natural Hazards chapter of the draft Safety Element.

STAFF RECOMMENDATION

Staff requests that the Commission review and provide comments on the draft Natural Hazards chapter.

STAFF ANALYSIS

This Element chapter describes those hazards that are naturally occurring, such as: seismic/geologic hazards, fire hazards, and flood hazards. This chapter provides an overview of each hazard, an assessment of its potential impacts, a review of current State, regional and local programs and policies which address the hazard, and a series of goals, policies and action intended to mitigate the prevalence of the hazard.

In preparing this document staff has consulted with the Alameda County General Service and Public Works Agencies, the Alameda County Fire Department and Zone 7 Water Agency.

NEXT STEPS

Following today's discussion, staff will refer the draft to California Geological Survey, California Emergency Management Agency (CalEMA), and the Central Valley Flood Protection Board for comments pursuant to section 65302(g)(5) of the California Government Code.

ATTACHMENTS

Natural Hazards [Draft]
Safety Element Workplan

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CHAPTER 1: NATURAL HAZARDS

1.0 PURPOSE AND INTENT

This chapter describes natural hazards present within unincorporated Alameda County and goals, policies and actions to minimize the losses due to seismic/geologic, fire and flood hazards.

2.0 SEISMIC/GEOLOGIC HAZARDS

2.1. Background

An earthquake is the release of stored energy from the earth's crust. The energy is released along a fault or a plane of weakness between two large masses of the earth's crust or its outer surface. The crust, between 10 to 15 miles thick in Alameda County, is fractured along fault lies. At a global scale, for reasons that are not completely known, pieces of the earth's crust are moving. Typically, two crustal masses move past one another at a rate of less than one inch per year. The energy released from an earthquake may be so small as to go unnoticed, except by sensitive measuring instruments to an amount so large as it can destroy any structure within its range.

The Planning Area is located in the San Andrea and Hayward fault zones, one of the most seismically active regions in the United States. This site has been the location of numerous moderate to strong earthquakes. Due to the high level of seismic activity, much of the area has been classified as seismic risk Zone 4, the highest risk category specified under the California Building Code.

Earthquakes can lead to various seismic hazards including: ground shaking, liquefaction, ground rupture and the generation of large waves in bodies of water. Seismic hazards may vary from area to area, and the level of risk is tied to the geologic conditions and the extent of land use proposed for any given site.

The strength of an earthquake is measured using the Richter scale, a numerical scale for quantifying an earthquake's magnitude. The force of an earthquake at a particular place is measured on the Modified Mercalli (MM) Scale. The MM scale is a subjective ranking of the earthquakes effect on persons and structures. Table S-1 summarizes the relationship between these two measurements. Table S-2 provides an abbreviated description of the MM scale.

Table S - 1: Relationship between the Richter and Modified Mercalli Scales[1]

Richter Magnitude	Modified Mercalli Category
1.0 - 3.0	I
3.0 - 3.9	II-III
4.0 - 4.9	IV-V
5.0 - 5.9	VI-VII
6.0 - 6.9	VII-IX
7.0 and higher	VIII or higher
8+	X-XI

Table S - 2: Abbreviated Modified Mercalli Scale[2]

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

[1] U.S. Geological Survey (USGS), http://earthquake.usgs.gov/learn/topics/mag_vs_int.php
[2] Ibid.

2.2. Setting and Geomorphology

Alameda County is located on the East Bay of the San Francisco Bay Region of Central Coastal California. Principal physiographic features include the Bay plain and Diablo Range. Alameda County lies within the bounds of the Coast Ranges geomorphic province. The Coast Range geomorphic province includes the northwest trending belt of mountain ranges, valleys, and basins that parallel the California coastline from Point Conception north to the Oregon border. It is bounded on the north by the south flank of Mount Diablo, one of the highest peaks in the Bay Area, reaching an elevation of 3,849 ft. San Francisco Bay forms the western boundary, the San Joaquin Valley borders it on the east and an arbitrary line from the Bay into the Diablo Range forms the southern boundary.[3]

The bay plain and the valley areas of Alameda County are underlain by Quaternary (from the present to 2 to 3 million years ago) unconsolidated deposits which, in turn, are underlain by sedimentary metamorphic and igneous rocks of up to 150 million years in age. The Quaternary deposits consist primarily of alluvial and estuarine sediments. The alluvial ranges from stream deposited sans, gravel, silts, clays and intermixtures to fine windblown sand. Estuarine sediments consists of silty clays and some sand and shell layers deposited in the bay and marshlands. Adjacent to the San Francisco Bay the younger alluvial deposits grade into younger bay mud, a variable, semi-fluid to firm silty clay with lenses of water-saturated fine sand. Younger bay mud is covered by landfills that vary from dense, engineered fills to trash accumulations of uncertain geotechnical properties.[4]

Bedrocks of various types and age underlie the areas within the Diablo Range. Almost all of the hills have a mantle of topsoil and weathered bedrock. These soil materials vary in depth from a few to many feet and present a substantial slope instability hazard. Where the bedrock is well bedded and erosion of man-made excavation undercuts the bedding, slope instability problems exist.[5]

2.3. Active and Potentially Faults

The County has been subjected to numerous seismic events, originating both on faults within the County and in other parts of the region. Six major Bay Area earthquakes have occurred since 1800 that have affected the County, and at least two of the faults that produced them run through or into the County. These earthquakes and the originating faults include the 1836 and 1868 earthquakes on the Hayward-Rogers Creek fault, and the 1861 earthquake on the Calaveras fault. Three earthquakes, in 1838, 1906 and 1989 originated on the San Andreas fault, west of the county near San Francisco or to the south. The

[3] E.J. Helley and R.W. Graymer, 1997, *Quaternary Geology of Alameda County, and Parts of Contra Costa, Santa Clara, San Mateo, San Francisco, Stanislaus, and San Joaquin Counties, California: A Digital Database, U.S. Geological Survey*, http://geopubs.wr.usgs.gov/open-file/of97-97/alqgeo.pdf
[4] Ibid.
[5] Ibid.

Working Group of California Earthquake Probabilities has determined that earthquakes of equally destructive forces are a certainty within the region.[6] According to their findings, the Hayward-Rodgers Creek fault system is estimated to have a probability of 31% of producing an earthquake of a magnitude of 6.7 or higher within the next 30 years, this probability is the highest of the Bay Area faults.

Faults that have been active during the Holocene period, approximately the last 11,000 years, are considered to be active faults, and those faults that have been active during the Quaternary period, approximately the last 1.8 million years, are considered to be potentially active faults.[7] This serves to differentiate faults for which sufficient evidence of recent activity has been noted to explicitly include them as known geologic hazards, distinct from those faults for which recent displacement is known or suspected, and whose latest activity has not been determined, but may have been within approximately the last 11,000 years. In addition to faults that have been classified as active or potentially active, there are others whose activity has not been clearly established by presently available information. Some of these faults are shown on Table S-2; others remain to be studied. Figure S-1 maps the location of active and potentially faults within the County.

Other active faults within the unincorporated areas include the Calaveras, Greenville, and Las Positas faults, as well as several potentially active faults and unnamed secondary faults adjacent to these faults. There are few or no studies pertaining to these additional secondary faults; therefore it is unknown if these faults may or may not experience secondary ground rupture during a large earthquake. Table S-3 (page 6) summarizes the active faults within the planning area and Table S-4 provides a summary of potentially active faults.

Scientists have yet to determine a way in which to predict the precise day and time of the next earthquake; however, past evidence points to the conclusion that areas of historically high seismicity[8] are the locations where damaging earthquakes are most likely to occur in the future.

[6] Working Group of California Earthquake Probabilities, 2008, *The Uniform California Earthquake Rupture Forecast Version 2 (UCERF 2)*, U.S. Geological Survey Open-File Report 2007-1437 and California Geological Survey Special Report 203 http://pubs.usgs.gov/of/2007/1437/

[7] California Geological Survey, *Note 31: Faults and Earthquakes in California*, 2003, http://www.consrv.ca.gov/CGS/information/publications/cgs_notes/note_31/note_31.pdf

[8] Seismicity is earth movement phenomena as related to earthquakes and also a measure of an area's susceptibility to earthquakes.

