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LCP Update Guide

Section 8. Coastal Hazards

OVERVIEW

The complete text of the California Coastal Act is available at the Coastal Commission's website, at: http://www.coastal.ca.gov/coastact.pdf. You'll find policies about coastal resources planning and management in Chapter 3.

Managing development to respond to coastal hazards is a key component of a local coastal program. The Coastal Act policies direct new development to reduce risks to life and property and avoid substantial changes to natural landforms. Coastal Act section 30253 provides, in part, that 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.

The responses to coastal hazards in a Land Use Plan (LUP) should provide for solutions that have the least impacts on coastal resources, taking into account future changes that will be associated with climate change and sea level rise.

LCPs require that safety and stability be assured for the life of a development. In updating your LCP, keep in mind that one of the primary approaches to minimize hazards is to avoid locating new development in hazardous areas, whenever feasible. If development could not occur without resulting in a significant risk to the public or property owners from hazards, it should not be allowed. This can be accomplished through policies related to appropriate land uses adjacent to hazardous areas, subdivision prohibitions, siting and design (e.g. setbacks), and redevelopment standards. You can also consider providing incentives for locating development away from hazardous coastal areas. The response will also depend on the hazard being addressed, whether shoreline erosion, fire or seismic risk, etc.

If it is not feasible to completely avoid a hazardous area, risk can be minimized by avoiding development in the hazardous area to the maximum extent feasible (for example through setbacks) and by designing the development to ensure it will be protected against the consequences of unavoidable hazards (for example through non-armoring features such as elevation or by requiring the

new structure to be removed when it becomes threatened). For shoreline hazards, neither shoreline armoring nor bluff retaining devices should be allowed as an option to protect new development. In fact, the LCP should include policies and regulations that require that all new development be conditioned prohibit the use of shoreline armoring in most cases. This is because shoreline protective devices can have significant adverse impacts to coastal resources, including:

- Direct loss of sandy and rocky beaches and intertidal areas that are a critical component of the marine ecosystem and public access and recreational resources;
- Interruption of natural shoreline processes, that may contribute to erosion of the shoreline in many areas;
- Impedance of recreational opportunities and public access to and along the coastline as a result of the structure's physical occupation of the beach, impacts on future beach area and impacts on sand supply; and
- Degradation of scenic and visual resources.

As such, shoreline protective devices should only be allowed in limited situations (e.g. to protect existing structures) and when no other feasible alternative exists, as prescribed in Coastal Act Sections 30235 and 30253.

This Chapter contains information for addressing different types of hazards, but given the importance of addressing sea level rise, it emphasizes those related to the shoreline.

An LUP Update offers the opportunity to plan comprehensively by evaluating current and future hazards, taking projected sea level rise into account, and developing policies that establish development patterns and site regulations that minimize hazards and avoid the need for shoreline protection, which harms coastal resources. Hazard Components of LCPs should be updated to address changed conditions and emerging issues related to adapting to climate change. Local governments are strongly encouraged to prepare Vulnerability Assessments for their coastal areas to better understand current and future risk from coastal hazards and sea level rise. Local Governments are encouraged to utilize existing sea level risk assessment tools such as the USGS modeling available through CoSMoS, or the NOAA Sea Level Rise Viewer. Once current and future hazardous areas have been identified through vulnerability analyses (or wave run-up analyses, geologic studies, and/or other similar community-wide, subdivision, or parcel scale investigations) LUP policies can be developed to achieve hazard avoidance or minimization goals in those areas.

The 2015 Coastal Commission Sea Level Rise Policy Guidance can be found at:

https://www.coastal.ca.gov/climate/slrguidance.html

Government at all levels continues to address impacts from climate change pursuant to the requirements of AB 32, the Global Warming Solutions Act of 2006, and numerous Executive Orders and Senate and Assembly bills. In 2015, the Commission adopted the Sea Level Rise Policy Guidance document to provide information on how to address sea level rise within the context of the Coastal Act (see sidebar to access this document).

In addition, hazards, climate change and sea level rise are addressed in other planning-related documents, such as Local Hazard Mitigation Plans (LHMPs), General Plan Safety Elements, Regional Sediment Management Plans, Climate Action Plans and Regional Transportation Plans. Planners should be aware of these documents and 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 documents may overlap with the studies appropriate for hazards planning in LCPs. Additionally, these agencies, organizations, and planning efforts may be good resources from which to gather information when performing these analyses for LCP updates.

For example, there is overlap between the required elements of a Local Hazard Mitigation Plan (LHMP) and Local Coastal Programs, 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. In order to be eligible for certain types of non-emergency disaster assistance, including funding for hazard mitigation projects, local governments are required by the Federal Emergency Management Agency (FEMA) to complete an LHMP and to update the plan every 5 years. Any sea level rise hazard avoidance strategies included in an LCP certification or update, such as relocation of critical facilities must be included in the LHMP narrative to be eligible for funding from FEMA to implement future projects. If a local government has recently updated their LHMP, the city or county can add narrative information on sea level rise strategies through an addendum to the LHMP, referred to by FEMA as an annex.

Similarly, there is overlap between the required elements of LCPs and General Plan Safety Elements, which are now required to address climate change and must be updated at least every five years.

In many cases, the analyses and adaptation options required for an LCP Update could be used for hazard mitigation plans, General Plan Safety Elements, and other plans, or vice versa, as a goal of each of these planning processes is to minimize or avoid impacts from coastal hazards. As a result, there may be opportunities to leverage funding and share work efforts

The Sea Level Rise Guidance and a variety of other resources for addressing climate change and sea level rise are noted below.

- **California Coastal Commission Sea Level Rise Policy Guidance:** While the Guidance includes extensive material about sea level rise, information particular to LCPs, including a recommended approach for completing a vulnerability assessment, can be found in Chapter 5:

  http://documents.coastal.ca.gov/assets/slr/guidance/August2015/5_Ch5_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

  A discussion of the legal context of sea level rise adaptation planning, including a detailed discussion of the issues regarding shoreline protective devices can be found in Chapter 8 of the Guidance:

  https://documents.coastal.ca.gov/assets/slr/guidance/August2015/8_Ch8_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

  Appendix C of the Guidance also contains a vast library of additional resources that may be useful for addressing sea level rise:

  https://documents.coastal.ca.gov/assets/slr/guidance/August2015/AppC_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

  A discussion of sea level rise vulnerability assessments – which are often conducted to provide the technical information that informs an LCP – is provided in the memo below. It summarizes the basic steps for conducting a vulnerability assessment as well as practical lessons learned about the process:

  https://documents.coastal.ca.gov/assets/climate/slr/vulnerability/CCC_Memo_on_SLR_Vulnerability_Assessments_FINAL.pdf

