Consideration of Sea Level Rise in Recent LCP Updates: City of Pacific Grove Case Study

Introduction

In August of 2015, the Coastal Commission unanimously adopted its Sea Level Rise Policy Guidance, which provides recommendations for how to address sea level rise within the context of the Coastal Act. In particular, the document discusses the importance of addressing sea level rise in Local Coastal Programs (LCPs). LCPs are a critical tool for addressing sea level rise because they dictate the types, intensities, and locations of allowable land uses in the coastal zone, providing a framework for implementing proactive adaptation strategies to address sea level rise vulnerabilities. However, many LCPs were certified in the 1980s and 1990s and would benefit from updates to reflect changed conditions, new information and knowledge, and new programs and policies, especially those related to climate change and sea level rise.

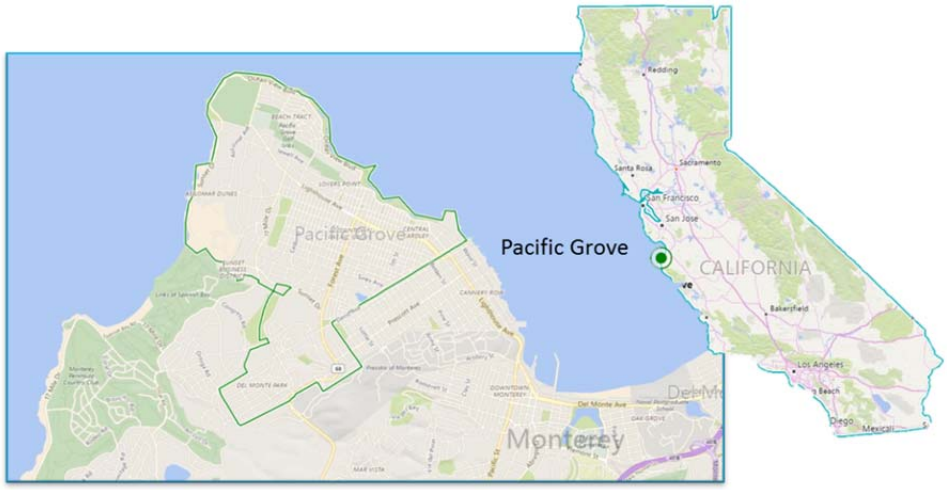
To that end, the Coastal Commission, in coordination with other state agencies including the State Coastal Conservancy and the Ocean Protection Council, has provided significant grant funding to support LCP updates with a particular emphasis on addressing sea level rise. To date, the Coastal Commission has awarded 3 rounds of grants totaling approximately $4.5 million to support the completion of sea level rise vulnerability assessments, adaptation plans, Land Use Plan (LUP) and Implementation Plan (IP) updates, and local adoption and Coastal Commission certification of LCPs. The first round of grants was completed in April of 2016.

Four jurisdictions with grants from the Coastal Commission were chosen as case studies to provide information on how sea level rise adaptation planning and related LCP policy development is carried out on a local scale. The four jurisdictions – Marin County, and the cities of Pacific Grove, Goleta, and Newport Beach, were chosen because they represent a variety of geographic areas as well as different planning approaches. These four case studies provide valuable information and lessons learned on topics such as finding the right level of detail for vulnerability assessments, the utility of including a specific adaptation planning step, and the importance of adaptive LCP policies. More information on these topics can be found in each of the individual case studies.

The schematic below shows a generalized ideal process for how to address sea level rise through an LCP update. As of January 2017, Pacific Grove has completed a vulnerability assessment and a draft update to the LUP, as well as developing an entirely new IP. The LUP and IP are currently being considered through the local process which will be followed by consideration by the Coastal Commission. Pacific Grove provides a good example of utilizing existing data sources to complete a vulnerability assessment and using that information to craft an updated LCP that, despite some limitations in the vulnerability assessment, includes policies to ensure safety of new development and to set up a phased adaptation planning approach that explicitly calls for additional assessment and planning work.