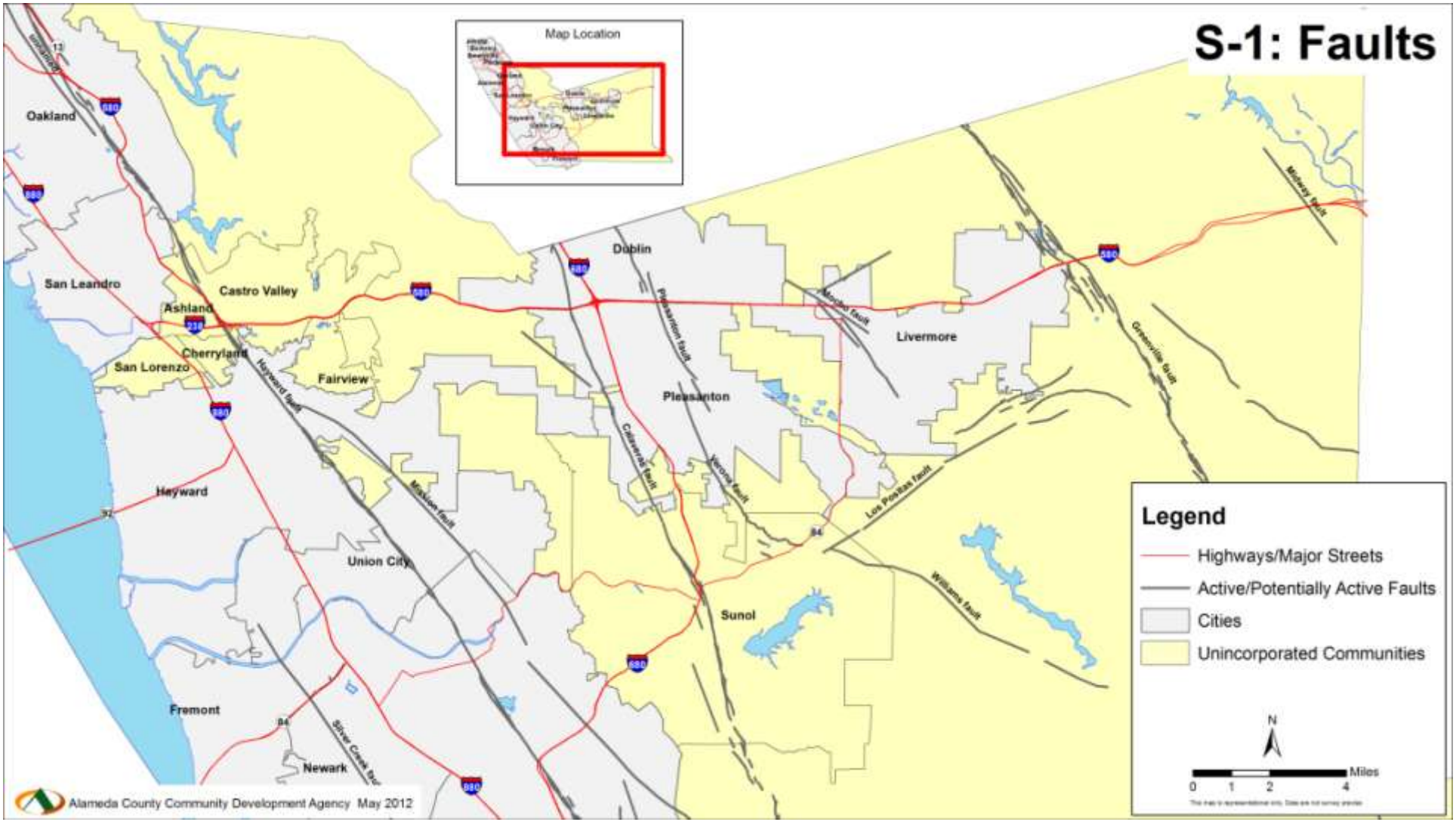

S-1: Faults
Map Location
Oakland
San Leandro
Castro Valley
Ashland
Cherryland
San Lorenzo
Fairview
Hayward
Union City
Fremont
Newark
Dublin
Pleasanton
Livermore
Sunol
Hayward fault
Mission fault
Calaveras fault
Verona fault
Pleasanton fault
Las Positas fault
Williams fault
Greenville fault
Midway fault
Silver Creek fault
Legend
Highways/Major Streets
Active/Potentially Active Faults
Cities
Unincorporated Communities
N
Miles
0 1 2 4
Alameda County Community Development Agency May 2012

Table S - 3: Active Faults within unincorporated Alameda County[9]

Fault	Recency of Movement	Classification	Criteria for Classification	Probability of Earthquake with a Magnitude ≥ 6.7 (Richter)	Estimated Maximum Magnitude (Richter)[10]
Hayward-Rogers Creek[11]	1889[12]	Active	Historical surface faulting, strong earthquakes	31%	6.5-7.3
Calaveras[13]	2007	Active	Historical surface faulting, strong earthquakes	7%	5.7-7.0
Greenville-Las Positas	1980	Active	Surface faulting	3%	6.8-7.0

Note: This list is not exhaustive. Additional information may establish that other faults in the County to be active, potentially active, or inactive.

Table S - 4: Potentially Active Faults within unincorporated Alameda County

Fault	Recency of Movement	Classification	Criteria for Classification	Probability of Earthquake with a Magnitude ≥ 6.7 (Richter)	Estimated Maximum Magnitude (Richter)
Verona[14]	Unknown	Potentially Active	Offset of soil deposits	Undetermined	Undetermined
Williams[15]	Unknown	Potentially Active	Recent seismicity	Undetermined	Undetermined
Midway[16]	Unknown	Potentially Active	Field observations	Undetermined	Undetermined
Mocho[17]	Unknown	Activity Unknown	Field observations	Undetermined	Undetermined
Mission	Unknown	Inactive	Geologic setting, microearthquake epicenters	Not Applicable	Not Applicable

[9] 2007 Working Group on California Earthquake Probabilities, 2008, *The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2)*, U.S. Geological Survey Open-File Report 2007-1437 and California Geological Survey Special Report 203 http://pubs.usgs.gov/of/2007/1437/

[10] Ibid. The ranges provide an estimate of the maximum intensity along various segments of the fault.

[11] Ibid. The Hayward-Rogers Creek Fault consists of three segments: the Hayward North, Hayward South, and Rogers Creek.

[12] Ibid. The largest earthquake to on the Hayward fault occurred on October 21, 1868 and had a magnitude of 7.0 (Richter).

[13] Ibid. The Calaveras Fault is comprised of three segments: the Calaveras North, Calaveras Central and Calaveras South.

[14] Unruh, Jeff and Sunderman, Sean, 2006, *Final Technical Report, Digital Compilation of Thrust and Reverse Fault Data for the Northern California Map Database: Collaborative Research with William Lettis & Associates, Inc., and the U.S. Geological Survey*
http://www.deltarevision.com/2006_docs/2006thrust_final_report.pdf

[15] Ibid.

[16] Clark, M. M., et al, 1984, *Preliminary Slip-rate Table and Map of Late Quaternary Faults of California*, U.S. Geological Survey

[17] Carpenter, D.W. et al, 1984, *Geology of the Lawrence Livermore National Laboratory Site and Adjacent Areas* http://www-erd.llnl.gov/library/UCRL-53316.pdf. This fault has also been associated with the Greenville fault.

2.4. Hazards

Ground Shaking

Ground shaking is the source of the most widespread earthquake damage. An earthquake produces seismic waves that emanate in all directions from the fault rupture surface. The seismic waves cause strong ground shaking, which typically is strongest near the fault and diminishes as the waves move through the earth away from the fault. The severity of ground shaking at a particular site is controlled by the interaction of several factors, including:

- the distance from the earthquake source; and
- earthquake magnitude; and
- the directivity (focusing of earthquake energy along the fault axis rather than perpendicular to the fault); and
- condition of underlying geologic materials (bedrock, sediment, soils, and man-made fill)[18]

Research occurring after the 1989 Loma Prieta earthquake has shown that areas underlain by unconsolidated, or man-made fill may amplify the strength and duration of strong ground motions, increasing the risk of damage.[19] These findings are consistent with earlier evidence suggesting that structures placed on man-made fill are especially susceptible to earthquake hazards. Strong ground shaking caused by fault movement during an earthquake has the potential to result in significant loss of life and property damage throughout the Planning Area. Maximum ground shaking would be expected to result from a large earthquake on one of the nearby active faults as described in Table S-2, although strong ground shaking may also occur as a result of moderate or large earthquakes on other faults in the San Francisco Bay region.

Structural Failures

As was noted above, ground shaking intensity is highly variable from one site to another. In addition, the effect of ground shaking on structures is related to their form, structural design, materials, construction quality, and location. One of the objectives of the California Building Code (CBC) is to protect the life and safety of building occupants and the public. The County has adopted the CBC as the basis of the County Building Ordinance (Chapter 15.08 of its General Ordinance Code). The application of the design and

[18] ABAG, *On Shaky Ground, 1995,1998*, http://www.abag.ca.gov/bayarea/eqmaps/doc/contents.html

[19] Stewart, Jonathan, *Key Geotechnical Aspects of the 1989 Loma Prieta Earthquake*,1997, http://nisee.berkeley.edu/loma_prieta/stewart.html

construction standards of Chapter 15.08 should ensure that new construction will withstand the forces associated with a major earthquake. Since the 1970s, the CBC has used data on the response of structures to earthquakes as a basis for structural design. However, buildings constructed prior to the mid-1970's generally would not meet current design provisions for earthquake forces as prescribed in the Chapter 15.08 of the County's General Ordinance Code. However, building constructed prior to the mid-1970's generally would not meet current design provisions for earthquake forces as prescribed in Chapter 15.08 of the County's General Ordinance Code. Of these buildings concrete tilt up structures, unreinforced masonry and soft story buildings, and older single family homes that have not been seismically retrofitted are the most susceptible to damage. Special occupancy buildings including: schools, hospitals, and other structures important to protecting public health and safety are required by the State, and by Chapter 15.08, to meet more stringent design requirements.

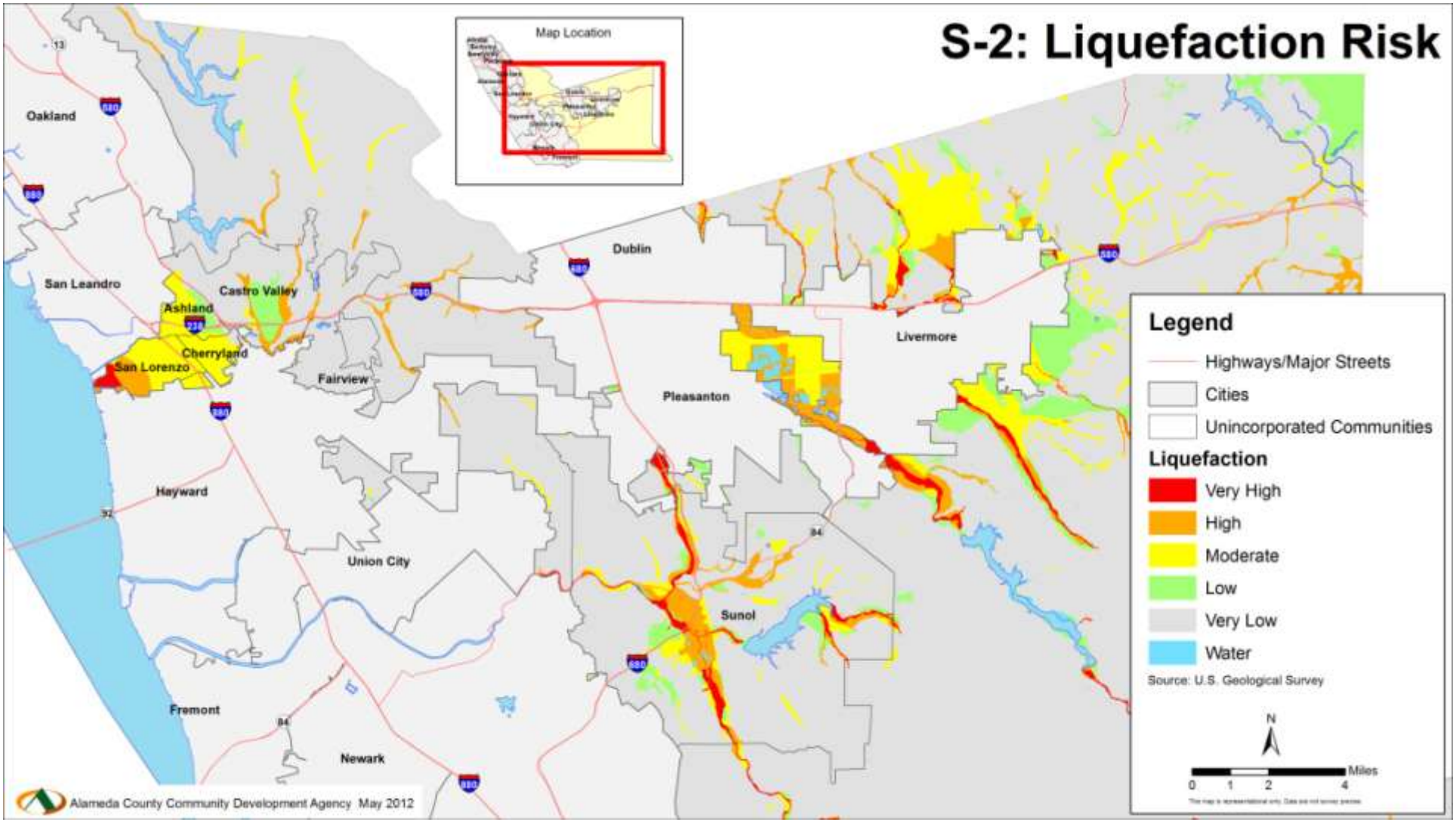
Surface Rupture

Surface fault rupture occurs when a movement on a fault deep within the earth breaks through the surface causing ground displacement. Ground rupture occurs along fault lines, and is normally limited to a fairly narrow zone along the trend of the primary fault, and to a lesser degree along secondary faults. The Alquist-Priolo Fault Zoning Act was developed by the State of California to regulate development occurring near active faults and to mitigate the risks associated with surface rupture.