- **Safeguarding California:** The Commission's adopted Policy Guidance was developed in coordination with the 2014 Safeguarding California plan. This plan, published by the Natural Resources Agency, is an update to the 2009 California Climate Adaptation Strategy. It provides policy guidance for state decision makers, and is part of the State's continuing efforts to reduce impacts and prepare for climate risks.

  http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf

  The Natural Resources Agency has also published **Implementation Action Plans** which show how state government is acting to implement the actions in Safeguarding California.

http://resources.ca.gov/docs/climate/safeguarding/Safeguarding%20California-Implementation%20Action%20Plans.pdf

The original 2009 California Climate Adaptation strategy is also available at:

http://resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf

- **California Climate Adaptation Planning Guide** presents the basis for climate change adaptation planning and introduces a step-by-step process for local and regional climate vulnerability assessment and adaptation strategy development at:

  http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/

Additionally, the following vulnerability assessments may be useful examples of assessments relevant to the LCP planning process:

- Humboldt Bay Sea Level Rise Adaptation Planning Project: Phase II Report
- City of Monterey Final Sea Level Rise and Vulnerability Analyses, Existing Conditions and Issues Report
- City of Goleta Coastal Hazards Vulnerability and Fiscal Impacts Report
- City of Del Mar Coastal Hazards, Vulnerability, and Risk Assessment

What should an updated Coastal Hazards section include?

All certified LCPs contain hazard policies or components that identify areas subject to coastal hazards and regulate development to minimize risks to life and property consistent with other policies of the Coastal Act. LCPs address, where applicable, hazards from wave and storm surge, flood, erosion, fire, landslide, earthquake and tsunami. An update to the certified LUP policies will likely focus on updating information on the location and extent of any coastal hazard areas and revising policies to reflect any new scientific information on current or anticipated conditions that may affect the extent and impacts of coastal hazards. This includes taking into account projected sea level rise when assessing any of the applicable hazards areas noted below.

To update an LUP it is important to assess changed conditions, present new data or new information for applicable areas of risk, and present updated land use designations, policies and maps for the following topics, as applicable.

- Beach or bluff areas subject to seasonal or long-term erosion, including consideration of accelerated erosion due to sea level rise
- Coastal or riverine flood hazard areas, including areas that will be subject to flooding in the future as sea levels rise
- Areas subject to flooding and wave run-up and other impacts, including from daily tides, King tides, storms, and extreme events both now and in the future as sea levels rise
- Tsunami inundation runup areas
- Geologic hazards, like landslide areas and areas of bluff and cliff instabilities
- Expansive soils or highly corrosive soils, considering changes resulting from possible rising groundwater table or salt water intrusion with rising sea level
- Subsidence areas
- Fire hazard areas (based on changes in development patterns and the urban/wildlands interface, and projected changes due to climate change)
- Seismic hazard areas, including areas of potential liquefaction (based on any new earthquake fault information)

Note that the Sea Level Rise Policy Guidance contains valuable information regarding assessing vulnerabilities from coastal hazards, particularly in Chapter 5 and Appendix B.

The Commission's Sea Level Rise Policy Guidance further recommends developing policies to address the following goals when updating an LCP to address sea level rise and coastal hazards:

- Update land use designations, zoning maps, and ordinances to account for changing hazard zones
- Include sea level rise in hazard analyses and policies
- Plan and locate new development to be safe from hazards, not require protection over its entire lifespan, and be protective of coastal resources
- Incorporate sea level rise adaptation into redevelopment policies
- Encourage the removal of development that is threatened by sea level rise
- Use "soft" or "natural" solutions as a preferred alternative for protection of existing endangered structures

- Limit bluff and shoreline protective devices to protect existing endangered structures
- Require special considerations for critical infrastructure and facilities
- Protect transportation infrastructure

Additionally, you should consider updated LUP policies that incorporate new techniques for avoiding or minimizing risks and mitigating impacts from shoreline hazards. Some such examples of adaptation and mitigation measures recently considered by the Commission are linked in this section and include:

- Utilizing beach nourishment, vegetative planting, living shorelines or other non-structural, "soft" solutions instead of shoreline armoring to protect against hazards
- Requiring "no future shoreline armoring" conditions or otherwise restricting future armoring for new development
- Restoring or mitigating ecosystem function loss from any armoring impacts to beach ecosystems
- Requiring sand supply and recreation impact fees to mitigate the negative impacts of shoreline protective devices
- Developing updated definitions and policies to ensure that redevelopment or reconstruction of existing development conforms to newer LCP setback and other siting and design standards
- Limiting the use of certain foundation designs, such as deepened caissons or buried walls or basements so that these foundation elements do not become future shoreline protective devises and don't inhibit future removal of these structures
- Requiring structures to be removed in response to future hazards based on defined triggers such as when a blufftop factor of safety setback is no longer met, or when the structure is located on public trust land as a result of the inland migration of the public trust line
- Requiring disclosures of current and future hazards risk and policies or standards related to future hazard response

Additional adaptation and mitigation measures that could be utilized include:

- Downzoning or otherwise using zoning regulations to reduce development pressure in current and future hazard areas
- Establishing buyout programs, leaseback programs, transfer of development (TDR) programs, and/or other mechanisms to provide incentives to relocate development that will be at risk in the future or

that will impact coastal resources, including public access and recreation

Where can I read some examples of updated hazards policies?

The many examples linked in this report offer a variety of hazard policy examples. Note that there is also a significant amount of planning currently underway to update LCPs to better address sea level rise and coastal hazards, particularly through the Commission's LCP Local Assistance Grant Program. More information about this work can be found on the Commission's website at https://www.coastal.ca.gov/lcp/grants/. As with any examples, geologic conditions along the shoreline vary, so please consult applicable Commission District staff for application to your LUP update.

