CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105- 2219
VOICE (415) 904- 5200
FAX (415) 904- 5400
TDD (415) 597-5885

W6h

Presentation on Draft Residential Adaptation Policy Guidance – Discussion Item Only

July 28, 2017

EXHIBIT

Exhibit 1: Draft Residential Adaptation Policy Guidance

California Coastal Commission
Residential Adaptation Policy Guidance

Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs

Photo Credit: Mary Matella

July 2017

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DRAFT RESIDENTIAL ADAPTATION POLICY GUIDANCE

July 2017

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How to Use this Document

Use this document as:	This document is NOT:
Interpretive Guidelines	**Regulations**
This Guidance is advisory and not a regulatory document or legal standard of review for the actions that the Commission or local governments may take under the Coastal Act. Such actions are subject to the applicable requirements of the Coastal Act, the federal Coastal Zone Management Act, certified Local Coastal Programs, and other applicable laws and regulations as applied in the context of the evidence in the record for that action.	
Examples to modify	**A substitute for consultation with CCC staff**
This Guidance contains model policies that may need to be customized before they can be incorporated into individual LCPs. In addition, not all policies are applicable in every jurisdiction. Commission staff can assist local governments with using the guidance to develop policies that help prepare for sea level rise impacts in their communities.	
A menu of options	**A checklist**
Not all of the content will be applicable to all jurisdictions, and readers should view the content as a menu of options to use only if relevant, rather than a checklist of requirements.	

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Introduction

This Guidance, which will be presented to the Coastal Commission for consideration and formal adoption as interpretive guidelines,[1] is intended to assist local governments in planning for sea level rise adaptation. The Guidance follows up on, and is meant as a companion document to, the Commission's 2015 Sea Level Rise Policy Guidance, which set forth broad principles related to planning for sea level rise. This Guidance provides a more in-depth discussion of sea level rise adaptation policies specifically related to residential development, and it provides examples of policies that cities and counties can consider for use in their communities. Not all model policies will apply in each community, and local governments may want to consider modifications to the language provided, depending on the specific community and geologic contexts of the area. Commission staff is available to assist with understanding and applying the guidance in specific communities.

Residential development is the foundation of many of California's coastal communities. However, as sea levels rise, and beaches migrate inland, maintaining residential development adjacent to the shoreline will cause the narrowing and eventual loss of beaches, dunes and other shoreline and offshore recreational areas. This new threat to public access has the potential to cause significant conflicts with the Coastal Act, which was enacted for the purpose of protecting California's coastal resources. It also conflicts with the public trust doctrine, as embodied in other statutes, Art. 10, Section 4 of the California Constitution, and the common law. Furthermore, it presents a significant environmental justice issue, if residents continue to enjoy shoreline access, while the general public is blocked from accessing the shore.

Given the severity of impacts that could occur as a result of sea level rise, and the uncertainties surrounding projections of sea level rise over the lifetimes of many coastal projects, communities, planners, coastal managers and project applicants will need to use adaptation strategies to effectively address coastal hazard risks and protect coastal resources over time. In Section 1, the Guidance explains how Local Coastal Program (LCP) planning for sea level rise can provide for resilient shoreline residential development while protecting coastal resources. Section 1 also presents background on LCP planning, residential development, and the challenges that sea level rise presents for different types of hazards and development.

Section 2 identifies LCP policies that apply to all adaptation planning efforts, while Section 3 details considerations for developing adaptation strategies in specific areas and contexts. As described in Section 4, these adaptation strategies will need to be evaluated, identified and implemented within a relevant set of laws, including the Coastal Act, public trust doctrine, and takings law. Section 5 on Implementation presents a summation of how LCP Planning Steps interact with specific adaptation policies (identified in Section 7). The Implementation Section also presents ways of phasing in adaptation strategies over time as sea levels rise. Next, Section 6 presents case studies showing how sea level rise vulnerabilities have recently been addressed in different types of community contexts.

Finally, Section 7 presents sample policies for cities and counties to consider for use in different community and geologic contexts. There are a number of options for how to address the risks and impacts associated with sea level rise in the shorter term, through evaluation of coastal

[1] Pursuant to Public Resources Code Section 30620.

development permit applications, and in the longer term through development of management plans and LCP updates. In most cases, the strategies for addressing sea level rise hazards will require proactive planning to ensure protection of coastal resources and development. Such proactive adaptation strategies generally fall into the following categories, though some strategies combine elements of more than one:

1) Avoid Siting Development in Hazard Areas;
2) Design for the Hazard (accommodation);
3) Move Development Away from Hazards (managed realignment/retreat);
4) Move Hazards Away from Development (soft or natural protection)
5) Build Barriers to Protect from Hazards (hard protection)

The LCP model policy language is organized according to these general adaptation approaches which may also be incorporated into conditions of approval of development by the Commission and local government through the coastal development permit process. Additionally, a section on community scale planning presents multiple adaptation approaches within individual policies.

Local governments structure their LCPs (through their Land Use Plans and Implementation Plans) in a variety of ways, with some local governments including significant policy detail in the LUP, and some reserving such detail for the IP. Some of the model policies in this policy guidance reflect a more general policy (as most commonly seen in an LUP) and some have more relevance to implementation or zoning policy (more typically seen in an IP). Local governments should customize the model policies to align with their communities' approach and to facilitate timely development of adaptation strategies.

Note: The model policies presented herein are intended to provide guidance for the development of LCP policies, with an emphasis on applicability to residential development. **Not all approaches listed here will be appropriate for every jurisdiction, nor is this an exhaustive list of options**. In addition, looking at a single policy does not indicate how the entire LCP achieves compliance with the Coastal Act. Similarly, in this policy guidance, the model policies work together. For example, policies on setbacks only work if you also have a policy requiring the site-specific hazard report that is needed to calculate the setback. Therefore, users of the model policies should consult all sections of this Guidance for assistance in understanding how the policies work together.

1. Background

The potential impacts of sea level rise in California fall directly within the state and local government's planning and regulatory responsibilities under the Coastal Act. Sea level rise has a number of effects, including increasing the risk of flooding, coastal erosion, and saltwater intrusion into freshwater supplies, which have the potential to threaten many of the resources[2] that are integral to the California coast, including coastal development, coastal access and recreation, habitats (e.g., wetlands, coastal bluffs, dunes, and beaches), coastal agricultural lands, water quality and supply, cultural resources, community character, and scenic quality. In addition, many possible responses to sea level rise, such as construction of barriers or armoring, can have adverse impacts on coastal resources. For example, beaches, wetlands, and other habitat backed by fixed or permanent development will not be able to migrate inland as sea level rises, and will become permanently inundated over time, which in turn also presents serious concerns for future public access and habitat protection.

The Coastal Act mandates the protection of public access and recreation along the coast, and of coastal habitats and other sensitive resources, as well as the provision of priority visitor-serving and coastal-dependent or coastal-related development. At the same time, it requires minimizing risks to life and property from coastal hazards. The Coastal Commission's Sea Level Rise Policy Guidance, adopted in August 2015, can help planners, decision makers, project applicants, and other interested parties continue to achieve these goals in the face of sea level rise by addressing its effects in Local Coastal Programs and Coastal Development Permits. The intent of this document is to build on the 2015 Sea Level Rise Policy Guidance to provide more specific details on how a community can address sea level rise in LCPs, which are essential planning tools for fully implementing sea level rise adaptation efforts.[3]

Importance of LCPs

LCPs contain the standards for future development and protection of resources in the coastal zone. Each LCP includes a Land Use Plan (LUP) and an Implementation Plan (IP). The LUP specifies the kinds, locations, and intensity of uses, and contains a required public access component to ensure that maximum recreational opportunities and public access to the coast is provided. The IP includes measures to implement the LUP, such as zoning ordinances. LCPs are prepared by local governments and submitted to the Coastal Commission for review and certification for consistency with Coastal Act requirements.[4]

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[2] The term "coastal resources" is meant to be a general term for those resources addressed in Chapter 3 of the California Coastal Act including but not limited to beaches, wetlands, agricultural lands, and other coastal habitats; coastal development; public access and recreation opportunities; cultural, archaeological, and paleontological resources; and scenic and visual qualities.

[3] The California Climate Adaptation Strategy (CNRA 2009) and Safeguarding California (CNRA 2014) specifically identify LCPs as a mechanism for adaptation planning along the California coast.

[4] In addition, there are other areas of the coast where other plans may be certified by the Commission, including Port Master Plans for ports governed by Chapter 8 of the Coastal Act, Long Range Development Plans for state universities or colleges, and Public Works Plans for public infrastructure and facilities. Following certification of these types of plans by the Commission, some permitting may be delegated pursuant to the Coastal Act provisions governing the specific type of plan.

To be consistent with the Coastal Act hazard avoidance and resource protection policies, it is critical that local governments with coastal resources at risk from sea level rise certify or update Local Coastal Programs to provide a means to prepare for and mitigate these impacts. The overall LCP update and certification process has not changed; however, the impacts of accelerated sea level rise should now be addressed in the LCP chapters pertaining to hazard and coastal resource analyses, alternatives analyses, community outreach, public involvement, and regional coordination. This Guidance is designed to facilitate the existing LCP certification and update steps by providing model language and recommendations to local governments for resilient residential shoreline development. Although the existing LCP certification and update processes are still the same, sea level rise calls for new regional planning approaches, new strategies, and enhanced community participation.

While the document is intended to guide LCP planning and development decisions to ensure effective coastal management actions, it is advisory and does not alter or supersede existing legal requirements, such as the policies of the Coastal Act and certified LCPs. Since many existing LCPs were certified in the 1980s and 1990s, it is important that future amendments of the LCPs consider sea level rise and adaptation planning at the project and community level, as appropriate. One of the Commission's top priorities is to coordinate with local governments to complete and update LCPs in a manner that adequately addresses sea level rise and reflects the recommendations in this document.

Residential Development

This policy guidance focuses on residential development because it is one of the most prevalent community development patterns along California's coast, and thus poses one of the more frequent hazards management challenges. Much of this challenge results from the overall pattern of residential development along California's coast that, for the most part, was established before the Coastal Act. Within many of these residential areas there is typically a mixture of structures built before and after the Coastal Act. In addition, many of California's urban coastal areas were built out during the post-WWII development boom that also coincided with a relatively "calmer" coastal period that had fewer, less intense storms. Thus, when the Coastal Act was passed in 1976, the State inherited many fixed development patterns in inherently hazardous coastal locations, perhaps due to an artificially low appreciation of the inherent risks in these locations at the time they were developed. The El Niños of 1977-78 and 1982-83 marked the end of the "calm" period and caused enormous amounts of property damage, shoreline erosion, and also often led to necessary emergency shoreline armoring.

Policymakers seeking effective responses to sea level rise in California must confront the inherent complexity of the challenge: California has more than 1271 miles of main coastline, with a diversity of physical environments, ranging from high cliffs to low river mouths; rocky substrates to sandy dunes; high wave energy exposed beaches to lower energy estuarine and bay environments.[5] And there are a wide variety of developed areas along this diverse coastline; for

[5] *See generally*, LIVING WITH THE CHANGING CALIFORNIA COAST (Gary Griggs et al. eds., 2005).

example, the U.S. Census Bureau identifies 117 distinct developed "places" on California's outer coast.[6]

Categorizing California's residentially-developed areas in a typology can help organize approaches for sea level rise adaptation. Typologies are systematic classifications of groups that have characteristics in common. Many fields use typologies to facilitate ordering of information for communication and outreach, from linguistics to natural resource management to climate adaptation.[7] In the case of hazards management, using a typology to describe residential development on the California coastline affirms the diversity of development contexts in California, and thus the complexity of the planning challenge, but it may also help frame the variety of key planning issues important for addressing sea level rise in particular places. Table 1 describes a conceptual grouping of shoreline residential development types.

Table 1. Shore development typology groups with associated subtypes

Shore Development Type		Subtype		
1	Urban blufftop	a) Low	b) High	
2	Urban beachfront	a) Beach	b) Dune	
3	Low density blufftop	a) Low	b) High	
4	Low density beachfront	a) Beach	b) Dune	
5	Urban estuary	a) Bay	b) River	c) Marsh
6	Low density estuary	a) Bay	b) River	c) Marsh

Considering the shoreline, backshore landscape and residential intensity patterns, this conceptual typology can describe the most common settings that bound the diverse development patterns along the California shoreline. Subtypes represent the geomorphic landscape for developed neighborhoods that are located on the beachfront, blufftop, or in other low-lying environments. The estuary type broadly covers low-lying shorelines characterized by some mixing of freshwater and saltwater, as seen at river mouths, lagoons, bays, and saltmarsh. The shore development type in combination with subtype gives a more useful level of detail to planners who are identifying the policies and ordinances to apply to development in their communities.

Although these residential types and subtypes should be addressed within their unique context, they often share a common challenge, in that protecting residential development that is located adjacent to the shoreline will result in narrowing and eventually eliminating the beach, or other coastal resource (e.g., wetlands, dunes) and loss of and/or damage to offshore recreation areas (e.g., for surfing). In order to protect beaches and other coastal resources for future generations, as required by the Coastal Act, this inherent conflict must be successfully addressed through sea level rise adaptation planning.

[6] U.S. Census Bureau, (2010). *Cartographic Boundary Shapefiles - Places (Incorporated Places and Census Designated Places)* [Data file] Retrieved from ftp://ftp2.census.gov/geo/pvs/tiger2010st/06_California/06/tl_2010_06_place10.zip (accessed October 1, 2015).

[7] Y. T. Maru, J. Langridge & B. B. Lin, *Current and Potential Applications of Typologies in Vulnerability Assessments and Adaptation Science* (CSIRO Climate Adaptation Flagship, Working Paper No. 7, 2011), https://research.csiro.au/climate/wp-content/uploads/sites/54/2016/03/7_Typologies-Adaptation_CAF_pdf-Standard.pdf.

Planning for sea level rise in an LCP context will require multiple policies and phased approaches. A list of model policies a community might consider for different shoreline types follows in Table 2.

Table 2. List of model policy options (see Section 7 for full model policy language)

UNDERSTANDING SEA LEVEL RISE HAZARDS
A.1 Identifying and Using Best Available Science
A.2 Identifying Planning Horizons
A.3 Mapping Coastal Hazards
A.4 Site-specific Coastal Hazards Report Required
A.5 Coastal Hazards Report Contents
A.6 Assumption of Risk, Waiver of Liability and Indemnity
A.7 Real Estate Disclosure of Hazards
AVOID SITING NEW DEVELOPMENT OR PERPETUATING REDEVELOPMENT IN HAZARD AREAS
B.1 Siting to Protect Coastal Resources and Minimize Hazards
B.2 Removal Plan Conditions for New Development in Hazardous Areas
B.3 Reliance on Shoreline Armoring
B.4 Bluff Face Development
B.5 Determining Bluff Setback Line
B.6 Minor Development in Hazardous Areas
B.7 Definition of Redevelopment
B.8 Nonconforming Structures
B.9 Restrict Land Division in Hazardous Areas
B.10 Takings Analysis
DESIGN FOR THE HAZARD
C.1 Adaptive Design
MOVING DEVELOPMENT AWAY FROM HAZARDS
D.1 Removal Conditions/Development Duration
D.2 Contingency Funds
D.3 Limited Authorization Period and Planned Retreat Management Plan
MOVING HAZARDS AWAY FROM DEVELOPMENT
E.1 Habitat Buffers-New Concepts
E.2 Non-structural Shoreline Armoring
E.3 Avoid Adverse Impacts from Stormwater and Dry Weather Discharges
E.4 Flood Hazard Mitigation
BUILDING BARRIERS TO PROTECT FROM HAZARDS
F.1 Shoreline Protective Devices
F.2 Prioritization of Types of Shoreline Protection
F.3 Siting and Design to Avoid and to Mitigate Impacts
F.4 Repair and Maintenance of Shoreline Armoring
F.5 Evaluation of Existing Shoreline Armoring
F.6 Shoreline Armoring Duration

F.7 Shoreline Armoring Mitigation Period
F.8 Shoreline Armoring Monitoring
F.9 No Future Shoreline Armoring
F.10 Bulkheads for Waterfront Development
COMMUNITY SCALE ADAPTATION PLANNING
G.1 Management of Sea Level Rise Hazards
G.2 Adaptation Plan
G.3 Sea Level Rise Hazard Overlay Zone
G.4 Beach Open Space Zone
G.5 Beach Replenishment
G.6 Improve Drainage on Bluffs to Reduce Erosion
G.7 Repetitive Loss
G.8 Beach Management Plan
G.9 Managed Retreat Program
G.10 Transfer of Development Rights Program
G.11 Geologic Hazard Abatement Districts (GHADs) and County Service Areas (CSAs)

2. Policy recommendations for all hazardous areas

Broadly, communities planning for sea level rise will need to embark on a process to learn about 1) the increasing hazards that threaten their communities and its coastal resources, 2) what options exist for protecting their threatened built and natural assets, and 3) what adaptation pathway choices are suitable given social, economic, legal, resource, and environmental justice concerns. This planning process includes identifying how and where to apply different adaptation mechanisms based on Coastal Act requirements, other relevant laws and policies, acceptable levels of risk, and community priorities. The list of model policies above (Table 2) and the discussion below is not exhaustive, but provides an introduction to a variety of options that are potentially applicable in most communities. By planning ahead, communities can reduce the risk of costly damage from coastal hazards, can ensure the coastal economy continues to thrive, and can protect coastal habitats, public access and recreation, and other coastal resources for current and future generations. While adaptation strategies should be chosen based on the specific risks and vulnerabilities of a particular region or project site, in the context of applicable Coastal Act and LCP requirements, the following broad policies exemplify important concepts for a strong LCP framework addressing sea level rise.

Use Best Available Science

Despite the variety of coastal community types and planning contexts, it is important that all local governments undertake vulnerability assessments and begin the adaptation planning process to allow for continued improvement of their communities in a way that also protects coastal resources and public access to the maximum extent feasible as the sea level rises. As a general matter, all communities should embrace the best available science and analyze high projections of sea level rise in their planning for coastal hazards. If detailed local vulnerability assessments have not been completed, the planning and project design process can rely on increasingly available mapping tools.[8] Policies A.1 – A.5 demonstrate model options for integrating best available

[8] For a list of available mapping tools, see CCC Sea Level Rise Policy Guidance, Appendix C.

science on sea level rise into LCP planning through use of sea level rise scenarios, mapping, and technical reports.

Ongoing monitoring of conditions on the ground will also be important for implementing adaptation strategies at the appropriate time; thus, communities should consider developing monitoring programs. Monitoring can occur on a site-specific basis (e.g., Policy F.8 – Shoreline Armoring Monitoring) or on a community scale, through adaptation programs that rely on specific thresholds to trigger implementation of adaptation phases (e.g., Policy G.8 – Beach Management Plan).

Disclose Risks to Property Owners

All communities should also be considering longer planning horizons and phased approaches that inform property owners and the public about planned adaptation through such mechanisms as hazard overlay zones, deed restrictions, real estate disclosures, and assurances or waivers of rights based on defined triggers sensitive to the specific planning context. Thus, LCP updates that account for the intent of Policies A.1 – A.7 and G.1 – G.2 are necessary for every community addressing sea level rise.

Avoid Hazards through Siting and Design

Development should be required to be resilient and safe, while assuring the protection of shoreline recreational resources and ecological values. Avoiding flooding and erosion through setbacks, siting, and design decisions that locate development at safe distances from potential hazards should be the first consideration for all types of new development. Restricting land division in hazard zones can also help avoid increasing hazard risks to coastal development.

