

PUBLIC REVIEW DRAFT

Sonoma County Local Coastal Plan

PUBLIC SAFETY ELEMENT September 2019



**Local Coastal Program
Permit Sonoma**

2550 Ventura Avenue
Santa Rosa, CA 95403

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PUBLIC SAFETY ELEMENT

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PUBLIC SAFETY ELEMENT

1. INTRODUCTION

1.1 Purpose

1.1.1 California Coastal Act

The Sonoma County coast contains 3,755 dwelling units as of 2018(Permit Sonoma GIS Community Profile) and, due to its outstanding natural beauty and recreational opportunities, hosts millions of visitors every year. However, many areas of the Coastal Zone are exposed to hazards related to earthquakes, geologic instability, flooding, sea level rise, tsunamis, coastal bluff erosion, wildland fire, and hazardous materials. The Public Safety Element establishes goals, objectives, and policies to protect the coastal residents and visitors from unreasonable risks from these hazards. The Element also identifies ongoing County initiatives, "Other Initiatives," that support public safety and promote inter-agency and community collaboration. Programs to implement proposed policies are also identified at the end of this element.

The 1976 California Coastal Act directs that new development minimize risks to life and property from environmental hazards and to avoid substantial alteration of natural land forms. Below is Section 30253, the applicable section of the Coastal Act.

Section 30253.

New development shall do all of the following:

- (1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
- (2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluff and cliffs.*
- (3) Be consistent with requirements imposed by an air pollution control district or the State Air Resources Control Board as to each particular development.*
- (4) Minimize energy consumption and vehicle miles traveled.*
- (5) Where appropriate, protect special communities and neighborhoods that, because of their unique characteristics, are popular visitor destination points for recreational uses.*

The Public Safety Element establishes goals, objectives, and policies to minimize potential human injury and property damage by guiding future development to reduce the exposure of persons and property to the above hazards. The policies in this Element are intended to avoid development which would result in unacceptable risks to the residents, visitors, private property, public facilities, and infrastructure in the Coastal Zone; and to minimize risks for existing development already located in hazard areas. Acceptable levels of risk are based on the nature of each hazard, the frequency of exposure, the number of persons exposed, and the potential damage.

The policies in the Public Safety Element are intended to avoid development which would adversely affect existing and future residents, visitors, and property; and to not place an undue financial burden on property owners and taxpayers by allowing development in hazard areas which may have unusually high costs for public services and disaster relief. The Public Safety Element is based on the best available science and information and official data sources to delineate areas potentially at risk from various hazards. It includes maps of known high hazard areas to not only guide development but also to increase awareness of inhabitants and aid in disclosure of potential hazards in real estate transactions.

The Public Safety Element is only one part of a comprehensive countywide approach to address hazards that also includes emergency response plans, pre-disaster preparation and training, pre-disaster mitigation, design and construction standards, and education.

1.2 Relationship to Other Elements

The hazards addressed in the Public Safety Element and the sensitivity of various land uses have been considered in preparing the Land Use Element. Policies in the Land Use Element limits the range of land uses allowed in high hazard areas to reduce the number of people and structures exposed to risk. The Public Safety Element policies are also coordinated with the policies of the Open Space and Resource Conservation, Public Facilities and Services, Circulation and Transit, and Land Use Elements.

1.3 Relationship to Other Plans and Regulations

The Local Coastal Plan, and Coastal Zoning Ordinance that implement it, are not the only means to minimize risks to public safety and property from hazards in the Coastal Zone. Local Coastal Plan policies are intended to be complementary to federal, state, and local laws, regulations, and plans that impose siting and design or other regulatory requirements to minimize risks from natural hazards to public safety and property and increase community resilience to these hazards. Implicit in the Public Safety Element is

the assumption that the County will continue to comply with these laws, regulations, and plans.

1.3.1 United States Coast Guard Sector San Francisco Area Contingency Plan

The Federal Water Pollution Control Act (Clean Water Act) prohibits discharges of oil and hazardous substances into or upon the Nation's waterways, shorelines, and adjoining areas. The Act mandates development of a National Contingency Plan, providing for coordinated federal response to releases of such materials. The Act also provides for the preparation of Area Contingency Plans (ACPs) for specific geographic regions.

The Sector San Francisco ACP covers the land masses and waters of Northern California, including Sonoma County and describes the authorities, roles, and responsibilities of parties involved in National Contingency Plan development and implementation. The ACP includes an inventory, along with maps and descriptions where appropriate, of notable sensitive resources that could be damaged by a release of oil or other hazardous material. The inventory includes biological and cultural resources at dozens of sites along the Sonoma Coast. For each site, the ACP describes resources of concern, known natural hazards in the area, response strategies specific to the site, and an overview of response logistics.

The U.S. Coast Guard has authority and jurisdiction to coordinate spill responses within the Coastal Zone. In the event of a spill or release, a U.S. Coast Guard representative, or Federal On-Scene Coordinator, evaluates the severity of the event and coordinates the response with other federal, state, and local agency representatives, in accordance with the ACP and other applicable plans, laws, and regulations. Sonoma County Departments that could be involved in the response effort include the Fire and Emergency Services Department, Sherriff's Office, and Department of Health Services, among others.

1.3.2 Sonoma County Hazard Mitigation Plan

The Federal Disaster Mitigation Act of 2000 requires local governments to adopt and implement a local hazard mitigation plan in order to be eligible for various types of pre-disaster and post-disaster community aid and grant programs from the Federal Emergency Management Agency (FEMA). Unlike an emergency response plan, a hazard mitigation plan focuses on identifying mitigation actions that can be taken before disasters occur to reduce the level of property damage, personal injury, and community disruption that might otherwise result. It is based on the premise that many of the

losses that could result from hazards could be avoided, prevented, or minimized through better planning, construction, design, and education.

In April 2017, the County adopted the most recent Sonoma County Hazard Mitigation Plan (Hazard Mitigation Plan) to help reduce the level of injury and property damage resulting from hazards including seismic hazards, landslides, floods, wildfires, and hazards resulting from climate change. The Hazard Mitigation Plan also addresses erosion, erosion is the loosening and transportation of rock and soil debris by wind, rain, or other running water or the gradual wearing away of the upper layers of the earth, sea-level rise, and tsunami, as secondary hazards. The Hazard Mitigation Plan includes hazard maps and a five-year implementation plan. The implementation plan identifies community policies, actions, and tools to reduce the public's exposure to hazards, minimize potential property damage and disruption, and reduce the costs of disaster relief. The Hazard Mitigation Plan implementation plan as amended is incorporated by reference into this Public Safety Element to ensure consistency as it is updated and revised every five years.

1.3.3 Sonoma County Climate Action Plan

Sonoma County has long recognized the need for local action to help meet the global challenge of climate change. In July 2016 the Regional Climate Protection Authority adopted the *Climate Action Plan 2020 and Beyond (Climate Action Plan 2020)*. The Climate Action Plan 2020 recommendations will be implemented by local jurisdictions.

The Climate Action Plan 2020 is the outcome of a coordinated, multi-partner planning effort to reduce greenhouse gas emissions in Sonoma County. It builds on previous efforts, and provides a framework for implementing measures to reduce greenhouse gas emissions adopted by the County and the nine cities.

The Climate Action Plan 2020 contain regional and project-level measures to support the County's effort to achieve the reaffirmed statewide reduction targets of 25 percent below 1990 levels by 2020, with long- term goals of 40 percent below 1990 levels by 2030, and 80 percent below 1990 levels by 2050. It includes a backcast of 1990 greenhouse emissions and a robust inventory of 2010 levels.

1.3.4 California Environmental Quality Act

Under the California Environmental Quality Act (CEQA), prior to any action on a project subject to CEQA, the lead agency which is the public agency that has the principal responsibility for carrying out or approving a project, must prepare an analysis of the impacts of the proposed project. The analysis must include an assessment of whether it

would expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault; strong seismic ground shaking; seismic-related ground failure; landslide; flooding in the 100-year floodplain; inundation by a seiche, tsunami, or mudflow; or hazardous materials. A seiche is a standing wave that oscillates in a lake as a result of seismic or atmospheric disturbances creating huge fluctuations of water levels. A seiche has to occur in an enclosed body of water such as a lake, bay or gulf. The hundreds year flood is the magnitude of a flood expected to occur on the average every 100 years, based on historical data. The 100-year flood has a 1/100, or one percent, chance of occurring in any given year.

The assessment must identify potential mitigation measures and project revisions or alternatives which may be considered to reduce the risks from such hazards to a level of less than significant. Most development projects in the Local Coastal Zone are subject to analysis under CEQA.

1.3.5 Other Laws and Regulations

A number of other state and federal laws and regulations complement the Local Coastal Plan's public safety intent by establishing siting constraints, study requirements, and building standards for specific types of development such as essential services buildings, dams, schools, hospitals, power plants, pipeline and transmission lines, and water supply and water treatment facilities. In addition, new construction in the Coastal Zone must comply with and meet the applicable standards of the California and Sonoma County Building Codes to increase resistance to or reduce risks from seismic events, geologic hazards, flooding, fires, and hazardous materials. The County will continue to apply and enforce all applicable design and siting requirements established by state and County Codes to increase the safety and disaster resistance of new or existing buildings whether private or public through the permit review process.

1.4 Scope and Organization

Goals, objectives, and policies applicable to risks from all general types of hazards are in Section 2, followed by sections on the specific hazard types – Geologic Hazards (Section 3), Flood and Inundation Hazards (Section 4), Sea Level Rise Hazards (Section 5), Wildland Fire Hazards (Section 6), and Hazardous Materials (Section 7). Each of these sections summarizes the extent of the hazard and the risk to public safety and property; and includes goals, objectives, and policies to reduce the exposure of persons and property to the hazard. Programs needed to implement proposed policies are also identified. In addition, the Element calls out ongoing or potential future County

initiatives, referred to as "Other Initiatives," that support public safety and promote inter-agency and community collaboration.

1.5 Determination of Acceptable Risks

Acceptable levels of risk are based upon the nature of each hazard, the frequency of exposure, the number of persons exposed, and the potential damage. The County is not able to guarantee that any particular development will not, at some time in the future, be adversely affected by the hazards identified in this Element because such hazards, by their nature, defy precise prediction. Acceptable levels of risk may vary depending on the type of hazard, degree of certainty of hazard exposure, and state of existing development. Acceptable risk can only be determined after all effort has been made to reduce the risk and does not include development that increases known risks to human health and safety in identified hazard areas.

Maps included in the Public Safety element are for illustrative purposes only and are not a suitable basis for parcel-specific decisions. The map scale and reproduction methods limit precision in physical features displayed. The parcels boundaries and physical features are not intended to represent surveyed data. Site-specific studies are required to draw parcel-specific conclusions.

Although there are significant regulatory requirements and controls to regulate the location and design of new construction or development and minimize the hazard risks to acceptable levels, it may not be possible to reach the same level of hazard avoidance or risk reduction for existing development, which has already been located in hazard areas or constructed prior to the enactment of applicable building and zoning codes designed to minimize hazard risk and vulnerability. Additionally, many sites within the coastal zone are subject to potential risks for multiple hazards, as such policies for all of the applicable hazards must be addressed, with the most restrictive or specific regulation applied.

Even with adequate planning, regulation, and mitigation, natural hazards and disasters cannot be prevented from occurring and the risk of impacts from such events cannot be eliminated altogether. Natural hazards and disasters will continue to occur. Although the County will take actions to guide future development, considerable development has already occurred in areas subject to hazards. The County will work to increase public and private disaster preparedness and response and plan accordingly to reduce the potential for harm and damage from such events, however, the potential for significant harm and damage arising from natural hazards and disasters remains.

Existing development and future development potential of parcels may be lost as a result of natural hazards and disasters. There is no obligation on the part of the County to compensate property owners for their losses or to allow rebuilding and development on parcels which cannot meet current building and zoning standards.

2. GENERAL HAZARDS POLICY

GOAL C-PS-1: **Prevent unnecessary exposure of people and property to risks of injury or damage from earthquake, geologic, flood, inundation, and wildland fire hazards and hazardous materials.**

Objective C-PS-1.1: Comply with all applicable land use, building, and development regulations codified by federal, state, and local government to minimize risks of personal injury and property damage from hazard events.

Objective C-PS-1.2: Make fully-informed decisions on land use, development, and real estate regarding hazards through the use and dissemination of the best available science, information, and analysis.

Objective C-PS-1.3: Implement pre-disaster mitigation actions identified in the most recent California Governor's Office of Emergency Services approved Hazard Mitigation Plan implementation plan to help reduce the level of risk and the level of personal injury and property damage that could result from hazards.

Objective C-PS-1.4: Minimize public costs for development in high hazard areas that are associated with high costs for public services and disaster relief.

The following policies, in addition to those in this Public Safety Element and the Open Space and Resource Conservation, Water Resources, and Land Use Elements shall be used to achieve these objectives:

Policy C-PS-1a: Continue to apply, update, and enforce all applicable design, siting, and construction requirements and standards established by federal, state, and the County government to increase the safety and natural disaster resistance, resilience, and accommodation of new or existing public or private buildings through the permit review process. Where a parcel is subject to multiple hazards the most restrictive or specific regulation will be applied. **(New/GP2020)**

Policy C-PS-1b: Make natural hazard maps, data, and information available for public use and review at the County permit office and County website. Provide maps, data, and information in order to guide land use, development, and real estate decisions that

affect risks to public safety and property from natural hazards. Post notices at the offices of the Sonoma County Recorder, Sonoma County Assessor, and Permit Sonoma that identify the location of these maps, data, and information.