- **City of Newport Beach Local Coastal Program Land Use Plan:** For a comprehensive suite of hazard policies see the following excerpt from the City of Newport Beach LUP, Section 2.8 Hazards and Protective Device, starting at p. 2-49.

  http://www.newportbeachca.gov/PLN/LCP/Internet%20PDFs/CLUP_Part%202_Land%20Use%20and%20Development.pdf

  This is part of the complete LUP, available at:

  http://www.newportbeachca.gov/trending/projects-issues/other-important-issues/local-coastal-program/coastal-land-use-plan

Some recent Commission LCP actions offer examples of the suggested modifications made to proposed LUP hazard policies. To review these Commission actions see:

- **Staff Report on the City of San Diego LCP Update for the Ocean Beach Community Plan** at:

  http://documents.coastal.ca.gov/reports/2015/8/th22c-8-2015.pdf

- **Revised Findings On City of Solana Beach LCP Land Use Plan**, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

- **City Of Laguna Beach Local Coastal Program Major Amendment LGB-MAJ-1-10 (Land Use Element Update)**, at: http://documents.coastal.ca.gov/reports/2011/12/W9c-12-2011.pdf

  The resulting modified text of the Laguna Beach LUP is:

Laguna Beach General Plan Land Use Element, at: http://documents.coastal.ca.gov/reports/2012/5/W13a-5-2012-a1.pdf

The most recent City of Laguna Beach update of its flood ordinance is:

Major Amendment Request No. 1-13-A (Flood) (LGB-MAJ-1-13A) to the City of Laguna Beach Certified Local Coastal Program, at: http://documents.coastal.ca.gov/reports/2013/6/Th14a-6-2013.pdf

♦ Information Sources for Sea Level Rise

Significant information is available in the Commission's Sea Level Rise Policy Guidance. See for example *Appendix C Resources for Addressing Sea level Rise* at:

http://documents.coastal.ca.gov/assets/slr/guidance/August2015/AppC_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

♦ Definitions

The California Code of Regulations, Title 14, Division 5.5, Chapter 8, be found at: http://government.westlaw.com/linkedslice/default.asp?SP=CCR-1000

You should also consider updating applicable definitions in order to guide implementation of the LCP policies and ordinances. Some definitions are defined in regulations, (see box) such as coastal bluff (in section 13577(h)). Others may need to be added or updated to reflect emerging issues.

Some definitions that may be important to consider addressing coastal hazards, sea level rise, or shoreline protection could include, as applicable, the following:

- Beach, bluff, sea cliff, shoreline
- Littoral cell
- Mean High Tide Line (such as: *Mean High Tide Line means the ambulatory line on the beach (contour lines) represented by the intersection of the beach face and the elevation represented by the average of all high tides (higher high tides and lower high tides) occurring over a 19-year period. The mean high tide elevation should be represented by the most recent 19-year tidal epoch as established by the National Ocean Service*)
- Existing Development
- Infill

- Principle structure (such as: *Any primary living quarters, main commercial buildings and functionally necessary appurtenances to those structures such as septic systems and infrastructure*)
- Economic/anticipated life of structure (*usually recommended by the Commission to be at least 75 or 100 years unless otherwise specified and restricted for specific development proposals*)
- Redevelopment (such as: *(1)exterior and/or interior renovations; or (2) demolition of an existing bluff top home or other principal structure which result in:*

  1. Demolition or replacement of 50% or more of an existing structure, including but not limited to, alteration of 50% or more of exterior walls and/or major structural components of the floor, roof and foundation, or a 50% increase in floor area; or

  2. Demolition, renovation or replacement of less than 50% of an existing structure where the proposed remodel would result in cumulative alterations exceeding 50% or more of the existing structure from the date of certification of the LUP)

The Commission's adopted Sea Level Rise Policy Guidance also contains a Glossary of terms.

For examples of some other definitions, see the following LCPs:

- **Laguna Beach General Plan Land Use Element**, Appendix - Glossary**,** page A-2, at: http://documents.coastal.ca.gov/reports/2012/5/W13a-5-2012-a1.pdf
- **City of Malibu Local Implementation Plan**, Definitions section, at: http://qcode.us/codes/malibu-coastal/
- **Revised Findings on City of Solana Beach LCP Land Use Plan**, particularly the definition of Redevelopment, Suggested Modification #144, pg. 56, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

What are some issues to address in an update of hazards management?

♦ Land Divisions

LUP land division policies should ensure that land divisions will result only in new parcels that can be developed consistent with the Coastal Act requirement that new development not require shoreline structures. Land divisions policies should thus assure that each new parcel can be developed with structures that

will not require shoreline protection during its 75 or 100 year anticipated economic life. In general land divisions that will result in new parcels which have no site where future structures can be located outside of high hazard areas would not address the Coastal Act requirement to minimize hazards. You should consider policies where each new parcel would have at least the minimum developable area, consistent with the zoning district, outside of any high hazard area. A sample policy, such as one from the adopted suggested modifications of the Solana Beach LUP, could be:

- **Revised Findings on City of Solana Beach LCP Land Use Plan**, pg. 29, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

  Policy 4.10 *Land divisions, including lot line adjustments, shall be prohibited unless all proposed parcels can be demonstrated to be safe from flooding, erosion, fire and geologic hazards and will provide a safe, legal, all-weather access road(s), which can be constructed consistent with all policies of the LCP.*

♦ Siting Development to Avoid Hazards/Setbacks

A critical element of every LCP is the designation of appropriate review and setback criteria for bluff, cliff, and beach level development. Siting criteria help to carry out Coastal Act requirements in Section 30253. You should consider LUP policies that avoid locating new development in hazardous areas where feasible. Where locating development to completely avoid hazardous areas is not feasible, policies should provide siting and design standards to minimize the exposure of new development to geologic, flood and fire hazards. These policies should address any additional exposure to flooding and erosion over time due to sea level rise and should include triggers for removal of the new development when it is threatened or when necessary to adequately protect coastal resources.

Your LCP should require a setback that assures that the structure will be stable for its anticipated life without the need for shoreline protective devices that alter the natural landform. The LCP should define what constitutes the anticipated life of a structure, which would become the standard once certified. While this may vary by jurisdictions/LCPs, in its recent actions when considering LCP Amendments, LCP updates, and in its permit actions, the Commission has generally defined the anticipated life of a structure as a minimum of 75 up to 100 years. This lifespan could potentially vary, though, if the development is conditioned to require its removal from the hazard zone at the end of the specified anticipated life or when the development became endangered.

For low-lying development on the beach or shoreline, both long-term shoreline erosion and the potential for inundation and flooding from daily tides, King Tides, and extreme events under existing conditions and in the future due to sea level rise should be part of the analysis. In other words, structures should be set back far enough that they will be safe from flooding and other coastal hazards in the future even after the shoreline has migrated inland in response to sea level rise. LUP policies should also specify design features such as elevation or floodproofing to ensure that structures that cannot be setback to completely avoid hazards will still be safe from impacts without the need for a shoreline protective device.

For development along coastal bluffs or cliffs, both slope stability and erosion should be part of the analysis. The relative stability of a slope can be calculated quantitatively by a slope stability analysis, in which the forces tending to resist a potential landslide are divided by the forces tending to drive a potential landslide. The industry standard for a "stable" site is that this quotient, called a factor of safety, be at least 1.5 in the static condition, and 1.1 to 1.2 under seismic conditions. The factor of safety generally increases with distance from the bluff edge, so the point at which the factor of safety reaches 1.5 constitutes a minimum setback for existing conditions and without considering erosion.