The long-term effectiveness of this strategy depends on the level of vulnerability a property experiences and whether existing development patterns (densities, lot sizes, etc.) easily allow siting to avoid hazards. These strategies are low cost compared to armoring solutions or other adaptation strategies. Policies B.1 – B.3, E.1 and E.4 could be considered to promote the safe location of new development.

Regulate Redevelopment

Communities updating their LCPs to address sea level rise have a strong rationale for requiring new development to meet standards that can be safe under expected future conditions. However, because many communities have existing development in hazardous areas already, it will be challenging to ensure that redevelopment is also resilient to future hazards, especially because redevelopment occurs incrementally. Thus, rebuilding and redevelopment definitions should be used to provide a foundation for implementing additional adaptation strategies.

Rebuilding and redevelopment restriction strategies could be used to limit a property owner's ability to rebuild or renovate a structure located in a sea level rise hazard zone. If the site allows, a structure could be set back from the coastal hazard as it redevelops. Other more design-based approaches that attempt to maintain development in such areas may also be appropriate in certain circumstances (e.g., elevation). Redevelopment policies should be coupled with real estate disclosures (Policy A.7) to inform buyers of the sea level rise hazards and future development restrictions.

These strategies are low cost compared to armoring solutions, and they allow property owners to

continue use of their property until rebuilding restrictions phase out high-risk and high-impact development over time.[9] Policies B.7 – B.8 offer examples of redevelopment and nonconforming structure policies.

3. Developing adaptation strategies for specific areas

After evaluating vulnerability and establishing policies to be used throughout hazardous areas, communities can begin the process of evaluating and choosing adaptation strategies for specific areas. In most cases, especially for LCP land use and implementation plans, multiple adaptation strategies will be needed and every community will need to assess their risks and their potential options. There are a number of options for how to address the risks and impacts associated with sea level rise. Choosing to "do nothing" or following a policy of "non-intervention" will likely lead to unacceptable exposure to hazards and impacts to coastal resources, so the strategies for addressing sea level rise hazards will require proactive planning to ensure protection of coastal resources and development. Such proactive adaptation strategies generally fall into three main categories: protect, accommodate, and retreat.

Protect: Protection strategies refer to those strategies that employ some sort of engineered structure or other measure to defend development (or other resources) in its current location, oftentimes without changes to the development itself. Protection strategies can be further divided into "hard" and "soft" defensive measures or armoring. "Hard" armoring refers to engineered structures such as seawalls, revetments, caisson and pier elevation, and bulkheads that defend against coastal hazards like wave impacts, erosion, and flooding. "Soft" alternatives refer to the use of natural or "green" infrastructure like beaches, dune systems, wetlands, and other engineered systems to buffer coastal areas. Strategies like beach nourishment, dune management, or the construction of "living shorelines" capitalize on the natural ability of these systems to protect coastlines from coastal hazards while also providing benefits such as habitat, recreation area, more natural aesthetics, and the continuation or enhancement of ecosystem services.

Accommodate: Accommodation strategies refer to those strategies that employ methods that modify existing developments or design new developments to decrease hazard risks and thus increase the resiliency of development to the impacts of sea level rise. On an individual project scale, these accommodation strategies include actions such as retrofits and/or the use of materials meant to increase the strength of development, building structures that can easily be moved and relocated, or using larger setbacks. On a community-scale, accommodation strategies include any of the land use designations, zoning ordinances, or other measures that require the above types of actions, as well as strategies such as clustering development in less vulnerable areas or requiring mitigation actions to provide for protection of natural areas even as development is protected.

Retreat: Retreat strategies are those strategies that relocate or remove existing development out of hazard areas and limit the construction of new development in vulnerable areas. These strategies include land use designations and zoning ordinances that encourage building in more resilient areas or gradually removing and relocating existing development. Acquisition and buy-out programs, transfer of development rights programs, and conditioning the removal of structures are examples of strategies designed to encourage managed retreat.

[9] McGuire, C. J. Adapting to sea level rise in the coastal zone: Law and policy considerations. CRC Press, 2013.

For purposes of implementing the Coastal Act, no single category or even specific strategy should be considered the "best" option as a general rule. Different types of strategies will be appropriate in different locations and for different hazard management and resource protection goals. The effectiveness of different adaptation strategies will vary across both spatial and temporal scales. In many cases, a hybrid approach that uses strategies from multiple categories will be necessary, and the suite of strategies chosen may need to change over time to address increased sea level rise and associated increased exposure to hazards. The legal context of various options will also need to be considered in each situation and ultimately, adaptive responses will need to be consistent with the Coastal Act. Thus, Figure 1 shows the basic conceptual stages that communities can step through when developing an adaptation plan: 1) Evaluate hazards and vulnerable areas; 2) Identify the assets at risk (built and natural environments); 3) Analyze alternative adaptation strategies; 4) Apply a legal framework to inform feasible adaptation strategies (*See* Section 4. Legal Considerations); and 5) Identify feasible, preferred adaptation strategy.

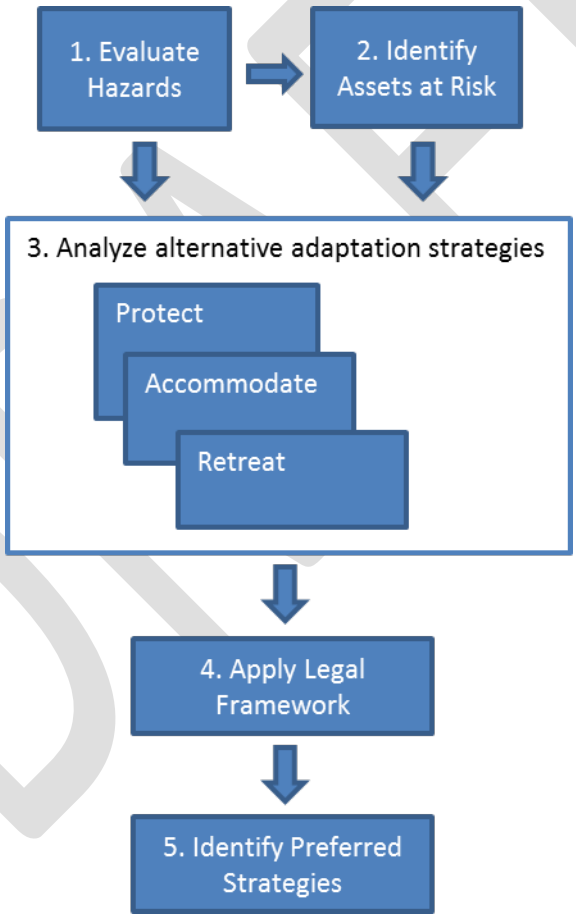

Figure 1. Planning Framework

Analyzing Alternative Adaptation Strategies

To comprehensively address sea level rise, communities must effectively communicate future vulnerabilities to the public, property owners, local governments, and other stakeholders. This can be done by involving the public and decision makers in early discussions of the coastal hazards, assets at risk, potential cost estimates, and visioning for the future shoreline using short and long-term adaptation goals. This process can educate stakeholders and help decision makers prioritize certain actions that are quickly identified as advantageous. From an economic perspective, understanding the costs and benefits of adaptation strategies will help communities identify and prioritize approaches for the LCP policies that will address sea level rise impacts.

When adaptation can address a large risk of near term harm immediately, and still provide benefits in the future, the economics can provide incentives for action. [10] In some cases, beach replenishment, wetland protection, or even elevating structures might fall into this category. By addressing risk with adaptation strategies that protect ecosystems, ensure public access, and avoid hazards, communities can work to enhance their coastal resources before resource loss occurs. Additionally, strategies that have a small cost to reduce risk should be a part of a community's adaptation framework. Some of these policies might refer to setback requirements, mobility designs for structures that could be moved, and larger drainage system requirements. Investments for the community and property owners that reduce risk in the present and still provide immediate value are a first tier of adaptation policy considerations.

In the case of expensive or complex adaptation strategies, another approach that community scale adaptation policies offer is one of reserving expenditure until certain triggers are met. These types of policies apportion risk over time and allow for the use of adaptation options closer to the time they are needed, rather than building now for the worst case future condition. When adaptation triggers cross a threshold (such as a designated beach width reduction or occurrence of flooding), policies would call for specified actions (such as sediment management activities). Other triggers, such as repetitive loss of properties or mean high tide line encroachment, might be used to shift risk to property owners through higher insurance rates, prohibiting hard armoring, or implementing rolling easements that specify how the public trust boundary moves inland.

A community visioning process and development of an adaptation plan are vital to scoping the appropriate strategies a community will phase over time to address hazards as they become manifest. In preparing an adaptation plan, communities should consider all of their options and evaluate them according to impact on coastal resources, effectiveness at reducing risk, costs, and feasibility (technical, legal, social, or political).

Siting New Development (Avoid)

Again, avoiding flooding and erosion and other such coastal hazards through setbacks, siting, and design decisions that locate development at safe distances from potential hazards should be the first consideration for all types of development. However, the details for determining setback distances and trigger conditions will need customization to local conditions. Providing for exceptions where there is a need to permit some form of new development in a hazardous area in order to avoid an unconstitutional taking of private property, local governments can plan for

[10] McGuire, C. J. Adapting to sea level rise in the coastal zone: Law and policy considerations. CRC Press, 2013.

protection of coastal resources without a total loss of economic use of a residential property. Policies B.1 – B.10 provide examples of these relevant siting policies and takings analysis.

Hard Shoreline Armoring (Protect)

Traditional approaches to managing coastal erosion and flood risk have relied on hard armoring of the shoreline. The type of armoring chosen (e.g., bulkheads, caissons, revetments, or seawalls) depends on geomorphic context and the structures all have varying costs and environmental impacts. "Holding the line" strategies using various types of hard armoring are often implemented on a parcel by parcel basis, but in some cases neighborhood scale implementation could be proposed. Shoreline armoring can serve to protect critical infrastructure and public access, and maintain community services for some period of time, after which, it may be appropriate to begin planning for the orderly relocation of development. However, shoreline armoring causes adverse impacts to coastal resources, including beaches, which will need to be mitigated.

California beaches, both wide sandy beaches and pocket beaches, as well nearshore coastal areas, are significant financial assets to coastal communities and the state.[11] Beaches and other shoreline areas also provide remarkable ecological value, including unique and important ecological services such as filtering water, recycling nutrients, buffering the coast from storm waves, and providing critical habitats for hundreds of species. When hard structures are used to protect the backshore, they form barriers that impede the ability of natural beaches and habitats to migrate inland over time and reduce sources of sand supply created by erosion, meaning public recreational beaches, wetlands, and other low-lying habitats will be lost as sea level continues to rise. This process is commonly referred to as "passive erosion" or "coastal squeeze" which is the narrowing of beaches due to the fact that the back of the beach on an eroding shoreline has been fixed in place. Sea level rise will thus eventually result in the "drowning" of intertidal and low-lying habitats, and loss of certain surfing resources, against a hardened shoreline if this adaptation strategy is perpetuated far into the future.

Hard armoring can also result in nuisance conditions for neighbors who suffer increased flooding or erosion as result of nearby armoring, as well as reduced public access along the shoreline. Other detrimental impacts may include negative visual impacts, recreation impacts (e.g., surfing limitations, reduced beach access), and interference with other ecosystem service functions. The effectiveness of hard armoring to protect development will also be reduced as sea level rises and storm intensity and frequencies increase. Relatedly, shoreline armoring costs will increase over time as coastal hazards and storms cause elevated levels of damage and increasing frequency of need for repair and maintenance. Policies F.1 – F.10 provide examples of policies that can be used to define the appropriate circumstances for hard armoring, and to promote transition from hard protection strategies to others that are more protective of coastal resources.

Soft Shoreline Protection (Protect)

Design of shoreline protection using "soft" measures or nature based solutions is another type of adaptation that can protect both development and coastal resources such as beaches. Strategies like beach nourishment, dune management, or the construction of "living shorelines" capitalize on

[11] In recent years, California tourism and recreation in the shore adjacent zip codes accounts for 39 percent of the ocean economy's GDP ($17.6 billion), 75 percent of its employment (368,000) and 46 percent of its wages paid ($8.7 billion) in 2012. (NOAA Report on the National Significance of California's Ocean Economy. 2015. https://coast.noaa.gov/data/digitalcoast/pdf/california-ocean-economy.pdf)

the natural ability of these systems to protect coastlines from coastal hazards while also providing benefits such as habitat, recreation areas, more pleasing visual impacts, and the continuation or enhancement of ecosystem services. This approach is often considered a way of extending the useful life of existing development setbacks. Because this approach is a somewhat newer concept in high energy wave environments, the effectiveness and impacts of many soft shoreline projects are in the early phases of implementation and will need additional monitoring. The cost of many nature based solutions can be high, and the longevity of engineered habitats given sea level rise remains to be observed.

In addition, it should be noted that the term "soft" protection can refer to shoreline restoration projects, or to shoreline armoring that includes a natural component, such as a revetment that is buried beneath sand and vegetated. While the former may be a permissible restoration project in many circumstances, the latter constitutes shoreline armoring that can generally only be approved if it is necessary to protect an existing structure or coastal dependent use and is the least environmentally damaging feasible alternative, as required by the Coastal Act.

Policies E.2 (Soft Shoreline Protection), F.2 (Prioritization of Types of Shoreline Armoring), and G.5 (Beach Nourishment) provide examples of relevant to soft shoreline protection.

Adaptive Design (Accommodate)

Building codes and adaptive home designs can provide resiliency when development in hazardous areas cannot be avoided. Design requirements related to building type and hazard zone type are common in Federal Emergency Management Agency (FEMA) flood zones. Local governments could adopt similar requirements in LCPs for elevating structures, floodproofing designs, or siting structures in ways that can accommodate flooding and erosion. In the short term, adaptive design can provide cost savings to residents in coastal hazard areas and extend the amount of time they can remain in a location that will suffer increasing damages due to sea level rise impacts. Implementing adaptive design that is in sync with FEMA risk reduction criteria also offers adaptation incentives for property owners in FEMA flood zones who might reduce their flood insurance rates.

Although these accommodation strategies can minimize hazards and ensure the safety and stability of new development, they can also lead to adverse impacts on coastal resources. For example, elevation of homes can cause visual impacts by blocking coastal views or detracting from community character. Elevation can lead to a circumstance where houses are safe but utilities, including roads, water and sewer services may be compromised. Pile-supported structures may, through erosion, develop into a form of shore protection that interferes with coastal processes, blocks access, and, at the extreme, results in structures looming over or directly on top of the beach. Finally, elevation, floodproofing, and other accommodation measures can also lead to a scenario where the beach and public trust lands migrate up and underneath or around the structure, blocking public access and the migration of habitat and infringement on public trust lands.

The strategy of using adaptive design to protect coastal resources and enable new development requires coupling with restrictions on hard armoring in order to minimize the coastal squeeze and other coastal resource impacts. In the short term, design accommodation might prevent structural damages from single storms, but in the long term these structures might have impacts on migrating habitats and public access and/or be subject to consistent threats from storm damage. In

these cases, eventual structural relocation or removal might be the most appropriate response to protect coastal resources and life and safety.

Policies C.1 (Adaptive Design) and E.4 (Flood Hazard Mitigation) provide examples of adaptive design policies.

Managed Retreat (Retreat/Realignment)

An alternative to holding the line, or protecting shorelines with armoring, is a retreat-based approach. Managed retreat refers to varying approaches to managing coastal hazard risk by structure relocation and/or abandonment of land.[12] These strategies can result in a landward redevelopment pattern and a managed realignment of development along the coast so that natural erosion and other coastal processes, including beach formation/creation, can continue.

Benefits of managed retreat strategies include allowing for the natural landward migration of the beach, dunes and wetlands as sea levels rise; decreasing hazard risk; protecting coastal resources on the water's edge; and savings on potential costs of construction, maintenance, and repair of shoreline protective devices. Managed retreat strategies for adapting to sea level rise have been found to be more cost-effective than maintaining armoring over timescales greater than 25 years.[13]

The feasibility of managed retreat and realignment strategies depends on a number of factors, but the willingness of residents to participate in voluntary programs and the short term costs of buyouts for local governments pose significant challenges for implementation. To build support for long term consideration of the retreat and realignment approach, communities will need to engage in such actions as community visioning, conducting economic analysis of adaptation options, and offering incentives for participation.

Selecting, financing, and promoting a managed retreat program will likely require a community scale approach to managing coastal hazards (Policy G.1) and creation of an Adaptation Plan (Policy G.2). Managed retreat programs (Policy G.9) can be structured using a variety of triggers and mechanisms. Acquisition and buyout programs, transfer of development rights programs, repetitive loss triggers (Policy G.7), and beach width triggers nested within a Beach Management Plan (Policy G.8) are some examples of potential managed retreat program components. Again, a community visioning process is the first step for communities to take in order to explore the potential for such an adaptation approach.

Advanced planning might open doors for other resources to be available to communities doing LCP development to address sea level rise. See the section on Coordination and alignment with other planning processes for more information on potential funding opportunities.

[12] Hino, M., Field, C.B. and Mach, K.J., 2017. Managed retreat as a response to natural hazard risk. *Nature Climate Change*.

[13] Turner, R.K., Burgess, D., Hadley, D., Coombes, E. and Jackson, N., 2007. A cost–benefit appraisal of coastal managed realignment policy. *Global Environmental Change*, 17(3), pp. 397-407.

4. Legal Considerations

As part of fully evaluating available adaptation strategies, communities should analyze their ability to implement those strategies consistent with applicable legal constraints. The most relevant legal considerations in coastal California include the Coastal Act, the public trust doctrine, and potential takings of private property interests.

Relevant Coastal Act Policies

A variety of Coastal Act policies related to sea level rise adaptation strategies need to be considered when evaluating LCP policy options. For example, in addition to other Coastal Act Chapter 3 policies, Sections 30210 through 30224 protect public access and recreational opportunities; Sections 30230 and 30231 protect marine habitats and water quality; Section 30233 regulates and restricts the placement of fill or other materials in waterways, including open coastal waters; and Section 30251 protects visual resources. In addition, Sections 30235, 30253, and 30240(b) generally apply. Certified local coastal programs should have policies that implement these Coastal Act requirements.

Section 30233 states in part:

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:*
>
> . . .
>
> *(6) Restoration purposes.*
>
> *(7) Nature study, aquaculture, or similar resource dependent activities.*

Section 30235 states:

> *Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fishkills should be phased out or upgraded where feasible.*

Section 30253 states in part:

> *New development shall do all of the following:*
>
> *(a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
>
> *(b) 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 bluffs and cliffs...*

Section 30240(b) states:

> *(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

Section 30253 requires new development to minimize risks from hazards, to avoid erosion and geologic instability, and to not in any way require construction of armoring that substantially alters natural landforms along bluffs and cliffs. A common way to achieve these requirements is through establishing bluff-top and shoreline setbacks. Despite this strict limitation on shoreline armoring for new development, Section 30235 allows armoring that alters natural shoreline processes when it is needed to protect existing development, coastal dependent uses, or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. However, such protection is only allowed if it is *required* – i.e., if the existing structure is in fact in danger, and the proposed shoreline protection is the least environmentally-damaging alternative to abate the danger.

As described in the Commission's 2015 Sea Level Rise Policy Guidance, the Commission interprets "existing" development in Section 30235 as development that was in existence when the Coastal Act was passed. In other words, Section 30235's directive to allow shoreline armoring in certain circumstances only applies to development that existed as of January 1, 1977. This interpretation is the most reasonable way to construe and harmonize Sections 30235 and 30253, which together evince a broad legislative intent to allow armoring for development that existed when the Coastal Act was passed, but avoid such armoring for new development now subject to the Act. This interpretation, which essentially "grandfathers" development that predates the Coastal Act, is also supported by the Commission's duty to protect public trust resources and interpret the Coastal Act in a liberal manner to accomplish its purposes.