Update hazard data as necessary to reflect any changes made by various responsible agencies including, but not limited to, the FEMA, United States Geological Survey (USGS), California Geologic Survey and /or California State Geologist, National Oceanic and Atmospheric Administration (NOAA), and California Department of Forestry and Fire Protection (CAL FIRE). In the event of conflicting information among these sources, Permit Sonoma staff shall determine which is most appropriate. Provide locally generated hazard data to these agencies involved in hazard mapping. **(New/GP2020)**

Policy C-PS-1c: Use and consider available natural hazard data, maps, analyses, and impact and vulnerability assessments from appropriate agencies; and require preparation of additional site-specific or project-specific hazards analyses when necessary to ensure full consideration of risks from natural hazards in the design and development review processes. **(New/GP2020)**

Policy C-PS-1d: Where new hazard data or information, analyses, or maps become available as a result of agency research, database updates, or more detailed site specific analyses, the best available science and information shall be used and considered consistent with the Local Coastal Plan even if it departs from the hazard maps and policies adopted with the Local Coastal Plan. **(New)**

Policy C-PS-1e: Where there is a significant factual question about whether a particular development has sufficiently mitigated the potential risks from natural hazards to an acceptable level, the applicant shall provide evidence that the development would not cause damage or substantial adverse impacts on coastal resources. If the development is consistent with the Local Coastal Plan, and the property owner wishes to proceed in the face of a factual question regarding risks from natural hazards, the property owner shall provide indemnification to the County, insurance or other security, and a recorded notice which will protect the interests of the County and notify future purchasers of the property of the potential problem. **(New/GP2020)**

Policy C-PS-1f: Property owners shall be responsible for conducting their own research, and determining, and understanding the vulnerabilities and risks to their real estate investments from hazard events. Property owners shall be encouraged to develop an emergency response plan and mitigation plan to address those hazards before emergency conditions occur, and to carry their own hazards insurance. In developing such plans, property owners shall be encouraged to consider the FEMA's National Flood

Insurance Program and Community Hazard Rating System, as well as the State of California Multi-Hazard Mitigation Plan. **(New)**

Policy C-PS-1g: Where existing development is located in a natural hazard area and is destroyed by a hazard event, there is no inherent public obligation to allow redevelopment or rebuilding which cannot meet current health and safety Codes and standards or to compensate the owner for the loss of their investment. **(New)**

Policy C-PS-1h: Land divisions, shall be prohibited unless all proposed parcels can be demonstrated to be safe from flooding, erosion, fire and geologic hazards; would not require the construction of shoreline protective devices; and can accommodate a safe, all-weather access. **(New)**

Policy C-PS-1i: Facilitate response and recovery from natural hazard events by improving the ability of public infrastructure and facilities to withstand and remain functional after hazard events. Where necessary, retrofit, replace, or relocate existing infrastructure and facilities to avoid unreasonable risks from hazards. **(New)**

3. GEOLOGIC HAZARDS POLICY

3.1 Background

Geologic hazards result from large scale seismic events and localized occurrences of expansive soils, slope instability, landslides, mudslides, subsidence, and coastal bluff erosion.

3.1.1 Seismic Hazards

Earthquakes are usually caused by sudden movement along geologic faults. Sonoma County has four active or potentially active earthquake faults within its boundaries identified by the state Alquist-Priolo Earthquake Fault Maps. Known geologic faults, including the San Andreas Fault system, within the 10 SubAreas of the Coastal Zone are shown on **Figures C-PS-1a-c**.

While a seismic event along any fault in the county could result in noticeable impacts along the Sonoma County coast, a seismic event along the Northern Segment of the San Andreas Fault system would be expected to have the greatest potential impact in the Coastal Zone due to the potential for surface fault rupture and violent ground shaking. As shown on Figures C-PS-1a-c, this fault generally lies off the west coast of the County. The fault crosses land at Bodega Bay, passes offshore, then crosses land again at Fort Ross running northward, through the Sea Ranch community, and continuing north into Mendocino County. Analysis of seismic data indicates that 8.5 magnitude earthquakes can

be expected along the San Andreas Fault, and that earthquakes of 8.0 or more along this fault can be expected every 200 to 400 years (Prentice, 1989).

The adverse effects of earthquakes result from the physical effects of ground shaking, surface fault rupture, liquefaction, and earthquake-induced landslides; or secondary effects such as fires, tsunamis, seiches, dam failure, and hazardous materials releases. Each of these effects is briefly discussed below.

Ground shaking. Ground shaking from earthquakes affects the greatest number of people and can cause the most damage of any geologic hazard. According to the *California Hazard Mitigation Plan*, damage due to ground shaking produces over 98 percent of all building losses in a typical earthquake. During an earthquake, the ground can shake for a few seconds or over a minute. The amount (strength and duration) of ground shaking is affected by many factors. Distance from the earthquake epicenter, the point on Earth's surface directly above the focus point of where the earthquake is originating underground, is the most significant factor. However, geologic conditions and the direction, magnitude, and depth of the fault rupture are also critical. Shaking, particularly horizontal shaking, results in the most earthquake damage because structures often have inadequate resistance to this type of motion. Unconsolidated and poorly consolidated alluvium, which is detrital materials such as clay, silt, sand, or gravel that has been deposited by running water, and terrace deposits will undergo greater ground shaking than consolidated bedrock formations. Unstable slopes also may undergo greater ground shaking, increasing the risk of landslides after an earthquake event. Figures C-PS-1a-c show ground shaking hazard potential on the Sonoma County coast based on maps produced by the California Geological Survey.

Ground Failure. Strong ground shaking during earthquakes can also result in ground failure. This risk increases with earthquake magnitude and ground shaking intensity but is also influenced by other factors such as slope, ground moisture, and the type and content of bedrock. Ground shaking on gentle and moderate slopes of poorly consolidated surface deposits can result in differential compaction, settlement and liquefaction. Liquefaction occurs when a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress such as shaking during an earthquake or other sudden change in stress condition, in which material that is ordinarily a solid behaves like a liquid. Damage from ground shaking can be increased by liquefaction and landslides. Liquefaction changes water-saturated soil to a semi-liquid state, removing support from foundations and causing buildings to sink. The most likely areas to experience liquefaction are valleys and tidal marshes with high water tables and sandy soils. Landslides, mudflows, and rock falls can result from

ground shaking and are most common on steep slopes but may also occur in areas of gentle slopes due to liquefaction of subsurface materials.

Ground Displacement along Faults. Surface fault ruptures can result from large magnitude earthquakes. Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Structures located within the fault rupture zone are subjected to excessive force. Most structures are not designed to withstand such large deformations and experience major damage. Pipelines crossing the fault zones can also be damaged by ground failure. During the 1906 earthquake, horizontal displacement along the San Andreas Fault averaged 15 feet in Sonoma County. Hazards from surface fault ruptures are generally avoided or minimized by limiting development in active fault zones in compliance with the Alquist-Priolo Earthquake Fault Zoning Act discussed in Section 3 (Geologic Hazards, Regulatory Setting).

Secondary Effects of Earthquakes. Earthquakes can result in additional property damage and human injury from secondary effects. Some earthquakes can result in large tsunami waves along the ocean shoreline or seiches on lakes which can cause damage by their force and by inundation of low-lying developed areas adjacent to the shoreline. Tsunamis and seiches are discussed in greater detail in Section 4 (Flood and Inundation Hazards). In addition, damage to utilities and other public facilities can produce disastrous secondary effects. Much of the destruction from the 1906 earthquake in Sonoma County was from fires that could not be put out due to broken water lines, damaged roads, and lack of communication. In addition, seismic events could trigger slope failure resulting in landslides which block or damage roads and infrastructure. Risks resulting from the secondary effects of earthquakes can be reduced by various methods, but locating essential facilities and dense populations within high hazard areas increase the potential for damage.

3.1.2 Other Geologic Hazards

The Sonoma County coast has other geologic hazards in addition to those arising from seismic events, which include expansive soils; slope instability, which can result in landslides; and coastal bluff erosion. Erosion is the loosening and transportation of rock and soil debris by wind, rain, or other running water or the gradual wearing away of the upper layers of the earth. Each of these hazards is discussed below. However, unlike other coastal communities, Sonoma County does not experience significant beach sand erosion issues.

Expansive Soils. Buildings, utilities, and roads can be damaged by underlying soils rich in clay that swell each winter and shrink each summer depending on rainfall. This is

a less obvious geologic hazard than earthquakes or landslides, but the gradual cracking, settling, and weakening of buildings over time could be significant.

Slope Instability. Slope instability includes landslides and other shallow soil slippage events that involve various forms of mass earth and rock movement downslope. The most common type of slope instability in Sonoma County is landslides. Landslide potential is generally greater on areas of steeper slope and can be triggered by heavy rainfall; earthquakes; road cuts; and construction activities such as grading and filling, placing culverts, and installing septic tanks. Logging, grazing, and removing vegetation may also adversely affect slope stability. Landslides and shallow soil slippage are prevalent in the Coastal Zone. **Figures C-PS-2a-c** show the areas on the Sonoma County coast subject to slope instability.

Landslides and coastal bluff erosion play a role in threatening development along the Sonoma County coastline. Development of homes, septic systems, landscape irrigation, and drainage as well as heavy rainfall and tidal action impact the rate of coastal erosion. Intensive grazing, tilling of slopes, and road construction have resulted in erosion on the Sonoma County coast through shallow slippage, gullying, sheet wash, and wind action. Ongoing coastal erosion has contributed greatly to historic sedimentation of Bodega Harbor, the Estero Americano, and other water bodies. State Highway 1 on the North Coast experiences landslides and erosion to the extent that the road is frequently closed for repair.

Coastal Bluff Erosion. According to the National Academy of Sciences (2012), most of the damage along the California coast is caused by storms, particularly by the confluence of large waves, storm surges, and high astronomical tides during a strong El Niño event; and a rising sea level would magnify the impacts of high waves and storm surges on the coastline. Storms and sea level rise are causing California coastal bluffs, beaches, and dunes to retreat at rates from a few centimeters to several meters per year. Coastal bluff erosion could increase abruptly from an episodic event such as a tsunami or an unusually severe winter storm. The National Academy of Sciences (2012) projects that California coastal bluffs could retreat more than 100 feet by 2100.

While the entire Sonoma Coast is subject to high rates of erosion and frequent landslides, the greatest hazards located between Bodega Bay and the Russian River. This section of the coast is characterized by a broad coastal prairie terminating in a steep bluff that drops 50 to 100 feet down to narrow rocky beaches. In the early 1900's the Bodega-Jenner Highway, later to become Highway 1, was constructed along the western edge of the coastal prairie. Beginning in the late 1920's, hundreds of small parcels were created in the land west of Highway 1 and sold as vacation home sites.

The majority of this development occurred before passage of the Coastal Act, with a substantial number of homes constructed before Sonoma County first required building permits in 1963.

Geologically, the coastal prairie is a thick layer of Franciscan *mélange*, which is highly fractured, easily erodible, and unstable. The combination of weak bedrock geology, high rainfall, and direct exposure to storm waves generates one of the highest rates of shoreline retreat in California. As bluff retreat began to threaten existing development west of Highway 1, property owners modified drainage and armored the shoreline, which failed to protect homes and actually accelerated erosion rates.

As of 2019, the greatest hazards from coastal erosion are at Gleason Beach, north of Scotty Creek. When these lots between Highway 1 and the ocean were created in 1927, the average lot was 300 feet deep. Twenty-one homes were developed on these lots. Over time, the ocean eroded the shoreline and finally reached the homes during the winter of 1997-1998, when development was severely damaged by storm wave run up. By February 2006, bluff retreat had reached the developed portions of the lots and five homes partially collapsed and were demolished. By the spring of 2017, only seven houses remained, and the edge of the bluff reached the fog line on Highway 1. Recognizing that previous attempts to stabilize Highway 1 were unsuccessful, Caltrans is now planning to realign this section of Highway 1 approximately 450 feet inland from the current location. The strategy of planned retreat, rather than hardening shoreline protections, will likely be applied more frequently as sea level rise, climate change, and erosion continue to threaten development west of Highway 1. In addition to the risk to existing development, public safety for people accessing the beach would also be at risk from coastal bluff erosion. If official or prescriptive paths or trails to the beach are eroded, people may decide to use unofficial or non-prescriptive routes over unstable bluffs to reach the beach.

Avoidance is the preferred method for minimizing the risk to and vulnerability of development from coastal bluff erosion. In cases where existing development is threatened, the first priority should be to evaluate the feasibility of relocating the development. Only when all other options are deemed infeasible should shoreline protection structures be considered. By appropriately siting new development, the need for a seawall, revetment, or other shoreline protection structure or alteration to the coastal bluff may be avoided.

If a bluff is determined to be stable, the setback from the top of the bluff should be calculated by the bluff retreat times the life expectancy of the house or building to be protected. If the bluff is determined to be unstable, a buffer should be added as a

safety factor to the setback from the top of the bluff. The buffer should be calculated through a site-specific quantitative slope stability analysis that incorporates historic data. However, due to the unpredictability of episodic erosion, a minimum buffer from the setback from the top of the bluff would be appropriate in all cases.

For purposes of this Local Coastal Plan, the terms bluff, bluff edge, bluff top, embankment, and blufftop redevelopment all have specific meanings, which are defined below and in the Glossary.

Bluff: A high bank or bold headland with a broad, precipitous, sometimes rounded cliff face overlooking a plain or body of water. A bluff may consist of a steep cliff face below and a more sloping upper bluff above.