Figure 1. Pacific Grove sea level rise planning as of January 2017

Background



The City of Pacific Grove is a relatively small coastal city in Monterey County, located immediately northwest of the City of Monterey on the northern tip of the Monterey Peninsula. The city's coastal zone is 458 acres, stretching from the Monterey Bay Aquarium through the Asilomar Conference Grounds. The coastal zone includes numerous land use types, including residential and commercial development near its downtown core, as well as significant coastal resources including Asilomar State Beach, the Asilomar Dunes Natural Preserve, numerous coastal access points and trails along Sunset Drive and Ocean View Boulevard, several offshore Marine Reserves, and important habitat for migrating monarch butterflies.


Aerial view of Pacific Grove, looking southward (from Pacific Grove LCP)

The City's Land Use Plan (LUP) was certified by the Commission in 1991, and a Coastal Parks Plan was adopted as an element of the LUP in 1998. The Coastal Parks Plan provides a tool for implementing various trail, bikeway, parking and circulation, and visual resource policies of the LUP, and applies to areas including the Lighthouse Reservation, Lovers Point Park, Asilomar, and other lands seaward of and including Ocean View Boulevard and Sunset Drive. The City's Implementation Plan has not yet been finalized or approved by the Commission. As such, the Commission continues to issue coastal development permits in Pacific Grove's coastal zone.

Recognizing the need to achieve a fully certified LCP for the City of Pacific Grove, the Commission approved a Round 1 LCP Grant (LCP-13-08) in 2013 ($130,000) for the city to complete its LCP. The overall goal of the project was to update the existing LUP and develop a newly certified IP to provide for an efficient and consistent City-administered coastal zone development review process that promotes sustainable development, coastal access, and conservation of coastal resources. The grant period ran from April 2014 to April 2016, and resulted in extensive public outreach on core coastal resource issues and development of a Climate Change Vulnerability Assessment. Both efforts helped form the basis for an updated LUP and a new IP which have been heard by the City's Planning Commission and are currently before the City Council for consideration. The City's proposed LCP is anticipated to be submitted to the Coastal Commission in mid-2017.

Vulnerability Assessment

In January 2015, the City of Pacific Grove published the *Final City of Pacific Grove Climate Change Vulnerability Assessment*. The report provides an evaluation of potentially significant impacts of climate change for the City's coastal zone with an emphasis on how anticipated climate change may affect people, resources, and infrastructure along the coast. The intent of this assessment was to inform and support the City's LCP, specifically the LCP policies related to climate change adaptation and coastal hazards planning.

Overall, the City of Pacific Grove used an approach that focused on providing a broad overview of climate change impacts and vulnerabilities based on existing resources, rather than developing new, locally-specific, detailed modeling of climate change impacts. This aligns with the recommendations of the Coastal Commission's *Sea Level Rise Policy Guidance*, as well as other State resources (*e.g.*, the *California Adaptation Planning Guide*). The Coastal Commission in particular recognizes that it may not always be feasible or appropriate to use the most state of the art modeling for all vulnerability assessments due to timing, staffing, and funding constraints, and instead recommends using the best and most locally-relevant tools and resources available at the time of the assessment. Where impacts cannot be quantitatively assessed in a highly detailed manner, potential vulnerabilities can instead be qualitatively discussed, and even a preliminary assessment can be useful for planning purposes. The City of Pacific Grove's vulnerability assessment and related planning work, combined with anticipated future efforts (discussed below), provides a good example for this more limited approach.

The City's climate change vulnerability assessment identified potential impacts from changes in temperature, precipitation, sea level rise, severe storms and ocean acidification, and wildfire. The report is broken down into 5 sections by resource/topic type – public health and safety, recreational resources and access, water management, biodiversity and habitat, and coastal development and infrastructure – and each section discusses the asset's exposure, sensitivity, potential impacts, adaptive capacity, and risk and onset to/from the various potential climate change impacts. Considering a suite of climate change impacts allowed the City to consider LCP policies (and other relevant plans and programs) that address a broad range of anticipated future conditions.