In the narrow class of cases subject to Section 30235, the Commission has generally approved shoreline armoring that meets the criteria specified in that provision, though imposed conditions to address impacts to coastal resources protected by other Coastal Act provisions. However, for residential development that does not qualify as "existing" development, shoreline armoring is disallowed if it is inconsistent with Section 30253 and/or other Chapter 3 policies of the Coastal Act. Thus, for development that does not qualify as "existing," jurisdictions will generally need to consider adaptation strategies other than using shoreline armoring. For example, appropriate strategies might include non-structural protective methods, such as beach nourishment and dune restoration, as well as accommodation and retreat.

Section 30240(b) requires the siting and design of development to prevent significant degradation of adjacent sensitive habitats and recreation areas under present and future conditions. Thus, new residential development could not rely on long-term accommodation through elevation or floodproofing if such elevation or floodproofing would foreseeably lead to a circumstance in which the residence is located on pilings above, or in the middle of, the migrated public sandy beach or public trust lands, because such development would degrade that recreational area and

would be incompatible with the continuance of the public recreational area as it migrates inland.

Section 30233 disallows the filling of coastal waters unless there is no feasible less environmentally damaging alterative, mitigation measures are provided, and the filling is for one of seven enumerated purposes – e.g., for certain coastal-dependent structures, restoration purposes, or aquaculture or other resource dependent activities. Placement of rock or other fill material for revetments or most shoreline armoring is not a resource dependent use, and would therefore generally be disallowed. However, dune restoration and some beach nourishment/restoration projects might qualify as permitted restoration activities. In addition, notwithstanding Section 30233, fill may also be allowed in narrow circumstances when required in order to protect "existing" development or coastal dependent uses under Section 30235. Permits for shoreline armoring should also include conditions to address compliance with other applicable Coastal Act or LCP requirements.

These policies, and LCP policies based on them, will limit the allowable adaptation strategies in certain cases. For example, new residential development generally may not rely on existing or new shoreline armoring to address coastal erosion, sea level rise, and related coastal hazards. This is because such shoreline armoring generally has negative impacts on natural shoreline processes, public access, visual resources, recreational resources, and intertidal and other important habitat, and is therefore not allowed pursuant to various Chapter 3 policies of the Coastal Act. However, it may be appropriate to rely on existing shoreline armoring to protect new residential development in some limited cases. For example, it may be appropriate for new development in developed urban areas that are protected by preexisting bulkheads to rely on retention and/or expansion of those bulkheads for an appropriate period of time if such retention/expansion is technically feasible (including considering rising groundwater levels), will provide adequate protection for the anticipated life of the project, and will not: (1) alter natural shoreline processes along bluffs or cliffs, (2) impair public access or impede public trust uses of the water,[14] (3) cause significant adverse visual impacts, (4) negatively impact marine habitat, or (5) otherwise conflict with Chapter 3 resource protection policies.

In addition, new or redeveloped homes may be able to rely on existing armoring to protect them if that armoring is independently needed in order to protect nearby coastal-dependent development or beaches. Likewise, shoreline armoring may be an allowable adaptation strategy, at least in the short-term, in order to protect areas where new and existing residential development are intermingled and it is not feasible to have the shoreline armoring only protect the existing development. Finally, it may be permissible in some cases to allow new development to rely on existing or new armoring if disallowing such development would constitute an unconstitutional taking of private property without just compensation (see section on Addressing Takings Concerns, below).[15] However, this is more likely to be the case on an empty lot where there is not any current economic use of the property. In the case of redevelopment of a current home, denial of redevelopment generally would not "take" all economic use or otherwise constitute a taking because there is already an existing economic use of the property. As described in Chapter

[14] In some cases, maintaining bulkheads may benefit public access by helping to maintain publicly accessible, navigable waterways, or public paths on top of the bulkheads. However, in general, any seaward expansion or encroachment by a bulkhead on shoreline area used by the public would constitute a negative impact to public access.

[15] Pub. Res. Code § 30010.

8 of the Commission's Sea Level Rise Policy Guidance, local jurisdictions will need to consider the specific legal context and circumstances that apply to each area or case when undertaking shoreline armoring-related LCP updates or approving individual development projects that include shoreline armoring.

Although coastal armoring generally has significant adverse impacts on coastal resources, there are situations—as described above—where armoring may be lawfully allowed and may represent a reasonable short- to mid-term adaptation strategy at a street/neighborhood-level or community-scale. This may be especially true in urbanized areas where existing residential development and/or critical infrastructure exist, where development is already protected by armoring, where the impacts of armoring on natural shoreline processes will be minimal due to the geology of the area and where the armoring is the least environmentally damaging alternative for adaptation. However, to the extent that LCP policies—or projects approved pursuant to them— allow for shoreline armoring, local governments must ensure that such policies and projects safeguard coastal access, mitigate for all impacts to coastal resources affected by armoring, and protect public trust resources. Again, as described in Chapter 8 of the Commission's Sea Level Rise Policy Guidance, local jurisdictions will need to consider the specific legal context and circumstances that apply to each area or case when undertaking shoreline protection-related LCP updates or approving individual development projects that include shoreline protection. When deciding on and developing policies to support an adaptation strategy that may include armoring in an LCP, local governments should consider working closely with Coastal Commission staff in crafting such land use policy language to address this unique and special circumstance and to be consistent with Coastal Act policies.

Public Trust Doctrine

Background on Public Trust Doctrine

The State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States in 1850. The state holds and manages these lands for the benefit of all people of the state for statewide purposes consistent with the common law public trust doctrine ("public trust"). The public trust ensures that title to sovereign land is held by the state in trust for the people of the state. Public trust uses include maritime commerce, navigation, fishing, boating, water-oriented recreation, visitor-serving facilities and environmental preservation and restoration. Non-water dependent uses such as residential and general office or commercial uses are generally inconsistent with public trust protections and do not qualify as public trust uses.

In coastal areas, the landward location and extent of the state's sovereign fee ownership of these public trust lands are generally defined by reference to the ordinary high water mark,[16] as measured by the mean high tide line;[17] these boundaries remain ambulatory, except where there has been fill or artificial accretion. More specifically, in areas unaffected by fill or artificial accretion, the ordinary high water mark and the mean high tide line will generally be the same. In areas where there has been fill or artificial accretion, the ordinary high water mark (and the state's public trust ownership) is generally defined as the location of the mean high tide line just prior to the fill or artificial influence. It is important to note that such boundaries may not be readily

[16] Civil Code § 670.

[17] *Borax Consolidated v. City of Los Angeles* (1935) 210 U.S. 10.

apparent from present day site inspections.[18]

The mean high tide line is the intersection of the shoreline with the elevation of the average of all high tides calculated over an 18.6-year tidal epoch. This property line is referred to as "ambulatory" for two reasons: first, gradual changes to the shoreline due to factors such as variations in the height and width of sandy beaches, shoreline erosion or accretion, and uplift or subsidence of land can change the location of where the mean high tide line meets the shoreline. Second, the elevation of the mean high tide line itself changes over time and is likely to increase at an accelerating rate in the future due to sea level rise. Over time, sea level rise will continue to gradually cause the public trust boundary to move inland. Boundaries between publicly-owned waterways and adjoining private properties (referred to as littoral if they are along lakes and seas and riparian if along rivers and streams) have always been subject to the forces of nature and property boundary law reflects these realities.

Accelerating sea level rise will likely lead to more disputes regarding the location of property boundaries along the shoreline, since lands that were previously landward of the mean high tide line have become subject to the state's ownership and protections of the public trust. These disputes, in turn, will affect determinations regarding what kinds of structures and uses may be allowed or maintained in areas that, because of sea level rise, either are already seaward of the mean high tide line, are likely to become seaward of the mean high tide line in the future, or would be seaward of the mean high tide line if it were not for artificial alterations to the shoreline.

California case law does not explicitly address how shoreline structures such as seawalls that artificially fix the shoreline temporarily and prevent inland movement of the mean high tide line affect property boundaries, if at all. The Ninth Circuit Court of Appeals, however, has interpreted federal common law as allowing the owner of tidelands to bring a trespass action against a neighboring upland property owner who built a revetment that prevented the natural inland movement of the mean high tide line. The court ruled that the actual property boundary was where the mean high tide line would have been if the revetment were not there and that the owner of the tidelands could require the upland owners to remove the portions of the revetment that were no longer located on the upland owners' properties.[19]

Coastal Commission and Local Government Public Trust Authority and Duties

The public trust gives the state the authority to manage tidelands and also imposes a duty to protect the public's interests in those tidelands.[20] The Legislature has broad authority to implement the public trust and to delegate authority over tidelands to state agencies or local governments. The State Lands Commission has exclusive jurisdiction over ungranted tidelands owned by the state,[21] as well as residual jurisdiction over tidelands granted to local trustees.[22] The Legislature has also granted to the Coastal Commission the authority to regulate and permit development within California's coastal zone, including development on tidelands or that may

[18] *Carpenter v. City of Santa Monica* (1944) 63 C. A. 2nd 772, 787.
[19] *United States v. Milner* (9th Cir. 2009) 583 F.3d 1174, 1189-1190.
[20] *Nat'l Audubon Soc'y v. Superior Court* (1983) 33 Cal.3d 419.
[21] Pub. Res. Code §§ 6301, 6305, 6009.
[22] *State of Cal. ex rel. State Lands Com. v. County of Orange* (1982) 134 Cal.App.3d 20.

affect tidelands.[23] In cases where development is proposed on tidelands, the applicant will need to obtain a lease or other appropriate authorization from the State Lands Commission or the appropriate tidelands grantee in addition to an appropriate development approval from the Coastal Commission.

When local governments approve development pursuant to a certified Local Coastal Program or other authority under the Coastal Act, they also have a responsibility to protect public trust resources associated with tidelands. Although the Coastal Commission retains the authority to issue coastal development permits for development located on tidelands,[24] local governments are obligated to have policies that regulate development on adjacent uplands in a manner that protects tidelands.[25] Local governments also play a critical role in protecting uplands that will likely become tidelands in the future due to sea level rise.

In describing the state's duty to protect public trust lands, the California Supreme Court has ruled that state agencies have a duty to "exercise […] continuous supervision and control over the navigable waters of the state and the lands underlying those waters."[26] Thus, when considering whether to approve projects that may affect public trust lands, agencies must consider the effects that the projects will have on "interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests."[27] Development located *on* tidelands must generally be water dependent or otherwise consistent with the public trust. As the State Lands Commission has articulated: "[u]ses that are generally not permitted on public trust lands are those that are not trust use related, do not serve a public purpose, and can be located on non-waterfront property, such as residential and non-maritime related commercial and office uses."[28] If there are competing trust-related uses of public trust lands, trustee agencies have significant authority to choose which use or uses to allow, though should attempt to reconcile competing trust uses or allow multiple uses when feasible.[29] For development located *near* tidelands, agencies must ensure that the development does not impair trust resources by, for example, impeding public access.[30]

Another underpinning of the public trust doctrine is that "[t]idelands subject to the trust may not be alienated into absolute private ownership; an attempted conveyance of such land transfers 'only bare legal title,' and the property remains subject to the public trust easement."[31] Although

[23] Pub. Res. Code §§ 30000 et seq., 30519(b).
[24] Pub. Res. Code § 30519(b).
[25] E.g., Pub. Res. Code §§ 30230, 30231, 30232, 30235, 30240, 30253.
[26] *Nat'l Audubon Soc'y,* 33 Cal.3d at 425.
[27] *Id*. at 426.
[28] CALIFORNIA STATE LANDS COMMISSION, PUBLIC TRUST POLICY FOR THE CALIFORNIA STATE LANDS COMMISSION, available at http://www.slc.ca.gov/About_The_CSLC/Public_Trust/Public_Trust_Policy.pdf; see also *Lechuza Villas West v. Cal. Coastal Comm'n* (1997) 60 Cal.App.4th 218 (upholding Coastal Commission's denial of permit for residential development due to concern that it would be located partly on tidelands).
[29] *Carstens v. Cal. Coastal Comm'n* (1985) 182 Cal.App.3d 277, 289; *Nat'l Audubon Soc'y,* 33 Cal.3d at 440; *State of California v. San Luis Obispo Sportsman's Assn*. (1978) 22 Cal. 3d 440, 448.
[30] See Pub. Res. Code § 30211; *Nat'l Audubon Soc'y*, 33 Cal.3d at 435-37 (agencies have duty to consider how use of non-trust resources affect public trust waters).
[31] *City of Berkeley v. Superior Court* (1980) 26 Cal.3d 515, 537 (quoting *Long Beach v. Mansell* (1970) 3 Cal.3d 462, 482); see also Cal. Const. art. X, § 3; Cal. Pub Res. Code § 7991. However, California courts have carved out a narrow exception allowing alienation of tidelands when the tidelands: 1) are valueless for trust purposes, 2) are

the state may lease trust lands for trust-consistent purposes, or may grant trust lands to public entities, or may lease to private entities subject to the public trust, courts will not interpret legislative action as fully alienating trust interests unless no other interpretation is reasonably possible.[32] This doctrine may affect landowners' ability to construct shoreline armoring that prevents the migration of tidelands, as approval of such armoring could be viewed as allowing the conveyance of what would be public tidelands into private use. At the least, it supports the idea that lawfully permitted shoreline armoring may temporarily prevent the *physical* migration of the shoreline but would not affect the *legal* migration of the boundary between private property and public tidelands.

No court has explicitly ruled on whether the Coastal Commission's or local governments' compliance with the Coastal Act fully satisfies their duty to consider and protect the public trust.[33] However, courts have ruled that compliance with other laws, such as the California Environmental Quality Act ("CEQA"), does not necessarily satisfy an agency's independent obligation to consider public trust impacts.[34] On the other hand, if agencies do in fact consider their public trust duties when analyzing a project's compliance with other environmental laws, that may well satisfy the agency's public trust obligations.[35]

Because the Coastal Act requires protection of public access, coastal habitats, recreation, and other public trust-related resources, analysis of a project's consistency with the Coastal Act (and, by extension, an LCP) may serve as an adequate analysis of a project's consistency with public trust principles. However, to ensure protection of the public trust, agencies should explicitly consider their public trust obligations when crafting LCP policies that govern development affecting tidelands and when considering whether to approve individual development projects that may affect public trust resources. In addition, the public trust doctrine should inform the interpretation of Coastal Act and LCP provisions to ensure that they are carried out in a manner that fully protects the public trust.

The Public Trust and Sea Level Rise Adaptation

Local jurisdictions should take their public trust duties into consideration when drafting sea level rise adaptation policies. For example, adaptation policies must ensure protection of public trust lands for public trust purposes, including maritime commerce, navigation, fishing, boating, water-

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dedicated to a highly beneficial public purpose, and 3) constitute a relatively small part of the whole trust area. *Mansell*, 3 Cal.3d at 485-86; *see also* Pub. Res. Code § 6307 (allowing exchange of tidelands for other lands if numerous factors are met).

[32] *People v. California Fish Co*. (1913) 166 Cal. 576, 597.

[33] But see *Carstens,* 182 Cal.App.3d 277 (holding that Coastal Commission properly exercised its duty to consider various uses of tidelands and to protect public access to such lands when it analyzed a permit amendment's consistency with Coastal Act public access provisions); *Citizens for East Shore Parks v. State Lands Comm'n* (2012) 202 Cal.App.4th 549, 577 (stating that the *Carstens* "court essentially made no distinction between compliance with the [Coastal A]ct and the public trust doctrine.").

[34] Compare *Citizens for East Shore Parks*, 202 Cal. App.4th 549 (agency's CEQA review, which analyzed public trust issues, satisfied the agency's duty to consider public trust issues) with *San Francisco Baykeeper, Inc. v. State Lands Comm'n* (2015) 242 Cal.App.4th 202 (complying with CEQA does not necessarily demonstrate compliance with public trust duties and, where agency failed to explicitly consider public trust obligations during CEQA review, it violated its public trust duties).

[35] *Id*.

oriented recreation, visitor-serving facilities and environmental preservation and restoration. Because private residential development is not considered a public trust use, policies specific to residential adaptation must ensure that residences and any ancillary development, including shoreline armoring, are not located on public trust lands and will not harm public trust resources by interfering with future migration of such trust lands. For development located on land subject to sea level rise and migrating public trust land boundaries, policies should ensure the relocation or removal of private residential development (including shoreline armoring for such development) before it impedes use of public trust land for public trust purposes.[36] Jurisdictions may also want to adopt a policy that requires, as a condition of a permit for new, shorefront development subject to sea level rise, that the landowner submit periodic evidence that the development remains on private property. Policies A.6 (Assumption of Risk), D.1 (Removal Conditions), F.8 (Shoreline Armoring Monitoring), and G.8 (Beach Management Plan) provide examples of how local governments could implement these requirements through their LCPs.

For a more in-depth discussion of the public trust doctrine in California and how it relates to sea level rise, see Center for Ocean Solutions, Stanford Woods Institute for the Environment, the Public Trust Doctrine: a Guiding Principle for Governing California's Coast under Climate Change (2017)[37].

General Principles of Takings Law

Please refer to the 2015 CCC SLR Policy Guidance for more background on the legal context of adaptation planning (Chapter 8. Legal Context).

The United States and California constitutions prohibit public agencies from taking private property for public use without just compensation. Section 30010 of the Coastal Act similarly prohibits public agencies implementing the Coastal Act from granting or denying a permit in a manner that takes or damages private property for public use without payment of just compensation. The classic "takings" scenario arises when a public agency acquires title to private property in order to build a public facility or otherwise devote the property to public use. In 1922, however, the United States Supreme Court ruled that, in certain circumstances, regulation of private property can constitute a taking even if the regulation does not involve acquisition of title to the property. As Justice Oliver Wendell Holmes stated, "while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking," (*Pennsylvania Coal Co. v. Mahon* (1922) 260 U.S. 393, 415.)

In the century since then, Courts have struggled to give agencies and property owners a more definite sense of exactly when a regulation "goes too far." The Supreme Court has identified three basic categories of takings that can occur in the context of land use regulation. Different legal

[36] See *Lechuza Villas West,* 60 Cal.App.4th at 225, 243 (describing how a landowner who wishes to construct homes near the shoreline "risk[s] building on land it has legal title to today but which may become tidelands as a result of natural forces," and upholding Coastal Commission's denial of a permit to construct homes near a beach because the applicant "failed to meet its burden of showing that the project would not encroach on [existing] public tidelands.").

[37] Center for Ocean Solutions, Stanford Woods Institute for the Environment. 2017. The Public Trust Doctrine: a Guiding Principle for Governing California's Coast under Climate Change. Available at http://centerforoceansolutions.org/sites/default/files/publications/The%20Public%20Trust%20Doctrine_A%20Guiding%20Principle%20for%20Governing%20Califonia%2527s%20Coast%20Under%20Climate%20Change.pdf.

standards apply depending on what kind of taking is at issue. (See, generally, *Lingle v. Chevron USA, Inc.* (2005) 544 U.S. 528).

The most straightforward test applies to what is variously called a categorical, total, *per se,* or *"Lucas"* takings, which occurs when a regulation deprives an owner of all economically beneficial use of the property (see *Lucas v. South Carolina Coastal Council* (1992) 505 U.S. 1003). An agency that completely deprives a property owner of all economically beneficial use of the property will likely be found liable for a taking unless background principles of property law, such as nuisance[38] or the public trust doctrine,[39] independently restrict the owner's intended use of the property. Courts have generally been very strict about when they apply this test. If any economically beneficial use remains after application of the regulation, even if the value of that use is a very small percentage of the value of the property absent the regulatory restriction, a *Lucas* taking has not occurred.