Bluff Edge: The line of intersection between the steeply sloping bluff face and the flat or more gently sloping bluff top; or the upper termination of a bluff, cliff, or seacliff. In cases where the top edge of the bluff is rounded away from the face of the bluff as a result of erosion processes related to the presence of the steep bluff face, the bluff line or edge shall be defined as that point nearest the bluff beyond which the downward gradient of the surface increases more or less continuously until it reaches the general gradient of the bluff. In a case where there is a step-like feature at the top of the bluff face, the landward edge of the topmost riser shall be taken to be the bluff edge. Bluff edges typically retreat landward due to coastal erosion, landslides, development of gullies, or by grading (cut). In areas where the bluff top or bluff face has been cut or notched by grading, the bluff edge shall be the landward most position of either the current or historic bluff edge. In areas where fill has been placed near or over the historic bluff edge, the original natural bluff edge, even if buried beneath fill, shall be taken to be the bluff edge.

Bluff Top: The upper surface of a bluff or cliff.

Blufftop Redevelopment: Structures located between the sea and the inland extent of the sea and the first public road paralleling the sea (or lagoon) that consist of additions, exterior or interior renovations, or demolition of an existing blufftop home or other principal structure which result in:

- (1) Alteration of 50 percent or more of an existing structure, including but not limited to, alteration of 50 percent or more of the roof, foundation, exterior walls, interior load-bearing walls, or a combination of both types of walls, or a 50 percent increase floor area; or
- (2) Demolition, renovation or replacement of less than 50 percent of an existing structure where the proposed remodel would result in cumulative alterations exceeding 50 percent or more of the existing structure taking into consideration previous additions approved on or after the effective date of the Coastal Act (January 1, 1977).

3.2 Regulatory Setting

3.2.1 Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface fault rupture by preventing the construction of buildings used for human occupancy on the surface trace of active faults. The Act does not address hazards associated with earthquakes such as ground shaking, landslides, or liquefaction.

Alquist-Priolo Earthquake Fault Zoning Act requires counties to designate Earthquake Fault Zones where movement of the earth's surface has taken place during the last 11,000 years; and to require a geologic report for projects proposed within these zones. The State Geologist has identified active faults and mapped Earthquake Fault Zones around the surface traces of the faults. The maps are provided to local agencies which must regulate development projects within the Earthquake Fault Zones. Figures C-PS-1a-c show the San Andreas Earthquake Fault Zones along the Sonoma County coast.

3.2.2 Seismic Hazards Mapping Act

The 1991 Seismic Hazards Mapping Act seeks to protect the public from the hazards caused by earthquakes. The Act requires the State Geologist to delineate and designate areas subject to strong ground shaking, landslides, and liquefaction as Seismic Hazard Zones; and for the California Geological Survey to prepare maps of these Hazard Zones. Counties must regulate certain types of development projects and withhold the development permits for sites within Seismic Hazard Zones until the geologic and soil conditions of the project site are investigated and appropriate mitigation measures, if any, are incorporated into the project plans. Counties must also take these Seismic Hazard Zones into account when adopting and revising land use planning and permitting ordinances and reviewing building permits. California Civil Code Sections 1103-1103.14 require disclosure through a Natural Hazard Disclosure Statement in real estate transactions if the property is located in an Earthquake Fault Zone or Seismic Hazard Zone.

3.2.3 Other Seismic Safety Regulations

In addition to the above, several other seismic safety regulations have been developed over the last century. A summary of these regulations is provided below:

- (1) The 1933 Field Act and Other School Seismic Safety Legislation requires thorough reviews of plans, strict inspections, and quality control standards for school construction.

- (2) The 1968 Geologist and Geophysicist Act requires geologic or seismic assessments to be carried out by qualified geologists and geophysicists.
- (3) The 1973 Alfred E. Alquist Hospital Seismic Safety Act requires all hospitals built after 1973 to be built to higher seismic standards so they can be reoccupied and remain functional after major earthquakes.
- (4) The 1979 Beverly Act authorizes creation of a Geologic Hazard Abatement District (GHAD) as a means to reduce geotechnical problems associated with development in geologically active areas such as erosion and failure of coastal bluffs. A GHAD is an independent public entity (public agency) formed as a Board of Directors which oversees the prevention, mitigation, and abatement of geologic hazards. Funding of a GHAD is through supplemental property tax assessments. A GHAD was proposed for shoreline protection and bluff stabilization for the Gleason Beach community in 2003, but was not adopted.
- (5) The 1986 Unreinforced Masonry Building Act requires local jurisdictions to address the life safety risks posed by Unreinforced Masonry (URM) buildings that were constructed before the adoption of seismic-resistant building codes.
- (6) The 1986 Essential Services Building Seismic Safety Act requires that essential services buildings be designed and constructed to be capable of providing essential services to the public after a disaster.

3.2.4 Shoreline Protection Structures

Seawalls and other shoreline protection structures are hardened structures installed along the coast which provide a physical barrier that armors and stabilizes the shoreline landward of the structure from the erosive forces of wave action. Shoreline protection structures are typically installed by private landowners or local, state, and federal governments in order to provide stabilization and protection of coastal development from floods, storms, and sea level rise. The use of shoreline protection structures is acceptable in some circumstances to serve coastal-dependent uses or to protect existing structures or public beaches when designed to eliminate or mitigate adverse impacts.

Although shoreline protection structures can be used to protect coastal development they are not appropriate to use in most circumstances due to the large amount of adverse environmental impacts that they generate. Shoreline protection structures prevent beaches from migrating inland and induce erosion in adjacent unprotected shoreline. These structures also have adverse impacts on recreational beach uses, scenic resources, and the natural supply of sand to shoreline areas. Shoreline protection structures also have a reality short structural lifespan relative to the high cost of installing and removing the structures. Despite the significant cost of installation, there are instances where the performance of such structures has been inadequate and the

erosion and damage they were installed to prevent or reduce still occurs. Remnants of failed shoreline protection structures and collapsed private buildings degrade the natural beauty of the Sonoma County coastline. Clean-up of these structures on the beach can pose a problem due to the high cost of funding a full clean-up or if equipment access to the beach is limited.

Section 30235 of the California Coastal Act allows seawalls and other shoreline protection structures only to protect existing development or public beaches or to serve coastal-dependent uses, and only in certain situations. Section 30610 allows reconstruction of a shoreline protection structure destroyed by a disaster without a coastal permit under certain conditions, including where the replacement structure is no more than 10 percent larger than the destroyed structure. Section 30611 allows, in the case of a disaster or other emergency, work to protect life and public property not including permanent erection of structures, valued at more than \$25,000 without a permit.

GOAL C-PS-2: Prevent unnecessary exposure of people and property to risks of injury or damage from earthquakes, landslides, coastal erosion, and other geologic hazards.

Objective C-PS-2.1: Locate and design new development to reduce the risks of human injury and property damage from existing and anticipated geologic hazards, including coastal bluff erosion, to acceptable levels.

Objective C-PS-2.2: Minimize the risks of human injury and property damage from existing and anticipated geologic hazards.

Objective C-PS-2.3: Minimize the need to construct seawalls or other shoreline protection structures to reduce impacts to natural shoreline processes, cultural and biological resources, views, and coastal access.

The following policies, in addition to those in this Public Safety Element and the Open Space and Resource Conservation, Water Resources, and Land Use Elements shall be used to achieve these objectives:

Policy C-PS-2a: Design and construct all structures for human occupancy, including mobile homes, in accordance with Zone 4 standards of the Uniform Building Code. **(Existing LCP)**

Policy C-PS-2b: Enforce the geologic provisions of Chapter 70 of the Uniform Building Code. **(Existing LCP)**

Policy C-PS-2c: Encourage strong enforcement of seismic safety requirements and regulations for design and construction of buildings and facilities subject to state and

federal standards, such as bridges, dams, power plants, hospitals, schools, and essential services buildings. **(GP2020)**

Policy C-PS-2d: Structures intended for human occupancy as defined in the Alquist-Priolo Special Studies Zones Act and related Administrative Code provisions shall be prohibited within 50 feet of the surface trace of any fault in Earthquake Fault Zones. **(GP2020)**

Policy C-PS-2e: Encourage the consolidation of lots and new structures in high hazard areas. **(Existing LCP Revised)**

Policy C-PS-2f: A site-specific geologic hazards report prepared by a licensed Geotechnical Engineer, Engineering Geologist, or Geophysicist shall be required for development projects proposed within Geologic Hazard Areas, as shown in **Figures C-PS-1a-cand C-PS-2a-c**. A geologic hazards report shall also be prepared where a site evaluation conducted for a Coastal Permit, building permit or grading permit application has identified that such a report is required. The geologic hazards report shall include the following information:

- (a) Description of the types and locations of the geologic hazards on the project site.
- (b) Analyses of the risks of human injury and property damage from geologic hazards associated with the proposed development, including but not limited to site preparation, grading, installation of septic systems, installation of drainage and road improvements, construction of foundations, and construction of buildings and structures.
- (c) Design siting and construction mitigation measures for the proposed development to minimize the potential for collapse; debris falling on occupants or pedestrians; failure of critical mechanical or electrical systems; releases of large quantities of hazardous or toxic materials; and substantial economic loss from geologic hazards.
- (d) Certification from the Geotechnical Engineer, Engineering Geologist, or Geophysicist that the risks of human injury and property damage from geologic hazards associated with the proposed development have been mitigated to an acceptable level. **(New)**

Policy PS-2g: As a condition of coastal permit approval for development in mapped Hazard Areas, require the applicant to record a document exempting the County from liability for any personal or property damage caused by natural geologic or other hazards on such properties and acknowledging that future shoreline protective devices to protect structures authorized by such coastal permit during the structure's economic life are prohibited. **(New)**

Policy C-PS-2h: Incorporate measures to mitigate to an acceptable level identified geologic hazards for all County road, public facility, and other projects. **(GP2020)**

Policy C-PS-2i: Applications for new development or redevelopment on coastal bluff property shall be required to include a site-specific coastal bluff erosion hazards report from a licensed Geotechnical Engineer, Engineering Geologist, or Geophysicist that establishes a geologic setback line for proposed new temporary (e.g., gazebos and portable spas) and permanent (e.g., roads, driveways, water lines, drainage improvements, and septic systems and leachfields) structures and infrastructure. This setback shall be no less than 100 feet and shall establish where on the bluff top stability can reasonably be assured for the economic life of the development (no less than 100 years). All new structures for human occupancy and infrastructure located on a bluff top shall be setback to ensure that it will not be endangered by coastal bluff erosion, retreat, and collapse; and thereby avoid the need for shoreline protection devices during the economic life of the development. The effect of any existing shoreline protective devices shall not be factored into the required stability analysis.

The coastal bluff erosion hazards report shall take the following factors into account in establishment of the geologic setback line:

- (1) Proposed extent of grading and site preparation.
- (2) Proposed plans for construction of roads, driveways, foundations, water lines, drainage improvements, and septic systems and leachfields.
- (3) Maximum coastal bluff retreat projected to occur within the economic life of the development (100 years). The projected coastal bluff retreat shall be calculated considering the specific geologic and hydrologic conditions on the site; historic coastal bluff retreat data; projections for future sea level rise according to the most up-to-date science; and existing and projections for changes in storm frequency, magnitude, and duration due to climate change. **(New)**

Policy C-PS-2j: Where existing development is threatened by coastal bluff erosion, the first priority shall be to evaluate the feasibility of relocating the development. The second priority shall be to consider the feasibility of less environmentally damaging alternatives than shoreline protection structures. Only when all other options are deemed infeasible should shoreline protection structures be considered. **(New)**

Policy C-PS-2k: Where, as a result of coastal erosion, it is no longer feasible based on size and environmental conditions for a parcel to meet the minimum requirements for development under the Sonoma County Code, the development potential of the parcel may be considered lost due to the forces of nature. There shall be no obligation on the part of the County to restore the development potential of such parcels through Code variances, lot line adjustments, transfer of development rights, or other means. **(New)**

Policy C-PS-2l: Avoid shoreline protection device construction, reconstruction, expansion, alteration, and/or replacement unless determined necessary by and compliant with California Coastal Commission and County of Sonoma Standards (**Appendix F**). (**New**)

Policy C-PS-2m: A shoreline protection device shall only be authorized for removal when the protected structure or asset has been removed, or a more appropriate protection option has been identified. In the case of coastal redevelopment, removal of the authorized shoreline protection device shall be required prior to construction of the redeveloped structure. (**New**)

4. FLOOD AND INUNDATION HAZARDS POLICY

4.1 Background

Flooding along rivers and creeks on the Sonoma County coast is a natural, annual phenomenon. Many smaller creeks and drainages along the coast drain smaller areas directly into the ocean without causing the flooding problems that occur on larger watershed basins or river systems. Floods on small streams usually peak and recede quickly, while floods on larger systems like the lower Russian River may not peak for two days or more after the start of a storm and may exceed flood stage for four days or more. In larger drainage basins, streams overflow banks when runoff from the watershed exceeds the capacity of the stream channel to carry the flow. Because the Coastal Zone is a narrow band of land near the coast, most of the flood waters draining to the ocean originate from inland areas outside the Coastal Zone.

Flooding can move, destroy, or damage buildings, roads, infrastructure, and personal property, not only by inundation but also by the force of flowing waters. Flood damage may weaken building materials and increase mildew, mold, bacteria and other disease vectors. Floods can result in human injury and pose a threat to life. Floods can wash away soil, erode banks, destroy crops, and transport loose objects and flood debris downstream; and may end up degrading Sonoma County beaches or offshore marine habitats.

Although floods are primarily associated with the overflow of rivers and creeks, damage from flooding and inundation can also result from dam failure, tsunamis, seiches, ocean surges and higher waves during storms, and sea level rise. Localized flooding can also occur from blocked or undersized storm water conveyance channels and infrastructure.

4.1.1 Stream and River Flooding

Flooding is most often associated with an overflowing stream or river. The floodplain is the area adjacent to the watercourse that is subject to recurring inundation from floods.