Liquefaction

Liquefaction is the rapid transformation of saturated, loose, fine-grained sediment to a fluidlike state and is typically caused by strong ground shaking during an earthquake. Liquefaction can result in substantial loss of life, injury, and damage to property. In addition, liquefaction increases the hazard of fires because of explosions induced when underground gas lines break, and because the breakage of water mains substantially reduces fire suppression capability.

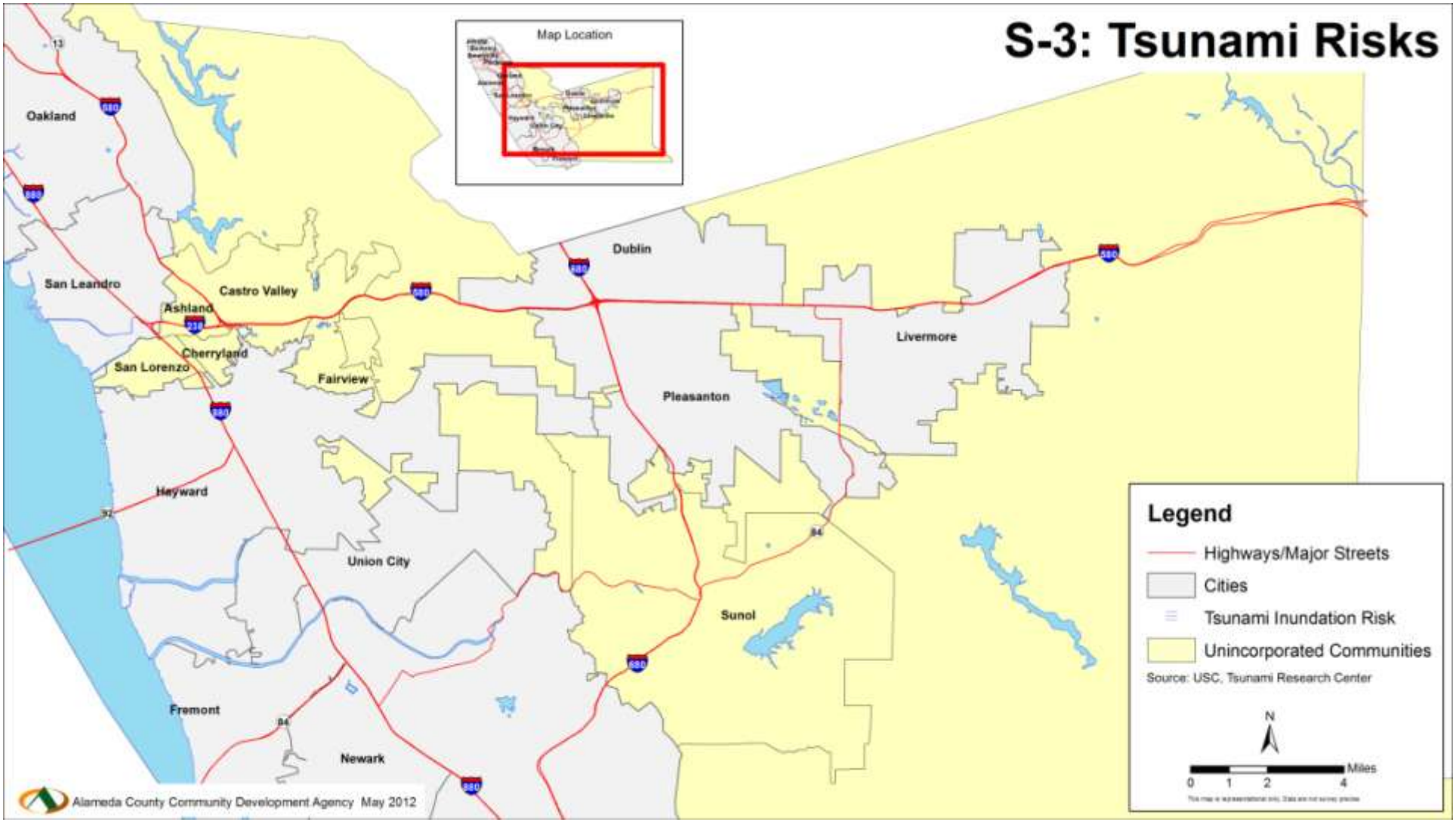
The potential for liquefaction to occur depends on both the susceptibility of near-surface deposits to liquefaction, and the likelihood that ground motions will exceed a specified threshold level. Much of the Planning Area is in the vicinity of an active fault (See Figure S-1); thus, the immediate area surrounding the earthquake epicenter will be exposed to strong ground shaking should a large earthquake occur. Areas most susceptible to liquefaction are underlain by loose granular sediments and low-lying lands adjacent to creeks and estuaries. Figure S-2 shows the liquefaction risk for the County.


S-2: Liquefaction Risk
Map Location
Oakland
San Leandro
Ashland
Castro Valley
Cherryland
San Lorenzo
Fairview
Hayward
Union City
Fremont
Newark
Dublin
Pleasanton
Livermore
Sunol
Legend
Highways/Major Streets
Cities
Unincorporated Communities
Liquefaction
Very High
High
Moderate
Low
Very Low
Water
Source: U.S. Geological Survey
N
Miles
0 1 2 4
Alameda County Community Development Agency May 2012

Tsunamis or Seiches

A major hazard associated with earthquakes is water inundation resulting from a tsunami or seiche. Tsunamis are a series of waves typically produced by an offshore earthquake, volcanic eruption, or landslide. A tsunami with a wave height of 20 feet at the Golden Gate Bridge, which is likely to occur approximately once every 200 years, would result in a runup of less than 10 feet above sea level. Some areas of San Lorenzo may be subject to flooding if a tsunami were to occur. Figure S-3 is a map of tsumani hazards within unincorporated Alameda County. A seiche is a long wave set up on an enclosed body of water such as a lake or reservoir. Seiches are inundations of the water surface that travel back and forth at regular periods determined by the depth and size of the water body. Seiches are usually caused by unusual tides, winds or currents, but may also be triggered by earthquake ground motion. The largest seiche wave ever measured in the San Francisco Bay, following the 1906 earthquake, was four inches high. Despite this occurrence, the Bay Area has not been adversely affected by seiches during its history within this seismically active region of California.[20]

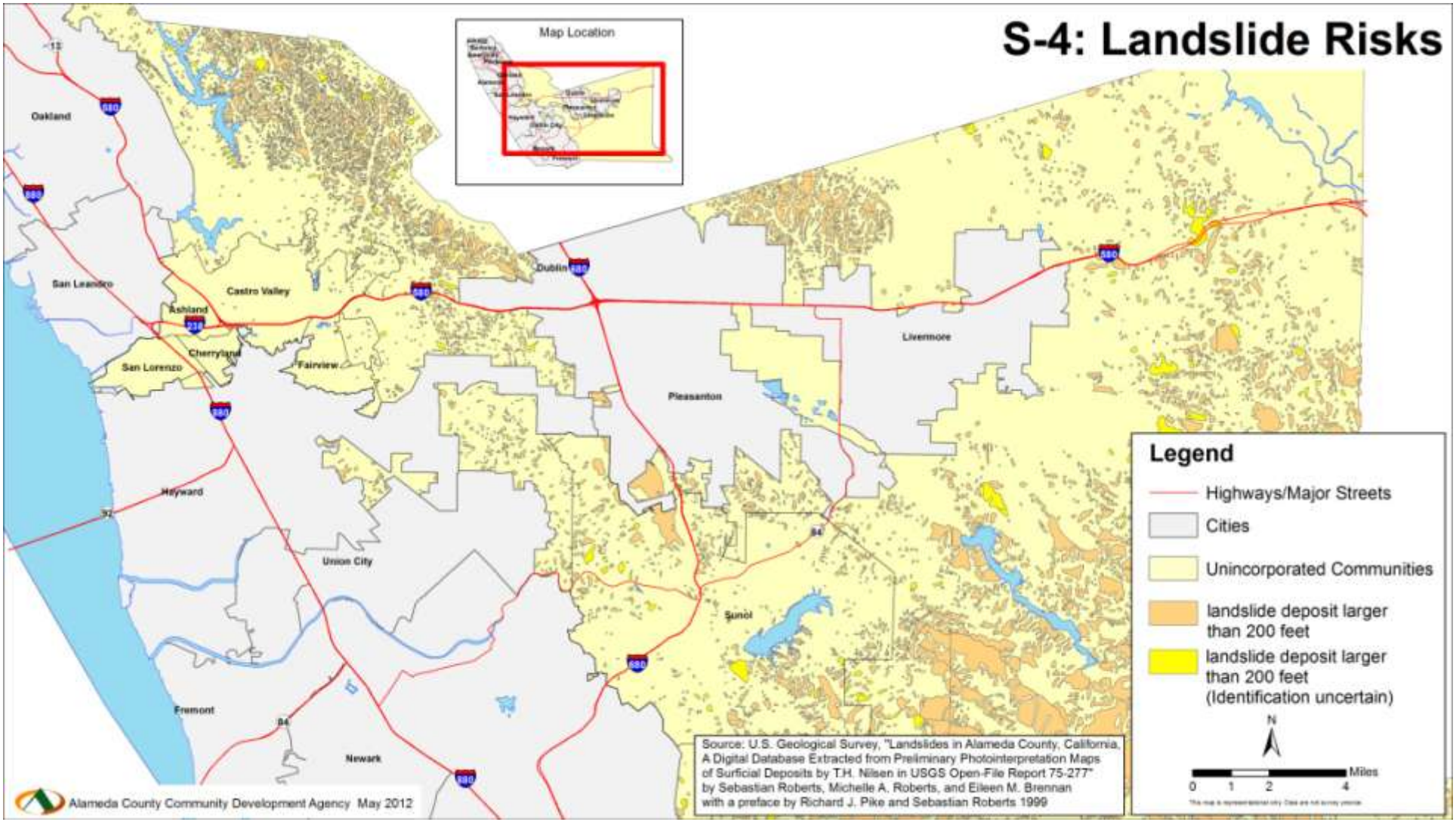
[20]U.S. Army Corps of Engineers San Francisco District, Port of Oakland, *Oakland Harbor Navigation Improvement (-50 Foot) Project SCH No. 97072051 Final Environmental Impact Statement/Report*, May 1998, Updated January 2000