Where a regulation significantly reduces the value of private property but does not completely deprive the owner of all economically beneficial use, the multi-factor "*Penn-Central"* test applies.[40] This test has no set formula, but the primary factors include the economic impact of the regulation, the extent to which the regulation interferes with distinct, reasonable investment-backed expectations, and the character of the governmental action. When evaluating the character of the governmental action, courts consider whether the regulation amounts to a physical invasion or instead more generally affects property interests through a program that adjusts the burdens and benefits of economic life for the common good. Whether a regulation was in effect at the time an owner acquired title is also a relevant factor, but is not by itself dispositive.[41] Because this test takes such a wide range of factors into account, case law does not provide clear guidance about the situations in which a regulation is likely to qualify as a "*Penn-Central"* taking. A *Penn-Central* claim is unlikely to succeed, however, unless the plaintiff can establish that the regulation very substantially reduces the value of the property.

The third category of takings claims applies to "exactions," that is, government permitting decisions that require a property owner either to convey a property interest or to pay a mitigation fee as a condition of approval.[42] Under the *Nollan/Dolan* line of cases, the agency must establish a "nexus" between the condition requiring a property interest or payment and the effects of the

[38] See *Scott v. City of Del Mar* (1997) 58 Cal.App.4th 1296 (city ordered removal of seawalls that were encroaching onto public beach; court held there was no compensable taking because the seawalls, which obstructed a public right-of-way, were public nuisances).

[39] No published California case has held that the public trust doctrine is a "background principle" that defeats a takings claim. However, given the doctrine's long-standing roots in state law and its basis in the common law, state constitution, and statutory law, commentators have argued that it is an established background principle of property law in the state. *See e.g.*, BILL HIGGINS, INSTITUTE FOR LOCAL GOV'T, REGULATORY TAKINGS AND LAND USE REGULATION: A PRIMER FOR PUBLIC AGENCY STAFF 14. Other states have also found the public trust to be a "background principle" for purposes of takings analysis. *Esplanade Properties, LLC v. City of Seattle* (9th Cir. 2002) 307 F.3d 978, 985; *McQueen v. S.C. Coastal Council* (2003) 354 S.C. 142, cert denied 124 S. Ct. 466 (2003).

[40] *Penn Central Transportation Co. v. City of New York* (1978) 438 U.S. 104.

[41] See *Murr v. Wisconsin* (2017) 137 S. Ct. 1933, 1945 ("The reasonable expectations of an acquirer of land must acknowledge legitimate restrictions affecting his or her subsequent use and dispensation of the property"); *Palazzolo v. Rhode Island* (2001) 533 U.S. 606, 632-633 (O'Connor, J., concurring).

[42] See *Nollan v. California Coastal Comm'n* (1987) 483 U.S. 825; *Dolan v. City of Tigard* (1994) 512 U.S. 374; *Koontz v. St. Johns River Water Management Dist.* (2013) 133 S.Ct. 2586.

project that that property interest or payment is mitigating. That property interest or payment must also be roughly proportional to the impact that it is intended to mitigate. In California, the *Ocean Harbor House* case is a good example of a shoreline structure impact mitigation requirement that was found by the courts to meet the relevant standards of nexus and proportionality.[43]

Addressing Takings Concerns

Sea level rise adaptation policies may potentially give rise to takings concerns. Because the determination of whether a particular policy or regulation may in some circumstances be applied in a way that constitutes a taking is so fact-intensive and context-specific, this Guidance cannot provide a simple set of parameters for when agencies should either allow exceptions to a land use regulation or consider purchasing a property interest. However, the Guidance does provide policy recommendations that could reduce the potential for a successful takings claim.

First, local governments have broad authority to regulate land use. Even actions that may significantly reduce property value, such as rezoning or downzoning in hazardous areas, are possible without generating a successful takings claim, especially if it is clear that the regulation serves a public purpose, such as protecting an existing public recreational beach area, and does not unfairly single out particular property owners. Likewise, legislatively imposed, generally applicable development standards that do not require dedication of private property for public use or payment of money to the public should not be considered "exactions" that are subject to the heightened scrutiny of *Nollan*/*Dolan*.[44] Accordingly, adopting generally applicable development standards through an LCP—such as bluff setbacks, floor elevation requirements, recorded notices of coastal hazards, or specific restrictions on shoreline armoring—may provide a lesser risk of successful takings claims than if such restrictions are imposed on an ad-hoc, permit-by-permit basis.

In addition, local governments can adopt policies that reduce the risks of takings claims. For example, policies requiring assumption of risk, disclosure of hazards, waiver of rights to shoreline protective devices, and disclosure of possible sea level rise and migrating public trust boundaries can ensure that new property owners are on notice regarding the limitations of the property. This, in turn, will help ensure that any such owners have an appropriate, "reasonable investment backed expectation" for the use of the property: namely, that such use will be limited by future hazards, exacerbated by sea level rise.[45]

Land use restrictions that prevent all economically beneficial use of the entirety of a property[46] are vulnerable to *Lucas* takings claims unless those uses would qualify as a nuisance or are prohibited by property law principles such as the public trust doctrine. Agencies can minimize the risk of these claims by allowing economically beneficial uses on some of the property or for a

[43] *Ocean Harbor House Homeowners Assn. v. California Coastal Com*m'n (2008) 163 Cal.App.4th 215.
[44] *Cal. Building Industry Assn. v. City of San Jose* (2015) 61 Cal.4th 435, 461-62.
[45] See *Murr*, 137 S. Ct. at 1946 (owners' expectations about what they may do on their land may be influenced by the fact that it is sensitive coastal land, which may be more heavily regulated by the state).
[46] What qualifies as the entirety of a property can also be the subject of dispute. The property will normally include all legal lots on which the proposed development would be located, but may also include other lots that are in common ownership and adjacent to, or in close proximity with, the lots that would be developed. See *Murr*, 137 S. Ct. at 1946; *Norman v. United States* (Fed. Cir. 2005) 429 F.3d 1081, 1091; *District Intown Properties Limited Partnership v. District of Columbia* (D.C. Cir. 1999) 198 F.3d 874, 880).

certain amount of time, and by exploring whether legal doctrines regarding nuisance or the public trust independently allow for the potential limitations on the use of the property.[47] For example, if a home or seawall would impede public access along the coast, it may be a nuisance, and denial of a permit for the home or seawall—or conditioning of the permit to allow access—should therefore not constitute a taking.[48] Establishing a buyout, leaseback, or transferrable development rights program for properties that are subject to significant development restrictions may also minimize potential exposure to takings claims.

Where a proposed development would not be located on public trust property and would be safe from hazards related to sea level rise in the near future, but cannot be sited so as to avoid those risks over the anticipated life of the structure, agencies may consider allowing the structure, but requiring removal once it is threatened or is no longer on private property. Property owners may argue that they have a right to protect threatened structures even if they have waived rights to shoreline armoring under the Coastal Act, but a recent federal court of appeal ruling casts significant doubt on the existence of any common law right to attempt to fix an ambulatory shoreline boundary through artificial structures such as seawalls.[49] In addition, a California case has held that a homeowner did not have a fundamental right to build a new revetment to protect his home from coastal hazards; rather, any right to build such a structure was subject to legitimate regulation under the Coastal Act.[50]

Local governments could also downzone areas vulnerable to sea level rise to reduce densities and limit development expectations, and they could manage nonconforming structures in order to bring them into conformance with LCP policies within a reasonable period of time. The long-term effectiveness of such a redevelopment-based adaptation strategy depends on at least two factors. First, policies should include clear measures that define the threshold of improvements that constitute "redevelopment." This is critical because, with "redeveloped" properties, the entire structure must be brought up to current LCP standards. In contrast, if the improvements qualify as "repair and maintenance," a landowner could maintain the structure for its remaining life and make minor improvements that meet current standards, but the whole structure need not meet current standards so long as the improvements do not increase the degree of non-conformity of a structure in a hazardous area. Additionally, in some cases, development that qualifies as repair and maintenance may be exempt from permitting requirements.[51] Second, an adaptation strategy should include downzoning of hazardous areas so that buildings destroyed by disasters are not allowed to be rebuilt in place.[52] Instituting rebuilding restrictions in advance of damage will give property owners time to adjust their investment backed expectations and help local governments avoid takings challenges.

If an agency is contemplating requiring property owners to dedicate open space easements or other property interests, or requiring the payment of fees to mitigate project impacts, the agency should be careful to adopt findings explaining how requiring the property interest or payment is

[47] See, e.g., *Scott v. City of Del Mar* (1997) 58 Cal.App.4th 1296.
[48] *Id.*; Civ. Code § 3479.
[49] *United States v. Milner* (9th Cir. 2009) 583 F.3d 1174, 1189-1190.
[50] *Whaler's Village Club v. Cal. Coastal Comm'n* (1985) 173 Cal.App.3d 240, 253-54 (abrogated on other grounds).
[51] Pub. Res. Code § 30610(d); 14 Cal. Code Regs. § 13252. See also any corresponding LCP provisions.
[52] See Pub. Res. Code § 30610 (g)(2)(A) (only allowing reconstruction of structures destroyed by natural disaster if the new structures conform to existing zoning requirements).

both logically related to mitigating an adverse impact of the project and roughly proportional to that impact. Legislatively adopting rules that establish the exact criteria for determining when to require these exactions and, if so, their magnitude, may also reduce an agency's exposure to takings claims.[53] With respect to mitigation fees, California cities and counties should also comply with applicable requirements of the Mitigation Fee Act.[54]

Navigating the balance between coastal resource protection and private property rights will require careful consideration of relevant precedent, nexus and rough proportionality, background principles of property law, and distinguishing government takings from takings by the forces of nature.[55] Figure 2 presents a flow chart of some of the criteria to consider when applying a legal framework to determine whether shoreline armoring is a feasible adaption strategy for residential areas.

Takings Analysis Policy

In order to avoid unconstitutional takings of private property, a community can choose to adopt an LCP policy that allows some development in a sea level rise hazard zone where development would normally be prohibited (Policy B.10 Takings Analysis). Such a policy can specify development standards that apply to new development allowed in hazard zones to avoid a taking; for example, it could specify that: (a) the amount, type, and duration of development allowed shall be the minimum necessary to avoid a taking; (b) all impacts to the coastal resources in the sea level rise hazard zone shall be avoided to the maximum extent feasible; and (c) all adverse impacts to the coastal resources in the sea level rise hazard zone shall be fully mitigated. By adopting such a policy, local governments can assess whether applying particular sea level rise adaptation policies in specific circumstances would likely result in a regulatory taking of private property without just compensation and, if so, allow a certain amount of development in order to avoid such a taking.

[53] The California Supreme Court has ruled that courts should be more deferential towards agencies when reviewing fees imposed pursuant to legislatively enacted rules of general applicability than when reviewing fees imposed on an ad hoc basis (see *Ehrlich v. City of Culver City* (1996) 12 Cal.4th 854, 881). The rationale is that fees imposed pursuant to rules of general applicability that involve little discretion are less likely to impose disproportionate burdens on property owners than fees determined on an ad hoc basis.

[54] Govt. Code, § 66000 *et seq.*

[55] Michael Allan Wolf, Strategies for Making Sea-Level Rise Adaptation Tools 'Takings-Proof', 28 J. Land Use & Envtl. L. 157 (2013), available at http://scholarship.law.ufl.edu/facultypub/404 (arguing that the Takings Clause of the United States Constitution applies to takings by government actors, not the forces of nature).

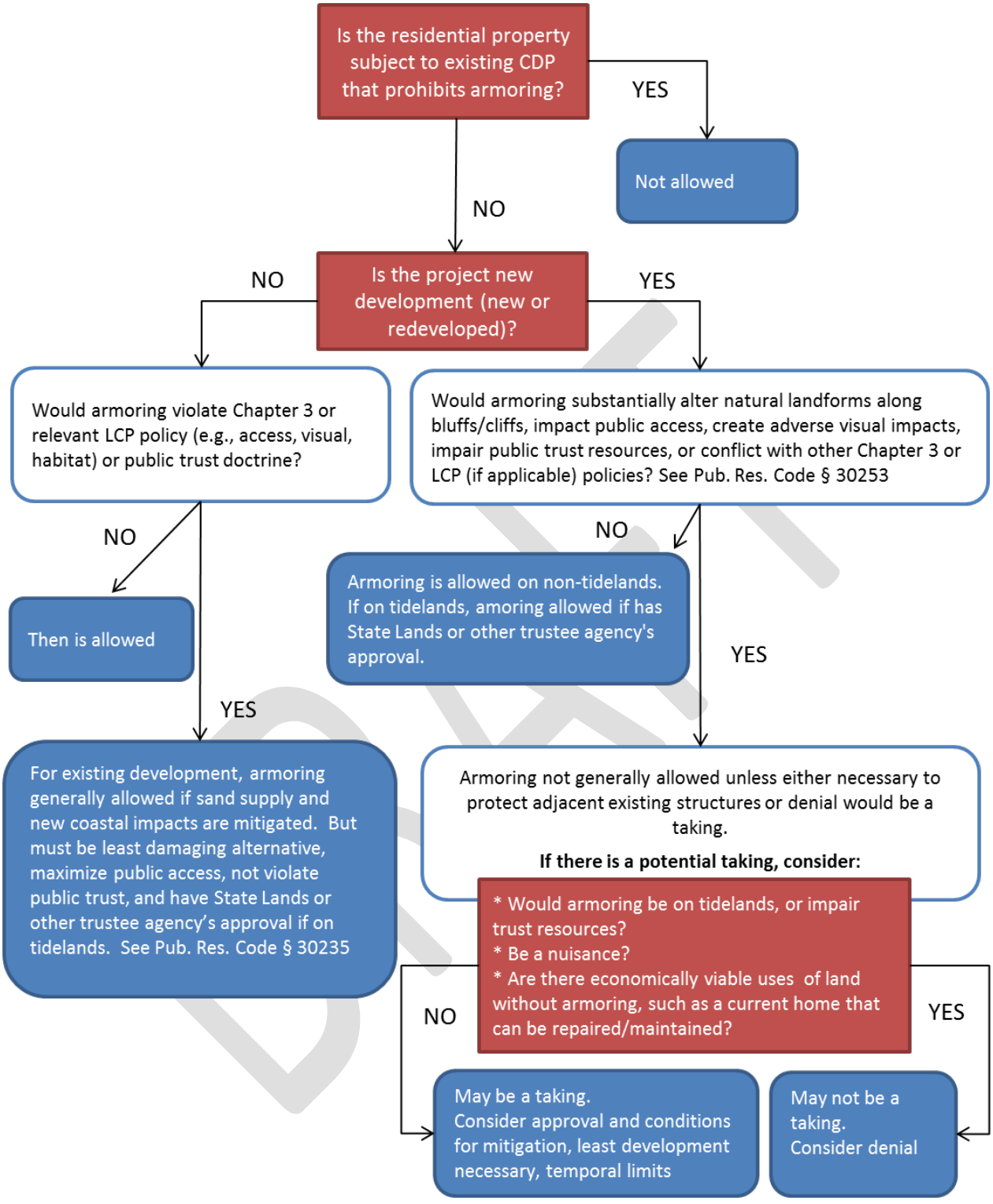

Figure 2. Legal framework for considering shoreline armoring to protect residential structures

5. Implementing Adaptation Strategies

After identifying appropriate adaptation strategies for each planning area, communities can look to the policy compendium in Section 7 for policy language that can help implement those strategies. For protection, look at policies F.1 – F.10. For accommodation, look at policies C.1, E.1– E.2, and E.4. And for retreat, look at policies D.1 – D.3. Community scale adaptation strategies (policies G.1– G.11) include all types of adaptation and hybrid approaches. These various policies fit into different stages of the LCP Planning Steps that culminate in LCP implementation and re-evaluation.

LCP Planning Steps

The steps below from the CCC Sea Level Rise Policy Guidance provide the broadest framework for addressing sea level rise in an LCP. All communities should step through this framework when planning to update their LCPs to address sea level rise.

1. **Determine a range of sea level rise projections relevant to LCP planning area/segment** using best-available science.

2. **Identify potential physical sea level rise impacts in the LCP planning area/segment**, including inundation, storm flooding, wave impacts, erosion, and/or saltwater intrusion into freshwater resources.

3. **Assess potential risks from sea level rise to coastal resources and development in the LCP planning area/segment,** including those resources addressed in Chapter 3 of the Coastal Act.

4. **Identify adaptation measures and LCP policy options** to include in the new or updated LCP, including both general policies and ordinances that apply to all development exposed to sea level rise, and more targeted policies and land use changes to address specific risks in particular portions of the planning area.

5. **Draft updated or new LCP for certification with California Coastal Commission**, including the Land Use Plan and Implementing Ordinances.

6. **Implement the LCP and monitor and re-evaluate strategies as needed** to address new circumstances relevant to the area, including updating policies to address changed circumstances through future LCP amendment.

The model policies presented in Section 7 of the policy guidance provide a suite of options for communities to consider when creating or updating their LCP to address sea level rise. Local governments structure their LCPs (through their Land Use Plans and Implementation Plans) in a variety of ways, with some local governments including significant policy detail in the LUP, and some reserving such detail for the IP. Some of the model policies in the Guidance reflect a more general policy (as most commonly seen in an LUP) and some have more relevance to implementation or zoning policy (more typically seen in an IP). Local governments should customize the model policies to align with their communities' approach and to facilitate timely development of adaptation strategies. Table 3 shows a crosswalk of Residential Adaptation Policies to the steps of the CCC Sea Level Rise Policy Guidance.

Table 3. Crosswalk of policies and LCP planning steps

Step for addressing sea level rise in LCP planning		Applicable residential adaptation policy #	
Step 1	Determine a range of sea level rise projections relevant to LCP planning area/segment using best-available science	A.1 Identifying and Using Best Available Science A.2 Identifying Planning Horizons	
Step 2	Identify potential physical sea level rise impacts in the LCP planning area/segment	A.3 Mapping Coastal Hazards A.4 Site-specific Coastal Hazards Report Required A.5 Coastal Hazards Report Contents	
Step 3	Assess potential risks from sea level rise to coastal resources and development in the LCP planning area/segment	G.1 Management of Sea Level Rise Hazards G.2 Adaptation Plan	
Step 4	Identify adaptation measures and LCP policy options	B.1-4 New Development B.5-6 Setbacks B.7-8 Redevelopment B.9 Land Division C.1 Adaptive Design D.1-3 Managed Retreat E1-4 Moving Hazards away from Development	F.1-10 Shoreline Armoring G.1-2 Developing Adaptation Planning Information G.5-8 Community Scale: Beach and Dune/Bluff/River Adaptation G.10 Transfer of Development Rights
Step 5	Draft updated or new LCP for certification with CCC		
Step 6	Implement the LCP and monitor and re-evaluate strategies as needed	A.3 Mapping Coastal Hazards G.3-4 Sea Level Rise Overlay Zones G.7-9 Trigger-Based Adaptation Approaches G.11 GHADs and CSAs	

Implementing adaptation strategies will be strengthened by tying policies to monitoring and enforcement of permit conditions. Actual policies and permits issued should be clear and identify benchmarks to evaluate implementation, so as to avoid any misunderstandings and to increase compliance.

Adaptation Pathways

A helpful approach for coastal communities to consider when planning for sea level rise involves phasing in short and long term adaptation strategies over time. This concept of adaptation planning pathways provide a structure for sequencing adaptation measures using the time horizon of expected sea level rise impacts. One way to think about this is approach is through integrating LCP Planning Steps 4 and 6 in the framework outlined in Table 3 above.