The magnitude of floods, can be described in terms of flow (cubic feet per second), elevation (height above a defined datum), or by the areal extent of flood water inundation. However, the more frequent and universal way of describing flood magnitudes is by their projected recurrence level - the bigger the flood, the more years that would typically be expected to pass statistically before it reoccurs. For instance, a flood level that would occur on average once every two years is referred to as the 2-year flood, and it would statistically have a 50 percent chance of occurring in any given year. A 10-year flood has a 10 percent chance of occurrence, a 50-year flood has a 2 percent chance, a 100-year flood has a 1 percent chance, and a 500-year flood has a 0.2 percent chance of occurring in any given year. Although the recurrence level is based on statistical averages, the actual occurrence of flood events varies and could occur at shorter intervals or even within the same year.

Storms are described in the same way - as the storm event of such a magnitude (amount of rainfall during a specified length of time) that it has a certain percent chance of occurring in any given year. For instance, the 100-year flood is the storm event of such a magnitude that it has a 1 percent chance of occurring in any given year. Similarly, the 10-year storm is a storm event of such a magnitude that it has a 10 percent probability of occurring in any given year.

Floodplains or flood zones are described with reference to the associated flood – as the areal extent of land that would be covered by the flood event of such a magnitude that it has a certain percent chance of occurring in any given year. For instance, the 100-year floodplain is the area that would be covered by the 100-year flood.

The FEMA and Federal Insurance Administration have assessed flood hazards for most major streams in Sonoma County. These assessments are periodically updated to reflect new data from flood studies and actual flood events. The FEMA maps show the 100-year floodplain and are commonly used as the primary source of flooding information for planning and development review and floodplain management. Where the subject river or stream has been studied by detailed hydrologic and hydraulic methods, FEMA may also designate a floodway within the 100-year floodplain. According to FEMA, the floodway is “where the water is likely to be deepest and fastest - the area of the floodplain that should be reserved (kept free of obstructions and development) to allow floodwaters to move downstream.” The floodway is generally considered to be the area where the flood risk is highest and the vulnerability of development is greatest.

Currently the Russian River is the only river on the Sonoma County coast for which the 100-year flood plain has been mapped by FEMA, shown on **Figures C-PS-3f-ii, 3g-ii, 3h-ii, and 3j-ii**. It shows the land area adjacent to a watercourse, drainage way, or creek which has been or may be covered by floodwaters. The boundaries of a flood plain are typically described in terms of the magnitude of a flood event such as the "100 year flood plain". Portions of the older unincorporated communities of Duncans Mills and Jenner lie within the 100-year flood zone of the Russian River in the Coastal Zone.

Within the area covered by the 100-year floodplain of the Russian River, the risk of human injury and property damage from flooding increases with the topographic depth, frequency of flooding, and force of the flood current. Properties within the floodway (approximate 10-year floodplain) would be subject to a greater depth and frequency of flooding and greater magnitude of cross currents than properties within the 25-year or 50-year floodplains. Development is prohibited within the river's floodway because the risk of human injury and property damage in this area is unacceptable.

The greatest threat to public safety and property exists where development is located in areas subject to recurring flooding. The Russian River has the highest frequency of flooding and greatest flood hazards in the Coastal Zone due to the size of its drainage basin and the amount of historic development in the floodplain. The Coastal Zone contains only about 237 of the 1,485 square miles (16 percent) of the Russian River Watershed. Therefore, most of the flood waters from the Russian River draining to the ocean originate from inland areas outside the Coastal Zone.

4.1.2 Dam Failure Inundation Zones

Flooding can also result from dam failure. The area of potential inundation resulting from the failure of a specific dam is designated as the Dam Failure Inundation Zone for that dam. The current mapping of dam failure inundation zones in the Coastal Zone shows that the areas which could be inundated by dam failure are already included in the 100-year flood zone. There are no major dams located within the Coastal Zone.

4.1.3 Coastal Flooding and Storm Surge

Areas designated as the VE Zone on FEMA's Flood Insurance Rate Map (FIRM) are considered to be in a Coastal High Hazard Area subject to high velocity waters from coastal flooding, tidal inundation, and tsunamis. However, FEMA has not designated all potential Coastal High Hazard Areas, and is in the process of updating its mapping of these areas.

4.1.4 Tsunamis

A tsunami is a series of traveling ocean waves, generated by a distant or near-shore undersea earthquake or landslide, that decrease in speed and increase in height as they enter shallow coastal waters. If these waves are much larger than usual, they can become a threat to human life and property by the force of the wave as well as by inundation. Following arrival of the first wave, subsequent waves may increase in height and arrive minutes to hours later. Factors influencing the size and speed of a tsunami include the source and magnitude of the triggering event, water depth, offshore topography, onshore topography, and coastline shape.

The National Oceanic and Atmospheric Administration (NOAA) heads the National Tsunami Mitigation Program, a federal and multi-state initiative to address tsunami hazards in the United States. The Program develops tsunami inundation and evacuation maps for at-risk communities. NOAA, the California Emergency Management Agency (CalEMA), California Geological Survey (CGS), and University of Southern California have conducted systematic analyses of all historic and possible tsunami hazards along the coast of California for the purpose of mapping tsunami run-up zones from nearshore events in these at-risk communities. Based on a comparison of historic tsunami events along the west coast of California and consideration of tidal fluctuations and other factors, a maximum tsunami wave height of 21 feet along the Sonoma County coast could be created by a large seismic event. However, given the limits of available data, and the possibility that future events may differ from historic events, it is possible that the actual inundation from a tsunami could be greater than currently projected.

For the purposes of this Local Coastal Plan and the *Sonoma County Operational Area Tsunami Response Plan and Evacuation Plan* (part of the *Sonoma County Hazard Mitigation Plan*), a conservative approach was assumed and a maximum tsunami wave height of 25 feet (7.6 meters) along the Sonoma County coast and 5 feet (1.5 meters) in San Pablo Bay were used to identify potential tsunami inundation areas.

Tsunami inundation maps for the Sonoma County coast and San Pablo Bay were released in 2009. The tsunami inundation zone on the Sonoma County coast is shown on **Figures C-PS-3a-k**. Not all tsunamis will inundate all areas in the potential zone. Some tsunamis may be only a few inches or a few feet and affect only a portion of the potential tsunami inundation zone.

Since most of the County coastline is elevated, most areas along the coast are considered safely out of reach of a potential tsunami wave. However, the low-lying coastal communities along the southern Sonoma County coast extending from Jenner to Bodega Bay have area of significant exposure and risk of human injury and property damage

because they contain low-lying public beaches, parks, and infrastructure; and residential and commercial development. Although there are no known recorded deaths from a tsunami in Sonoma County, there were small impacts from tsunamis in 1946 and 1960.

Under the California Coastal Analysis and Mapping Project (CCAMP), FEMA is initiating flood studies/mapping projects in coastal areas as a result of Congressional appropriations for flood hazards mapping. These efforts will address gaps in required engineering and mapping for high flood risk areas impacted by coastal flooding. The Open Pacific Coast Study is a component of CCAMP that involves detailed coastal engineering analysis and mapping of the Pacific coast of California. Results from the Open Pacific Coast Study will be used to remap the coastal flood risk and wave hazards for fifteen California counties, including Sonoma County.

4.1.5 Floodplain Management

The primary method of reducing the risk of hazards and impacts from flooding is through floodplain management. In addition to mapping flood hazards, floodplain management may include restrictions on the type and location of land uses and development in the floodplain. Land uses which can sustain periodic flooding and decrease flood hazards downstream would be encouraged. Floodplain management may also include establishing development and construction standards that minimize vulnerability to flood hazards, such as requiring the first floor of structures to be one foot above the base flood elevation. Floodplain management may also include increased retention of stormwater runoff in the watershed, acquisition of property in flood hazard zones, public education and outreach, and other methods which reduce the need for costly construction projects and disaster relief.

Floodplain management is required by federal and state law. Various incentives such as flood insurance, loans, and State funding of flood control projects are offered if flood management practices are followed including measures that are taken to increase the hydrologic capacity of a natural water course or to create new man-made channels or reservoirs to drain and contain precipitation that otherwise exceeds the capacity of the water course, in an effort to reduce flood damage, usually to man made improvements. In Sonoma County, floodplain management has reduced flood damage primarily by limiting the kind and extent of new construction in flood hazard areas and by elevating existing structures above the base flood elevation. However, property damage from flooding is still a major and persistent problem along the Russian River, which has resulted in Sonoma County having the highest rate of repetitive property losses from flooding in California; and which indicates that a more proactive approach is needed.

The floodplain policies of this Local Coastal Plan are intended to limit development within 100-year flood plain areas; require compliance with siting, development, and constructions standards to minimize the risk of flood hazards for new development; and collaborating and participating in the County’s multi-strategy approach to reduce repetitive flood loss properties and minimize the risks for existing development.

4.2 Regulatory Setting

Section 30253 of the 1976 California Coastal Act, directs that new development minimize risks to life and property in areas of high geologic, flood, and fire hazard. Section 30236 of the 1976 California Coastal Act addresses the situations in which rivers and streams may be substantially altered for flood control projects – only where no other method for protecting existing structures in the floodplain is feasible, and where such protection is necessary for public safety or to protect existing structures.

GOAL C-PS-3: Prevent unnecessary exposure of people and property to risks of human injury and property damage from flooding and other types of inundation hazards

Objective C-PS-3.1: Regulate new development to reduce the risks of human injury and property damage from existing and anticipated flood hazards to acceptable levels.

Objective C-PS-3.2: Minimize risks of human injury and property damage for existing development within flood hazard areas with an emphasis on reducing repetitive property losses.

The following policies, in addition to others in this Public Safety Element and those in the Open Space and Resource Conservation, Water Resources, and Land Use Elements, shall be used to achieve these objectives:

Policy C-PS-3a: Any area that would be inundated by a 100–year flood event shall be considered to be a flood hazard zone. The Flood Insurance Rate Maps (Flood Rate Maps) adopted by FEMA shall be used as the official source of flood elevation data and flood hazard zone mapping and the 100-year flood and to support the National Flood Insurance Program (NFIP) and associated flood insurance studies. Land use planning and development review shall be based on the Flood Rate Maps except where more detailed parcel-specific and site-specific analyses of flood elevations and flood hazard zones based on scaled interpretations of the Flood Rate Maps are available. Where local analyses indicate flood elevations or flood hazard zones which differ from the adopted Flood Rate Maps, such data shall be provided to FEMA so they may be amended.

(New/GP2020)

Policy C-PS-3b: Floodplain management shall be given priority over flood control structures for preventing property damage from flooding, except where the intensity of development requires a high level of protection, justifies the costs of a bank or shoreline protection structure, and such structure complies with requirements of the California Coastal Act and shoreline protection structure requirements of this Public Safety Element. **(GP2020)**

Policy C-PS-3c: Encourage increased stormwater retention and decreased stormwater runoff both within and outside of the Coastal Zone to reduce flooding within the Coastal Zone. Floodplain storage capacity shall be preserved by avoiding fill in areas outside of the FEMA 100-year flood hazard zones which retain or could retain flood waters. **(GP2020)**

Policy C-PS-3d: New development, water diversion, vegetation removal, and grading shall be regulated to minimize any increase in flooding and related human injury and property damage. **(GP2020)**

Policy C-PS-3e: Drainage facilities shall be designed to minimize off-site drainage and flooding according to the most current County flood control and design criteria. Alternative bio-engineered drainage designs (e.g., low impact development techniques) are preferred and shall be proposed where they provide adequate capacity and performance to handle expected stormwater flows. The cost of drainage facilities required to handle stormwater runoff from new development shall be the responsibility of the new development. **(GP2020)**

Policy C-PS-3f: Construction of structures within 100 feet of the top of any natural or manmade embankment which defines a channel shall be prohibited, except where Permit Sonoma finds the flood hazard risk to life and property has been minimized. Reductions to building setbacks in 100-year floodplains shall be avoided. Where this policy conflicts with **C-OSRC-5c(2)** of the Open Space and Resource Conservation Element, the more restrictive of the two shall apply. **(Existing LCP Revised)**

Policy C-PS-3g: Assess potential hazards from proposed development on a case by case basis to ensure that siting, mitigation measures, or design changes are sufficient to reduce exposure to these hazards to an acceptable level. Such assessments shall consider hazards from river and creek flooding, dam failure, storm surge and high waves during storms, sea level rise, and undersized or blocked stormwater facilities. **(New)**

Policy C-PS-3h: New dwellings shall be prohibited in Tsunami Hazard Zones. **(Existing LCP Revised)**

Policy C-PS-3i: Tentative and final subdivision maps and approved site plans shall show areas subject to flooding as designated on the Flood Rate Maps adopted by the FEMA. **(GP2020)**

Policy C-PS-3j: Evaluate potential flood and inundation hazards for development projects relative to potential repetitive property loss, and incorporate mitigation measures to reduce the potential for human injury and property damage to a level of less than significant. Evaluate impacts from sea level rise, and storm inundation events. Consider unique coastal characteristics, infrastructure, and adaptive capacity in project design. **(GP2020 Revised)**

Policy C-PS-3k: Work with County Departments, responsible agencies, public, and other stakeholders to develop and implement a long-term plan for reducing repetitive property losses from flooding as detailed in Policy PS-2d of General Plan 2020. Conduct ongoing flood monitoring, implementation of the Local Hazard Mitigation Plan, consider participation in federal hazard programs. **(GP2020)**

5. SEA LEVEL RISE HAZARDS POLICY

5.1 Background

Sea level rise has been taking place since the end of the last Ice Age, about 20,000 years ago before the beginning of human history. Recent studies suggest that as a result of global climate change, sea level rise will accelerate during the coming decades and increase significantly over the next 100 years.