Most coastal bluffs are steadily retreating due to erosion, impacts from storm waves, and effects from sea level rise. In order to assure that the site will still have a 1.5 factor of safety at the end of its economic life, the amount of bluff retreat expected over its life must be added to the initial setback.

Sea level rise should also be incorporated into the erosion rate used in the factor of safety analysis. It is clear that future erosion rates are likely to be higher than historic rates; but, there is no single fully accepted approach for estimating future bluff erosion with sea level rise. One approach used in the past has been to use the high range of historic erosion rates to represent future erosion rates. A more process-based method is to correlate future erosion rates with the increased frequency and duration of wave impacts. This approach may be reviewed at Cal Adapt: http://cal-adapt.org/ and is discussed in Chapter 5 and Appendix B of the Commission's Sea Level Rise Policy Guidance.

Additional information on bluff erosion and setbacks can be found in a memo that the Coastal Commission's staff geologist presented to the Coastal Commission:

> **Establishing development setbacks from coastal bluffs**, at:
> https://www.coastal.ca.gov/w-11.5-2mm3.pdf

For examples of LUP policies on bluff setbacks, see the suggested modifications to the City of Solana Beach LUP, the City of Laguna Beach LUP and from the San Luis Obispo County LUP for the Estero Area:

- **Laguna Beach General Plan Land Use Element**, beginning on p. 7-20, at: http://documents.coastal.ca.gov/reports/2012/5/W13a-5-2012-a1.pdf
- **San Luis Obispo County Local Coastal Program Major Amendment No. 2-04 (Part 2) Estero Area Plan**, at: http://documents.coastal.ca.gov/reports/2008/7/Th16a-7-2008.pdf
- **County of San Luis Obispo Estero Area Plan**, Ch. 7 Planning Area Standards, at: http://www.slocounty.ca.gov/Assets/PL/Area+Plans/Estero+Area+Plan.pdf
- **Revised Findings on City of Solana Beach LCP Land Use Plan**, suggested modifications on Hazards beginning on p. 22, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

The examples from the City of Solana Beach and the City of Laguna Beach include bluff setback policies that address sea level rise. See for example policy 4.27 from the City of Solana Beach:

> ***Policy 4.27***:*…The predicted bluff retreat shall be evaluated considering not only historical bluff retreat data, but also acceleration of bluff retreat made possible by continued and accelerated sea level rise, future increase in storm or El Niño events, the presence of clean sands and their potential effect on the pattern of erosion at the site, and any known site-specific conditions…*

It is also important to include setback policies that distinguish accessory structures, to allow their easy removal or relocation.

Finally, when adequate setbacks are not feasible, policies should address future hazards due to sea level rise, and require relocation or removal of structures when they are threatened or when necessary to protect coastal resources. The Commission has regularly applied conditions to permit approvals that achieve this objective. An example of this concept in a LUP policy was recommended as a suggested modification in the Commission staff's recommendation for approval of the County of Marin's Land Use Plan Amendment in November 2016:

> ***Policy C-EH-11.*** *Mitigation Measures Required for Development Subject to Hazards. Development in shoreline, bluff face, and blufftop areas that are subject to hazards shall comply with all of the following, including through application of conditions of approval that provide for same: (1) Development shall be removed and the affected area restored to a natural condition if: (a) the County declares the development unsafe for occupancy and/or use and the development*

requires new and/or augmented shoreline protective devices (including additional elevation for structures already elevated pursuant to C-EH-5) to be made safe for occupancy and/or use; (b) the development requires new and/or augmented shoreline protective devices (including additional elevation for structures already elevated pursuant to C-EH-5); (c) the development encroaches onto public trust land (including as the public trust migrates) (other than legally established development that is as of the date of LUP certification already elevated above public trust lands in Bolinas and Tomales Bay); (d) access and utilities are no longer available to serve the development; (e) the blufftop edge erodes to the minimum setback line established via Policy C-EH-6; and/or (f) required by subsequent adaptation planning (see Policy C-EH-17). Bonding sufficient to cover such removal and restoration shall be provided. …

Additional guidance specific to evaluating sea level rise continues to be considered by the Commission, both in review of Coastal Development Permit applications as well as in ongoing LCP update work carried out through the LCP Local Assistance Grant Program.

♦ Redevelopment and Reconstruction in Oceanfront and Blufftop Areas

An LUP Update provides an opportunity to review current geological assessment requirements and setback standards for permit applications to reconstruct or replace homes and other primary structures on bluff and shorefront areas. Requirements for siting oceanfront or blufftop structures, including redeveloped structures, should account for the best available science regarding the adverse impacts of shoreline armoring on coastal resources and the threats from projected sea level rise. Applying such information to your jurisdiction could result in updating LCP policies to develop a strategy for addressing redevelopment of shorefront areas to achieve, for example, the gradual relocation of development to minimize risks to life and property and to avoid permanent armoring of the shoreline and the adverse shoreline impacts typically associated with such armoring.

If not addressed, cumulative additions, significant alterations and remodels, redevelopment and repair and maintenance of existing blufftop and shorefront homes and other existing structures can extend their economic life and perpetuate development in a location that over time is exposed to greater hazards. Such development increases the likelihood of eventual proposals for shoreline protection with the associated impacts to public access, recreation, sand supply, and other coastal resources.

LCP definitions and policies should be updated to clarify when and how redevelopment or reconstruction activities in shorefront and blufftop areas will need to comply with updated LUP geologic stability and erosion control policies.

The Commission's Sea Level Rise Policy Guidance deals directly with potential approaches for managing shoreline hazards and protecting coastal resources as shoreline structures are redeveloped. See Chapter 7, Strategies A12 and A13 at:

- **Sea Level Rise Policy Guidance:**

  http://documents.coastal.ca.gov/assets/slr/guidance/August2015/7_Ch7_Adopted_Sea_Level_Rise_Policy_Guidance.pdf

In establishing or revising setback policies, the LCP should also account for various scenarios where both existing protective structures currently exist and where they do not, and where it is feasible to remove older shoreline protective structures. While existing development may be eligible to be considered for protective structures, the LCP should ensure that an addition or remodel does not: (1) accelerate the need for a shoreline structure (e.g., the addition should not be further seaward than the existing structure); or (2) increase the likelihood of a future seawall beyond the existing development's expected life (e.g., the existing structure is within the bluff top setback and nearing the end of its expected life and the addition is substantial and at the same location).