Many Section 7 model policies facilitate implementation of this approach. For example, distinguishing between short and long-term actions and triggers are inherent in such policies as D.1 Removal Conditions/Development duration; G.5 Beach replenishment; G.7 Repetitive Loss; and G.8 Beach Management Plan. To put this in context, urban and less developed coastal

communities could choose these same policy options (e.g., setbacks) and still follow different pathways based on timing of impacts (e.g., the level of asset vulnerability to increments of sea level rise), designated triggers (e.g., beach width), investment resources (e.g., capital improvement funds), and availability of inland parcels (e.g., for transfer of development rights).

The planning pathway approach for community scale adaptation also provides a way to manage uncertainty in timing and extent of sea level rise impact by incorporating triggering actions in the planning or implementation stages of adaptation strategies. For example, triggers related to the extent of flooding or frequency of damages might be selected to initiate new phases of adaptation (Figure 3). These triggers should be informed by local community involvement, and will reflect a community's risk tolerance, local conditions, and adaptation vision.

Another element of providing for resilient residential adaptation could also be to specify a minimum planning horizon for community services. Some of the model policies reference the temporary loss of community services (utilities, roads, water treatment, etc.) as potentially triggering the next phase of adaptation. A community visioning and adaptation planning process should include discussion of such options for vulnerable areas. Communities should also plan for the potential of higher administration costs for adaptation programs in the future, especially as trigger conditions begin to emerge. Education, outreach, and enforcement activities might be a significant part of these transition times.

While adaptation options are typically designed to last for particular amounts of time, the coastal environment is dynamic and adaptation measures are not guaranteed to work forever. Communities should look for signs that some options have run their course and plan adaptation pathways to transition actions as needed, despite any predicted impact timeframe. Finally, analyzing a worst-case "high" projection for the planning horizon or expected life of the proposed development provides a conservative upper bound for planning pathways based on current information. It is important to note that not all development will be designed to withstand the sea level rise impacts projected in the planning horizon, but analysis of high sea level rise scenarios over the typical anticipated life of development types will help in adaptation planning. In areas subject to future hazards, the life of any particular development will be limited by site conditions. In some cases, it may be appropriate to design for the local hazard conditions that will result from more moderate sea level rise scenarios, as long as decision makers and project applicants plan to implement additional adaptation strategies if conditions change more than anticipated in the initial design. It might also be appropriate to allow some development on constrained parcels where investment backed expectations are appropriately limited by having permit conditions that acknowledge future coastal hazard risks and include plans for future adaptation measures or structure removal.

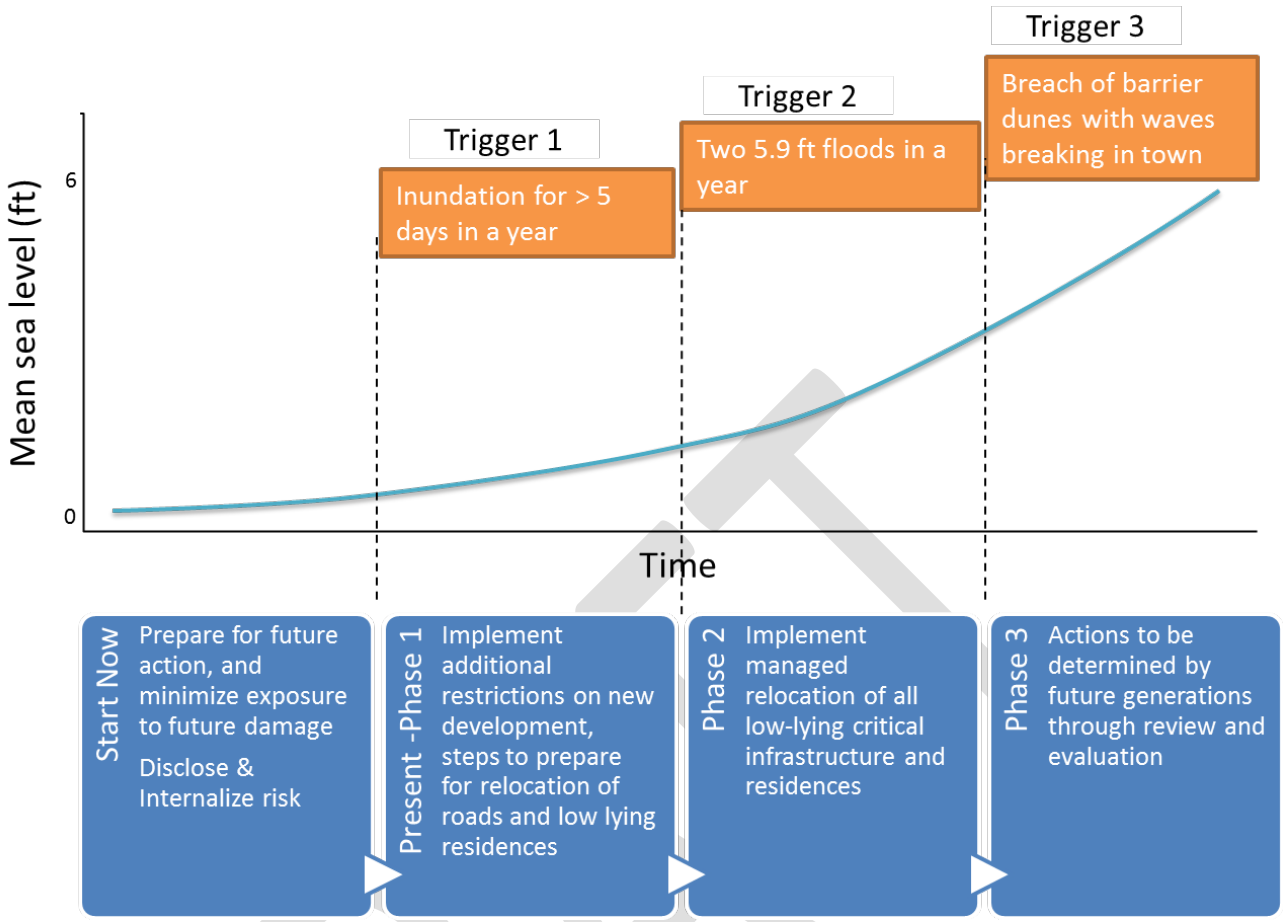

Figure 3. Hypothetical example of adaptation pathway, based on Barnett et al. (2014)[56]

Coordination and alignment with other planning-related processes

Many other planning processes, project reviews, and studies require or may include key information relevant to an LCP evaluating and addressing sea level rise risks. Planners should be aware of these potential overlaps and do their best to track the on-going work of state and federal agencies, and make an effort to share information in cases where analyses required for some of these planning activities may overlap with the studies appropriate for sea level rise planning in LCPs. Planners should coordinate regionally where appropriate and possible. Additionally, these agencies, organizations, and planning efforts may be good resources from which to gather information when performing analyses needed for LCP updates.

One of the main areas of overlap with LCP planning is with the required elements of a Local Hazard Mitigation Plan (LHMP), and the Commission recommends coordinating an LHMP update with an LCP update if possible. As part of an LHMP, local governments identify the natural hazards that impact their community, identify actions to reduce the losses from those hazards, and establish a coordinated process to implement the plan. Other opportunities for

[56] Barnett, J., Graham, S., Mortreux, C., Fincher, R., Waters, E., & Hurlimann, A. (2014). A local coastal adaptation pathway. *Nature Climate Change*, *4*(12), 1103.

sharing sea level rise information to inform related planning processes and documents include alignment with National Flood Insurance Program and Community Rating System guidelines in floodplain ordinances, relevant General Plan elements, capital improvement plans, and regional transportation plans.

Regarding General Plans, recent legislation (SB 379) requires General Plan Safety Elements to address climate change through a set of goals, policies, and objectives based on a vulnerability assessment. To govern effectively in the coastal zone, a General Plan should be consistent with the local government's LCP, including with respect to climate change impacts such as sea level rise. Some LCPs are combined with the local government's General Plan and Zoning Ordinance documents, and some LCPs are separate documents that work in tandem with the General Plan and Zoning Ordinance. Regardless, when developing or amending a General Plan, local governments should coordinate closely with the California Coastal Commission to assure that general plan provisions intended to apply in the coastal zone are consistent with the governing LCP and California Coastal Act as relevant. This alignment can be achieved through consistency between policies in the LCP and the General Plan, and by aligning the vulnerability assessments now required by SB 379 with the recommendations on sea level rise vulnerability assessments provided in the Sea Level Rise Policy Guidance.

For more examples of coordination and alignment opportunities, refer to the number of similar planning processes, projects, and documents listed in the CCC Sea Level Rise Policy Guidance[57].

6. Case Studies of typology groups and policy issues

The effort to put residential development patterns along California's coast into categories or types affirms the importance of understanding context when developing policy. It also illustrates it may be difficult to generalize how to implement "adaptation" along the shoreline in specific places. This section presents six short case studies of coastal communities that have some portion of their coastal shoreline that fits into the groups determined by the conceptual typology, to explore the implications of diverse contexts for adaptation planning policy issues.

1. URBAN BLUFFTOP: SOLANA BEACH, SAN DIEGO COUNTY

The Solana Beach community is built out along the shoreline, and the beaches below the existing blufftop residential development are highly valuable public access and recreational resources. They are also subject to constant wave attack and long-term erosional trends. The cliffs themselves are high and do not provide stable development sites without reliance on measures such as significant setback distances of development from the bluff edge, substantial foundation development such as deep caissons (subterranean concrete piers), or beach-level seawalls and mid- and upper-bluff retention structures. The primary adaptation challenge in Solana Beach has been how to protect existing blufftop development, and potentially allow redevelopment of existing homes, while not losing the beach below or the aesthetic of the natural cliff form. Much of this development is now protected by seawalls and upper bluff retention structures. Many of the existing blufftop homes have seawalls which prevent natural retreat of the beach and result in loss of beach resources. However, maintaining the existing development pattern will likely lead to

[57] See Figure 10 in Coastal Commission's 2015 Sea Level Rise Policy Guidance

long-term loss of beach resources without significant long-term retreat of blufftop development or alternatively, measures such as sand replenishment.

Solana Beach developed a Land Use Plan (LUP) approved by the Coastal Commission in January 2014 to address these and other issues, including requiring the consideration of accelerated sea level rise in conducting slope stability and safe setback analysis for new development. The LUP also lays out specific policies for the redevelopment of existing blufftop residential development.[58] The Implementation Plan portion of the LUP, which would include more specific development standards, has yet to be completed.

In May 2017, the Coastal Commission approved an LCP amendment for the City of Solana Beach to incorporate the results of a recreational fee study focused on mitigating adverse impacts to beach recreation from seawall development.[59] This type of effort is a step toward developing mitigation policies that can be applied to private seawall projects that have adverse impacts on the public recreational values of the beach. The Coastal Commission previously has imposed beach impact fees on shoreline armoring projects to mitigate for the loss of recreational beach values, including using travel-cost and real estate valuation methods to account for the future loss of beach recreation area.[60] While methods for quantifying and incorporating ecological values into beach impact fees have yet to be endorsed by the Coastal Commission and designing fees that adequately compensate for beach losses is a challenge, this area is an active subject of research and requires further work.

Given the current extent of shoreline armoring in Solana Beach, mitigation strategies for shoreline structure development will be critical to effective long-term protection of the beach environment. The Cities of Solana Beach and Encinitas also are hoping to benefit from a federally-sponsored 50-year beach replenishment effort potentially to begin sometime in 2018-19. While beach replenishment may be an attractive option for communities such as Solana Beach, it is important to note that these types of projects are expensive and complex, often requiring Congressional approval of projects carried out by the Army Corps of Engineers. These projects may easily take over 10 years to be authorized and funded. It is also unclear whether the large investment in such projects will actually result in long-term protection of the beach in places like Solana Beach, where the beaches and cliffs are constantly subject to high wave energy, and thus where the results of sand replenishment may be short-lived.[61] Additionally, beach replenishment projects can introduce impacts to ecological systems and surfing resources; as such, these projects require careful analysis and planning.

[58] CITY OF SOLANA BEACH, SOLANA BEACH LAND USE PLAN (2014), http://solana-beach.hdso.net/LCPLUP/LCPLUP-COMPLETE.pdf. CCC, Adopted Findings for Solana Beach Land Use Plan, June 14, 2012.

[59] CCC, City of Solana Beach LCP Amendment No. LCP-6-SOL-16-0020-1 (Public Recreation Fee), May 11, 2017.

[60] See e.g., CAL. COASTAL COMM'N, ADOPTED FINDINGS FOR COASTAL DEVELOPMENT, PERMIT APPLICATION NO. 2-10-039 (2013), https://documents.coastal.ca.gov/reports/2013/8/Th17a-8-2013.pdf; CAL. COASTAL COMM'N, REVISED FINDINGS FOR COASTAL DEVELOPMENT, PERMIT APPLICATION NO. 3-02-024 (2005), pp 29-39.

[61] Gary Griggs & Nicole Kinsman, Beach widths, cliff slopes, and artificial nourishment along the California Coast, Shore & Beach, Vol. 84, No. 1, Winter 2016.

2. URBAN BEACHFRONT: BROAD BEACH, LOS ANGELES COUNTY[62]

More than 100 homes first constructed in the 1930's and redeveloped over the decades sit along Broad Beach just inland of the ocean. Over the last several decades, Broad Beach has eroded significantly and this has placed the homes, backyards and septic systems in danger. A 0.8 mile-long emergency rock revetment was constructed to protect the homes, resulting in the loss of significant beach area and covering many existing public lateral access dedications previously required by the Coastal Commission and now held by the State Lands Commission. The homeowners formed a Geological Hazard Abatement District (GHAD) to address the shoreline erosion and beach management problem collectively. The GHAD is a type of local assessment district that can enable communities to pool resources to conduct hazards studies and fund adaptation measures. Among other strategies, the Broad Beach GHAD proposes a 20-year beach replenishment program to maintain the beach in front of the revetment, which would be buried under a restored coastal dune complex. Broad Beach is one of the first large scale examples of this GHAD mechanism being used for funding sea level rise adaptation measures.

The Broad Beach project raises significant issues about the long-term impacts of the beach homes and associated revetment on the beach; public access and recreation; and ecological value of the dune and beach complex, which will likely require frequent maintenance. There is considerable uncertainty about how long the GHAD's proposed restoration of public beach seaward of the revetment will last in the face of on-going beach erosion and sea level rise. Concerns also exist about the potential impacts of the proposed sand replenishment on beach and marine habitats, including sensitive offshore habitats in the Point Dume State Marine Conservation Area. Acknowledging the precedential nature and aspirations of the project, adaptive management relying on a series of monitoring thresholds has been proposed to ensure resources are being adequately protected. The Coastal Commission approved the Broad Beach project in October 2015. However, the approval only extends for 10 years so that it can be revisited and revised if necessary, based on a better understanding of the replenishment project performance, including the implications for public access and natural shoreline resources.

Broad Beach is a good example of a testing a hybrid of hard armoring/rock strategy and soft sand replenishment and dune restoration.. The Commission's action also considers the longer-term operation of LCP requirements for redevelopment at Broad Beach, which, similar to the rules for Solana Beach, essentially require redeveloped homes to move inland as far as possible. However, unlike Solana Beach, the Malibu LCP (which applies to portions of the Broad Beach project that are not in the Commission's retained jurisdiction over tidelands) also requires homes to be elevated on concrete piers, which potentially removes the need for placing rock at beach level – an option that is not available in the high cliff setting of Solana Beach. Over time, this may allow for the removal of the revetment as a way to further protect shoreline resources from sea level rise. However, there is considerable uncertainty as to whether conditions will allow for such phased retreat. This uncertainty is one of the reasons that the Commission limited its approval of the beach replenishment and hard armoring approach to 10 years subject to extensive monitoring and reporting requirements.

3. LOW DENSITY BLUFFTOP: BIG LAGOON, HUMBOLDT COUNTY

[62] This discussion relies on: Addendum from Cal. Coastal Comm'n South Central Coast District Staff, to Cal. Coastal Comm'rs & Interested Pers., Staff Recommendation on Coastal Development Permit No.4-15-0390 (October 7, 2015) (on file with the Cal. Coastal Comm'n).

The Big Lagoon area illustrates how a relatively less dense, more rural development context allows for the use of relocation and planned retreat for both existing and new development. Big Lagoon is in the northern part of Humboldt County, composed of an uplifted marine terrace approximately 40-90 feet above mean sea level. Many of the parcels in the area are used for commercial timber harvesting and rural residences. Bluff erosion and geologic instability currently pose risks to many existing structures located on bluff edges, and sea level rise will increase erosion rates in the future. Sudden catastrophic bluff failure events have already led to emergency relocations of homes along the bluffs between Big Lagoon and Patrick's Point on several occasions, including emergency relocations of dozens of cabins starting in the 1940s and continuing as recently as 2013.[63] Development permits for cabin relocations were issued even before the effective certification of the Humboldt County LCP in 1986. One recent example of planning for retreat and relocation occurred in 2015 when Humboldt County submitted an LCP amendment that would affect a 13-acre lot owned by Big Lagoon Park Company. The amendment of the North Coast Area Plan segment of the Land Use Plan and the Implementation Plan of the Humboldt County LCP reconfigured the boundary lines between existing Residential Estates (RE) and Coastal Commercial Timberland (TC) land use and zoning designations. The zoning change allows managed retreat of 14 existing cabins away from the bluffs.

The proactive planned relocation of development in Big Lagoon was also mirrored in a case of proposed new development in a hazardous blufftop area of Humboldt County. On a location just downcoast of the Big Lagoon cabin development, on the same high eroding bluff formation, the Coastal Commission relied on a "takings override" finding to approve a new house in February 2014 (Winget project).[64] The agency used the best available scientific projections for sea level rise and erosion rates to determine that the proposed house would last about 50 years before it needed to be removed to avoid falling to the beach below. Rather than deny the project entirely, the Commission conditioned it to incorporate adaptive measures that allow for an economic use of the site as long as possible. Before the erosion threat reaches the point of requiring removal, the property owners committed to annual monitoring of the bluff edge and triggers for more thorough geotechnical study as erosion continues to encroach on the development. In this way, the property owners can maximize the amount of time possible to safely stay in their residence.

4. LOW/MEDIUM DENSITY BEACHFRONT: STINSON BEACH, MARIN COUNTY[65]

There is significant residential development along the shoreline of Marin County's Stinson Beach community that is subject to long-term erosion, wave run-up, coastal flooding, septic failure, and water distribution pipe failure. Calle del Arroyo, a principal access road to the Calles, Patios, and Seadrift neighborhoods of Stinson Beach, may also experience increased flooding and eventual permanent inundation, severely limiting access and utility infrastructure to portions of the community. Flooding from Bolinas Lagoon and Easkoot Creek already occurs and will likely worsen with future rising sea levels. Stinson Beach is similar to Broad Beach in terms of the density of homes on the immediate beach front. In general, though, there is relatively more beach area in front of the homes as compared to Broad Beach. In the past Marin County has generally

[63] CALIFORNIA COASTAL COMMISSION, HUMBOLDT COUNTY LCP AMENDMENT LCP-1-HUM-15-0011-2 2 (2015).
[64] CALIFORNIA COASTAL COMMISSION, STAFF REPORT: REGULAR CALENDAR, APPLICATION NO. 1-12-023 24 (2013).
[65] *See generally* CALIFORNIA COASTAL COMMISSION, MARIN COUNTY LOCAL COASTAL PROGRAM AMENDMENT NUMBER LCP-2-MAR-15-0029-1 (MARIN LCP UPDATE) (2016). Note that the Commission has not acted on the hazards policy at the time of the release of this policy guidance.

allowed redevelopment of beach homes if they comply with FEMA flood elevation rules, but this has resulted in some elevated structures that potentially raise concerns about visual resources and community character, as well as beach access and recreation. Thus, similar to some parts of Malibu and elsewhere in the state, over the longer-run there may be a concern that the mean high tide, and thus public trust lands, will migrate to and eventually under elevated homes. This eventuality demonstrates the need to more comprehensively address the potential conflict between coastal hazard mitigation and coastal resource protection, including protection of the public trust interest in tidelands.