Sea level rise has been recognized as a significant threat to low-lying coastal areas around the world since the issue of global climate change influenced by human activities emerged in the 1980s. People, property, and biotic resources in low lying coastal areas face a long-term threat of inundation as a result of sea level rise; and the potential damages to property, biotic resources, and infrastructure may be considerable. Many coastal communities and infrastructure will be threatened by increased frequencies and intensities of flooding and gradual inundation as sea level rises. Higher ocean levels will also increase creek and river flooding, coastal bluff and shoreline erosion, and the impacts of tsunamis.

Section 30006.5 of the California Coastal Act identifies sea level rise as one of the topics for which additional scientific and technical analysis and recommendations are necessary to aid coastal planning, conservation, and development decisions. This Local Coastal Plan includes policies to address hazards from sea level rise to enhance the safety of residents and visitors, while providing a framework for consideration and

permitting of coastal development projects. This Local Coastal Plan acknowledges the threat of sea level rise and supports appropriate responses, while recognizing that sea level rise is a global rather than a purely local issue.

5.1.1 California Coast Sea Level Rise

Although global sea level rise has been fairly gradual, Coastal California has experienced noticeable sea level rise for at least the past century. According to the *Safeguarding California Plan: 2018 Update* (California Natural Resources Agency 2018), sea level has risen by an average of about 7 inches along California's 1100-mile coastline during the past century. According to *The Impacts of Sea-Level Rise on the California Coast* prepared by the California Climate Change Center in partnership with the Pacific Institute (Heberger et al. 2009; referred to as the Pacific Institute Report), under medium to medium high levels of greenhouse gas emissions, the mean sea level along the California Coast will rise from 3.3 to 4.6 feet by year 2100.

The best available science and guidance on sea level rise on the Pacific Coast is in *Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* (National Academy of Sciences 2012; National Academy Report). The National Academy Report clarifies that variation in land motion complicates the issue of sea level rise, because in the immediate future it is relative sea level rise at any particular location along the West Coast, combined with short-term increases in sea level during coastal storms and high tides that matter to individual communities, rather than global sea level rise alone. The National Academy Report found a steep change in projected sea level rise at Cape Mendocino in Humboldt County due to tectonic uplift. The report states that much of the land on the coast north of Cape Mendocino is rising at up to 0.1 inch per year, whereas the land on the coast south of Cape Mendocino is sinking at an average rate of about half that. As a result, relative sea level north of Cape Mendocino has been falling over the past ten decades while the level south of Cape Mendocino has been rising.

Storms and Sea Level Rise. Storms and flooding in California typically occur during the winter from November to April and are influenced by several climate patterns, most prominently the El Niño Southern Oscillation. Every two to seven years, the Southern Oscillation alternates between two phases, La Niña and El Niño. In contrast to La Niña, "El Niño years" generally result in persistently low air pressure, greater rainfall, and high winds.). The water levels reached during these large, short-term events have exceeded mean sea levels projected for year 2100, so understanding their additive effects is crucial for coastal planning.

Low air pressure during a storm causes an immediate rise in sea level above predicted tides, referred to as storm surge. It also increases wind activity, generating erosive waves on top of the already high sea level. This combination of factors during an El Niño event can cause widespread damage in coastal areas. As sea level rises, flooding from storms will become more frequent and potentially more hazardous.

Impacts. Rising sea levels, large coastal storms, and extreme high tides contribute to flooding and erosion that threatens California coastal communities. Rising seas increase the risk of coastal flooding, storm surge inundation, bluff and coastal erosion, shoreline retreat, saltwater intrusion, and wetland loss or migration. The net result of coastal storms and sea level rise is coastline retreat, ranging from a few centimeters per year for bluffs made of resistant bedrock to several meters for beaches and dunes. These rates of coastline retreat will increase with rising sea levels and are likely to further increase if waves become higher (National Academy Report). The impacts of sea level rise will vary according to local factors such as shoreline characteristics and topography, the location and extent of development, and local drainage and wind patterns.

According to the Pacific Institute Report, nearly half a million Californians will be at risk from future sea level rise. California has the nation's largest ocean economy, valued at about \$47 billion/year, with the majority connected to coastal recreation and tourism as well as shipping and ports. Many of the facilities and much of the infrastructure supporting these industries, as well as the state's many miles of public beaches, are within just a few feet of present sea level. Sea level rise will result in more frequent flooding and gradual inundation, as well as increased bluff, dune, and shoreline erosion. This flooding and erosion will affect transportation facilities, utility systems, storm water systems, ports and harbors, large wetland areas, and coastal development (i.e., homes and businesses).

5.1.2 Projected Sea Level Rise on the Sonoma County Coast

Climate change is affecting natural and built systems around the world, including the California coast. In the past century, average global temperature has increased about 1.4°F, and average global sea level has increased 7 to 8 inches. Sea level at the San Francisco tide gauge has risen 8 inches over the past century, and the National Research Council (NRC) projects that by 2100, sea level in California south of Cape Mendocino may rise 66 inches. The Sonoma County Focused Vulnerability Assessment for Bodega Bay research shows that in the worst case scenario, sea-level could rise 78 inches by 2100 as shown in **Table C-PS-1**. The two major causes of global sea level rise are thermal expansion of warming oceans and the melting of land-based glaciers and polar ice caps. While Sonoma County's ocean coast regularly experiences erosion,

flooding, and significant storm events, sea level rise would exacerbate these natural processes, and lead to significant social, environmental, and economic impacts. The third National Climate Assessment cites strong evidence showing that the cost of doing nothing exceeds the costs associated with adapting to sea level rise by 4 to 10 times. Therefore, it is critically important that Sonoma County plan and prepare to adapt to sea level rise to ensure public resources and coastal communities are resilient for present and future generations. Future Development considerations should include future vulnerabilities to sea level rise and corresponding habitat migration.

Table C-PS-1: Focused Vulnerability Assessment Sea Level Rise Projections

Scenario	Projected Sea Level Rise	
	feet	cm
1 - 2016	0	0
2 - 2030	0.83	25
3 - 2050	1.67	50
4 – 2100 Best Case	3.33	100
5 – 2100 Worst Case	6.56	200

Sea level rise inundation maps were prepared for Sonoma County using the Pacific Institute Report’s projected sea level rise, together with 100-year fluvial flood events for year 2100. **Figures C-PS-4a-c** illustrate the areas along the Sonoma County coast at risk from erosion, and Figures C-PS-3a-k illustrate the areas at risk from permanent inundation and temporary flooding as a result of sea level rise during a 100-year storm event by year 2100.

Sonoma County Planning staff examined the digital data from the Pacific Institute Report that was used to prepare Figures C-PS-3a-k. **Table C-PS-2** shows, by SubArea, the public roads, State facilities, and County facilities projected to be permanently inundated or temporarily flooded as a result of sea level rise and the 100-year coastal storm event by year 2100. In addition to the public roads and facilities listed in Table C-PS-2, numerous residential, commercial, recreational, and vacant properties and portions of the California Coastal Trail are projected to also be inundated or flooded.

Sea Level Rise Vulnerability Assessment for the Sonoma Coast. In May 2017 Sonoma County completed a sea level rise adaptation planning effort for the Sonoma Coast. The County first conducted a general assessment of the coastal areas, communities, land uses, development, and public facilities most vulnerable to sea level rise impacts to prioritize development of community-specific focused vulnerability

Table C-PS-2: Public Roads, State Facilities, and County Facilities on the Sonoma County Coast Potentially Inundated or Flooded as a Result of Sea Level Rise and the 100-Year Flood by Year 2100

SubArea	Public Roads	State Facilities	County Facilities
1 The Sea Ranch North	Highway 1	<i>Del Mar Landing State Ecological Reserve</i>	<i>Gualala Point Regional Park & Beach</i> <i>The Sea Ranch Access Trails:</i> Bluff-Top; Salal; and Walk-on Beach
2 The Sea Ranch South			<i>The Sea Ranch Access Trails:</i> Shell Beach; Stengel Beach; Pebble Beach; and Black Point Beach
4 Salt Point		<i>Salt Point State Park:</i> Fisk Mill Cove; Gerstle Cove; Horseshoe Cove; Horseshoe Point; Salt Point; and Stump Beach	
5 Timber Cove/ Fort Ross	Highway 1	<i>Fort Ross State Historic Park:</i> Fort Ross Cove; Kohlmer Gulch; Sandy Cove; and Windermere Point	<i>Stillwater Cove Regional Park:</i> Stillwater Cove & Boat Launch; Stillwater Cove Expansion: Pocket Cove and Bluff Trail – Ocean Cove to Stillwater Cove
7 Duncans Mills	Highway 1 Hwy 116 B Street Freezeout Rd Main St Moscow Rd Steelhead Blvd	<i>Sonoma Coast State Park Access Trails:</i> Duncans Mills River; Rancho del Paradiso - Freezeout River; Steelhead Boulevard River; and Willow Creek - Freezeout	
8 Pacific View/ Willow Creek	State Highway 1 Emery Rd Willow Creek Rd Wrights Beach Access Rd	<i>Sonoma Coast State Park & Beach:</i> Arched Rock; Duncans Cove, Point, & Landing; Penny Island; Blind Beach; Furlong Gulch Beach; Goat Rock Beach; Mann Beach; No Name Beach; North Portuguese Beach; Portuguese Beach; Wrights Beach; Monte Rio to Willow Creek Trail; and Willow Creek Campground & River Access Trail	<i>Doran Regional Park & Beach</i>

Table C-PS-2: Public Roads, State Facilities, and County Facilities on the Sonoma County Coast Potentially Inundated or Flooded as a Result of Sea Level Rise and the 100-Year Flood by Year 2100 (continued)

SubArea	Public Roads	State Facilities	County Facilities
<p>9 State Beach/ Bodega Bay</p>	<p>Highway 1 Bay Flat Rd Bean Ave Brooke Rd Churchill St Doran Beach Rd Driftwood Rd Extension–Westshore to Whaleship Roads Maryana Dr Ocean View Ave Shaw Ct Smith Brothers Rd Westshore Rd</p>	<p><i>Bodega Dunes Campground</i> <i>Sonoma Coast State Park:</i> North Salmon Creek Beach and South Salmon Creek Beach <i>(Doran Regional Park: U.S. Coast Guard facility)</i></p>	<p><i>Birdwalk Loop Trail</i> <i>Doran Regional Park & Beach:</i> Doran Beach; Doran Beach Road; Jetty Day Use Area; Miwok Tent Campground; boat launch & parking; and visitor’s center/operations <i>Westside Regional Park:</i> boat launch; RV & tent campsites; and parking <i>Mason’s Marina, Spud Point Marina, Bodega Bay Sport Fishing Center:</i> onshore facilities</p>
<p>10 Valley Ford</p>	<p>Highway 1 John’s St Middle Rd School St (Main St) Valley Ford – Estero Rd Valley Ford – Freestone Rd Valley Ford Rd</p>		<p><i>Gold Ridge Soil Conservation District Office</i></p>
<p>Notes: ¹ Pacific Institute Report (Heberger et al., 2009) ² The County’s hazards maps and tables can be used as a resource for identification of potential hazard areas and vulnerable properties; however, absence of maps alone cannot be considered absence of hazard, and local site conditions must be examined using the best available science.</p>			

assessments. The *Sonoma County Coast General Vulnerability Assessment* was completed in June 2016. The *General Vulnerability Assessment* depicts the inundation from sea-level rise in 1-foot increments up to 6 feet (2100 scenario). The results are those SubAreas with a relative vulnerability of “high” are Highcliffs/Muniz-Jenner (SubArea 6), Pacific View/Willow Creek (SubArea 8), and State Beach-Bodega Bay (SubArea 9).

Based on these results, the County identified the community of Bodega Bay as the subject for a focused vulnerability assessment. The *Bodega Bay Focused Vulnerability Assessment and Adaptation Strategies* (Vulnerability Assessment) and recommendations are located in **Appendix G**

5.1.3 Exposure to Inundation and Erosion

As part of the Sonoma County coast sea level rise adaptation planning effort funded by the Ocean Protection Council, the Center for Ocean Solutions analyzed the relative exposure of coastline areas to erosion and sedimentation caused by storms, and the role of natural habitat in reducing this exposure (Hartge et. al., 2016a).

The Center of Ocean Solutions (COS) and the National Capital Project (NCP) have conducted spatial analyses areas along the Sonoma County coastline at risk of erosion and inundation caused by storms. In addition, the analyses evaluated the role of natural habitat in reducing coastal exposure in Sonoma County. The information below summarizes the findings for the spatial analyses under a 2030 sea level rise scenario (National Academies of Science, 2012).

Figures C-PS-4a-c depict the findings of the analyses of coastal exposure for Sonoma County to erosion and inundation caused by storms under a 2030 sea level rise scenario. The coastal exposure values reflect the relative exposure of different coastline segments to erosion and inundation caused by coastal storms. The map is based on spatial data that includes the 2030 projection for sea level rise, coastal geomorphology, coastal topography and bathymetry, surge potential, wind and wave exposure, natural habitats, and human population. This mapping approach is qualitative and provides a broad overview of the spatial patterns of coastal exposure along the Sonoma County coastline to help prioritize future nature-based adaptation planning strategies for specific locations.

The habitats fringing a coastline attenuate waves and thus reduce storm-related damage to shorelines from erosion and inundation. North of the Russian River mouth to the northern extent of Sonoma County, kelp forest habitat backed by rocky cliffs dominate the landscape and are generally low exposure. In contrast, south of the

Russian River mouth, a greater diversity of habitats (e.g., wetlands, beaches, dune systems) are present and are habitats that are highly exposed to erosion and inundation during storms compared to north of the River mouth. As coastal development and rising sea levels alter or damage these habitats, coastlines and nearby infrastructure become increasingly vulnerable to storms.