S-3: Tsunami Risks
Map Location
Oakland
San Leandro
Castro Valley
Ashland
Cherryland
San Lorenzo
Fairview
Hayward
Union City
Fremont
Newark
Dublin
Pleasanton
Livermore
Sunol
Legend
Highways/Major Streets
Cities
Tsunami Inundation Risk
Unincorporated Communities
Source: USC, Tsunami Research Center
N
Miles
0 1 2 4
Alameda County Community Development Agency May 2012

Landslides/Slope Instability

Landslides and slope instability are generally caused by earthquakes, weak materials, stream and coastal erosion, and heavy rainfall. The rate of landsliding is affected by the type and extent of vegetation, the slope angle, the degree of water saturation, the strength of the rocks, and the mass and thickness of the deposit. In addition, certain human activities tend to make the earth materials less stable and increase the chance of ground failure. Activities contributing to instability include extensive irrigation, poor drainage or ground-water withdrawal, removal of stabilizing vegetation and over-steepening of slopes by undercutting them or overloading them with artificial fill. The causes of failure, which normally produce landslides and differential settlement, are augmented during earthquakes. As a result of these potential risks, construction on slopes steeper than about 15 percent typically requires special grading, special foundation design, or site modification to mitigate slope ground conditions and reduce the potential for slope instability. Threats to structures would be greatest in areas that are close to natural channels or are situated on potentially unstable slopes.

Figure S-4 is a map of landslide risks within unincorporated Alameda County. The mapping indicates those areas that are considered “least susceptible,” “marginally susceptible,” “generally susceptible,” and “most susceptible” to slope failure. The criteria used to delineate the relative hazard areas included the nature of the geologic materials underlying the surface, the steepness of slopes, the presence or absence of visible slope failures, and the presence or absence of active forces that could cause failures, such as stream processes or shrink-swell potential soils.


S-4: Landslide Risks
Map Location
Oakland
San Leandro
Castro Valley
Ashland
Cherryland
San Lorenzo
Fairview
Hayward
Union City
Fremont
Newark
Dublin
Pleasanton
Livermore
Sunol
Legend
Highways/Major Streets
Cities
Unincorporated Communities
landslide deposit larger than 200 feet
landslide deposit larger than 200 feet (Identification uncertain)
N
Miles
0 1 2 4
Source: U.S. Geological Survey, "Landslides in Alameda County, California, A Digital Database Extracted from Preliminary Photointerpretation Maps of Surficial Deposits by T.H. Nilsen in USGS Open-File Report 75-277" by Sebastian Roberts, Michelle A. Roberts, and Eileen M. Brennan with a preface by Richard J. Pike and Sebastian Roberts 1999
Alameda County Community Development Agency May 2012

2.5. Development Standards for Known Seismic and Geologic Hazards

The following is a summary of development guidelines and regulations pertaining to seismic and geologic hazards.

The Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code 2621, et seq.) was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to limit the construction of buildings used for human occupancy on the surface trace of active faults. The Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. Under the Act, development of a building for human occupancy is generally restricted within 50 feet of an identified fault. A fault or fault zone is considered active under the provisions to the act if there is evidence of surface displacement in the last 11,000 years

The Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (Public Resources Code 2690, et seq.), (SHMA) passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The SHMA requires the California Geological Survey (formerly the Department of Mines and Geology, DMG) to prepare new Seismic Hazard Zone Maps showing areas where liquefaction or earthquake-induced landslides have historically occurred or where there is a high potential for such occurrences. The purpose of the maps is to help reduce and, where feasible, mitigate earthquake hazards in new construction. The County is required to use the maps in the regulatory process to mitigate the potential danger and high costs of such events.

The Alameda County General Ordinance Code

Section 15.08.240 of the Alameda County Building Ordinance requires applicants for new construction to submit soils or geologic reports for sites affected by a number of seismic and geologic hazards. In addition, new structures are required to incorporate design elements to reduce building failures. The Grading, Erosion and Sediment Control Ordinance (Alameda County General Ordinance Code, Chapter 15.36) establishes standards for grading, construction and the control of erosion and sediments. In addition, Section 15.36.110 of the County Grading Ordinance gives the Director of Public Works the authority to require a soils and geologic investigation in support of any proposed development on private property. Chapter 16, the Subdivision Ordinance, contains various provisions relating to the investigation

of seismic and geologic hazards, and the design and construction of improvements relating to the subdivision of property.

The California Environmental Quality Act (CEQA)

CEQA requires that all projects be evaluated to determine if they "expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:"

1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.

2. Strong seismic ground shaking.

3. Seismic-related ground failure, including liquefaction.

4. Landslides.

Projects must also be evaluated for their potential to:

- Result in substantial soil erosion or the loss of topsoil.

- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

- Be located on expansive soil, as defined in the California Building Code, creating substantial risks to life or property.

- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

2.6. Goals, Policies and Implementing Actions

Goal 1.	**To minimize risks to lives and property due to seismic and geologic hazards.**

Policies

P1. To the extent possible, projects should be designed to accommodate seismic shaking and should be sited away from areas subject to hazards induced by seismic shaking (landsliding, liquefaction, lurking, etc.) where design measures to mitigate the hazards will be uneconomic or will not achieve a satisfactory degree of risk reduction. (Source: Seismic Safety and Safety Element, pg. 6)

P2. Structures should be located at an adequate distance away from active fault traces, such that surface faulting is not an unreasonable hazard. (Source: Seismic Safety and Safety Element, pg. 6)

P3. Aspects of all development in hillside areas, including grading, vegetation removal and drainage, should be carefully controlled in order to minimize erosion, disruption to natural slope stability, and landslide hazards. (Source: Seismic Safety and Safety Element, pg. 6)

P4. Within areas of demonstrated or potential slope instability, development should be undertaken with caution and only after existing geological and soil conditions are known and considered. In areas subject to possible widespread major landsliding, only very low density development should be permitted, consistent with site investigations; grading in these areas should be restricted to minimal amounts required to provide access. (Source: Seismic Safety and Safety Element, pg. 7)

P5. All existing structures or features of structures which are hazardous in terms of damage, threat to life or loss of critical and essential function in the event of an earthquake should be, to the extent feasible, brought into conformance with applicable seismic and related safety (fire, toxic materials storage and use) standards through rehabilitation, reconstruction, demolition, or the reduction in occupancy levels or change in use. (Source: Seismic Safety and Safety Element, pg. 7, with minor revision)

P6. The County shall not approve new development in areas with potential for seismic and geologic hazards unless the County can determine that feasible measures will be implemented to reduce the potential risk to acceptable levels, based on site-specific analysis. The County shall review new development proposals in terms of the risk caused by seismic and geologic activity. (Source: ECAP, pg. 74)

P7. The County, prior to approving new development, shall evaluate the degree to which the development could result in loss of lives or property, both within the development and beyond its boundaries, in the event of a natural disaster**.** (Source: ECAP, pg. 74)

P8. The County shall ensure that new major public facilities, including emergency response facilities (e.g., hospitals and fire stations), and water storage, wastewater treatment and communications facilities, are sited in areas of low geologic risk. (Source: ECAP, pg. 74)

P9. Site specific geologic hazard assessments, conducted by a licensed geologist[21], shall be completed prior to development approval in areas with landslide and liquefaction hazards as indicated in Figures S-2 and S-4 and for development proposals submitted in Alquist-Priolo Zones as indicated in Figure S-1, hazards to be mapped include:

- Seismic features
- Landslide potential
- Liquefaction potential

Mitigation measures needed to reduce the risk to life and property from earthquake induced hazards should be included. (Source: Eden Area Plan, pg. 8-11)

P10. Buildings shall be designed and constructed to withstand ground shaking forces of a minor earthquake (1-4 magnitude) without damage, of a moderate (5 magnitude) earthquake without structural damage, and of a major earthquake (6-8 magnitude) without collapse of the structure. The County shall require that critical facilities and structures (e.g. hospitals, emergency operations centers) be designed and constructed to remain standing and functional following an earthquake. (Source: ECAP, pg. 75)

P11. All construction in unincorporated areas shall conform to the Alameda County Building Ordinance, which specifies requirements for the structural design of foundations and other building elements within seismic hazard areas.

[21] In staff correspondence dated July 25, 2012, John Rogers of the Public Works Agency provided the following clarification pertaining to this policy "Soils studies within areas of earthquake-induced landslide and liquefaction are not required to be performed by a licensed geologist. The rule is that any portion of the study that is defined as civil engineering should be conducted by a geotechnical engineer, and that any portion classified as the practice of geology should be conducted by an engineering geologist or a geologist. Most soils studies are performed by geotechnical engineers. Geologists typically perform fault zone studies."