Marin is one of the first local communities to go through the process of conducting an extensive climate change vulnerability assessment, beginning work on adaptation planning, and submitting an LCP that attempts to address sea level rise to the Coastal Commission for certification. While accommodation of vulnerable structures, roads and utilities, primarily through elevation and retrofits, is identified by the county as a short-term priority for Stinson Beach, longer term actions remain to be further studied or proposed. For example, the county's vulnerability assessment concludes that the beach area in front of the Seadrift[66] revetment will be mostly lost by 2100. The county is currently recommending a policy of allowing structures to be raised 3 feet above FEMA's Base Flood Elevation to account for future sea level rise. In the future, adaptation options might include major beach replenishment, restrictions on rebuilding structures destroyed by storms, and removal or relocation of structures. The LCP update was heard by the Coastal Commission in November 2016, but action on the coastal hazards section of the update was deferred. The Commission staff recommended approval of the LCP if it was modified to address specific concerns regarding coastal hazards policy and adaptation planning. For example, the staff accepted the County's proposed addition of 3 feet of elevation to new structures in response to sea level rise, but also recommended adding specific triggers for removal of this development in the long run should these projections be exceeded and/or result in the loss of public trust and recreational beach resources. In recognition of the uncertainty of current projections, the Commission staff also recommended a requirement to revisit adaptation measures in 10 years, including the creation of sandy beach management plans to protect the valuable beaches in Marin County.

5. DEVELOPED ESTUARY: NEWPORT BEACH, ORANGE COUNTY

Estuarine environments present a different set of sea level rise policy concerns compared to developed bluffs or beaches. The development of Newport Bay Harbor was authorized in 1934 and carried out by the Army Corps of Engineers. Islands within Newport Bay were built-up using dredged sediments within the estuary and now residences and small piers are common in the bay. Increased erosion, loss of coastal wetlands, permanent or periodic inundation of low-lying areas, increases in coastal flooding, and salt water intrusion are all expected sea level rise impacts facing Newport Beach. Structures on islands within Newport Bay and the bayside of Balboa Peninsula typically rely on bulkheads (retaining wall structures similar to seawalls but typically not designed for wave impacts) to ensure protection against coastal flooding and shoreline retreat. Most immediate sea level rise adaptation measures in Newport Bay will be to reinforce and

[66] Property in the Seadrift subdivision is subject to a settlement agreement that governs allowable development in that area; planning for that area therefore has unique constraints because it will need to be consistent with the terms of that agreement.

elevate those existing bulkheads. However, protection of the public tidelands seaward of the bulkheads for public use is a primary concern and must be addressed on a comprehensive basis.

The Coastal Commission approved an Implementation Plan (IP) submitted by the City of Newport Beach in September 2016.[67] As approved the IP adds requirements to the LCP that sea level rise be addressed in Coastal Hazards Reports and Geologic Stability Reports for new development applications, and that shoreline management plans be created for existing development. These management plans must include evaluation of adaptation options exploring the feasibility of hazard avoidance, beach replenishment, and planned retreat. The City also requires property owners to record a waiver of future shoreline armoring for new development. In the case of bulkheads, applicants must waive rights to future protection, including repair or maintenance, enhancement, or any activity affecting the bulkhead, that results in any encroachment seaward of the authorized footprint when public lands (tidelands or sandy beach area) are present seaward of the existing bulkhead. In this way, redevelopment of the existing pattern of bulkhead-reliant areas includes measures that allow for landward relocation of new development and bulkheads in the future, not unlike the redevelopment standards for Solana Beach.

6. LOW DENSITY ESTUARY: BODEGA BAY, SONOMA COUNTY

The Sonoma County coast supports agricultural lands, timber preserves, open space areas, recreational lands, and low-density community development. In contrast to Newport Bay, Bodega Harbor is a small shallow natural harbor in Sonoma County, protected from the larger expanse of Bodega Bay to the south by a narrow spit of land. The area has relatively low density residential development, and large expanses of natural habitat, both in tidal mudflats and salt marsh, presenting different policy questions than the highly urbanized context of Newport Bay. For example, in one recent coastal permit application, the Coastal Commission found that there was a policy conflict and applied the conflict resolution provision of the Coastal Act to provide protection of ESHA wetlands in Bodega Bay while allowing redevelopment of the existing Lundberg residence.[68] The residence was moved out of ESHA and special conditions put in place to mitigate the impacts from the development. These conditions included a revised habitat restoration and monitoring plan; restrictions on future development, including a prohibition on development within sensitive habitat areas; and a restriction on future shoreline protective devices.

The Lundberg residence relied on design plans that accounted for 55 inches of sea level rise and waves during a 100-year storm. It was also found to be elevated sufficiently to withstand a tsunami wave during its 75 year anticipated life. However, as with the Marin County LCP and the Winget project in Big Lagoon, the inherent uncertainty associated with coastal hazards and sea level rise projections means that the residence might face threats sooner than expected. To mitigate this future risk, the permit contained a requirement to remove the proposed development when the residence is no longer safe to inhabit or is threatened with coastal hazards that would require a response beyond ordinary repair and maintenance.

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[67] CALIFORNIA COASTAL COMMISSION, CITY OF NEWPORT BEACH IMPLEMENTATION PLAN LCP-5-NPB-15-0039-1 53 (2016).

[68] CALIFORNIA COASTAL COMMISSION, STAFF REPORT ADDENDUM FOR W16A, CDP APPLICATION NUMBER 2-14-0673 29-36 (2015).

7. Model Policy Language

All local governments working on addressing climate change impacts in their coastal zone should analyze the possible effects of sea level rise and evaluate how sea level rise planning strategies could be implemented through their LCPs to protect public access and coastal resources and minimize hazards. Prior sections of this policy guidance present background, legal considerations and adaptation planning information to guide use of the model policies presented in Section 7.

A. UNDERSTANDING SEA LEVEL RISE HAZARDS

Note: Policies to define best available science, anticipated duration of development types, coastal hazard zones, and technical studies required in given contexts all provide ways to inform risk assessments and plan for the future effects of sea level rise and coastal hazards. Assumption of risk policies and real estate disclosures provide important mechanisms for educating property owners about hazards and their options for addressing them in the future.

Best Available Science

A.1 Identifying and Using Best Available Science

The best available, up-to-date scientific information about coastal hazards and sea level rise shall be used in vulnerability assessments, the evaluation of coastal development permit applications, and the preparation of technical reports and related findings. Analyses shall include multiple sea level rise scenarios, one of which is a worst-case "high" projection for the planning horizon or expected duration of the proposed development ***[insert the minimum anticipated duration of development, e.g.,*****(minimum 100 years unless otherwise specified)***]***, based on best available scientific estimates of expected sea level rise at the time of the analysis. Sources of information may include, but shall not be limited to, state and federal agencies, research and academic institutions, and non-governmental organizations, such as the California Coastal Commission (CCC), Ocean Protection Council (OPC), National Oceanic and Atmospheric Administration (NOAA), the National Research Council, and the Intergovernmental Panel on Climate Change.

As of [***insert date***], the best available science is [***insert reference***]. However, best available science shall be updated, in keeping with regional policy efforts, as new, peer-reviewed studies on sea level rise become available and as agencies such as the OPC or the CCC issue updates to their guidance. Vulnerability assessments and related mapping shall be updated at least every ten years, or as necessary to address significant changes in sea level rise estimates.

A.2 Identifying Planning Horizons

The appropriate time horizon to use to evaluate sea level rise depends on the anticipated duration of development, after which such development is expected to be removed, replaced or redeveloped. For example, if a new structure has an anticipated duration of 75 years, then the hazards analysis will evaluate the site over 75 years, including evaluating the range of projected sea level rise over that time period. Using that evaluation, the structure would be set back or designed to avoid hazards over the planning horizon, if possible. However, in areas subject to future hazards, the life of any particular development will be limited by site conditions and may be less than the duration anticipated at time of construction. The anticipated life of development in the coastal zone is not an entitlement to maintain development in hazardous areas, but should

be used for sea level rise planning purposes, and is generally defined by the following timeframes, unless a site or project specific analysis determines otherwise:

a. Ancillary development or amenity structures (e.g. trails, bike racks, playgrounds, parking lots, shoreline restrooms): 5-25 years
b. Residential or commercial structures: 75-100 years
c. Critical infrastructure: 100-150 years

A.3 Mapping Coastal Hazards

Note: Local governments may consider using LCP coastal hazard maps for the evaluation of CDP applications, in-lieu of site-specific coastal hazard reports, if the CDP includes requirements to minimize impacts and address the potential for future hazards to the site, including requirements that property owners accept the risk of developing in a hazardous location (A.6–Assumption of Risk), and agree to remove development subject to appropriate future triggers (D.1–Removal Conditions). In other words, if the overall program includes clear parameters that prevent new hard armoring and phases structure relocation or removal, subject to identified criteria, reliance on a broader scale hazard map might be appropriate. Site specific factors might also preclude the use of regional maps in some cases, so the purpose of the maps and local constraints are important considerations as well.

The [***insert name of City or County***] shall map areas subject to existing and future coastal hazards that will be exacerbated by sea level rise and that present risks to life and property. These areas require additional review and regulation to minimize risks and protect coastal resources.

a. Coastal Hazard maps shall be developed that show areas of the [***City or County]*** that are subject to current or future coastal hazards. The maximum anticipated extent of potential coastal hazards (based on a worst-case "high" projection of sea level rise, using best available science) shall be considered. Coastal hazard areas include, but are not limited to the following:

- Coastal bluff erosion areas
- Beach erosion hazards areas
- Storm flood extent areas (estuarine or riverine related)
- Wave run up: Areas subject to direct wave attack and damage from wave runup
- Tidal inundation: Areas where routine inundation from tides occurs now and where inundation is likely to occur in the future with sea level rise
- Groundwater Inundation: Current and future areas subject to hazards caused by the uprising of groundwater and/or reduced or inadequate drainage

b. Development proposed in potential hazard areas, including those mapped as hazardous [***insert reference to Coastal Hazard maps referenced above***, ***e.g. in Figure X***], shall be evaluated for potential coastal hazards at the site, based on all readily available information and the best available science. If the initial evaluation determines that the proposed development may be subject to coastal hazards over its anticipated duration, a site-specific Coastal Hazard Report is required, the purpose of which is to ensure that such development can be built in a manner consistent with applicable Local Coastal Program coastal hazards policies (see Policies A.4 – Site-specific Coastal Hazard Report Required, and A.5 – Coastal Hazard Report Contents).

c. The [***City or County]*** shall put property owners on notice if their parcels are subject to current or future coastal hazards on the Coastal Hazard maps.

d. Coastal Hazard maps shall be updated periodically as new science and modeling results and/or state guidance become available. This update shall occur every 10 years at minimum, or more frequently as necessary, through an LCP amendment.

Site-specific Coastal Hazard Studies

Note: Site specific studies are necessary unless hazards are identified on LCP hazard maps at a level of detail adequate to ensure LCP policies and development standards can be complied with. These site specific hazard study policies (A.4 and A.5) are intended to apply to residential development and to be used together in an LCP.

A.4 Site-specific Coastal Hazard Report Required

All development in areas potentially subject to coastal hazards shall be evaluated by reports that are prepared by a licensed civil engineer with expertise in coastal engineering and geomorphology or other suitably qualified professional. These reports shall be based on the best available science, shall consider the impacts from the high projection of sea level rise for the anticipated duration of the proposed development, shall demonstrate that the development will avoid or minimize impacts from coastal hazards, and shall evaluate the effect of the development over time on coastal resources (including in terms of impacts on public access, shoreline dynamics, natural landforms, natural shoreline processes, and public views) as project impacts continue and/or change over time, including in response to sea level rise.

A.5 Coastal Hazard Report Contents

Note: Local governments should customize the policy addressing the scope and analysis required for the Coastal Hazard Report in a manner compatible with building code requirements and other applicable zoning and LCP policies and regulations.

Coastal Hazard Reports required pursuant to Policy A.4 (Site-specific Coastal Hazard Report Required) shall include analysis of the physical impacts from coastal hazards and sea level rise that might constrain the project site and/or impact the proposed development. Reports should address and demonstrate the site hazards and effects of the proposed development on coastal resources, including discussion, maps, profiles and/or other relevant information that describe the following:

a. Current conditions at the site, including the current:
   - tidal range, referenced to an identified vertical datum
   - intertidal zone
   - inland extent of flooding and wave run-up associated with extreme tidal conditions and storm events
   - beach erosion rates, both long-term and seasonal variability
   - bluff erosion rates, both long-term and episodic

b. Projected future conditions at the site, accounting for sea level rise over the anticipated duration of the development, including the future:
   - Shoreline, dune, or bluff edge, accounting for long-term erosion and assuming an increase in erosion from sea level rise
   - intertidal zone

- inland extent of flooding and wave run-up associated with both storm and non-storm conditions

c. Safety of the proposed structure to current and projected future hazards, including:
   - Identification of a safe building envelope on the site that avoids hazards
   - Identification of options to minimize hazards if no safe building envelope exists that would allow avoidance of hazards
   - Analysis of the adequacy of the proposed building/foundation design to ensure stability of the development relative to expected wave run-up, flooding and groundwater inundation for the anticipated duration of the development in both storm and non-storm conditions
   - Description of any proposed future sea level rise adaptation measures, such as incremental removal or relocation when threatened by coastal hazards

d. Discussion of the study and assumptions used in the analysis including a description of the calculations used to determine long-term erosion impacts and the elevation and inland extent of current and future flooding and wave runup.

e. For blufftop development, the report shall include a detailed analysis of erosion risks, including the following:
   - To examine risks from erosion, the predicted bluff edge, shoreline position, or dune profile shall be evaluated considering not only historical retreat, but also acceleration of retreat due to continued and accelerated sea level rise and other climatic impacts. Future long-term erosion rates should be based upon the best available information, using resources such as the highest historic retreat rates, sea level rise model flood projections, or shoreline/bluff/dune change models that take rising sea levels into account. Additionally, proposals for blufftop development shall include a quantitative slope stability analysis demonstrating a minimum factor of safety against sliding of 1.5 (static) and 1.1 (pseudostatic, k=0.15 or determined through a quantitative slope stability analysis by a geotechnical engineer), whereby safety and stability must be demonstrated for the predicted position of the bluff and bluff edge following bluff recession over the identified project life, without the need for caissons or other protective devices. The analysis should consider impacts both with and without any existing shoreline protective devices.

f. For development on a beach, dune, low bluff, or other shoreline property subject to coastal flooding, inundation or erosion, the report shall include a detailed wave uprush and impact report and analysis, including the following:
   - The analysis shall consider current flood hazards as well as flood hazards associated with sea level rise over the anticipated duration of the development. To examine risks and impacts from flooding, including daily tidal inundation, wave impacts, runup, and overtopping, the site should be examined under conditions of a beach subject to long-term erosion and seasonally eroded shoreline combined with a large storm event (1% probability of occurrence). Flood risks should take into account daily and annual high tide conditions, backwater flooding, water level rise due to El Niño and other atmospheric forcing, groundwater inundation, storm surge, sea level rise appropriate for the time period, and waves associated with a large storm event (such as the 100 year storm or greater). The analysis should consider impacts both with and without any existing shoreline protective devices.

A range of sea level rise scenarios shall be examined to understand the range of potential impacts that may occur throughout the anticipated duration of the development. At a minimum, flood risk from the highest projected sea level rise over the anticipated duration of the development, based on the current best available science, should be examined. Additionally, the analysis should consider the frequency of future flooding impacts (e.g., daily impacts versus flooding from extreme storms only) and describe the extent to which the proposed development would be able to avoid, minimize, and/or withstand impacts from such occurrences of flooding. Studies should describe adaptation strategies that reduce hazard risks and neither create nor add to impacts on existing coastal resources and that could be incorporated into the development.

Assumption of Risk

Note: A key component of an assumption of risk policy to address sea level rise hinges on property owners acknowledging that shoreline protective devices are not allowed in the future to protect the residential development, and accepting the responsibility to remove or relocate structures and restore the site if it becomes unsafe, it is no longer located on private property, or removal is required pursuant to adaptation planning requirements.

A.6 Assumption of Risk, Waiver of Liability and Indemnity

As a condition of coastal permit approval for new development in an area subject to current or future hazards, applicants shall be required to record a deed restriction on the property to acknowledge and agree [***modify following list as necessary to address specific case***]: 1) that the development is located in a hazardous area, or an area that may become hazardous in the future; 2) to assume the risks of injury and damage from such hazards in connection with the permitted development; 3) to unconditionally waive any claim of damage or liability against the ***[insert local government name, and Coastal Commission, if permit is appealed]***, its officers, agents, and employees for injury or damage from such hazards; 4) to indemnify and hold harmless the ***[insert local government name, and Coastal Commission, if permit is appealed]***, its officers, agents, and employees with respect to approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards; 5) to waive rights to shoreline armoring in the future; 6) that public funds may not be available in the future to repair or continue to provide services to the site (e.g., maintenance of roadways or utilities); 7) that the occupancy of structures where sewage disposal or water systems are rendered inoperable may be prohibited; 8) that the structure may eventually be located on public trust lands; and 9) that the structure may be required to be removed or relocated and the site restored if it becomes unsafe, it is no longer located on private property, or removal is required pursuant to adaptation planning requirements.

Real Estate Disclosure

Note: A local government has the authority to require real estate disclosures related to coastal hazards for all applicable properties within their jurisdiction. Such disclosures can be required when property is transferred, regardless of whether it is subject to CDP authorization.

A.7 Real Estate Disclosure of Hazards

The ***[City or County]*** shall require real estate disclosures of all coastal hazards, including hazards associated with anticipated sea level rise, geologic hazards, and erosion. Disclosure documents related to any future marketing and sale of property subject to coastal hazards (including hazards associated with anticipatory sea level rise scenarios, geologic hazards, groundwater inundation, coastal bluff retreat, coastal flooding, or shoreline erosion, including any hazards identified in ***[City or County]*** hazards maps, vulnerability assessments, or any site-specific hazard analyses of sea level rise), including but not limited to specific marketing materials, sales contracts and similar documents, shall notify buyers of the coastal hazards exposure and the terms and conditions of any coastal development permits. Disclosure should include information about any development restrictions and site exposure to coastal hazards including, but not limited to, episodic and long-term shoreline retreat and coastal erosion, landslide, seismic hazards, and geologic instability, and other potential hazards exacerbated by future sea level rise.

B. AVOID SITING NEW DEVELOPMENT AND/OR PERPETUATING REDEVELOPMENT IN HAZARD AREAS

Note: The policies in Section B are meant to be used together to provide guidance for new development on vacant parcels as well as redevelopment in areas with existing residential patterns. The intent of these policies is to site and design to protect coastal resources and minimize risks to life and property to the maximum extent feasible using setbacks, redevelopment, nonconforming structure, and land division restrictions in areas threatened by sea level rise. Understanding the more complex redevelopment and takings concerns for some communities, new policies for removal plans and reliance on shoreline protection will be important for proactive sea level rise planning.