Coastal habitats provide an ecosystem service by reducing the impacts of storms and by increasing resilience in coastal areas. However, with ever increasing stresses on ecosystems, it is important to identify where natural habitats provide the greatest benefits to prioritize adaptation planning efforts that protect or restore those critical natural habitats. The habitat types which provide the highest level of natural protection have been identified and mapped.

Figures C-PS-5a-c depict the areas along the Sonoma County coastline in which natural habitat plays a role in reducing exposure to erosion and inundation during storms. For example, the dark brown areas in Doran Beach and south of Salmon Creek indicate locations where habitats play the largest role in reducing exposure. The lighter tones in the map also indicate where habitat areas provide a protective coastal ecosystem service.

5.1.4 Adaptation to Sea Level Rise

Much is at stake from sea level rise, and in order to minimize damage and losses, California's coastal communities must make adaptation to sea level rise a priority by conducting community sea level rise vulnerability and risk assessments and developing a Sea Level Rise Adaptation Plan. Developing a risk assessment involves considering the actual or future threats or hazards of concern, the economic importance or value of public facilities and infrastructure to the community, and the certainty of projected impacts to the degree that these are known or can be expected. Developing a Sea Level Rise Adaptation Plan involves setting goals, identifying objectives and adaptation measures, developing adaptation strategies for different types of land uses and facilities. The Adaptation Plan should consider public access, unique water dependent infrastructure, inundation caused by storm events, salt water intrusion, and consistency across any state and federal sea level rise projections.

In any coastal community there are three types of areas to be considered for adaptation planning: (1) undeveloped land that is considered or zoned to be developable; (2) existing unprotected development, including residential and commercial areas as well as infrastructure; and (3) existing development that has already been armored. The major armored area along the Sonoma County coast is a portion of the residential development above Gleason Beach. The Gleason Beach Highway 1 Realignment project

proposed by Caltrans is an example of a “retreat” adaptation strategy. The proposal is to realign a 3,700 foot, two-lane section of Highway 1 about 400 feet inland of the current alignment at Gleason Beach. The purpose of the project is to provide a safe transportation facility that is no longer vulnerable to advancing coastal erosion.

Adaptation strategies for private property may be different or more difficult from those appropriate for and public property. Over a longer timescale, the cost of restricting or limiting new development in areas vulnerable to the hazards or impacts from sea level rise is far lower than the cost of addressing damaged or threatened development. For existing private development in vulnerable areas, potential strategies for addressing the impacts from sea level rise include:

- (1) Develop incentives for planned retreat or relocation from vulnerable areas; establish mandatory rolling setbacks for future development or significant redevelopment in areas that are likely to be affected by the impacts from sea level rise within the anticipated lifetime of the structures.
- (2) Develop a plan and identify funding or other incentives for purchase or relocation of existing structures out of vulnerable areas.
- (3) Restrict rebuilding of structures in vulnerable areas that have been damaged by storms or the impacts from sea level rise.
- (4) Evaluate existing armored areas to determine whether additional armor or retreat is the most practical long-term approach.
- (5) Reduce and eliminate dependence on shoreline protection structures; there may be some critical structures where armoring may provide short-term protection until other long-term solutions can be implemented.

For existing public infrastructure or community resources including ports, and public trust uses such as navigation and recreation, strategies for addressing the impacts from sea level rise include:

- (1) Develop retreat or retrofit plans for existing infrastructure subject to future flooding, and remove and relocate or replace the infrastructure according to the plans.
- (2) Increase adaptive capacity of shoreline roads, and determine the feasibility of relocating shoreline roads and increasing culvert and roadside ditch capacity. Work with entities such as Caltrans that plan, construct, or operate infrastructure.
- (3) Modify the Local Coastal Plan Public Access Element and Public Access Plan to ensure long- term protection of the function and connectivity of existing public access and recreation resources.

- (4) Site and design all future projects and infrastructure to account for sea level rise projections based on the best available science and the projected life spans of the structures and facilities.
- (5) Reduce and eliminate dependence on shoreline protection structures; there may be some critical structures where armoring may provide short-term protection until other long-term solutions can be implemented.

Based on the costs and benefits as well as the risks, the adaptation plan should then identify the threshold at which the community should take action to prevent, reduce, or adapt to impacts from sea level rise. For example, a coastal park or parking lot can be used intermittently for a long time with periodic winter flooding, but a water or wastewater treatment plant at or near beach elevation must be retrofitted, relocated, or replaced well in advance of facility flooding or failure to ensure continued public services.

For new development in vulnerable areas, potential strategies for addressing the impacts from sea level rise include:

- (1) Consider revising Local Coastal Plan land use, siting, and design standards for new development to avoid and minimize risks.
- (2) Evaluate policies and standards for wetland, ESHA, and stream buffers to ensure protection of sensitive habitat into the future and to maximize the role natural habitats can play in reducing the impacts of sea level rise.
- (3) Consider revising bluff erosion rates and setback standards to avoid and minimize risks.

GOAL C-PS-4: Prevent unnecessary exposure of people and property to risks of injury or damage from sea level rise.

Objective C-PS-4.1: Regulate new development to reduce the risks of human injury or property damage in areas subject to projected future sea level rise and other coastal hazards to an acceptable level, incorporating adaptive capacity in design and operation when hazard risk exceeds a project-specific threshold.

Objective C-PS-4.2: Minimize the risks for existing development of human injury and property damage from projected future sea level rise and other coastal hazards to an acceptable level.

Objective C-PS-4.3: Assess what existing development and public facilities and infrastructure are vulnerable to projected future sea level rise and other coastal hazards.

Objective C-PS-4.4: Assess the risks to and potential impacts on existing development and public facilities and infrastructure from projected future sea level rise, inundation from seasonal storm events, and other coastal hazards.

Objective C-PS-4.5: Develop a plan for community adaptation to projected future sea level rise and other coastal hazards to reduce the risks and impacts to an acceptable level.

The following policies, in addition to others in this Public Safety Element and those in the Open Space and Resource Conservation, Water Resources, and Land Use Elements, shall be used to achieve these objectives:

Policy C-PS-4a: For the purposes of vulnerability and risk assessments, mapping, land use planning, and adaptation planning, consider the areas projected to be inundated by sea level rise by 2100 (including under projected high tides, high water conditions in combination with high tides, and with wave and wind impacts during storm events) to be potentially hazardous areas at risk of flooding using the best available scientific estimates, aligning with projections used by regional, state and federal agencies. **(New)**

Policy C-PS-4b: Use the best available science and technical analyses available in combination with site-specific information when evaluating land use or development proposals in areas subject to sea level rise and other coastal hazards. **(New)**

Policy C-PS-4c: Applications for Coastal Development Permits for development potentially subject to hazards from projected sea level rise, shall include a geologic/flood hazards report prepared by a licensed Geotechnical Engineer that evaluates the potential risk from inundation and/or coastal erosion over the economic life (100 years) of the development. The report shall evaluate a range projected sea level rise based on the latest state guidance and include recommendations on development location, design, and construction to reduce risk from coastal hazards and enhance adaptability of the development coast. **(New)**

Policy C-PS-4d: New development shall be set back a sufficient distance landward or otherwise sited and designed to avoid or minimize, to the maximum extent feasible, inundation and/or coastal erosion resulting from the extent of projected sea level rise, storm events, and other coastal hazards based on the best available science over the expected economic life of the development (100 years). **(New)**

Policy C-PS-4e: For development proposed where potential inundation, flooding, and/or coastal erosion resulting from projected sea level rise cannot be completely avoided, sea level rise adaptation measures shall be evaluated and incorporated into the development siting, design, construction, and operation. **(New)**

Policy C-PS-4f: New development shall be avoided on undeveloped land immediately adjacent to wetlands or other sensitive habitats that are at risk of inundation or flooding resulting from projected sea level rise so that these lands are available for wetland or other habitat restoration projects. **(New)**

Policy C-PS-4g: A buffer at least 100 feet wide from the upland edge of wetlands and riparian habitat shall be provided for new development. Buffers shall be measured from the extent of projected sea level rise in tidally influenced areas based on the best available science. In some cases, including for salt marsh wetlands, the required buffer should be greater than 100 feet. The California Department of Fish & Game, U.S. Fish & Wildlife Service, and U.S. Army Corps of Engineers shall be consulted to determine the buffer width. **(New)**

Policy C-PS-4h: As a condition of Coastal Development Permit approval for development subject to hazard risks in the Geologic Hazard Area Zone, Flood Hazard Area Zone, and areas subject to inundation from sea level rise, require the applicant to record a document approved by Permit Sonoma indemnifying the County from liability for any personal or property damage caused by natural geologic or other hazards on such properties and acknowledging that future shoreline protective devices to protect structures shall be avoided. Consider California Coastal Commission Draft Residential Adaptation Guidance, or successor document, in development of the condition. **(New)**

Policy C-PS-4i: The conditions of approval for any Coastal Development Permit on public or private property that is subject to hazards from projected sea level rise shall include the requirement that the owner shall record a deed with the following notice included: "The subject property is located in an area subject to inundation, flooding, or coastal erosion hazards as a result of projected sea level rise." **(New)**

6. WILDLAND FIRE HAZARDS POLICY

6.1 Background

The combination of highly flammable fuel, long dry summers and steep slopes creates a significant natural hazard of large wildland fires in many areas of Sonoma County. Wildland fire results in death, injury, economic losses, and a large public investment in firefighting efforts. Woodlands and other natural vegetation are destroyed resulting in the loss of timber, wildlife habitat, scenic quality and recreation. Soil erosion, sedimentation of fisheries and reservoirs, and downstream flooding can also result.

Most damage results from a few large fires in the dry weather months. There were 21 wildland fires of 100 acres or more in the County between 1989 and 2000.

Fire hazard severity has been mapped by the CAL FIRE. Areas on the County coast with a high or very high fire risk are shown on **Figures C-PS-6a-c** and include Timber Cove and Sea Ranch. The highest fire hazard in Sonoma County is found in mountainous areas with dry summers, plenty of fuel, and steep slopes.

Residences have increased the number of fires in rural areas. Ninety-seven percent of the wildland fires over 50 acres in Sonoma County since 1989 were caused by human activities or facilities. Residences in rural areas cause fire suppression agencies to devote limited resources to structural protection while the wildfire spreads.

The probability of large damaging fires in developed areas is affected by weather conditions and the spread of fires in surrounding wildland areas. The type of construction, preventive measures, and the extent of fire suppression services are the chief factors which determine how far these fires spread.

6.1.1 Hazards and Risk Assessment

Fire hazards shown on Figures C-PS-6a-c are only a general picture of the actual hazard because of the size of the areas and differences in vegetation and slope. The maps show the fire hazards only in unincorporated areas which are classified as wildlands and are therefore within the State Responsibility Area served by CAL FIRE.

6.1.2 Land Use Planning

In order to reduce the risks of property damage and human injury from wildland fires in rural areas, the types and intensities of land uses should be limited. Rural development should be most restricted where natural fire hazards are high, fire protection is limited, and road access prevents timely response by firefighting personnel and rapid evacuation by residents. Wildland fire hazards may be reduced by mitigation measures including removing vegetation and installing dependable water systems, but cannot be eliminated entirely.

6.1.3 The Sea Ranch Fuels Management

A landscape and fire management plan for The Sea Ranch was implemented in the 1990s to balance fire safety with the basic concept of preserving the natural landscape. In 2002 The Sea Ranch Association (TSRA) introduced a more aggressive Fuels Management Program to reduce fuel loads throughout The Sea Ranch. The Sea Ranch Association has continued to implement and expand the program. It incorporates the Sonoma County Fire Safe Standards (see Regulatory Environment below) and includes the following objectives and actions: create roadside fuel breaks to allow for safe evacuation and emergency access; reduce fuels on hillsides below homes to reduce fire

intensity; enlarge the Highway 1 fuel break and reduce fuels on both sides of the highway; introduce sheep and goat grazing in the meadows on both sides of Highway 1; enhance riparian vegetation and remove conifers in drainages; and control new vegetation growth. TSRA also addresses fire safety around individual structures through its Defensible Space Fuel Management Resolution which requires the owners of developed property to maintain the fuel breaks around structures mandated by CAL FIRE; and its Design Manual Rules, which outline the permit process, procedure, and standards for fuels management on private lots and neighboring property.

6.1.4 Fire Safety Standards

Fire hazard regulations are intended to minimize on-site property damage and personal injury, avoid damage to adjacent properties, and reduce the cost of fire suppression services. Increasing built-in fire protection in those areas where new construction is allowed is the most cost effective way of achieving these objectives. All development must have adequate water available for fire suppression, whether from a hydrant and community system or from an on-site storage tank.

Where development is permitted near wildlands and natural vegetation, the fire hazard must be further mitigated by other measures. The locations of subdivision lots and building envelopes can maximize access by emergency vehicles and minimize construction in steep or wooded areas. Fire retardant roof materials are now required in high fire hazard areas. Preventing the spread of wildland fires to and from structures also requires use of fire retardant materials and/or removal of surrounding vegetation and clearing of fuel breaks.

Differences in local, state, and federal fire safety standards and requirements and in staffing and training among local fire districts prompted the formation of the Sonoma County Department of Fire Services in 1985, now the Sonoma County Fire and Emergency Services Department. Improvements in standards for road design, water supply, and sprinkler systems have increased the effectiveness of local fire protection services. In February 2003 the County Board of Supervisors approved Ordinance Nos. 5402 and 5373 that amended the County Fire Code to require fire sprinklers for both residential and commercial development with some exceptions. In recent years, fire services have reorganized and consolidated in order to minimize administrative costs and to promote more efficient and consistent service response.