P12. To the extent feasible, major infrastructure including transportation, pipelines, and water and natural gas mains, shall be designed to avoid or minimize crossings of active fault traces and to accommodate fault displacement without major damage that could result in long-term service disruptions. (Source: Eden Area Plan, pg. 8-12)

P13. The County shall encourage the retrofitting of existing structures and other seismically unsafe buildings and structures to withstand earthquake ground-shaking. (Source: Eden Area Plan, pg. 8-12)

P14. In order to minimize off-site impacts of hillside development, new construction on landslide-prone or potentially unstable slopes shall be required to implement drainage and erosion control provisions to avoid slope failure and mitigate potential hazards. (Source: Eden Area Plan, pg. 8-12)

Actions

A1. Require all new construction to meet the most current, applicable, lateral force requirements. (Source: Seismic Safety and Safety Element, pg. 6)

A2. Require applications for development within Alquist-Priolo Study Zones to include geological data that the subject property is not traversed by an active or potentially active fault, or that an adequate setback can be maintained between the fault trace and the proposed new construction. (Source: Seismic Safety and Safety Element, pg. 6)

A3. Require sites to be developed in accordance with recommendations contained in the soil and geologic investigations reports. (Source: Seismic Safety and Safety Element, pg. 6)

A4. Establish standards for areas previously in Alquist-Priolo Study Zones, and eliminated in the last update. (Source: Seismic Safety and Safety Element, pg. 6)

A5. Regulate, with collaboration from utility owners, the extension of utility lines in fault zones. (Source: Seismic Safety and Safety Element, pg. 6, with minor revisions)

A6. Establish (with collaboration from utility owners) and enforce design standards for transportation facilities and underground utility lines to be located in fault zones. (Source: Seismic Safety and Safety Element, pg. 6)

A7. Require soils and/or geologic reports for development proposed in areas of erodible soils and potential slope instability. (Source: Seismic Safety and Safety Element, pg. 7)

A8. Pursue programs to identify and correct existing structural hazards, with priority given to hazards in critical, essential and high occupancy structures and in structures built prior to the enactment of applicable local or state earthquake design standards. (Source: Seismic Safety and Safety Element, pg. 7)

A9. Support regional or statewide programs providing funding or technical assistance to local governments to allow identification of existing structural hazards in private development and providing assistance to public and private sectors to facilitate and to minimize the social and economic costs of hazards abatement. (Source: Seismic Safety and Safety Element, pg. 7)

A10. Continue to require the upgrading of buildings and facilities to achieve compliance with current earthquake bracing requirements as a condition of granting building permits for major additions and repairs. (Source: Seismic Safety and Safety Element, pg. 7)

A11. Continue, and as required, expand programs to provide the public information regarding seismic hazards and related structural hazards. (Source: Seismic Safety and Safety Element, pg. 7)

A12. Require geotechnical studies prior to development approval in geologic and/or seismic hazard areas as identified by future studies by federal, state, and regional agencies. Require or undertake comprehensive geologic and engineering studies for critical structures regardless of location. (Source: Castro Valley Plan, pg. 10-30)

A13. Adopt and amend as needed the most current version of the California Building Code (CBC) to ensure that new construction and renovation projects incorporate Earthquake-resistant design and materials that meet or exceed the current seismic engineering standards of the CBC Seismic Zone 4 requirements. (Source: Castro Valley Plan, pg. 10-30)

A14. Periodically update detailed guidelines for preparation of site-specific geologic hazard assessments. These guidelines shall be prepared in consultation with the County Building Official, County Engineer, County Counsel and the County Risk Manager and shall ensure that site-specific assessments for development requiring discretionary permits are prepared according to consistent criteria. (Source: Eden Area Plan, pg. 8-13, with revisions)

A15. Develop and implement an earthquake retrofit plan to reduce hazards from earthquakes. The plan should identify and tally the seismically unsafe buildings and structures,

including unreinforced masonry, unreinforced concrete and soft-story buildings, and require inspection for these structures. It should also identify sources of funding to help reconstruct or replace inadequate structures and assist homeowners with earthquake retrofitting. (Source: Eden Area Plan, pg. 8-13)

A16. On sites with slopes greater than 30 percent, require all development to be clustered outside of the 30 percent slope area. (Source: Castro Valley Plan, pg. 10-31) With the exception that development[22] upon any area outside of the Urban Growth Boundary where the slope exceeds 25% shall not be permitted. (Source: ECAP, pg. 74)

A17. Aspects of all development in hillside areas, including grading, vegetation removal and drainage, should be carefully controlled in order to minimize erosion, disruption to natural slope stability, and landslide hazards. The County's development standards and guidelines, permit application review process, Section 15.08.240 of its Building Ordinance, the Grading Erosion and Sediment Control Ordinance (Chapter 15.36 of the Alameda County General Ordinance Code), the Stormwater Management and Discharge Control Ordinance (Chapter 13.08), and Subdivision Ordinance (Title 16) shall serve to implement this policy.

3.0 FIRE HAZARDS

3.1. Fire Related Hazards

Fire hazards exist in both developed and undeveloped areas. Those occurring in developed areas typically include buildings, rubbish, automobiles, and grass fires on vacant lots. Those in undeveloped areas often include large brush and grass fires. Alameda County is subject to the threat from urban fires, and especially wildland fires, due to its hilly terrain, weather conditions, and the nature of its plant coverage. Due to the intensity of development, the number of the potentially affected populations, and the difficulties of containment, the County must also devote major resources to controlling potential fire hazards in its urban areas. In order to quanitify this potential risk, California Department of Forestry (CDF) has developed a Fire Hazard Severity Scale which utilizes three criteria in order to evaluate and designate potential fire hazards in wildland areas. The criteria are fuel loading (vegetation), fire weather

[22] Development, as defined by the "Save Open Space and Agricultural Lands" initiative, or commonly referred to as Measure D, is the placement or erection of any solid material or structure; construction, reconstruction or alteration of any structure; change in the density or intensity of any use of land, including any division of land; grading, removing, extraction or deposition of any materials; and disposal of any waste.

(winds, temperatures, humidity levels and fuel moisture contents) and topography (degree of slope). A map based upon this data has been included as Figure S-5.

3.2. Provision of Fire Services

The Alameda County Fire Department (ACFD)[23] is responsible for providing emergency fire and medical response, as well as fire prevention services, to all residents of the unincorporated areas of Alameda County, exclusive of the Fairview area. In addition, fire and emergency services are provided under contractual agreements with the cities of Dublin and San Leandro, and the U.C. Lawrence Berkeley National Laboratory. The Department's total service area encompasses approximately 475 square miles and has a daytime population of 266,000. The area contains a number of major roadways, highways, and interstates that carry thousands of private and commercial vehicles on a daily basis; large suburban and commercial centers; agricultural and wildland areas; and lakes and marinas. The geography and demography of the unincorporated area excluding Fairview is served by nine stations, encompasses 431 square miles with a population of126,397 and poses significant operational challenges. The eastern and southern areas include large portions of wildland, grazing land, and rural farmlands. The majority of the population is centered in the western area which is heavily urbanized with a mix of residential, commercial, and light industrial. The Department staffs two stations that serve two sites of the Lawrence Livermore National Laboratory. In the East County, the Department has a contract with the federal Veteran's Administration to provide service to its medical facility. First responder paramedic services are available on a 24-hour per day, 365 day per year basis throughout the entire ACFD service area. The Department also has contractual agreements with a number of other agencies including the cities of Pleasanton and Hayward to optimize service delivery to unincorporated island areas of the County. The Department is responsible for the administration and operation of the Alameda County Regional Emergency Communications Center (ACRECC), which dispatches over 62,000 EMS and fire calls annually. The dispatch center provides dispatch and communication center services for the Alameda County Fire Department, the Alameda County Emergency Medical Services Agency, US Army Camp Parks, and the cities of Alameda, Fremont and Union City. The goal of the ACRECC is to enhance the regional dispatch and communication system through the consolidation of fire and medical dispatch.

The California Department of Forestry is responsible for fire prevention and suppression in their "state responsibility areas". Protection against structural and wildland fire hazards is also provided to unincorporated parts of the County by contract. These contract areas are commonly referred to as "local responsibility areas".

[23] This information was obtained from the ACFD 2008 Annual Report http://www.acgov.org/fire/documents/annual-report-2008.pdf

The ACFD has established several mutual aid agreements with a variety of agencies to ensure a high level of fire and medical services throughout the unincorporated areas in the event of a local or regional disaster. Currently, aid agreements exist with the U.C. Berkeley Lawrence National Laboratory, the City of Oakland, the San Ramon Valley Fire Protection District and the Livermore-Pleasanton Fire Department. The ACFD agreement with the City of Oakland includes a mutual aid response to cover the southern Oakland Hills area, and a shared automatic agreement for Interstates 580, 880, and 680. All fire departments within Alameda County share a countywide mutual aid agreement and are a part of the State Master Mutual Aid Plan.[24]