The Commission has been addressing these issues in recent updates. A recent action includes the approval with suggested modifications of the LUP for the City of Solana Beach:

- **Revised Findings on City of Solana Beach LCP Land Use Plan**, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

♦ Shoreline Protective Devices

When updating an LUP, you can revise or add policies that reduce the need for shoreline protection, minimize adverse impacts of allowed protection, and facilitate alternative forms of shoreline protection that do not involve armoring. LUP policies should work in tandem with other coastal hazards policies designed to ensure the safety of new development without the need for shoreline protective devices, and should reflect that the appropriateness, design, and duration of protective structures will be a consideration in permit review for both shorefront development (including redevelopment) and for the shoreline structures themselves – whether the work is new, replacement, repair or maintenance. Chapter 7 of the Commission's Sea Level Rise Policy Guidance contains numerous strategies that could be incorporated into an LCP

update to address issues regarding shoreline protective devices. Some specific topics to consider are also discussed below.

Avoiding Future Armoring

Appropriate siting and design of development in shorefront or blufftop areas, discussed earlier in this chapter, is one method for ensuring that new development will not require future shoreline protection**,** thereby avoiding and minimizing the adverse effects of shoreline protective devices**.** You should also consider a policy that directs that, where geologic site assessments confirm that new development is proposed to be safe for the life of the development, there will be no armoring permitted in the future that would alter natural shoreline processes or substantially alter natural landforms along bluffs and cliffs. This can be implemented through policies that require a deed restriction that waives any rights that may exist to future shoreline protection.

For Commission permit findings discussing this issue, see for example:

- **Coastal Development Permit 5-09-105 (Norberg),** at: http://documents.coastal.ca.gov/reports/2012/7/Th11a-7-2012.pdf

Removal of Existing Protective Devices

Local governments may find it appropriate to identify and develop options to incrementally remove existing protective devices, as applicable, over time in order to protect beaches and public access and recreation areas in the face of sea level rise. For example, the updated LCP should consider policies that link shoreline protective devices to the existing principal structure for which they were built, and should consider policies that limit the extent of allowed repairs or replacement of existing shoreline protection devices that are no longer necessary to protect the principal structure they were built to protect. For more explanation of this issue, see, for example:

- **Commission findings on Coastal Development Permit # 6-09-033 (Garber et.al.),** at: http://documents.coastal.ca.gov/reports/2010/10/Th16c-10-2010.pdf
- **Findings for suggested modifications of the City of Solana Beach LUP for Shoreline Hazards section,** beginning on page 59, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

Minimizing and mitigating impacts of armoring

When updating your LCP policies, you should require that impacts of shoreline armoring, when authorized, be minimized and mitigated to the greatest extent feasible. For example, LCP policies should ensure that if allowed, the shoreline protection is of a type and design that will result in the least impact to the resources. LCP policies should require that applicants for shoreline protection

perform an alternatives analysis that evaluates different types of options or structures, including managed retreat and nature-based solutions, considers relocating structures to avoid public lands and limiting encroachment onto the beach, and ensures that the structure will be visually compatible with the environment.

LCP policies should also require mitigation for any unavoidable impacts to coastal resources. For example, shoreline protective devices must be designed to eliminate or mitigate adverse impacts on public access and recreation, as well as local shoreline sand supply. Sand supply mitigation approaches to consider in an LCP update could include:

- Developing a comprehensive shoreline protection program that includes regular shoreline surveys to evaluate short and long-term shoreline trends
- Identifying priorities for types of shoreline protection, setting forth technical criteria and standards for the structural design of shoreline protective devices. When possible/feasible, the armoring itself should be designed to incorporate public access features (e.g. public viewing areas, lateral and vertical accessways, etc) and minimize impacts to public views by incorporating design features that mimic surrounding natural features.
- Developing programs for opportunistic beach nourishment and identifying which beaches should have priority for nourishment;
- Developing a program to allow for the mitigation of seawall impacts through payment of a one-time fee, or an annual or regular fee that is used to improve recreational opportunities by replenishing beaches in the same littoral cell as the seawall;
- Joining or establishing a regional shoreline authority that will enable mutual support and coordination on shoreline issues that are of concern beyond an individual jurisdiction;

The California Coastal Sediment Management Workgroup facilitates regional approaches to protecting, enhancing and restoring California's coastal beaches and watersheds through federal, state and local cooperative efforts. Read about it, at: http://www.dbw.ca.gov/csmw/default.aspx

For helpful information and ideas on how to mitigate impacts from seawalls, see:

- **Report on In-Lieu Fee Beach Sand Mitigation Program: San Diego County,** 1997, at: http://www.coastal.ca.gov/pgd/sand1.html,

The Coastal Sediment Management Workgroup (see sidebar) and various regional partners have completed three Regional Sediment Management Plans which can offer some information. See information at:

- **Coastal Regional Sediment Management Plans,** at: http://www.dbw.ca.gov/csmw/crsmp.aspx

For some additional information and examples on addressing the impacts of shoreline armoring on recreation, visual resources and habitat loss and requiring mitigation for these impacts, see the following Coastal Commission actions:

- **Coastal Development Permit 6-07-133 (Li, Encinitas),** at: http://documents.coastal.ca.gov/reports/2010/6/W11a-6-2010.pdf
- **Coastal Development Permit 6-05-72 (Las Brisas Condominium HOA)**, at: http://www.coastal.ca.gov/sd/W8e-10-2005.pdf.
- **Coastal Development Permit 3-02-024 (Ocean Harbor House Seawall)**, at: http://www.coastal.ca.gov/sc/Th13a-1-2005.pdf
- **Coastal Development Permit 2-10-039 (Lands' End Associates, LLC, Pacifica)**

Monitoring and maintenance

Most shoreline protection devices need occasional maintenance for to continue to perform effectively. Strategy A.21 (at page 138) in Chapter 7 of the Sea Level Rise Policy guidance recommends periodic monitoring of a shoreline protective device to examine for structural damage, excessive scour or other impacts from coastal hazards and sea level rise and to ensure that the structures remain within the initial footprint and that they retain functional stability.

Updated LCPs could initiate a monitoring program which provides triggers or conditions which would lead to some form of maintenance, when necessary. See for example:

- **County of Santa Cruz County Code,** Section 16.10.070, at: http://www.codepublishing.com/ca/santacruzcounty/

  16.10.070 (H)(3)(g) All shoreline protection structures shall include a permanent, County approved, monitoring and maintenance program.