To address sea level rise, the City relied primarily on sea level rise hazard mapping completed by the Pacific Institute, one of several recommended existing resources for sea level rise information in the Commission's *Sea Level Rise Policy Guidance*. This mapping shows both current flooding from a 100-year storm event and the anticipated flooding extent from a 100-year storm event with 55 inches of sea level rise (the projection for 2100 used in that effort). Separate hazards maps also show the projected erosion for 55 inches of sea level rise by 2100, using a method that accelerates historical rates to account for increasing sea levels over time.

It is important to note that there are several limitations to the Pacific Institute work. First, the hazard mapping was completed prior to the release of the 2012 NRC Report – considered the current best available science on sea level rise projections for the state of California – and therefore uses a projection of just 55 inches by the year 2100 rather than the 66 inches identified in the NRC report. Second, the flooding analysis uses a "*bathtub model*" approach which means that areas below the elevation of the projected sea level rise will show up as flooded whether or not there is a hydrological connection. Third, the erosion layer and the flooding layer are not aggregated together. In other words, the maps do not show the additional areas that will flood after the shoreline has eroded over time. Lastly, because these maps only show the 100-year flood plus 55 inches of sea level rise, they don't illustrate the impacts of day-to-day inundation or small storm flooding in 2100, nor is there a good way of seeing interim impacts (*e.g.*, impacts for 2030, 2050, 2070).

Despite these limitations, the Pacific Institute hazards maps are a good tool for providing a broad overview of what assets could be potentially vulnerable to flooding and/or erosion from sea level rise by the year 2100.

In the case of Pacific Grove, the City is fortunate in that much of its coastline is made up of granitic rock that is fairly resistant to wave attack and is therefore slow to erode. Further, much of the City's development is both elevated on the rocky bluffs and separated from the bluff edge by open space that is devoted to parkland and blufftop trails. Thus, the majority of the City's built environment will be relatively safe from many of the impacts associated with sea level rise through the next few decades.

Development identified in the assessment as being vulnerable to sea level rise (specifically, the 55 inches of SLR plus a 100-year storm) includes:

- ~75 residential structures

- Visitor-serving amenities along Ocean View Boulevard (*e.g.*, restaurant, motel, inn)
- Hopkins Marine Station
- Ocean View Boulevard (a portion of which is designated as an evacuation route) and Sunset Drive and related public recreational trails and resources in this area
- 7 wastewater pump stations and numerous stormwater outfalls


Tide Pools at Point Pinos
(from Pacific Grove LCP, Photo Credit NBNMS)

The assets most vulnerable to sea level rise impacts in the City of Pacific Grove are open space areas including parks, trails, and related recreational amenities, as well as natural habitats including beaches and tide pools. As identified above, because the City has reserved most of the areas immediately adjacent to the coastline for open space and public recreation, it is these recreational and natural habitat assets that will be impacted first. Unfortunately, the natural habitats may be fairly sensitive to impacts to sea level rise and may not have a high adaptive capacity. This is partially a result of the rocky bluffs that help to protect much of the City's assets – because these bluffs are more resistant to erosion, beaches or rocky tidepools in front of the bluffs may be drowned as sea levels rise rather than being able to migrate inland. Conversely, most of the recreational assets have a low sensitivity to impacts from sea level rise. For example, whereas it may not be acceptable for a wastewater pump station or a single family residence to be flooded during a severe storm even on a rare occurrence, parks and trails can still be used even if they are partially or fully flooded on an occasional basis.

Thus, research questions remain regarding the ability of Pacific Grove's natural assets to persist as sea levels rise and planning questions remain for the recreational assets – specifically, how often they can be flooded or what percentage of the area could be permanently lost to erosion or inundation before the impacts are no longer tolerable for the public.