3.3. Development Standards to Mitigate Fire Hazards

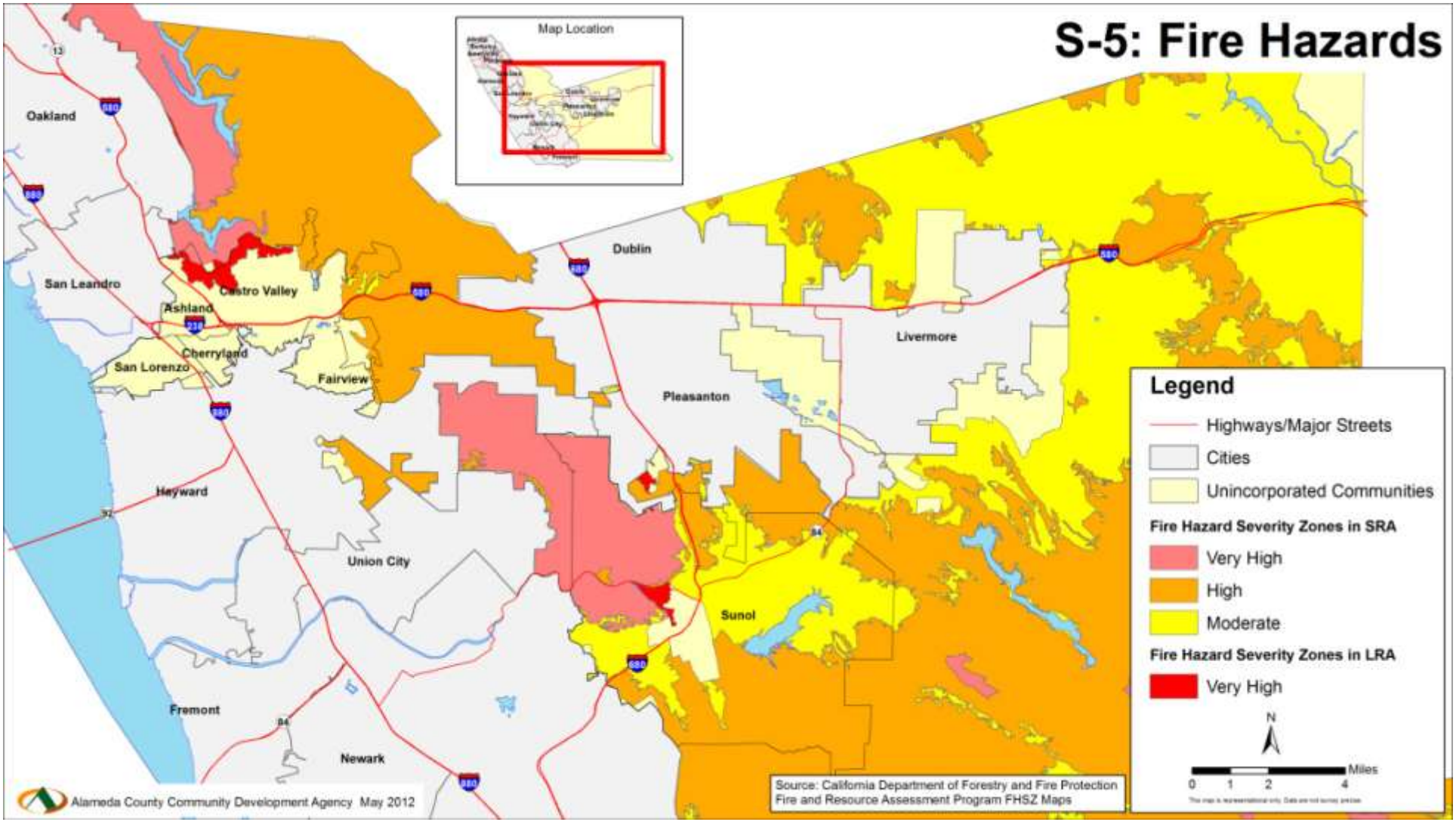
The Alameda County Ordinance Code

The Uniform Fire Code (Section 6.04 of the County Ordinance Code) and the Building Code (Title 15) form the basis of the County's fire prevention standards. These codes call for the installation, maintenance, and ongoing inspection of fire protection systems under the direction of the local fire chief. In addition, the Fire Code authorizes the Fire Chief to specify water supply and road design standards (such as the number of roads required for access to the site, the road width, and weight capacity). Under Section 16.20.020(G) of the Subdivision Ordinance (Title 16), the subdivider or developer must install water mains, fire hydrants, and fire appurtenances to supply water for fire suppression in conformance with district standards.

The California Environmental Quality Act (CEQA)

Under CEQA, a project sponsor must declare if the project would, "Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands." Projects that would result in increased wildland fire risk should develop appropriate alternatives and mitigations that would prevent or reduce threats from wildland fires.

[24] Excerpted from the Eden Area General Plan, page 5-12


S-5: Fire Hazards
Map Location
Oakland
San Leandro
Castro Valley
Ashland
Cherryland
San Lorenzo
Fairview
Hayward
Union City
Fremont
Newark
Dublin
Pleasanton
Livermore
Sunol
Legend
Highways/Major Streets
Cities
Unincorporated Communities
Fire Hazard Severity Zones in SRA
Very High
High
Moderate
Fire Hazard Severity Zones in LRA
Very High
N
Miles
0 1 2 4
Source: California Department of Forestry and Fire Protection
Fire and Resource Assessment Program FHSZ Maps
Alameda County Community Development Agency May 2012

3.4.

3.5. Goals, Policies and Implementing Actions

Goal 2.	**To reduce the risk of urban and wildland fire hazards.**

Policies

P1. Urban and rural development and intensive recreational facilities should be discouraged in hill open space areas lacking an adequate water supply or nearby available fire protection facilities. (Source: Seismic Safety and Safety Element, pg. 7)

P2. Hill area development, and particularly that adjoining heavily vegetated open space area, should incorporate careful site design, use of fire retardant building materials and landscaping, development and maintenance of fuel breaks and vegetation management programs, and provisions to limit public access to open space areas in order to minimize wildland fire hazards. (Source: Seismic Safety and Safety Element, pg. 7)

P3. Development should generally be discouraged in areas of high wildland fire hazard where vegetation management programs, including the creation and maintenance of fuel breaks to separate urban uses would result in unacceptable impacts on open space, scenic and ecological conditions. (Source: Seismic Safety and Safety Element, pg. 7)

P4. All urban and rural development, existing and proposed, should be provided with adequate water supply and fire protection facilities and services. Facilities serving hill area development should be adequate to provide both structural and wildland fire protection. The primary responsibility falls upon the owner and the developer. (Source: Seismic Safety and Safety Element, pg. 8)

P5. Structures, features of structures, or uses which present an unacceptable risk of fire should be brought into conformance with applicable fire safety standards. (Source: Seismic Safety and Safety Element, pg. 8)

P6. Plan new public and private buildings to minimize the risk of fires and identify measures to reduce fire hazards to persons and property in all existing development. (Source: Castro Valley Plan, pg. 9-13)

P7. The County shall adhere to the provisions of the *Alameda County Fire Protection Master Plan* and *Fire Hazard Mitigation Plan.* (Source: ECAP, pg. 76)

P8. The County shall limit residential development to very low densities in high fire hazard zones identified in Figure 6. (Source: ECAP, pg. 76)

P9. The County shall require all new homes in rural residential areas that are located in "high" and "very high" fire hazard areas to be sited and designed to minimize risks to life and property. (Source: ECAP, pg. 76)

P10. The County shall require the use of fire resistant building materials, fire resistant landscaping and, and adequate clearance around structures in "high" and "very high" fire hazard areas. (Source: ECAP, pg. 76)

P11. The County shall require that open space within developed areas be designed and maintained to minimize fire hazards and ensure compatibility between development and any significant biological resources. (Source: ECAP, pg. 19)

P12. The County shall refer development applications to the Alameda County Fire Department, or the local Fire District for review and recommendation. (Source: ECAP, pg. 76)

P13. The County shall support fire service agencies in maintaining and improving existing Insurance Safety Organization (ISO) ratings. (Source: ECAP, pg. 76)

Actions

A1. Limit or prohibit development and activities in areas lacking adequate water and firefighting facilities. (Source: Seismic Safety and Safety Element, pg. 7)

A2. Enforce design standards and guidelines through the site development, planned development, and subdivision review process. (Source: Seismic Safety and Safety Element, pg. 7)

A3. Require environmental impact assessment for development proposals in areas of severe fire hazard. (Source: Seismic Safety and Safety Element, pg. 8)

A4. Enforce, and as required, revise development standards. (Source: Seismic Safety and Safety Element, pg. 8)

A5. Enforce applicable provisions of the Alameda County Subdivision and Building Ordinances .

A6. Encourage fire safety public education and information programs. (Source: Seismic Safety and Safety Element, pg. 8)

A7. The County shall maintain a current map of areas subject to wildland fires.

A8. Establish clearly in County zoning and other ordinances that the Fire Department has the authority to recommend denial or modification to proposed development projects, particularly for projects proposed within “high” or “very high” fire zone areas as identified in Figure 5, Fire Hazards, to reduce the risk of bodily harm, loss of life, or severe property damage and environmental degradation. (Source: Castro Valley Plan, pg. 10-7)

A9. Establish clearly in County zoning and other ordinances that the Fire Department may require the use of appropriate fire resistant building materials, installation of fire sprinklers, and/or vegetation management, and that such requirements shall be based on a property’s access, slope, water pressure, and proximity to wildland areas. Such requirements shall apply particularly to projects proposed within Very High Fire Zone Areas as identified in Figure 5, Fire Hazards, but may also apply to other properties where access for emergency vehicles does not fully comply with adopted standards. (Source: Castro Valley Plan, pg. 10-7)

A10. Establish an interdepartmental review process for proposed projects where Fire, Public Works, Planning, and other County Departments consult and establish reasonable and consistent requirements for streets, driveways, and emergency access prior to zoning approval. (Source: Castro Valley Plan, pg. 10-7)

A11. Revise the review process for any project that proposes an increase in density so that any inadequacy of water pressure for fire hydrants and fire flows for fire suppression purposes is identified early in the development review process. Also identify if the roadway serving the project is deficient in terms of access for emergency vehicles. Identify any access improvements that may be required, for example roadway widening along property frontage, or additional off-street parking. (Source: Castro Valley Plan, pg. 10-8)

A12. Upgrade and standardize fire hydrants to accept equipment from neighboring fire districts so that the County can accept assistance through a mutual aid request during an emergency. (Source: Castro Valley Plan, pg. 10-8)

A13. Enforce the requirement that Home Owners' Associations in Planned Unit Development areas are responsible for vegetation management by establishing a regular review schedule for areas subject to this requirement. (Source: Castro Valley Plan, pg. 10-8)

A14. Revise the County's Integrated Vegetation Management Program to require private property owners to maintain the vegetation on their property in a condition that will not contribute to the spread of a fire. Requirements for private property owners could include, but need not be limited to, the following:

- Maintain a 30-foot defensible space around all buildings and structures;
- Remove all portions of trees within 10 feet of chimneys and stovepipe outlets;
- Remove materials or plants that may act as a fuel or a conveyance of fire (such as dead/dying wood on trees adjacent to/overhanging structures, leaves, pine needles, etc. on rooftops or elsewhere on the property); and
- Install spark arrester in chimney and or stovepipe outlets. (Source: Castro Valley Plan, pg. 10-9)

A15. Consider establishing and funding an enforcement district for fire hazard areas and wildland, intermix and interface areas; and establish an inspection period to be conducted annually for properties located in these areas. Mail notices to the residents in these areas notifying them of the inspection period, listing the standards for vegetation management on their properties, and suggesting tips for compliance. Additional funding would be required, such as the formation of an assessment district or other means. (Source: Castro Valley Plan, pg. 10-9)

A16. In hillside areas where street widths are substantially below the minimum 20-foot width standard required for emergency access, one or more of the following requirements should be imposed to ensure adequate emergency access:

- Sprinklers;
- Turnouts along the paved roadway;

- Additional on-site parking;
- Increased roadway width along the front of the property; or
- Parking Restrictions. (Source: Castro Valley Plan, pg. 10-10)

A17. Establish consistent standards for private streets depending on the number of units that the street will serve the number of required parking spaces per unit, and reasonable access requirements and operational needs of emergency access vehicles and garbage trucks. Standards should include:

- Minimum paved roadway width requirements (i.e., 20 feet for roads serving five or more units or when part of required fire apparatus access, and 12 feet for roads serving between two and five units that is not part of required fire apparatus access);
- Turnarounds;
- Landscaping;
- Red curbs and signage for no parking zones;
- Sidewalks; and
- Parking standards. (Source: Castro Valley Plan, pg. 10-10)

A18. The County shall prepare a comprehensive wildland fire prevention program including fuelbreaks, brush management, controlled burning, and access for fire suppression equipment. (Source: ECAP, pg. 77)

A19. The County shall prepare a disaster response plan for buildings exceeding 3 stories (or 30 feet, whichever is less), public assembly facilities, and facilities housing dependent populations. (Source: ECAP, pg. 77)

A20. The County shall develop wildland fire regulations including site criteria building setbacks, construction standards, minimum road widths, maximum road grades, and evacuation routes. (Source: ECAP, pg. 76)

A21. The County shall adopt by ordinance the "Wildland Fire Safety Requirements" contained in the Alameda County Fire Protection Master Plan. (Source: ECAP, pg. 76)