The Coastal Commission also often requires monitoring and maintenance, such as in the following cases:

- **Coastal Development Permit 3-10-044 (Crest Enterprises LLC)**, Special Conditions #9 and 10, respectively, on pg. 35, at: http://documents.coastal.ca.gov/reports/2011/7/W7a-7-2011.pdf
- **Coastal Development Permit 6-10-018 (Brown),** Special Condition 8 on page 15-16 at**:** http://documents.coastal.ca.gov/reports/2016/8/th18a-8-2016.pdf
- **Coastal Development Permit 3-12-030 (Pebble Beach Company**

Seawalls), special Conditions #8 and #9, respectively , on pages 9-11 at**:** http://documents.coastal.ca.gov/reports/2013/6/F12b-6-2013.pdf

Proposed "maintenance" may trigger the issue of how to deal with a seawall that is reaching the end of its useful design life and whether continued incremental repairs are appropriate. Required geotechnical reports should assess design life, extent of necessary "repairs," expected future "repairs," and alternatives.

You should consider policies that address the potential impacts of the "repaired" wall, particularly if the impacts of a structure in that location have never been addressed. In addition, if a seawall is at the end of its design life, this is an appropriate time to consider whether any type of shore protection is still necessary, and, if some protection is necessary, whether the existing structure is the type and design that has the least potential for future and long-term impacts to coastal resources, and whether mitigation for any impacts is provided.

Procedurally, most seawall maintenance will require coastal permits (see Code of Regulations §13252). (However, ongoing seawall maintenance can be permitted over a period of time (e.g., for 10 or 20 years) when the seawall is first approved, obviating the need to obtain CDPs for each maintenance episode). For more information, read more from Coastal Commission's staff engineer in:

- **Procedural Guidance Document: Monitoring,** January 1997, at http://www.coastal.ca.gov/pgd/pgd-mon.html#Introduction

♦ Sea Level Rise

In addition to updating LCPs to implement specific adaptation strategies, updated LCPs should clearly explain that sea level rise should be considered in all planning and land use decisions. For example, updated policies may identify using best available science, including up to date projections of sea level rise when completing site-specific analyses for development in potentially hazardous areas.

The following are examples of some recent suggested modifications to LUP policies to broadly include considerations of sea level rise:

Revised Findings on City of Solana Beach LCP Land Use Plan, at: http://documents.coastal.ca.gov/reports/2012/6/Th24a-6-2012.pdf

> ***Policy 4.60****: Siting and design of new shoreline development and bluff retention devices shall take into account predicted future changes in sea level. In particular, an acceleration of the historic rate of sea level rise shall be considered and*

based upon up-to-date scientific papers and studies, agency guidance… and reports by national and international groups such as the National Research Council and the Intergovernmental Panel on Climate Change. Consistent with all provisions of the LCP, new structures shall be set back a sufficient distance landward to eliminate or minimize, to the maximum extent feasible, hazards associated with anticipated sea level rise over the expected economic life of the structure.

- **Marina Del Rey Land Use Plan** A component of the Los Angeles County Local Coastal Program, at:

  http://planning.lacounty.gov/assets/upl/data/pd_marina-del-rey-2012.pdf

  7. New Development shall be sited and designed to ensure that it is not adversely affected by impacts from climate change, including the potential impacts from continued and accelerated sea level rise over the expected design life of the new development.

  8. Applications for coastal development permits for major development shall include a report prepared by a certified civil engineer describing the hazards to the area from continued and accelerated sea level rise. Siting and design of new major shoreline development anywhere in Marina del Rey Harbor and the siting and design of new or replacement shoreline protective devices shall take into account anticipated future changes in sea level, based on the best available scientific information and projections or range of projections of future sea level. Replacement of a structure refers to more than 50% of the cumulative repair and maintenance. Due to the uncertainties about future sea level rise, a range of likely and extreme rises in sea level shall be used in the planning and permitting of development to assess project sensitivity to future water levels, identify possible adverse consequences to the development and the surrounding area if the anticipated sea level is exceeded, and determine the minimum acceptable amount of future sea level rise that can be used for design purposes.

  10. Los Angeles County should study the potential impacts of continued and accelerated sea level rise and flooding of water ways on the existing or proposed structures within all development zones, including impacts to development

zones, traffic flow, public access, natural areas and water quality. The County should delineate low lying areas which may be inundated by tsunamis, floods or unusually high tides and/or may be damaged by excessive wave action, and changes to inundation and high damage areas due to continued and accelerated sea level rise.

11. Periodically review tsunami preparation and response policies/practices to reflect current and predicted future sea level trends, development conditions, and available tools and information for preparedness and response.

- **City of Dana Point Harbor Revitalization Plan & District Regulations Land Use Plan Component**, at: http://documents.coastal.ca.gov/reports/2010/10/W13a-10-2010.pdf

  8.6.5-1 Siting and design of new shoreline development anywhere in Dana Point Harbor and the siting and design of new or replacement shoreline protective devices shall take into account anticipated future changes in sea level, based on the best available scientific information and projections or range of projections of future sea level.

  8.6.5-2 Due to the uncertainties about future sea level rise, a range of likely and extreme rises in sea level shall be used in the planning phase to assess project sensitivity to future water levels, identify possible consequences to the development and the surrounding area if the anticipated sea level is exceeded, and determine the minimum acceptable amount of future sea level rise that can be used for design purposes.

  8.6.5-3 OC Dana Point Harbor shall study the potential impacts of sea level rise and flooding of San Juan Creek on the existing or proposed structures along the seawall.

Planning for Tsunamis

Update hazards maps.

Avoid developing in hazardous areas.

Site critical facilities outside of the hazardous zone.

Keep policies current and based on the latest science.

If avoidance is not possible, develop plans for evacuation and examine options to elevate or floodproof key development elements.

♦ Tsunami Hazards

Historically, LCP policies have not always adequately addressed hazards caused by certain natural disasters. Updating your LCP is an opportunity to ensure that the full range of possible natural disasters that could occur are addressed using the latest available information. It is important to realize that during the last 20 years, much more information, inundation models and science has become available. In addition impacts to coastal areas from the tsunami off Japan in 2011 illustrate the importance of regulating new development in a manner that avoids and minimizes risks from such disasters.

Sea level rise will exacerbate the impacts of a tsunami so it is important to incorporate sea level rise estimates into tsunami wave impact analysis.

An example of an action addressing tsunami run up hazards and sea level rise is in the suggested modifications adopted for the Humboldt County LCPA No.HUM-MAJ-1-08 (Samoa).

- **Humboldt County LCP Amendment No. HUM-MAJ-1-08 (Samoa),** suggested modifications on pages 56, 62; 71; 87-92, at:

  http://documents.coastal.ca.gov/reports/2011/3/Th7a-3-2011.pdf

These modifications for example, assure that any new residential lot has a building site where the first habitable floor can be located above the tsunami run-up zone, adequate evacuation plans and building standards for tsunamis, and key infrastructure is located so that it can remain operational as sea level rises.