B.1 Siting to Protect Coastal Resources and Minimize Hazards

a) Non-specific:

New development shall be sited to avoid hazards, taking into account predicted sea level rise hazards, including groundwater changes, over the anticipated life of the development. If hazards cannot be completely avoided, then development shall be sited and designed to protect coastal resources and minimize risks to life and property to the maximum extent feasible. New development shall assure stability and structural integrity of the development, and not contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area.

b) Shoreline-specific:

Siting and design of new development on or near the shoreline shall take into account coastal hazards and the extent of shoreline migration and groundwater changes that can be anticipated over the expected duration of the development. This landward migration shall be determined based upon historical erosion rates, acceleration of erosion and flooding due to continued and accelerated sea level rise, storm damage, and foreseeable changes in sand supply. Development shall be set back a sufficient distance to prevent impacts to coastal resources, minimize coastal hazards over the anticipated life of the development, assure stability and structural integrity of the development, and not contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area. If development cannot be set back sufficiently to avoid all risk during its anticipated life, due to lot size, configuration or other

factors, it shall be located as far landward as possible and sited and designed to protect coastal resources and minimize hazards to the extent feasible (See also Policy E.4 – Flood Hazard Mitigation). In addition, when permitted, all development shall be subject to removal plan conditions in Policy B.2 – Removal Plan Conditions for New Development in Hazardous Areas.

c) Blufftop-specific:

New development shall be set back a sufficient distance to ensure its structural integrity for the anticipated duration of the development, taking into account sea level rise, erosion, and other geologic hazards, without reliance on shoreline protective devices, including any existing shoreline protective devices associated with the site, pursuant to Policy B.5 – Determining Bluff Setback Line. Site-specific coastal hazard studies shall include a quantitative slope stability analysis demonstrating safety and stability for the predicted position of the bluff following bluff recession for the anticipated duration of the development under historical bluff retreat conditions, as well as with acceleration of bluff retreat due to continued and accelerated sea level rise and other climatic impacts (see Policy B.5 – Determining Bluff Setback Line). If development cannot be set back sufficiently to avoid all risk during its anticipated duration, due to lot size, configuration or other factors, it shall be located as far landward as possible and sited and designed to protect coastal resources and minimize hazards to the extent feasible. In addition, when permitted, all development shall be subject to removal plan conditions in Policy B.2 – Removal Plan Conditions for New Development in Hazardous Areas.

d) Dune-specific:

Siting and design of new development adjacent to dunes shall take into account the extent of landward migration of the foredunes that can be anticipated over the anticipated duration of the development. This landward migration shall be determined based upon historic dune erosion, storm damage, anticipated sea level rise, and foreseeable changes in sand supply. Development shall be set back a sufficient distance to prevent impacts to coastal resources, assure structural stability of the development, and avoid coastal hazards over the expected duration of the development. If development cannot be set back sufficiently to avoid hazards during its anticipated duration, due to lot size, configuration or other factors, it shall be set back as much as possible and sited and designed to protect coastal resources and minimize hazards to the extent feasible (See also Policy E.4 – Flood Hazard Mitigation). When permitted, development shall be subject to removal plan conditions in Policy B.2 – Removal Plan Conditions for New Development in Hazardous Areas.

B.2 Removal Plan Conditions for New Development in Hazardous Areas

Require preparation of a Removal and Restoration Plan as a condition of approval for development subject to coastal hazards, to ensure that should the development meet any of the removal criteria in Policy D.1 – Removal Conditions/Development Duration, it will be the property owner's responsibility to remove the structure and restore the site in a way that best protects coastal resources. The plan shall specify that in the event that portions of the development fall to the bluffs or ocean before they are removed/relocated, the landowner will remove all recoverable debris associated with the development from the bluffs and ocean and lawfully dispose of the material in an approved disposal site. The plan shall also specify that such removal requires a coastal development permit.

B.3 Reliance on Shoreline Armoring

All new development, including redevelopment (as defined in Policy B.7), shall be sited and designed to ensure that it does not require shoreline protective devices that substantially alter natural landforms to provide engineering geologic stability and that it will be safe from erosion, flooding, and wave run-up for the anticipated duration of the development. This is true even if new development, including redevelopment, is protected by a legally authorized shoreline protective device, in which case the new development and redevelopment on the site shall still be designed and sited in a manner that does not require or rely on the use of a shoreline protective device to ensure geologic stability. Any existing shoreline armoring structure associated with the new development shall be removed if it is no longer necessary to protect the development, and it is not needed to protect adjacent development that is still entitled to retain shoreline armoring.

B.4 Bluff Face Development

Structures, grading, and landform alteration on bluff faces are prohibited, except for the following: public access structures where no feasible alternative means of public access exists or shoreline protective devices if otherwise allowed by the LCP. Such structures shall be designed and constructed to be visually compatible with the surrounding area to the maximum extent feasible and to minimize effects on erosion of the bluff face.

B.5 Determining Bluff Setback Line

The bluff or geologic setback line is the location on the bluff top inland of which stability can be reasonably assured for the anticipated duration of the development without need for shoreline protective devices. The setback line shall account for the amount of erosion anticipated over the life of the development, plus an additional setback to ensure slope stability under future conditions. To determine and document the setback line, applications for bluff property development must include a geotechnical report from a licensed Geotechnical Engineer or a certified Engineering Geologist that establishes the bluff or geologic setback line for the proposed development. The analysis shall include a quantitative slope stability analysis demonstrating a minimum factor of safety against sliding of 1.5 (static) or 1.1 (pseudostatic, k-0.15 or determined through analysis by the geotechnical engineer), using shear strength parameters derived from relatively undeformed samples collected at the site. Future long-term erosion rates shall be based upon the best available information on bluff failure mechanisms, using resources such as the highest historic retreat rates, sea level rise flood projections, shoreline change models that take rising sea levels into account, future increase in storm, El Niño or other climatic events, and any known site-specific conditions. The analysis shall assume that any current shoreline protective device does not exist, such that the site would erode in a manner similar to unarmored sites in the same vicinity.

B.6 Minor Development in Hazardous Areas

Minor and/or ancillary development, including ***[insert relevant development types based on existing pattern of development and consistent with view protection policies, e.g., public trails, benches, gazebos, patios, etc.]***, may be located seaward of the bluff or shoreline setback line, but no closer than [***insert appropriate distance***] inland of the bluff edge, provided that development is removed or relocated when threatened. In the event that portions of the development fall to the bluffs or ocean before they are removed/relocated, the landowner will remove all recoverable debris associated with the development from the bluffs and ocean and lawfully dispose of the material in an approved disposal site.

Improvements, Alterations and Additions to Existing Structures

Note: Improvements and alterations that result in replacement of 50% or more of the existing structures shall be considered a replacement structure and treated as new development/redevelopment. All additions must conform with all applicable LCP policies, but an addition that results in redevelopment shall require the whole structure to be brought into conformance with the LCP. Redevelopment is intended to capture alterations related to structural components OR market value. For example, in cases where development might be less than the 50% threshold for redevelopment, it might still be considered redevelopment if an increase in economic value exceeding 50% of market value results from the activity.

B.7 Redevelopment

A development proposal reaches the threshold of being a replacement structure or redevelopment if it meets criteria A or B below. Development meeting this definition must be brought into conformance with all applicable LCP policies.

A. Development that consists of alterations including (1) additions to an existing structure, (2) exterior and/or interior renovations, and/or (3) demolition or replacement of an existing home or other principal structure, or portions thereof, which results in:
   (1) Alteration (including demolition, renovation or replacement) of 50% or more of major structural components including exterior walls, floor, roof structure or foundation, or a 50% increase in gross floor area. Alterations are not additive between individual major structural components; however, changes to individual major structural components are cumulative over time from the date of the LUP (or subject amendment) certification.

   (2) Alteration (including demolition, renovation or replacement) of less than 50% of a major structural component where the proposed alteration would result in cumulative alterations exceeding 50% or more of a major structural component, taking into consideration previous alterations approved on or after the date of this LUP (or subject amendment) certification; or an alteration that constitutes less than 50% increase in floor area where the proposed alteration would result in a cumulative addition of 50% or greater of the floor area, taking into consideration previous additions approved on or after the date of this LUP (or subject amendment) certification.

OR

B. Development that consists of any alteration of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction, based on the documented construction bid costs and either an appraisal by a professional property appraiser or County assessor data, if it is based on current market values.

B.8 Nonconforming Structures

When proposed development would involve redevelopment of an existing structure that is legally non-conforming due to a coastal resource protection standard, the entire structure must be made to conform with all current development standards and applicable policies of the LCP. Improvements to existing non-conforming structures, regardless if the proposed improvements meet the threshold of redevelopment, shall not be permitted when 1) improvements to existing structures increase the degree of non-conformity and/or the hazardous condition by developing

seaward; 2) larger structures are proposed in non-conforming locations; or 3) improvements extend the anticipated duration of the development in a non-conforming location.

Land Division

B.9 Restrict Land Division in Hazardous Areas

Limit land divisions, including lot line adjustments, in areas vulnerable to coastal hazards, including hazards exacerbated by sea level rise. Prohibit the creation of new lots (including adjusted lots) in such areas, unless it is demonstrated either that: 1) the new lot(s) would be permanently protected for open space, public access, or other similar purposes consistent with the LCP, or 2) resultant parcels contain a buildable area in which development on new lots would avoid impacts to coastal resources; would remain located on private property despite the migration of the public trust boundary; not require the future construction or augmentation of a shoreline protective device; maintain public services (e.g., water, sewer, and safe, legal, all-weather access as applicable) over the anticipated duration of the development; and otherwise be consistent with all LCP policies.

Exceptions

B.10 Takings Analysis

Where full adherence to all LCP policies, including for setbacks and other hazard avoidance measures, would preclude a reasonable economic use of the property as a whole, the [***city or county, or Commission if on appeal***] shall allow the minimum economic use and/or development of the property necessary to avoid an unconstitutional taking of private property without just compensation. There is no taking that needs to be avoided if the proposed development constitutes a nuisance or is otherwise prohibited pursuant to other background principles of property law (e.g., public trust doctrine). Continued use of an existing structure, including with any permissible repair and maintenance (which may be exempt from permitting requirements), may provide a reasonable economic use. If development is allowed pursuant to this policy, it must be consistent with all LCP policies to the maximum extent feasible.

C. DESIGN FOR THE HAZARD

Note: Accommodation strategies rely on methods that modify existing developments or design new developments to decrease hazard risks and thus increase the resiliency of development to the impacts of sea level rise. Design options for accommodation can be an important part of phasing a community's response to sea level rise impacts. The policy below is general, but could be customized to the applicable hazards a community is confronting. See Policy E.4 for flood hazard mitigation design options.

Adaptive Design

(Reference Policy E.4 Flood Hazard Mitigation)

C.1 Adaptive Design

For new development, where relocation and/or structure removal might be necessary at some time in the future, ensure that foundation designs or other aspects of the development will accommodate future relocation and/or structure removal. Such relocation and/or removal shall be demonstrated in final plans, and may be phased over time. Alternative design options should be considered and employed where appropriate and if site conditions allow, such as constructing smaller structures, increasing finished floor elevations, and installing wall flood vents.

D. MOVING DEVELOPMENT AWAY FROM HAZARDS

Managed Retreat

D.1 Removal Conditions/Development Duration

New development on private property located in hazardous areas shall be conditioned to require that it be removed and the affected area restored if: (a) any government agency has ordered that the structures are not to be occupied due to coastal hazards, or if any public agency requires the structures to be removed; (b) essential services to the site can no longer feasibly be maintained (e.g., utilities, roads); (c) the development is no longer located on private property due to the migration of the public trust boundary; (d) removal is required pursuant to LCP policies for sea level rise adaptation planning; or (e) the development requires new and/or augmented shoreline protective devices. Such condition shall be recorded on a deed restriction against the subject property.

D.2 Contingency Funds

Require property owners proposing new development in hazardous areas to document that financial contingencies are in place if it becomes necessary to modify, relocate and/or remove development that becomes threatened in the future by sea level rise and/or when removal triggers are met. For significant new development, such as hotels or multi-family housing, financial contingencies must be in the form of a bond, letter of credit, cash deposit, lien agreement or other security deemed adequate by the ***[insert City or County]*** Attorney.

D.3 Limited Authorization Period and Retreat Management Plan

Note: The authorization period could be limited to a number of years or conditions on the ground. (Reference Policy G.9– Managed Retreat Program for application to an area)

In areas vulnerable to current or future coastal hazards where there is a substantial risk of damage to the structure during the anticipated duration of the development, new development that is otherwise allowed and that is significant in size, scope or importance (e.g., multi-family housing, critical infrastructure, visitor serving resources, or shoreline armoring for such, etc.) shall be subject to a limited authorization period to allow time for development of a Retreat Management Plan for the site. The Retreat Management Plan shall fully evaluate methods for relocation, modification to or removal of the development, including removal of any shoreline protective device that is no longer allowed or needed, and remediation of the site. The plan shall evaluate and consider all potential constraints, including geotechnical and engineering constraints; potential phasing options with timelines; project costs; and potential funding options. The plan shall be submitted with documentation sufficient to support all analyses, methodologies, and conclusions.

Prior to the expiration of the authorization period, relocation or removal of the development and remediation of the site, or proposed retention of any portion the development beyond the initial authorization period, should be evaluated. If retention of any shoreline protective device is proposed, it requires an evaluation of alternatives to the shoreline protective device that are capable of protecting the development and that can eliminate and/or reduce impacts to public access, public views, shoreline processes, marine resources, and other coastal resources at the site. The information concerning these alternatives must be sufficiently detailed for evaluation of the feasibility of each alternative for addressing site issues under the Coastal Act and the LCP.

E. MOVING HAZARDS AWAY FROM DEVELOPMENT

Note: The model policies below should be considered for relevant shoreline types. It is important to note that the term "soft" shoreline armoring can refer to shoreline restoration projects, or to shoreline armoring that includes a natural component, such as a revetment that is buried beneath sand and vegetated. While the former may be a permissible restoration project in many circumstances, the latter constitutes shoreline armoring that is generally not permitted to protect new development, though is required to be approved if it is necessary to protect an existing structure or coastal dependent use, and is the least environmentally damaging feasible alternative, as required by the Coastal Act.

E.1 Habitat Buffers

Provide a buffer of at least ***[insert distance of wetlands buffer]*** feet in width from the edge of wetlands or other environmentally sensitive habitat areas and at least ***[insert distance of wetlands buffer]*** feet in width from the edge of riparian habitat. A sea level rise buffer area shall be added to the habitat buffer if necessary to allow for the expected migration of wetlands and other shoreline habitats caused by sea level rise over the anticipated duration of the development. Uses and development within sea level rise buffer areas shall be limited to minor passive recreational uses, with fencing, desiltation or erosion control facilities, or other improvements deemed necessary to protect the habitat, to be located in the upper (upland) half of the buffer area. Water quality features required to support new development shall not be constructed in wetland buffers. Temporary uses may be placed in the sea level rise buffer area until such time as sea level rise causes the wetlands or other shoreline habitat to migrate to within 100 feet of the temporary uses, at which time, they shall be removed. All habitat and buffers identified shall be permanently conserved or protected through the application of a deed restriction, open space easement or other suitable device. All development, such as grading, buildings and other improvements, adjacent to, or draining directly to a habitat area must be sited and designed so it does not disturb habitat values, impair functional capacity, or otherwise degrade the habitat area.

E.2 Soft Shoreline Protection

Encourage the use of soft or natural shoreline protection methods, such as dune restoration, beach/sand nourishment, living shorelines, horizontal levees, and other "green" infrastructure as alternatives to hard shoreline protective devices. Soft shoreline protection devices shall be fully evaluated for coastal resource impacts, and shall only be approved if found consistent with the LCP policies related to shoreline protection. The ***[City or County]*** should consider how these options may need to change over time as sea level rises.

E.3 Avoid Adverse Impacts from Stormwater and Dry Weather Discharges

New development shall provide adequate drainage and erosion control facilities that convey site drainage in a non-erosive manner to minimize hazards resulting from increased runoff and erosion. Runoff shall be directed inland to the storm drain system or to an existing outfall, when feasible. If no storm drain system or existing outfall is present, blufftop runoff shall not be channelized or directed to the beach or the ocean.

E.4 Flood Hazard Mitigation

If it is infeasible for new development to avoid flooding hazards, development should be designed to minimize risks from flooding, including as influenced by sea level rise, over the anticipated life of the development to the maximum extent feasible and otherwise constructed using design

techniques that will limit damage caused by floods. Residential design shall incorporate appropriate flood hazard mitigation measures, including: ***[include all applicable, and add any other appropriate measures]*** elevating the finished floor (e.g., above the estimated combined 100-year storm flood elevation considering sea level rise and wave uprush scenario); locating only non-habitable space below the flood hazard elevation; elevating and storing hazardous materials out of the flood hazard area; elevating mechanical and utility installations; prohibiting basements; and using flood vents and anchoring structures where appropriate. However, elevation should be limited to ensure consistency with visual resource protection policies, and to ensure that access to utilities, including water, sewer, and roads, can continue over the anticipated duration of the development. If such access cannot be ensured consistent with LCP policies, then conditions shall be added requiring assumption of risk, removal conditions, and retreat management plan.

F. BUILDING BARRIERS TO PROTECT FROM HAZARDS

Shoreline Armoring

Note: Managing shoreline armoring has been challenging for many local governments because urban areas are frequently made up of both developed and undeveloped lots. In addition, many developments in existence in 1976 have since been "redeveloped" through renovations, remodeling, additions, and complete demolition and rebuild. The reality of effective shoreline management is that the Coastal Act and LCPs must address and be applied to a wide variety of physical and legal circumstances that may not be addressed by a simple application of the clean Coastal Act distinction between existing development that may be entitled to shoreline armoring and new development that is not. A suite of shoreline armoring policies can offer guidance for many of the shoreline armoring contexts, laying out the general policies first, then offering details on prioritization, siting and design, mitigation, and expectations for the shoreline armoring in the future.

F.1 Shoreline and Bluff Protective Devices

Shoreline protective devices, including revetments, breakwaters, groins, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes, are allowed when required to serve coastal-dependent uses or protect existing principal structures (i.e., development that existed as of January 1, 1977, when the Coastal Act took effect) or public beaches in danger from erosion, when there is no less environmentally damaging alternative. Any such structures shall be sited to avoid sensitive resources and designed to eliminate or mitigate adverse impacts on local shoreline sand supply and other coastal resources. Existing marine structures causing water stagnation or contributing to pollution problems and fish kills shall be phased out or upgraded where technically feasible.

F.2 Prioritization of Types of Shoreline Protection

Shoreline protective devices shall only be permitted if no other feasible, less environmentally damaging alternative, including but not limited to removal or relocation of the threatened development, beach nourishment, non-structural drainage and native landscape improvements, or other similar non-structural options, can be feasibly used to address erosion hazards. Such non-structural options shall be identified, used and prioritized wherever possible to protect coastal resources, including coastal habitats, public recreational uses, and public access to the coast. Where such non-structural options are not feasible in whole or in part, soft protection (e.g., sand bags, revetments that are combined with dune restoration, etc.) shall be used and prioritized wherever feasible before any more significant hard shoreline protective devices (including, but

not limited to, seawalls, revetments, breakwaters, groins, bluff retention devices, and piers/caisson foundation systems) are permitted.

F.3 Siting and Design to Avoid and to Mitigate Impacts

New shoreline protective devices shall be sited and designed to avoid coastal resource impacts to the maximum extent feasible, including through: eliminating or mitigating all adverse impacts on beach area and local shoreline sand supply; protecting and enhancing public recreational access; protecting and enhancing public views; minimizing alteration of, and being visually subordinate to, the natural character of the shoreline; avoiding or mitigating impacts to archeological resources; and protecting other coastal resources in a manner consistent with the Coastal Act.