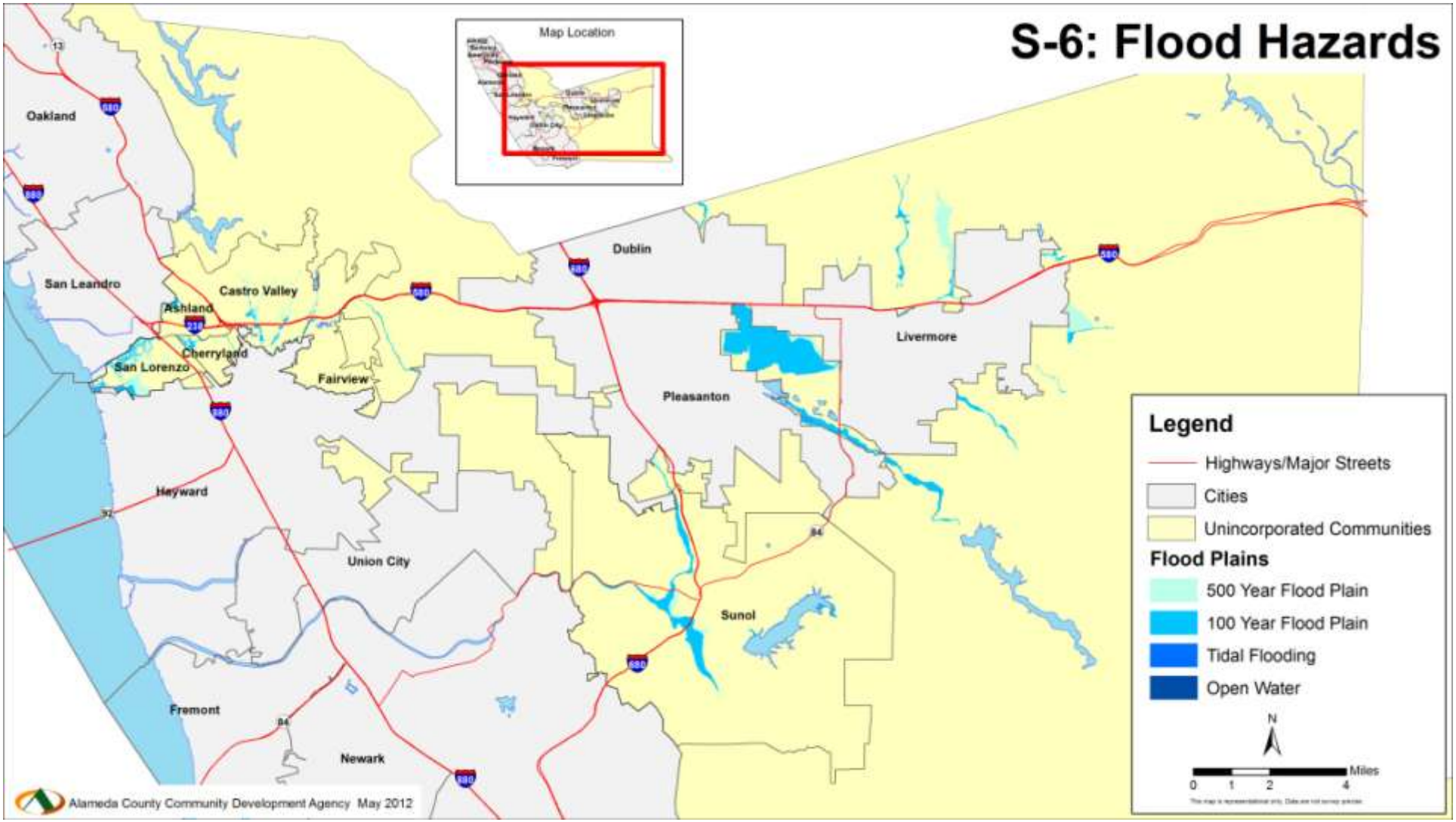
A22. The County shall work with the California Department of Forestry and Fire Protection to designate "very high fire hazard severity zones" in conformance with AB 337 (1992). The County shall ensure that all zones designated as such meet the standards and requirements contained in this legislation. (Source: ECAP, pg. 77)

4.0 FLOOD HAZARDS

4.1. Flood Related Hazards

A flood plain is a naturally-occurring feature near a river or creek that floods periodically. When development brings pavement, roofs, and other hard surfaces, rainfall percolates less into the ground. Runoff to the nearby river or creek increases, and the development within the flood plain can be subject to flooding. Hazards often are the result of above average rainfall over a short duration, resulting in increased runoff and flooding along area creeks and areas with poor drainage. Flood prone areas are generally described as areas that have a one in a hundred (or 1%) chance of being inundated in any given year. Areas potentially subject to flooding from a 100-year event include various low-lying areas and areas adjacent to creek channels as mapped by the Federal Emergency Management Agency (FEMA). In conjunction with FEMA's effort, flood elevations and limits have been determined for the affected areas. A map of flood hazards is provided in Figure S-6.

Flooding occurring within the boundaries of the Planning Area is typically caused by heavy rainfall and runoff volumes that exceed the capacity of existing storm drainage and flood control systems. However, throughout the urbanized parts of the County, flood hazards have been greatly reduced through the efforts of the Alameda County Flood Control and Water Conservation District (ACFCWCD) and the Zone 7 Water Agency. Each of these entities designs, constructs and maintains flood protection facilities to meet existing and projected community needs. Their systems are adequate for most situations.


S-6: Flood Hazards
Map Location
Oakland
San Leandro
Ashland
Castro Valley
Cherryland
San Lorenzo
Fairview
Hayward
Union City
Fremont
Newark
Dublin
Pleasanton
Livermore
Sunol
Legend
Highways/Major Streets
Cities
Unincorporated Communities
Flood Plains
500 Year Flood Plain
100 Year Flood Plain
Tidal Flooding
Open Water
N
Miles
0 1 2 4
Alameda County Community Development Agency May 2012

4.2. Dam Inundation

In accordance with State law, the County has also evaluated possible flood risks arising from the failure of dams or reservoirs. Within the state of California, oversight of dams falls to the Department of Water Resources, Division of Safety of Dams (DOSD). Existing dams under DOSD jurisdiction are inspected annually to ensure adequate maintenance and to direct the dam owner to correct any known deficiencies. Regular inspections and routine maintenance of the dams substantially reduces the risk of catastrophic failure. Figure S-7 highlights those areas that within the Planning Area that might be affected by flooding in the event of a dam or reservoir failure. The depth of inundation would vary from zero in upland areas to many feet on low-lying areas and in creek channels. There are no State or local restrictions for development within dam failure inundation areas; however, the Emergency Services Act (Government Code Section 8589.5) requires that dam inundation maps be prepared to identify flood risk and that local jurisdictions prepare evacuation procedures in the event of a catastrophic dam failure.

The following table, Table S-5, lists all of the dams within or adjacent to the planning area.

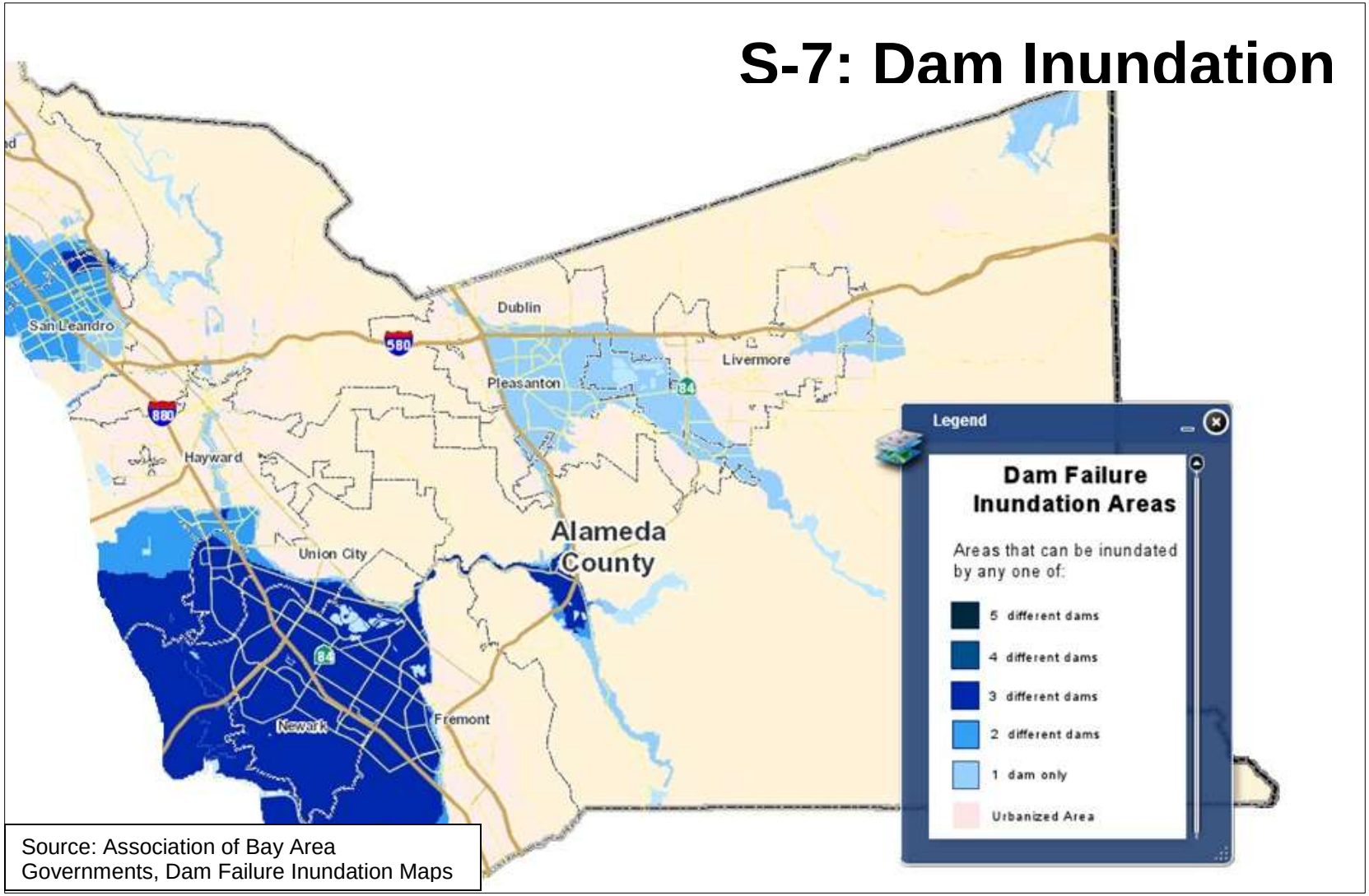
Table S - 5: Dams within or Adjacent to the Planning Area[27]

Name	Owner	Type	Capacity (acre/feet)
Almond	EBMUD	Earth	20
Bethany Forebay	CA Department of Water Resources (CADWR)	Earth	5,250
Calaveras	City/County of SF	Hydraulic Fill	100,000
Chabot	EBMUD	Hydraulic Fill	10,281
Cull Creek	ACFCWCD	Earth	310
Del Valle	CADWR	Earth	77,100
James H. Turner	City/County of SF	Earth	50,500
New Upper San Leandro	EBMUD	Earth	42,000
Patterson (1-062)	CADWR	Earth	98
San Lorenzo Creek	ACFCWCD	Earth	380
South	EBMUD	Earth	156
Ward Creek	ACFCWCD	Earth	130

In 2011, San Francisco Public Utilities Commission began construction on a replacement for the Calaveras Dam downstream from its current location. This project may result in a change to the dam inundation areas as indicated on the map above. The County will continue to monitor the project and, if necessary, will revise its dam inundation map.