Additional examples of tsunami hazard policies are provided below:

- **City of Crescent City LCP Amendment No. CRC-MAJ-1-03 (LCP Update),** suggested modifications on pages 131-137 of Exhibit 1, at:
  http://documents.coastal.ca.gov/reports/2010/10/Th11a-10-2010.pdf
- **Major Amendment Request No. 2-08 to the City of Redondo Beach Certified Local Coastal Program**, in particular suggested modifications on page 11 for hazards, at:
  http://documents.coastal.ca.gov/reports/2009/7/Th11a-7-2009.pdf
- **The City of Newport Local Coastal Program Land Use Plan,** Section 2.8.2 beginning at p. 2-50, at:
  http://www.newportbeachca.gov/PLN/LCP/Internet%20PDFs/CLUP_Part%202_Land%20Use%20and%20Development.pdf
- **The County of Del Norte LCP Amendment No. DNC-MAJ-2-03 (LCP Update),** at:
  http://documents.coastal.ca.gov/reports/2009/10/W17b-10-2009.pdf
- **The City of Crescent City LCP Amendment No. CRC-MAJ-1-09 (Costa Norte),** at:
  http://documents.coastal.ca.gov/reports/2009/6/F4a-6-2009.pdf

For examples of tsunami policies that include sea level rise see the City of Dana Point's LCP update:

- **Revised Findings for Major Amendment No. 1-10 (Dana Point Harbor Implementation Plan),** especially suggested modifications on p. II-3.10, at:

  http://documents.coastal.ca.gov/reports/2011/4/W11a-4-2011-a1.pdf

Tsunami inundation maps for evacuation planning have been published by CAL EMA at the following site:

- **Tsunami Inundation Map**, at:

  http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/Pages/Statewide_Maps.aspx

The National Weather Service has developed a Tsunami Ready program to help communities plan for a tsunami, many agencies are working to improve our ocean observing systems and provide better information on oceanic and weather conditions, and FEMA is updating the coastal flood maps.

♦ Fire Hazards

Where feasible, development should be sited to avoid areas of very high fire hazard in order to minimize risk to life and property. But where such siting cannot be avoided, you should consider policies that minimize risk through other techniques including managing vegetation to create defensible space around structures. But such vegetation management (sometimes referred to as fuel modification or brush management) if in or adjacent to significant native or environmentally sensitive habitat areas (ESHA) or public parklands can adversely impact and significantly degrade the qualities of those areas.

LCPs can be updated to guide how State defensible space requirements can be applied in a manner that remains consistent with the Coastal Act. Public Resources Code § 4291 mandates two different fire-safe zones for structures in fire hazard areas: (1) a 30 ft. firebreak zone immediately adjacent to the structure where all flammable vegetation must be removed, and (2) an additional 70 ft. fuel reduction zone. An LUP update should develop policies to clarify how such vegetation management can be conducted to ensure environmentally sensitive habitat areas (ESHA) and other coastal resource protection can be addressed in: (1) new subdivisions, and (2) new development or redevelopment of existing structures on existing lots. LCPs can also address coastal permit requirements and agency coordination for fuel modification activities.

Updating your LCP offers the opportunity to ensure that fire prevention rules covering your jurisdiction are integrated into the LCP and that there is internal consistence among fire, ESHA and other related resource protection provisions. It is also an opportunity to address issues related to climate change and fire hazards. More information about this can be found in:

- **Safeguarding California** at:
  http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf

- **Cal-Adapt: Wildfire: Fire Risk Map**, at: http://cal-adapt.org/fire/

Subdivisions

Minimizing hazards can first be addressed in policies on subdivisions and lot line adjustments. To avoid future conflict with resource protection policies, consider the following policies:

- No new lot should be created on which a subsequent dwelling with its necessary fuel modification would be inconsistent with ESHA or scenic and visual resource policies; and,
- No new lot should be created on which a subsequent dwelling with its necessary fuel modification would result in fuel modification encroachment on adjacent public park, recreation or protected open space lands.

An example is in the City of Laguna Beach LUP:

- **Laguna Beach General Plan Land Use Element**, at: http://documents.coastal.ca.gov/reports/2012/5/W13a-5-2012-a1.pdf

  Action 10.6.3 *No new division of land shall be allowed which would require new fuel modification (e.g. vegetation removal) or new fuel breaks in environmentally sensitive habitat areas or on public open space or park lands to protect new development within the resultant lots.*

Existing Lots

Risk and impacts from fire hazards can also be avoided or minimized through policies for siting new development on existing lots. It may be necessary to require design or siting modifications of a building in order for its defensible space zone to be accommodated consistent with ESHA and scenic resource policies.

An example of where this occurred is described in the staff report for:

- **Coastal Permit Appeal A-1-DNC-07-036 (Trask)** at http://documents.coastal.ca.gov/reports/2008/10/F7c-10-2008.pdf

You should consider a policy that ensures that any standards that apply to new structural development should generally apply to any required vegetation management for fire protection as well. For example, in permit review of proposed size and location, not only would the structural footprint be considered but the 100 foot fuel reduction zone around it would be considered as well. If an LCP's ESHA policies prohibit removal of certain vegetation that fuel reduction provisions dictate should be removed, then resizing or relocation of the structure should occur so the fuel reduction zone is modified to avoid the

ESHA removal. Similarly, if a proposed expansion of an existing structure would result in a fuel reduction zone intruding into protected ESHA, the expansion would have to be scaled back, relocated and/or not approved. In cases where otherwise impermissible vegetation removal for fuel management purposes must be allowed to prevent a claim of unconstitutional takings of private property, some form of compensatory mitigation could be required. For example, the City of San Diego has a program to buy and place in open space additional land that serves as compensation.

For examples of LCP fuel modification policies see:

- **Laguna Beach General Plan Land Use Element**, policies 7.6 and 10.6 and associated Actions at pages 7-20 through 7-24, at: http://documents.coastal.ca.gov/reports/2012/5/W13a-5-2012-a1.pdf

The findings that the Commission adopted to support policies 7.6 and 10.6 are at:

- **City of Laguna Beach Amendment LGB-MAJ-1-10 Local Coastal Program – Land Use Element (LUE) Update/Land Use Changes**, at: http://documents.coastal.ca.gov/reports/2011/12/W9c-12-2011.pdf

Fire Hazard Management and ESHA

In evaluating fire prevention and potential impacts to ESHA, you should consider policies and implementation requirements that ensure that the evaluation identifies:

- What is the lateral and vertical extent of ESHA (i.e., is the canopy, or understory, or both affected by potential fuel modification or just certain components ESHA?);
- Which, if any, ESHA species are considered flammable vegetation or combustible growth and under what circumstances;
- What typical fire reduction measures (e.g., limbing, thinning, understory clearance) can be undertaken without adversely impacting the ESHA; and,
- What non-combustible or non-flammable vegetation is compatible with the ESHA;
- What alternatives to ESHA vegetation removal may be available, such as modifying structural exteriors to be composed of non-flammable materials or adding sprinkler systems.