CalFire enforces requirements for firefighting and prevention, works with property owners on controlled burns, and advises rural residents on fire prevention methods. CalFire is currently preparing minimum fire safety standards for wildland areas. See

“Regulatory Setting” below for more information about CalFire responsibilities and activities.

Another important component of fire safety is an improved system of street addresses throughout the county. Fire response time, particularly in rural areas, is occasionally affected by the ability of the responder to locate the affected address. Improved visibility and standardizing street addresses can result in reduced emergency response time.

6.1.5 Public Education

Increased public awareness of fire hazards and fire safe practices is an effective way to avoid or reduce future fire damages and loss of life. Emergency service providers typically provide educational programs that focus on fire prevention. In addition to continuing to promote these ongoing programs, fire prevention information can be provided directly to the general public and to prospective permit applicants for incorporation into the building design. Such a program can be further expanded to include fire hazard information by providing fire hazard warning signs along roadways in particularly vulnerable fire hazard areas.

6.2 Regulatory Environment

The California Department of Forestry and Fire Protection (CAL FIRE) has lead responsibility for fighting wildland fires in designated State Responsibility Areas. The Sonoma County Fire and Emergency Services Department (County Fire) provides fire prevention, fire protection, rescue, emergency medical, code enforcement, and arson investigation services for the unincorporated areas of Sonoma County that are not included in an independent fire protection district. County Fire is responsible for enforcing the California Fire Code and other fire-related codes and ordinances. It enforces vegetation management, reviews building construction plans, and performs inspections of new construction for fire code compliance. In addition, three volunteer fire districts providing fire protection services to different portions of the Sonoma County Coastal Zone. See the Public Facilities and Services Element for a more detailed description of the fire protection services in the Coastal Zone.

The Sonoma County Fire Code is based on the National Fire Code, California Fire Code, Uniform Building Code, and California Subdivision and Development Code; constitutes the local adoption of the California Building Code; and is in Chapter 13 of the Sonoma County Code. It sets forth the requirements of the Sonoma County Fire Safety Ordinance, referred to as the Fire Safe Standards. The County Fire Code was adopted to establish minimum fire safe standards for development within the unincorporated area of the county. The County Fire Code requirements ensure that all new development within the

unincorporated area of the county will provide a basic level of fire protection around itself making it easier and safer for fire fighters to fight wildland and structure fires.

The Fire Safety Standards include but are not limited to requirements for emergency access, road naming and addressing, minimum emergency water supply and sprinklers to ensure a supply of water to fight or defend property from a fire, fuel modification and defensible space to reduce the possibility and intensity of a wildfire, and other fire protection measures. Due to the severe fire risk in many areas of the County, the County's Fire Safe Standards which outline development standards for emergency access, water supply, and vegetation management are more stringent than those required by the California Fire Code.

GOAL C-PS-5: Prevent unnecessary exposure of people and property to risks of injury or damage from wildland and structural fires.

Objective C-PS-5.1: Work with other fire agencies to improve fire safety standards, carry-out fire prevention and protection programs, and educate the public about fire hazards and fire prevention.

Objective C-PS-5.2: Regulate new development to reduce the risks of human injury and property damage from known fire hazards to an acceptable level.

The following policies, in addition to those in the Land Use and Public Facilities and Services Elements, shall be used to achieve these objectives:

Policy C-PS-5a: Encourage continued operation of California Department of Forestry and Fire Protection programs for fuel breaks, brush management, controlled burns revegetation, and fire roads; however, brush clearing and controlled burns shall not take place in designated Environmentally Sensitive Habitat Areas (ESHAs) or other sensitive habitats. **(Existing LCP Revised)**

Policy C-PS-5b: Controlled burns shall be allowed on agricultural land with a permit from the local fire agency and in consultation with the local Air Quality Management District and California Department of Forestry and Fire Protection. **(Existing LCP)**

Policy C-PS-5c: Automatic fire sprinkler systems or other on-site fire detection and suppression systems shall be required in all new residential and commercial structures, with exceptions for detached utility buildings, garages, and agricultural-exempt buildings. **(GP2020)**

Policy C-PS-5d: The severity of natural fire hazards, potential damage from wildland and structural fires, adequacy of fire protection services, and mitigation measures

consistent with the Public Safety Element shall be considered in the review of proposed development projects. **(GP2020)**

Policy C-PS-5e: Fire management plans shall be required for subdivisions and new or expanded recreational facilities in non-urban areas, including development of California Department of Parks and Recreation and Sonoma County Regional Parks holdings. Such plans shall include, but not be limited to, adequate water storage, adequate ingress and egress for emergency vehicles and occupant evacuation, and building siting to minimize fire hazards. **(Existing LCP Revised)**

Policy C-PS-5f: Encourage and promote fire safe practices and the distribution of fire safe educational materials to the general public, permit applicants, and local planning agencies. **(GP2020)**

Policy C-PS-5g: Provide fire hazard information signs in Areas of Very High or High Potential for Large Wildland Fires in a manner that is consistent with the Local Coastal Plan and does not degrade Scenic Highway Corridors or scenic views. **(GP2020)**

Policy C-PS-5h: Encourage private individuals and communities on the Sonoma coast to construct small-scale water storage facilities for back-up use in the case of fire and for back-up non-potable water demand. **(Existing LCP Revised)**

7. HAZARDOUS MATERIALS

7.1 Background

Many substances can be hazardous to human health and the environment, which includes air, soil, water, plants, and animals. The California Health & Safety Code defines a hazardous material as "any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and the environment if released into the workplace or the environment." Common hazardous materials include oils, fuels, paints and varnishes, antifreeze, cleaning products, solvents, pesticides (includes herbicides, insecticides, fungicides, and rodenticides), and the associated hazardous waste. The increased use of hazardous materials has increased the potential hazards from hazardous materials and actual human injury and environmental damage, especially when they are used and disposed of near surface water. Public concerns have led to tighter controls on the production, transport, storage, sale, and use of hazardous materials, particularly on the handling and disposal of concentrated residues and wastes produced by power plants and other industrial operations.

Hazardous materials are found at many locations in Sonoma County. The electrical generating plants in The Geysers geothermal area use and produce hazardous materials hauled on winding mountain roads. Spills and releases of such materials have occurred. Petroleum fuels get into groundwater and surface water, particularly from underground storage tanks at gasoline stations and marinas. Preventing hazardous materials in the County's solid waste landfills and transfer stations and industrial operations is important because these materials could affect water quality. Boat use, repair, and maintenance activities at Bodega Bay, Spud Point Marina, and Porto Bodega in the Coastal Zone involve the storage, handling, use, and disposal of hazardous materials such as oils and fuels, paints and varnishes, solvents, and cleaning agents that may drain to surface water.

Pesticides are another hazardous material commonly used in Sonoma County by agricultural operations as well as residential, commercial, and recreational land uses. While state law preempts local regulation of pesticides, the County does have the authority to establish use restrictions applicable to its own operations. By doing so, the County can set an example that will encourage others to reduce reliance on pesticides.

Concerns about Outer Continental Shelf (OCS) oil and gas development led to the approval of Ordinance 3592R in the late 1980s, a Countywide ballot initiative that requires voter approval of any proposed Local Coastal Plan Amendment to allow onshore facilities that would support OCS oil and gas development (see Outer Continental Shelf Development Policy in the Land Use Element). The issue of potential oil or other hazardous material spills from onshore support facilities would be addressed in the required environmental documents on the proposed projects.

The management of hazardous materials is included in this Public Safety Element because it has become a major public safety issue requiring attention significant personnel and financial resources and attention by local agencies. Different local, state, and federal agencies have different responsibilities in regulating hazardous materials, discussed under "Regulatory Setting" below.

7.2 Regulatory Setting

Public concerns over the possible adverse effects of hazardous materials on human health and the environment have led to tighter regulatory controls on the production, transport, storage, sale, handling, and use of hazardous materials.

7.2.1 Federal Hazardous Materials and Waste Programs

The primary federal laws regulating hazardous materials, administered by the United States Environmental Protection Agency (U.S. EPA), are the Resource Conservation and

Recovery Act of 1976 (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). CERCLA, often referred to as the Superfund, was enacted to provide broad federal authority to clean up releases or threatened releases of hazardous substances at abandoned hazardous waste sites in the U.S. The hazardous materials waste program under RCRA establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal — in effect, from cradle to grave. In any given State, U.S. EPA or the State hazardous waste regulatory agency enforces hazardous waste laws. The U.S. EPA encourages States to assume primary responsibility for implementing a hazardous materials and waste program through State adoption, authorization, and implementation of the regulations.

7.2.2 State of California Hazardous Materials and Waste Programs

The State of California has assumed the primary responsibility for implementing the federal hazardous materials and waste program. California legislation in 1993 (Senate Bill 1082) established the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The Unified Program consolidates, coordinates, and makes consistent the California Environmental Protection Agency (Cal EPA) environmental programs which include:

- (1) Hazardous materials inventories and business plans
- (2) Permitting for generators of hazardous waste and operators of on-site hazardous waste treatment
- (3) Aboveground storage tanks
- (4) Underground storage tanks
- (5) Spill or accidental release prevention, control, and response
- (6) Fire code management plans

Under the Unified Program, Cal EPA certifies local agencies to implement the six state environmental programs listed above within their jurisdictions. The appointed local lead agencies are referred to as Certified Unified Program Agencies (CUPAs).

7.2.3 California Coastal Act

Section 30232 of the California Coastal Act requires that measures to protect against hazardous materials spills, and facilities and procedures for containment and cleanup of hazardous substances spills, be incorporated into proposed projects meeting the definition of development and which involve handling or transporting hazardous substances.

7.2.4 Sonoma County Hazardous Materials and Waste Lead Agencies and CUPAs

Hazardous Materials. The California Department of Toxic Substances Control (DTSC) is vested with the primary authority through the U.S. EPA to enforce federal and state laws pertaining to the regulation of hazardous materials and waste in California. The DTSC has authorized the Sonoma County Fire and Emergency Services Department as the lead agency and CUPA to enforce federal, state, and local laws pertaining to hazardous materials and hazardous waste management.

The Fire and Emergency Services Department enforces Chapter 29 of the Sonoma County Code regarding hazardous materials management, and for preparing a comprehensive hazardous materials and hazardous waste management plan. Chapter 29 regulates the storage, handling, and management of hazardous materials, whether in waste or non-waste form, unless specifically preempted by state or federal law. The Fire and Emergency Services Department is also responsible for emergency response to hazardous materials incidents throughout most of the County in coordination with local fire and police personnel, and enforces portions of the California Fire Code which address hazardous materials, including routine inspections.

Underground Storage Tanks. The State Water Resources Control Board (SWRCB) is vested with the primary authority through the U.S. EPA to enforce federal and state laws pertaining to leaking Underground Storage Tanks containing hazardous substances. The SWRCB has authorized the Sonoma County Department of Health Services as the lead agency and CUPA to enforce federal, state, and local laws pertaining to leaking underground storage tanks in the County.

Pesticides. The California Department of Pesticide Regulation (DPR) is vested with the primary authority through the U.S. EPA to enforce federal and state laws pertaining to the proper and safe use of pesticides in California. DPR's enforcement of pesticide use in the field is largely carried out in California's 58 counties by County Agricultural Commissioner Offices and their staffs. The DPR has authorized the Sonoma County Office of the Agricultural Commissioner as the lead agency and CUPA to enforce federal, state, and local laws pertaining to the use, storage, and sales of pesticides in the County.

Oil Spills. The Oil Pollution Act of 1990 (OPA) improved the nation's ability to prevent and respond to oil spills by establishing provisions that expand the federal government's ability, and provide the money and resources necessary, to respond to oil spills. Under the OPA, the U.S. Coast Guard and U.S. EPA are the lead responsible agencies for preventing, preparing for, and responding to oil spills that occur in and around coastal waters and inland waters of the United States, respectively.

The Office of Spill Prevention and Response (OSPR), within the California Department of Fish and Wildlife, serves the responsibilities as public trustee and custodian for the protection, management, and restoration of the fish, wildlife, and plants across the State. As such, it is one of only a few agencies in the United States that both maintains major pollution response authority and public trustee authority for wildlife and habitat. In 2014, Governor Jerry Brown expanded the capabilities of the OSPR to include all state surface waters at risk of oil spills from any source, which more effectively captured possible spills from pipelines, production facilities, and railroad oil shipments (California features more than 7,000 rail crossings over water bodies).

Transport of Hazardous Waste. The California Department of Toxic Substances Control (DTSC) is vested with the primary authority through the U.S. EPA to enforce federal and state laws pertaining to the transport of hazardous waste in California. The DTSC has authorized the California Highway Patrol and Office of the State Fire Marshal to enforce some of the federal, state, and local laws pertaining to the transport of hazardous waste.

To operate in California, hazardous waste transporters must be registered with the DTSC. Unless specifically exempted, hazardous waste transporters must comply with the regulations of the U.S. Department of Transportation, DTSC, California Highway Patrol, and Office of the State Fire Marshal.

GOAL C-PS-6: Prevent unnecessary exposure of people and property to risks of injury or property damage from hazardous materials.

Objective C-PS-6.1: Regulate the handling, storage, use, and disposal of hazardous materials in order to reduce the risks of injury or property damage from hazardous materials.