[27] CA Department of Water Resources, Division of Safety of Dams, Complete Listing of Dams within the Jurisdiction of the State of California in Alphabetically order by name of the Dam

S-7: Dam Inundation



Source: Association of Bay Area Governments, Dam Failure Inundation Maps

4.3. Development Standards for Areas at Risk of Flooding

The following is a summary of development guidelines and regulations pertaining to flood hazards.

Federal Emergency Management Agency (FEMA), National Flood Insurance Program (NFIP)

The County in conjunction with other local jurisdictions participates in the FEMA sponsored National Flood Insurance Program (NFIP). The NFIP provides flood insurance to businesses and individuals in known flood hazard areas. As a participant, the County must comply with FEMAs standards for the regulation of development in special flood hazard areas and conduct floodplain management activities not only to reduce or prevent the loss of life or property, but also preserve and protect the floodplain.

The California Environmental Quality Act (CEQA)

The Act includes several provisions that address flood prevention and loss caused by floods. Through the environmental review process authorized under the Act a project must declare if it would:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff (e.g., due to increased impervious surfaces) in a manner which would result in flooding on- or off-site (i.e. within a watershed);
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems due to changes in runoff flow rates or volumes;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows; and
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam

Projects that would result in one or more of these environmental effects would be required to consider an alternative to the particular project or to provide appropriate mitigations that either reduce or eliminate these hazards.

The Alameda County General Ordinance Code

The Alameda County Ordinance Code addresses flood hazard mitigation in the following documents:

- Section 15.08.230 of the Building Ordinance
- Grading Erosion and Sediment Control Ordinance (Chapter 15.36)
- Floodplain Management (Chapter 15.40)

New developments within a floodplain is generally required to be at least one foot above the 100-year flood levels, or may be restricted completely within any designated floodway (i.e. the central portion of certain 100 year flows).

These documents are periodically reviewed and updated to ensure consistency with State law and/or NFIP requirements.

4.4. Goals, Policies and Implementing Actions

Goal 3.	**To reduce hazards related to flooding and inundation.**

Policies

P1. New structures located within the floodway fringe (i.e. the area bordering, but outside of the floodway) of a one hundred year floodplain should either be designed and located to allow unrestricted flow of flood-waters or be able to withstand flood forces.

P2. Surface runoff from new development should be controlled by on-site measures including, but not limited to structural controls and restrictions regarding changes in topography, removal of vegetation, creation of impervious surfaces, and periods of construction such that the need for off-site flood and drainage control improvements is minimized and such that runoff from development will not result in downstream flood hazards. (Source: Seismic Safety and Safety Element, pg. 8)

P3. Structures shall generally be located away from shoreline areas subject to tsunami inundation, except where they can be feasibly designed to withstand the effects of inundation. (Source: Seismic Safety and Safety Element, pg. 8)

P4. Development shall only be allowed on lands within the 100-year flood zone if it will not:

- Create danger to life and property due to increased flood heights or velocities caused by excavation, fill, roads and intended use.

- Impede access of emergency vehicles during a flood.
- Create a safety hazard due to the expected heights, velocity, duration, rate of rise and sediment transport of the flood waters at the site.
- Exacerbate costs of providing governmental services during and after flooding, including increased maintenance and repair of public utilities and facilities.
- Interfere with the existing water flow capacity of the floodway.
- Substantially increase erosion and/or sedimentation.
- Contribute to the deterioration of any watercourse or the quality of water in any body of water. (Source: Eden Area Plan, pg. 8-19)

P5. Both public and private service facilities and utilities in existing 100-year flood zones, shall be flood-proofed to a point at, or above, the base flood elevation. (Source: Eden Area Plan, pg. 8-19)

P6. The County shall prevent the construction of flood barriers within the 100-year flood zone that will divert flood water or increase flooding in other areas. (Source: Eden Area Plan, pg. 8-19)

P7. To the extent feasible, the County shall continue to improve its rating under the National Flood Insurance Program so that flood insurance premiums for residents in flood areas may be reduced. (Source: Eden Area Plan, pg. 8-20)

P8. Property owners should be encouraged to purchase National Flood Insurance, which reduces the financial risk from flooding.

P9. Development shall comply with applicable NPDES requirements. (Source: Eden Area Plan, pg. 8-20)

P10. The County shall work with the Alameda County Flood Control and Water Conservation District and Zone 7 Water Agency to provide for development of adequate storm drainage and flood control systems to serve existing and future development. (Source: ECAP, pg. 67, with minor revision)

P11. The County shall promote flood control measures that advance the goals of recreation, resource conservation (including water quality and soil conservation), groundwater

recharge, preservation of natural riparian vegetation and habitat, and the preservation of scenic values of the county's arroyos and creeks. (Source: ECAP, pg. 67)

P12. The County shall require new development to pay their fair share of storm drainage and flood control improvements. (Source: ECAP, pg. 67)

P13. The County shall regulate new development on a case-by-case basis to ensure that, when appropriate, project storm drainage facilities shall be designed so that peak rate flow of storm water from new development will not exceed the rate of runoff from the site in its undeveloped state. (Source: ECAP, pg. 67)

P14. The County shall ensure that development proposals within designated dam inundation areas are referred to the Office of Emergency Services and to appropriate local police departments for evaluation and updating of emergency response and evacuation plans. (Source: ECAP, pg. 67)

P15. All development proposals shall comply with following sections of the Alameda County Ordinance Code: Chapters 13.08 (Stormwater Management and Discharge Control), 13.12 (Watercourse Ordinance), and 15.36 (Grading Erosion and Sediment Control); Section 15.08.230; Floodplain Management (Chapter 15.40); and Title 16 (Subdivision Ordinance).

Actions

A1. Enforce applicable provisions of the Building Code (Source: Seismic Safety and Safety Element, pg. 8)

A2. Require environmental assessment of project impacts. (Source: Seismic Safety and Safety Element, pg. 8)

A3. Utilize site development and planned development district review. (Source: Seismic Safety and Safety Element, pg. 8)

A4. Require studies where development is proposed in areas designated by FEMA as a having a potential flood risk and that any resulting development conform to the study findings.

A5. Ensure that all construction and development activities obtain all applicable federal, state, regional, and County permits and approvals related to grading and erosion control,

stormwater management and discharge control, and watercourse protection. (Source: Castro Valley Plan, pg. 10-18)

A6. Require new development to comply with the requirements and criteria for stormwater quantity controls established in the Alameda County Hydrology and Hydraulics Criteria Summary (HHCS) to control surface runoff from new development. (Source: Castro Valley Plan, pg. 10-19)

A7. Dedicate adequate resources to ensure effective and timely monitoring and maintenance of public drainage facilities, including storm drains, to maintain adequate capacity for peak flows in the area. (Source: Castro Valley Plan, pg. 10-19)

A8. Use the Alameda County Flood Plain Management Ordinance (Chapter 15.40) and Section 15.08.230 of the Alameda County Building Code when assessing flood risk prior to project completion, as well as ongoing risk after flood control and improvement projects are implemented.

A9. Work with ACFCWCD, and other agencies and jurisdictions to conduct feasibility studies, and implement flood control improvement projects, including, but not limited to: creek restoration, regional detention facilities in existing or proposed open space areas and/or parks, dredging; existing area dams that are silted-up, dredging existing facilities for increased capacity and recreation. (Source: Castro Valley Plan, pg. 10-20)

A10. Establish design standards, guidelines and setback requirements for development on properties that abut creeks and waterways, and require the replanting and restoration of riparian vegetation as part of any discretionary permit. Implement and enforce creek setback requirements for development for properties that abut creeks in coordination with the ACFCWCD and Zone 7 Water Agency. (Source: Castro Valley Plan, pg. 10-20, with minor revision)

A11. Continue to participate in activities that prevent or reduce flood impacts to existing and future development as described under the Community Rating System program developed by FEMA’s National Flood Insurance Program. (Source: Eden Area Plan, pg. 8-20)

A12. Monitor potential changes in information regarding tsunami hazards for the unincorporated area. (Source: Eden Area Plan, pg. 8-20)

A13. Review and revise Chapters 13.08 (Stormwater Management and Discharge Control), 13.12 (Watercourse Ordinance), 15.36 (Grading Erosion and Sediment Control), Title 15

(Subdivision Ordinance), and Section 15.08.230 of the Building Code as needed to minimize flood risks within the County and to comply with State and Federal flood control requirement.

PROPOSED PLANNING COMMISSION SAFETY ELEMENT UPDATE WORKPLAN

STAFF TASKS	SCHEDULE	CHAPTER/DOCUMENT	MEETINGS	MEETING OBJECTIVES
Kick off meeting	May 2012	N/A	Planning Commission May 21, 2012	Provide overview of the Element; establish subcommittee to oversee the preparation of the Element.
Draft chapter on man made hazards	May 2012	Hazardous materials and aviation hazards	Planning Commission June 18, 2012	Discuss element chapter and related goals, policies and actions
Draft chapter on emergency preparedness	June 2012	Emergency Preparedness	Planning Commission July 16, 2012	Discuss element chapter and related goals, policies and actions
Draft chapter on natural hazards	July 2012	Natural Hazards	Planning Commission September 17, 2012	Discuss element chapter and related goals, policies and actions
Draft CEQA Document	July 2012	CEQA Document	Planning Commission October 22, 2012	Discuss the draft CEQA document
Circulate CEQA Document and Draft Element	October 2012	N/A	N/A	N/A
Review complete Element and CEQA document	November 2012	All	Planning Commission TBD	Discuss the entire Element