Impacts from shoreline protective devices on beach area and local shoreline sand supply include: losing sand and beach area through the device's physical encroachment on a beach, fixing of the back beach, preventing new beach formation in areas where the bluff/shoreline would have otherwise naturally eroded, and losing sand-generating bluff/shoreline materials that would have entered the sand supply system absent the shoreline protective device. If such impacts cannot be avoided, they shall be mitigated through options such as new public access or recreational facilities. If such options are not feasible, proportional in-lieu fees that consider the full value of the beach—including with respect to impacts on shoreline sand supply, sandy beaches, public recreational access, public views, natural landforms, and water quality—may be used as a vehicle for impact mitigation provided that such in-lieu fees are deposited in an interest bearing account managed by the **[*insert City or County*]** and used only for acquisition of coastal public access areas and coastal public access and recreational improvements.

F.4 Repair and Maintenance of Shoreline Protective Devices

Repair and maintenance of existing, legally permitted shoreline protective devices may be permitted as repair and maintenance only if the activities do not result in an enlargement or extension of armoring and where an engineering or geological study demonstrates that, in the absence of such repair and maintenance, the structure(s) associated with and protected by the shoreline protective device would be subject to damage from identified coastal hazards. Repair and maintenance activities shall not result in a seaward encroachment of the shoreline protective device. Repair and maintenance projects shall include measures to address and mitigate all coastal resource impacts the shoreline protective device is having, including with respect to local sand supply, public views and public recreational access. Replacement of 50 percent or more of the protective device shall not be considered repair and maintenance but instead constitutes a replacement structure subject to provisions applicable to new shoreline protective devices.

F.5 Evaluation of Existing Shoreline Armoring

Applications for new development or redevelopment that is associated with and/or protected by existing shoreline protective devices shall not rely on the device for protection (see B.3 - Reliance on Shoreline armoring) and shall be required to provide an assessment of the continued efficacy and necessity of such shoreline armoring. This must include an evaluation of whether the shoreline protective device can be removed or modified (and affected areas restored to natural conditions) in light of the development proposed (e.g., if the development is being modified to provide a greater setback or relocated inland) to better protect public recreational access and other coastal resources. If the assessment indicates that existing shoreline protective devices can be removed or modified, including if there is a greater coastal resource benefit to removal or modification, and if the shoreline armoring is located on the same property as the proposed development, then removal or modification shall be required as a condition of approval for the development unless the armoring continues to be necessary to protect other existing structures or

coastal dependent uses entitled to protection. In all cases, shoreline protective devices shall only be authorized until the time when the qualifying development or resource that is protected by the shoreline protective device is no longer present and/or no longer requires protection.

F.6 Shoreline Armoring Duration

Shoreline protective devices shall only be authorized until the time when the existing principal structure that is protected by such a device: 1) is no longer present; 2) no longer requires armoring; or 3) is redeveloped. Permittees shall be required to submit a coastal permit application to remove the authorized shoreline protective device within six months of a determination that the shoreline protective device is no longer authorized to protect the structure it was designed to protect because the structure is no longer present or no longer requires armoring and the device is not needed to protect adjacent development that is still entitled to shoreline armoring. In the case of redevelopment, removal of the shoreline protective device shall be required as part of construction of the redeveloped structure.

F.7 Shoreline Armoring Mitigation Period

As a condition of approval for new, redeveloped or repaired shoreline protective devices, the ***[City or County]*** shall require mitigation of impacts to shoreline sand supply, public access and recreation, and any other relevant coastal resource impacts in 20-year (or smaller) increments, starting with the building permit completion certification date. Permittees shall apply for a coastal permit amendment prior to expiration of each 20-year mitigation period, proposing mitigation for coastal resource impacts associated with retention of the shoreline protective device beyond the preceding 20-year mitigation period, and such application shall include consideration of alternative feasible mitigation measures in which the permittee can modify or remove the shoreline protective device to lessen its impacts on coastal resources.

F.8 Shoreline Armoring Monitoring

As a condition of approval for new, redeveloped or repaired shoreline protective devices, the ***[City or County]*** shall require a monitoring plan to identify the impacts of the shoreline armoring on the surrounding area and determine when a shoreline protective device is no longer needed for protection. The monitoring plan shall specify requirements for periodic inspection for structural damage, excessive scour, or other impacts from coastal hazards and sea level rise, impacts to shoreline processes and beach width (both at the project site and the broader area and/or littoral cell as feasible), and impacts to public access and the availability of public trust lands for public use.

F.9 No Future Shoreline Armoring

Property owners shall be required to waive any rights to future shoreline protection, and private property owners shall be required to record that waiver, as a condition of approval of a coastal development permit for new development on a beach, shoreline, bluff, or other area subject to coastal hazards, including but not limited to tidal and storm flooding, wave runup, and erosion, as influenced by sea level rise over time (see also Policy A.3 – Assumption of risk). Shoreline armoring may be permitted to protect coastal dependent uses, or existing structures that were legally constructed prior to the adoption of the Coastal Act (i.e., January 1, 1977), when found to be the least environmentally damaging feasible alternative and when all feasible mitigation is provided, unless a waiver of future shoreline armoring was required by a previous coastal development permit.

F.10 Bulkheads for Waterfront Development

New development or redevelopment on property currently protected from flooding by bulkheads is permitted to rely on those bulkheads to demonstrate that the project will protect life and

property from coastal hazards if: 1) the existing bulkheads, and feasible augmentation of them necessary to protect the proposed structure over its life, do not alter natural shoreline processes along bluffs or cliffs or cause adverse impacts to public access, marine habitat, aesthetics or other coastal resources, including when considering migration of public trust lands and impacts from anticipated groundwater changes; and 2) property owners record a waiver of any rights to seaward expansion of the bulkhead as a condition of approval of a coastal development permit for new development when a coastal hazards report (see Policy A.4 –Site-specific Coastal Hazard Report Required) establishes that an existing bulkhead cannot be removed and/or an existing or replacement bulkhead is required to protect existing principal structures and adjacent development or public facilities on the site or in the surrounding area. Waiver of rights to future shoreline protection includes repair or maintenance, enhancement, reinforcement, or any other activity affecting the bulkhead, that results in any encroachment seaward of the authorized footprint of the bulkhead. The principal structure(s) should be set back a sufficient distance 1) to allow for repair and maintenance of that bulkhead including access to any subsurface deadman or tiebacks and 2) to allow for realignment of necessary bulkheads as far landward as possible and in alignment with bulkheads on either side.

G. COMMUNITY SCALE ADAPTATION PLANNING

Note: Much of sea level rise adaptation for residential land use will require a community approach, as the scope of parcel level actions is too limited to address all coastal hazard impacts, especially when existing residential patterns are already located in hazardous locations. For example, unless individual bulkheads in a community are raised together, the lowest one will be the weak link and expose larger areas (homes and roads) to flooding.
Community scale adaptation plans should also take into account other climate change impacts (e.g. changes in precipitation patterns, fire frequency, etc.), and work with other counties and cities to develop and incorporate expectations for potential future impacts given other watershed scale changes. These changes may be related to climate change effects, other development upstream, or management decisions and processes.

Developing Adaptation Planning Information

G.1 Management of Sea Level Rise Hazards

i. Gather information on the effects of sea level rise, including identifying the most vulnerable areas, structures, facilities, and resources; specifically areas with priority uses such as public access and recreation resources, including the California Coastal Trail, Highway 1, significant ESHA such as wetlands or wetland restoration areas, open space areas where future wetland migration would be possible, and existing and planned sites for critical infrastructure.

ii. The [***Insert city or county***] shall conduct a vulnerability assessment [by ***insert date***] using best available science identified pursuant to Policy A.1 - Identifying and Using Best Available Science - and multiple sea level rise scenarios including estimates of high projections of expected sea level rise.

iii. The [***Insert city or county***] shall update Sea Level Rise Maps at least every 10 years or as necessary to allow for the incorporation of new sea level rise science, monitoring results, and information on coastal conditions.

iv. Research the potential to increase setbacks for or relocate existing and planned development to safer locations in order to minimize hazards and protect coastal resources. Explore the feasibility of a managed retreat program, which may involve protecting vacant land through zoning or conservation easements and/or removing development from areas vulnerable to sea level rise and restoring those areas to a natural state for open space or recreation. Identify potential mechanisms and incentives for implementation, which may include options to:

a. Acquire vacant vulnerable properties.
b. Acquire developed vulnerable properties before damage occurs.
c. Acquire developed vulnerable properties after significant destruction by storms, erosion, or high tides.
d. Explore the feasibility of public parkland exchange programs that encourage landowners to move out of hazardous areas.
e. Identify and make available (e.g., through rezoning) land outside the hazard areas to allow owners of vulnerable properties to relocate nearby.
f. Explore clustering of development density in areas not vulnerable to coastal hazards and limiting development in areas that are vulnerable.
g. Develop Transferable Development Credit programs.
h. Develop programs to phase out the use of homes in coastal hazard areas, such as through leasebacks.
i. Work with entities that plan or operate infrastructure, such as Caltrans, public utilities, railroads, water districts, etc., to plan for potential relocation or realignment of public infrastructure impacted by sea level rise.
j. Develop Geologic Hazard Abatement Districts (GHADs), County Services Areas (CSAs), or other similar entities to address the prevention, mitigation, abatement, and control of geologic hazards for specific neighborhoods

v. Join and/ or facilitate collaborative sea level rise adaptation efforts with other local, regional, state and federal entities to promote restoration or enhancement of natural ecosystems, such as coastal wetlands and sandy beaches.

vi. Support efforts to monitor sea level rise impacts to recreational resources, natural resources and ESHA, including ***[insert names of beach areas]***; ***[insert names of wetland areas]***; and ***[insert names of creeks]***and other creeks; rocky intertidal areas, beaches and other habitat types vulnerable to sea level rise. Collaborate with other local, regional, state and federal entities to establish monitoring methods and track the effects of sea level rise.

vii. Promote natural infrastructure pilot projects (horizontal levees, dune restoration, etc.) with environmental benefits that enhance natural and recreational resources while protecting assets from sea level rise and increased storm surges. Study and monitor such projects over time and share lessons learned with other jurisdictions.

viii. Update standards for ESHA buffers and setbacks to account for sea level rise, based on the best available science and considering the effects of shoreline development on landward migration of wetlands.

G.2 Adaptation Plan

Develop and implement an adaptation plan that examines priorities for adaptation, timelines, options, specific projects to be implemented, phasing and action triggers. As components of the adaptation plan, assess seasonal and long-term shoreline changes and the potential for flooding or damage from erosion, sea level rise, waves, storm surge or seiches. Plans should provide recommendations for adapting existing development, public improvements, coastal access, recreational areas, and other coastal resources. Plans should evaluate the feasibility of hazard avoidance, managed retreat, restoration of the sand supply and beach nourishment in appropriate areas.

Sea Level Rise Overlay Zones

Note: Policies on Sea Level Rise Overlay Zones should cross reference relevant LCP policies that provide the actions triggered by the presence of the zone. An overlay zone can meet multiple objectives, set boundaries based on a worst case scenario, and define the policy considerations for those areas. For example, policies in Sea Level Rise Overlay Zones might trigger downzoning, redevelopment restrictions, structure removal, or other adaptation measures for development. A Sea Level Rise Overlay Zone could also be incorporated into a shoreline management plan that preserves coastal resources in the long term, allows for inland shoreline migration, and defines future expectations for what development will be permitted in sea level rise hazard zones going forward.

G.3 Sea Level Rise Hazard Overlay Zone

(Reference Policy A.3 Mapping Coastal Hazards)
Minimize risks to life and property associated with sea level rise through application of policies and standards specific to the Sea Level Rise Hazard Overlay Zone [***insert reference to maps, e.g., (see Figure X)***]. Policies in this section ***[insert section or policy numbers]*** shall apply to all properties within the Sea Level Rise Hazard Overlay Zone.

G.4 Beach Open Space Zone

Establish a 'Beach Open Space' zone located in ***[the defined hazard/management area]*** to provide for current and future beach access and management, including inland migration of the beach as sea level rises. The purpose of the zone is to provide for protection of the migrating/ambulatory beach and public access to and along it. All existing development that is not for public access or recreation would become non-conforming in the zone district. Unless otherwise required to be approved pursuant to other LCP policies, new development would be prohibited within the zone, with the exception of : 1) new development on properties that participate in the Managed Retreat Program as specified in Policy G.9–Managed Retreat Program, and 2) development related to habitat restoration, public access or beach/ocean recreational opportunities.

Community Scale: Beach and Dune Adaptation

G.5 Beach Nourishment

In coordination with the Coastal Commission and other permitting agencies (e.g., State Lands Commission, U.S. Army Corps of Engineers), develop and implement a comprehensive beach nourishment program to assist in maintaining beach width and elevations. The beach nourishment program should include measures to protect water quality and to minimize and mitigate potential adverse biological resource impacts from deposition of material, including measures such as sand compatibility specifications, restrictions on volume of deposition, timing or seasonal restrictions,

and identification of environmentally preferred locations for deposits. The [***insert City or County***] should consider developing an opportunistic sand program and determining how replenishment options may need to change over time as sea level rises.

Community Scale: Bluff Erosion Adaptation

G.6 Improve Drainage on Bluffs to Reduce Erosion

Investigate areas which could be significantly contributing to increased groundwater flows to the bluffs and determine whether improving drainage and/or reducing irrigation could potentially reduce bluff erosion. If measures to improve drainage or reduce over-watering are found to have the potential to reduce bluff erosion, the ***[insert City or County]*** should inform property owners about appropriate irrigation practices and drainage improvements as part of existing water conservation outreach programs.

Trigger-Based Adaptation Approaches

Note: Trigger-based adaptation approaches present a mechanism by which adaptation actions can be phased over time. These policies should be developed through a community adaptation planning process that specifies appropriate trigger types and responsive actions (e.g., beach nourishment) or programs (e.g., managed retreat program). Model policies G.7 – G.9 contain conceptual elements or triggers that could be written in a single customized policy for a particular location. For example, a managed retreat program could use repetitive loss or beach width triggers to set community priorities for targeted buy-outs. Additionally, a similar policy to the managed retreat program for beaches could be applied for wetlands or other habitat areas subject to sea level rise.

G.7 Repetitive Loss

The ***[insert City or County]*** shall develop a Repetitive Loss Program to eliminate or reduce damage to property, impacts on coastal resources, and the community disruption caused by repeated flooding or storm damage. A Repetitive Loss Structure is a structure that has suffered damage and filed FEMA claims on two or more occasions during a rolling 10-year period. The Repetitive Loss Program shall require properties with Repetitive Loss Structures to be rezoned over time to less intensive uses to accommodate shoreline migration, increased coastal flooding, inundation, and related sea level rise impacts. The Program shall include maintaining a database of property flooding and damage to further identify and monitor local hazard areas, as resources are available. Where hazards cause reasonable use to be difficult to achieve, acquisition of the property by the ***[insert City or County]*** shall be encouraged.

G.8 Beach Management Plan

Establish a comprehensive beach management plan within the framework of adaptation planning and regular LCP updates to protect and enhance existing beach areas. The Plan shall identify actions and programs that can be implemented in the near term or would be implemented based on pre-determined future triggers to preserve recreational, habitat, and other coastal resource values and should include research into opportunities for additional adaptation actions that would be implemented based on future impacts. The beach management plan shall also include and expand upon the following actions:

a) Establish a minimum beach width that maintains optimum public recreational access and habitat function. The analysis used to establish the minimum width shall include considerations of daily tidal range, seasonal erosion, and short-term, storm driven erosion.

b) Establish appropriate triggers for sediment management activities and/or implementation of the Managed Retreat Program (Policy G.9) so that width is maintained as the beach naturally migrates over time in response to erosion, sea level rise, and other coastal processes
c) Monitor beach width, mean high tide and bluff toe elevation.
d) Monitor public access, beach use, and any impacts to public trust lands. Identify and track locations, times, and durations throughout the year when the beach is too narrow to be adequate for recreation and/or lateral access.
e) Pursue opportunities for beach nourishment or otherwise increasing beach widths and enhancing beach access.
f) Evaluate adaptation opportunities for vulnerable roads and highways that provide beach access, and pursue opportunities that would maintain vehicular, bicycle and pedestrian access while protecting the beach and public access to it.
g) Revise the ***[City or County's]*** Local Hazard Mitigation Plan to provide for and support the Managed Retreat Program and to incorporate findings of relevant Vulnerability Assessments or Adaptation Plans.

G.9 Managed Retreat Program

Establish a Managed Retreat Program to remove, modify or relocate development when necessary to protect and provide for the migrating shoreline. The Managed Retreat Program must consist of at least the following components:.

a) When the beach area of [***insert jurisdiction or specific beach name(s)***] is reduced below the minimum beach width established pursuant to Policy G.8, development adjacent to the beach that has participated in the Managed Retreat Program must be moved, modified or removed and the area restored to open space to ensure the minimum beach width of ['[***XXX feet' or 'to restore adequate public access to the beach' feet***].
b) All new development, which includes redevelopment including but not limited to modification of the foundation for elevation, in the Beach Open Space zone must participate in the Managed Retreat Program. Permits for such development shall be conditioned to require its modification or removal when necessary to maintain the minimum beach width, and a deed restriction must be recorded to carry out this requirement and notify all new owners of this condition.
c) The [***insert City or County***] shall pursue funding to purchase easements or development rights for existing development from property owners who voluntarily participate in the Managed Retreat Program. Restrictions applied pursuant to voluntary participation may be structured such that managed retreat cannot be triggered on the subject property for a minimum length of time, such as a minimum of 30 years, unless the structure is damaged or threatened and modifications to the structure itself (such as elevation or floodproofing) cannot address the threat. Funding for the voluntary program may come from in-lieu fees, grants, or other state or federal funds.
d) The [***insert City or County]*** shall pursue funding to acquire non-conforming structures within the Beach Open Space zone and lease these residences to provide residential or vacation rental use until such a time that the structure routinely blocks lateral public access; is within the minimum beach width area; is damaged beyond ***[XX%] or is threatened with imminent damage;%];*** is no longer habitable; or leasing becomes otherwise infeasible.

Transfer of Development Rights

Transfer of development rights (TDR) is a market-based tool that can help implement phased retreat from shoreline hazard zones. TDR programs enable individual transactions to transfer development rights from privately owned parcels (i.e., sending sites) to areas that can accommodate additional growth (i.e., receiving sites). Property owners in sending areas receive compensation for giving up their right to develop, while developers in receiving areas pay for the right to develop at greater densities or heights than would otherwise be allowed by current zoning. TDR is not intended to limit growth, but can allow communities to identify which areas are suitable to receive development rights and how much additional development is appropriate.

G.10 Transfer of Development Rights Program

The City shall encourage the protection of ***[insert description of shoreline such as coastal bluff tops, dunes, or beaches]*** by establishing a Transfer of Development Rights program that concentrates development in receiving districts that are outside of areas vulnerable to sea level rise and provides for the transfer of development rights from sending districts that are in areas vulnerable to sea level rise.

Financing Adaptation

Geologic Hazard Abatement Districts (GHADs), County Service Areas (CSAs), and other similar entities provide a potential means for funding sea level rise adaptation measures on a neighborhood scale. By accumulating a funding reserve for anticipated future needs, a GHAD or CSA can provide the financial resources necessary for adaptation approaches that extend beyond a single parcel. Typically, these entities can borrow from lenders or issue bonds with very attractive credit terms.

G.11 Geologic Hazard Abatement Districts (GHADs) and County Service Areas (CSAs)

Explore the feasibility of forming Geologic Hazard Abatement Districts (GHADs) and/or CSAs to fund measures to address the prevention, mitigation, abatement, and control of geologic hazards within a designated sea level rise hazard zone.