The following policies, in addition to others in this Public Safety Element and those in the Land Use and Public Facilities and Services and Water Resources Elements, shall be used to achieve these objectives:

Policy C-PS-6a: Siting of hazardous waste repositories, incinerators, facilities that use a substantial quantity of hazardous materials, or other similar facilities intended primarily for hazardous waste disposal shall be avoided in any area subject to inundation, flooding, coastal erosion hazards resulting from projected sea level rise and other coastal hazards, and in areas subject to heightened ground shaking during an earthquake event (Modified Mercalli Index (MMI) Ground shaking Intensity Level higher than Strong (VII) as identified on Figures C-PS-1a-c or within one quarter mile of schools. Siting shall be avoided in any area designated for urban residential or rural

residential use; on agricultural lands; or near waterways, bays, or the ocean.
(GP2020)

Policy C-PS-6b: A use permit shall be required for any commercial or industrial use involving hazardous materials in threshold planning quantities as determined by Federal and State laws. A hazardous materials management plan shall be required as a condition of approval for such permits. **(GP2020)**

8. IMPLEMENTATION PROGRAMS

8.1 Public Safety Implementation Programs

Program C-PS-1: Develop a comprehensive adaptation plan and incentives for planned retreat or relocation from hazard areas;

- (1) Establish mandatory rolling setbacks for future development or significant redevelopment in areas that are likely to be affected by the impacts from sea level rise within the anticipated lifetime of the structures.
- (2) Identify funding or other incentives for purchase or relocation of existing structures out of vulnerable areas or areas exposed to significant hazards risks.
- (3) Limit rebuilding of structures in vulnerable areas that have been damaged by storms or the impacts from sea level rise, including increased rates of erosion.
(New)

Program C-PS-2: Where geologic hazards threaten multiple properties in the same vicinity and all would benefit from a unified, coordinated response to minimize risks, consider the formation of a Geologic Hazard Abatement District (GHAD) as a means to reduce geotechnical problems associated with development in geologically active areas. A GHAD is an independent public entity (public agency) which oversees the prevention, mitigation, and abatement of geologic hazards. Funding of the GHAD is through supplemental property tax assessments. **(New)**

Program C-PS-3: Develop a Strategic Plan for and incorporate into existing plans, damage assessment and recovery of essential service buildings and facilities consistent with Policy PS-1n of the General Plan 2020. **(GP2020)**

Program C-PS-4: Consider amending or adopting a new hazard combining zone to address impacts related to development and redevelopment in hazard areas and on coastal bluffs in order to protect such development from the effects of costal bluff erosion. **(Existing LCP Revised)**

Program C-PS-5: Where additional data and information is necessary to adequately assess the on-site and off-site flood and inundation hazards from a proposed development, to develop mitigation measures, or to determine compliance of an existing or proposed development with the Coastal Zoning Ordinance, a supplemental site-specific flood and inundation hazards analysis shall be required. The site-specific analysis may include but is not limited to:

- (1) Topographic mapping.
- (2) Analysis of the influence of sea level rise on flood elevations and flood and inundation hazards and zones.
- (3) Delineation of flood and inundation hazard zones.
- (4) Calculation of expected flood elevations.
- (5) Calculation of expected flood velocity.
- (6) Analysis of the impacts on on-site and off-site flooding, drainage, and stormwater runoff.
- (7) Using construction details and specifications, analysis of compliance with the Coastal Zoning Ordinance.
- (8) Using cost and appraisal data, analysis of when reconstruction, rehabilitation, additions, or other improvements to structures would constitute a substantial improvement under the Sonoma County Code.
- (9) Development of mitigation measures to reduce or eliminate the potential for human injury and property loss from flood and inundation hazards, particularly in areas subject to repetitive property loss. **(New)**

Program C-PS-6: Establish a new Flood Hazard Area Combining Zone to include regulations for the permissible types of uses, intensities, and development standards in the following flood and inundation hazard areas:

- (1) 10-Year Base Flood Zones
- (2) 100-Year Base Flood Zones
- (3) Areas at Risk from Sea Level Rise by 2100 – Flooding
- (4) Areas at Risk from Sea Level Rise by 2100 – Landward Limit of Erosion High Hazard Zone
- (5) Areas at Risk from Tsunami of Up to 25 Feet

As a condition of coastal permit approval for development in the Flood Hazard Area Combining Zone, require the applicant to record a document exempting the County

from liability for any personal or property damage caused by natural geologic or other hazards on such properties and acknowledging that future shoreline protective devices to protect structures authorized by such coastal permit during the structure's economic life are prohibited. **(New)**

Program C-PS-7: Consider developing regulations that require the use of low impact development techniques to reduce stormwater runoff from new development. **(GP2020)**

Program C-PS-8: Consider preparing a study of the impacts of sea level rise and other coastal hazards on public facilities and infrastructure, private development, communities, and natural ecosystems based on the best available scientific estimates and current state guidance as part of future updates to the Hazard Mitigation Plan. **(New)**

Program C-PS-9: Study, monitor, develop, and implement a plan to mitigate the impacts to groundwater from saltwater intrusion resulting from sea level rise and storm events based on the best available science. **(New)**

Program C-PS-10: Consider preparation of a Sea Level Rise Vulnerability and Risk Assessment, and Adaption Plan for the Sonoma County coast based on guidance from the California Coastal Commission's Sea-Level Rise Policy Guidance (2018), the California Ocean Protection Council's Sea-Level Rise Guidance (2018), and other applicable publications. Focus on those SubAreas of the Sonoma County coast at the highest risk of inundation, flooding, or coastal erosion resulting from sea level rise, which include The Highcliffs/Muniz/Jenner (SubArea 6), Pacific View/Willow Creek (SubArea 8), Duncans Mills (SubArea 7), and State Beach/Bodega Bay (SubArea 9).

Preparation of the Sea Level Rise and Coastal Hazards Adaptation Plan shall involve collaboration with pertinent County of Sonoma departments and agencies, independent utility districts, and responsible federal and state agencies; and participation of the public.

The Sea Level Rise and Coastal Hazards Adaptation Plan shall focus on public and quasi-public facilities and infrastructure and include the following components:

- (1) Discussion of the following planning tools to help communities adapt to sea level rise and other coastal hazards: public purchase of private property for public uses, sale or transfer of public land to accommodate relocated roads and infrastructure, transfer of development rights, parcel reconfiguration, and zoning and land use designation amendments.
- (2) Requirements and standards for siting, design, and construction of new public facilities and infrastructure and private structures in areas subject to sea level rise and other coastal hazards as mapped in the Vulnerability Assessment.

- (3) Requirements and standards for maintenance and removal of abandoned structures.
- (4) Cost/benefit analyses of: a) adaptation measures versus no adaptation measures and b) carrying-out adaptation measures pre-inundation versus post-inundation (i.e., emergency conditions).
- (5) Plan for full disclosure of potential hazards to owners of property in areas subject to sea level rise and other coastal hazards as mapped in the Vulnerability Assessment.
- (6) Identify options and mechanisms to minimize or avoid County obligations to compensate for private property loss or damage resulting from sea level rise and other coastal hazards.

The County will continue to work with the Ocean Protection Council and other agencies and organizations to develop possible adaptation strategies for particular areas of the Sonoma County coast. **(New)**

Program C-PS-11: Identify existing green infrastructure (coastal land, habitats, vegetation, natural features, and ecological processes) which may be used to increase coastal resiliency to climate change, sea-level rise, and flood and geologic hazards (erosion); and strategies for adapting to climate change and sea-level rise through maintenance or enhancement of this green infrastructure. These adaptation strategies may include, but are not limited to, planned retreat, land preservation, habitat conservation, and habitat restoration. **(New)**

Program C-PS-12: Periodically review and update the extent of projected sea level rise in the Local Coastal Plan based on best available science. **(NEW)**

Program C-PS-13: Consider adopting an ordinance which prioritizes relocation and allows reconstruction of a structure damaged or lost from inundation or flooding related to sea level rise where certain criteria can be met; an evaluation of the feasibility of relocation to a location where hazard risks are minimized is provided; where relocation is not feasible, a reconstructed structure must be raised a minimum number of feet above the anticipated base flood elevation considering projected future sea level rise during the economic life of the structure based on the most up-to-date science; and where such an adaptation approach is considered feasible and practical and is expected to minimize the risk of inundation and flooding of the structure to an acceptable level. **(New)**

Program C-PS-14: Continue to adopt revisions to the California Fire and Building Codes and other standards which address fire safety as they are approved by inspection organizations and the State of California. Review, revise, and/or adopt existing or new

local Codes, ordinances, and Fire Safe Standards to reflect contemporary fire safe practices. **(GP2020)**

Program C-PS-15: Proposed development projects shall be referred to the Sonoma County Fire and Emergency Services Department and responsible fire protection agencies for their review and comment. **(GP2020)**

Program C-PS-16: Improve and standardize the County's street addressing system in order to reduce emergency service response times. **(GP2020)**

8.2 Other Initiatives

Other Initiative C-PS-1: Coordinate flood hazard analysis and floodplain management activities with the United States Army Corps of Engineers (USACOE), FEMA, State Office of Emergency Services (State OES), Sonoma County Fire and Emergency Services Department, Sonoma County Water Agency (SCWA), and other responsible agencies. **(GP2020)**

Other Initiative C-PS-2: Encourage FEMA to update its flood insurance studies and Flood Insurance Rate Maps (Flood Rate Maps) to show the following information. This mapping would allow regulations and mitigation efforts to focus on the areas at the highest risk of flood hazards, and allow flood insurance premiums to be more reflective of the actual flood hazard risks on specific properties. Provide FEMA data generated from detailed parcel-specific and site-specific analyses of flood elevations and flood hazard zones when available to assist in updating flood insurance studies and Flood Insurance Rate Maps.

- (1) Flood elevations and flood hazard zones which reflect inundation hazards unique to the Coastal Zone such as sea level rise and greater ocean surges and larger waves during storms based on the most up-to-date data and science, including data developed under the California Coastal Analysis and Mapping Project and Open Pacific Coast Study (OPC Study); and
- (2) Detailed mapping of the 100-year floodplain to delineate the 10-year, 25-year, and 50-year floodplains. **(New)**

Other Initiative C-PS-3: Coordinate with state and local emergency services to educate the public about the areas subject to inundation from a tsunami, where to go in the event of an earthquake, and evacuation routes in the event of a tsunami by distributing educational materials to parcel owners within the tsunami run-up zone and by erecting signage specified by the Sonoma County Operational Area Tsunami Response Plan. **(New)**

Other Initiative C-PS-4: Encourage the California Department of Parks and Recreation, Sonoma County Regional Parks Department, Sonoma County Agricultural Preservation and Open Space District, Sonoma Land Trust, and similar organizations to purchase natural lands adjacent to wetlands or other sensitive natural habitats which are at risk of inundation or flooding from projected sea level rise, based on the best available science, for use as wildlife habitat. **(New)**

Other Initiative C-PS-5: Work with stakeholders to develop a disclosure for real estate transactions involving properties subject to inundation, flooding, and/or coastal erosion hazards as a result of projected future sea level rise. Prior to the lease, sale, or other conveyance of any portion of public property, or issuance of a Coastal Development Permit for the use or development of public lands subject to projected sea level rise, provide a Real Estate Disclosure Statement which states that the property is located in an area that is subject to inundation, flooding, or coastal erosion hazards as a result of projected sea level rise. **(New)**

Other Initiative C-PS-6: Work with the California Department of Forestry and Fire Protection to identify areas of high fire fuel loads and take advantage of opportunities to reduce those fuel loads, particularly in Areas with Very High or High Potential for Large Wildland Fires and in High Fire Hazard Severity Zones. **(GP2020)**

Other Initiative C-PS-7: The Sonoma County Department of Emergency Services shall offer assistance to local agencies in adopting and enforcing fire safety regulations and shall work with local agencies to develop proposed improvements to related County Codes and standards. **(GP2020)**

Other Initiative C-PS-8: Encourage the California Department of Parks and Recreation, and the Sonoma County Regional Parks Department to continue efforts to educate the public about fire hazards and fire prevention. **(Existing LCP Revised)**

Other Initiatives C-PS-9: Continue to educate the general public about and promote the reduction in use of hazardous materials, proper disposal of hazardous materials, and the use of safe alternatives to hazardous materials in County operations and private businesses. **(GP2020 Revised)**

Other Initiatives C-PS-10: Work with applicable regulatory agencies to regulate the use, disposal, and transport of hazardous materials consistent with adopted County policies. **(GP2020 Revised)**

9. REFERENCES

- California Coastal Commission. 2018. Sea Level Rise Policy Guidance. Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits. Adopted August 2015. Science Update adopted November 2018.
- California Natural Resources Agency. 2018. Safeguarding California Plan: 2018 Update. A report to the Governor of the State of California in response to Executive Order S-13-2008.200 p.244.
- California Ocean Protection Council. 2018. State of California Sea-Level Rise Guidance: 2018 Update.
- Hartge, E., L. Wedding, J. Reiblich, W. McEnery. April 21, 2016. *Initial General Vulnerability Assessment: Sonoma County*. Center for Ocean Solutions. Prepared for County of Sonoma Permit & Resource Management Department under Ocean Protection Council (OPC) Sea Level Rise Adaptation Planning Grant CO300500. 12 pp.
- Heberger, M., H. Cooley, P. Herrera, P., P.H. Gleick, and E. Moore. 2009. The impacts of sea-level rise on the California coast. Prepared by California Climate Change Center. 101 p.
- National Academies of Science. 2012. Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future. Prepared by Committee on Sea Level Rise in California, Oregon, and Washington; Board on Earth Sciences and Resources; Ocean Studies Board, Division on Earth and Life Studies; and National Research Council. The National Academies Press, Washington, D.C. 250 p.
- National Research Council. 2010. Adapting to the impacts of climate change. The National Academies Press, Washington, D.C. 244 p.
- Russell, N. and G. Griggs. 2012. Adapting to sea level rise: a guide for California's coastal communities. University of California, Santa Cruz. Prepared for the California Energy Commission, Public Interest Environmental Research Program. 49 p.