See, for example:

- **City of San Diego Municipal Code,** §142.0412, at: http://docs.sandiego.gov/municode/MuniCodeChapter14/Ch14Art02Division04.pdf

Permit Conditions and Procedures and Agency Coordination

Updating fire hazard management provisions in your LCP is also an opportunity for various departments and agencies, such as the fire, planning and parks, to coordinate. While "100 feet clearance for fire safety" is a typical slogan found on signs, actual application of the fuel modification rules can be much more nuanced. Input and discussion by fire and biological experts could hopefully lead to preparing more specific vegetation management guidance tailored to the ESHA(s) in question, rather than a general 100 foot clearance recommendation. Especially if your community has sensitive vegetation and scenic open spaces, it would be helpful for the various departments to agree on and provide common detailed guidance on which species need to be removed in what locations, which just need trimming and where, and what vegetation can be maintained or planted and where. Your LCP can offer permit conditions for fuel modification such as erosion control, revegetation with fire-resistant species and siting of any equipment access and staging areas out of sensitive areas. The City of San Diego LCP contains an example of this approach:

- **City of San Diego Municipal Code,** §142.0412 regarding brush management, at: http://docs.sandiego.gov/municode/MuniCodeChapter14/Ch14Art02Division04.pdf

Correspondingly, clarifying and coordinating review responsibilities can be helpful so that applicants are not given conflicting advice by planning and fire officials. The following LCP policy strives to achieve such coordination:

- **City of Malibu Land Use Plan,** page 71, at: http://malibucity.org/DocumentCenter/View/4422

  4.54 Should the County of Los Angeles Fire Department policies regarding fuel management and fire protection conflict with the policies and provisions of the Malibu LCP, particularly those relating to the protection of ESHA, personnel from the Fire Department and the City of Malibu shall meet and agree on measures to balance the need for fire protection for structures with the need to protect environmental resources.

It also may help to clarify how permit requirements apply to vegetation clearance for fuel reduction purposes. Please see:

- **Section 1 -- Local Coastal Permit Requirements** of Part II of this Update Guide, at:

http://www.coastal.ca.gov/la/lcpguide/lcp_ip_guide.pdf

♦ Flooding

Hazards from flooding should also be addressed in an LCP update, and as noted on pages 4-5 of this document this should include updated flood hazard area mapping. The Federal Emergency Management Agency (FEMA) provides resources for identifying and managing risks from flooding:

> *Through FEMA's flood hazard mapping program, Risk Mapping, Assessment and Planning (MAP), FEMA identifies flood hazards, assesses flood risks and partners with states and communities to provide accurate flood hazard and risk data to guide them to mitigation actions. Flood hazard mapping is an important part of the National Flood Insurance Program (NFIP), as it is the basis of the NFIP regulations and flood insurance requirements. FEMA maintains and updates data through Flood Insurance Rate Maps (FIRMs) and risk assessments. FIRMs include statistical information such as data for river flow, storm tides, hydrologic/hydraulic analyses and rainfall and topographic surveys.* **[***https://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping***]**

In addition to the FEMA resources for identifying current flood risk, the Department of Water Resources has funded the preparation of the Technical Methods Manual that provides guidance for engineers to adapt the current FEMA maps of flooding and runup to account for various amounts of sea level rise. In addition to this manual, USGS is developed a Coastal Storm Modeling System to provide mapped scenarios of flooding and sea level rise, available now for Sonoma County through San Mateo, and Santa Barbara through San Diego, and eventually all the California coast.

However, in updating an LCP, flood hazard management measures must be consistent with requirements of the Coastal Act. For example, fill to raise structures or development such as levees to protect sites may be proposed as floodplain management measures, but must also be consistent with resource protection policies of the Coastal Act for protection of wetlands, rivers and streams, environmentally sensitive habitat areas and community character. Also, efforts to protect one area from flood risk should not divert that risk to another location.

LCP flood management efforts must also anticipate and plan for future changes in sea level Risk identification should expand upon the current risk identification developed by FEMA and measures to minimize risks of flooding

should take into account the combined effects of sea level rise, high tides, storm surge, and extreme wave effects. The Sea Level Rise adopted Policy Guidance includes several provisions to address flooding risks:

> *A.2b Incorporate wave runup zones and sea level rise in coastal flood hazard maps: Develop coastal flood maps that include areas that will be subject to wave action and flooding due to sea level rise. These maps may be able to rely upon existing flood maps, such as the FEMA Flood Insurance Rate Maps, for current flood areas and base conditions, but should be augmented to include future conditions, including sea level rise, likely to occur through the life of proposed new development. (Page 128)*

Additional guidance is provided in Table B.6 on page 247 of the SLR Guidance.

Some recent LCP updates address risks from flooding and the FEMA provisions. For example see:

- City of Grover Beach update

https://documents.coastal.ca.gov/reports/2014/8/F14b-8-2014.pdf

- San Luis Obispo County SLO LCPA 1-04 Part 1 (Flood Hazard Ordinance) stfrpt 6.29.05.doc

https://documents.coastal.ca.gov/reports/2005/7/Th7a-7-2005.pdf

- City of Port Hueneme LOCAL COASTAL PROGRAM MAJOR AMENDMENT No. MAJ-1-10 (Flood Hazard Overlay Zone)

https://documents.coastal.ca.gov/reports/2010/5/W10a-5-2010.pdf

- LA County Santa Monica Mountains LCP

https://documents.coastal.ca.gov/reports/2014/4/Th17a-4-2014.pdf

♦ Multi-Hazard Approach

FEMA is now promoting an "all hazards approach" for hazards management. Rather than planning for each type of hazard separately, this approach looks at the whole environment, recognizes the positives and negative aspects of where to build, and then considers ways to mitigate for the various hazards. Community resilience and inclusion of various climate change issues such as

sea level rise, is being emphasized in the multi-hazard approach. FEMA has published:

- ***2013 State Hazard Mitigation Plan (SHMP)*** *at*

  http://hazardmitigation.calema.ca.gov/plan/state_multi-hazard_mitigation_plan_shmp