The City's vulnerability assessment does not answer these questions, nor is there a detailed discussion of the limitations of the modelling work or the data and information gaps. Overall, the shortcomings in the assessment largely stem from the limitations of the modelling resource used (as explained above, the Pacific Institute Hazard maps don't integrate erosion and flooding and only show a single sea level rise scenario), and therefore many of the remaining planning questions couldn't be answered by this work. However, this vulnerability assessment could have been improved somewhat by more clearly explaining the limitations of the modeling and laying out topics that future assessments could or should focus on to provide more useful planning information.

Despite the limitations of the sea level rise modeling work and the related shortcomings of the vulnerability assessment, the assessment did provide important information on sea level rise

vulnerabilities that has been incorporated into the (ongoing) LCP policy development, as discussed below.

Development of the LCP Update

The City of Pacific Grove currently has a draft LUP and draft IP that are reflective of coordination and iterative review with Coastal Commission staff and the public over the course of the past year. The City has had several Planning Commission meetings on the draft LUP and IP documents, and the draft LCP will next be reviewed by the City Council, before being submitted to the Coastal Commission for review and ultimate certification.

Although the current draft policies are still subject to change in response to comments from the Planning Commission, City Council, and the public, as well as through future coordination with the Coastal Commission, the draft LCP currently contains a variety of policies to address sea level rise. This includes policies that ensure new development is designed to be safe from hazards; policies that address current known vulnerabilities; and policies that call for and lay out a framework for future vulnerability assessment and adaptation planning and implementation. These policies are described in the bullet points below.

- **Best available science and future updates:** Land Use Plan (LUP) policies HAZ-1 and HAZ-2 call for the City to continue to gather information on the impacts of sea level rise and other coastal hazards. HAZ-1 states that the City shall use the best available science in future vulnerability assessments and shall analyze a variety of time horizons as applicable and feasible. HAZ-2 states that the City shall complete periodic evaluations based on evolving science to assess the need for updated LCP policies to address hazards. This policy also sets up a trigger for when these periodic evaluations should commence, specifically at the time when "the mean high water tidal datum has risen 3 inches on average for an entire year above the forthcoming updated tidal epoch mean high water level at the Monterey Tide Gauge[1]".

- **Hazards reports:** LUP policy HAZ-12 states that development proposed in potential hazard areas shall be evaluated for potential coastal hazards at the site based on readily available information, and that if it is found to be in an area potentially subject to coastal hazards over its anticipated lifetime, a site specific hazard report prepared by a qualified geologist/engineer shall be required. This policy also sets up a trigger (in line with the 3 inches of sea level rise after the next tidal epoch is established, as discussed in HAZ-2) upon which all development either in or near a potential hazard area shall require a site specific hazards analysis.

- **Siting and design:** LUP policies HAZ-8 through HAZ-11 require new development, including public recreational and access facilities and infrastructure, to be sited and designed in a manner that minimizes risks to life and property, avoids impacts from

[1] The National Tidal Datum Epoch is the 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken to obtain mean values (such as Mean High Water). The present NTDE is the average tide observations over the years 1983-2001. The NTDE is considered for revision every 20-25 years, suggesting that the next NTDE could be established within the next 5-10 years.

coastal hazards, and avoids impacts to coastal resources over its lifetime. HAZ-10 specifically states that no new major critical public infrastructure should be allowed in an area potentially subject to coastal hazards. HAZ-11 specifies that development and use of land below the 20-foot elevation (as measured from mean high tide) shall be limited to open space, low-intensity public recreational and access facilities, and coastal dependent or coastal related structures.

- **Shoreline protective devices:** LUP policies HAZ-13 through HAZ-17 lay out a suite of policies related to shoreline protective devices (SPDs). HAZ-13 states that it is the intent of the LCP to ensure that SPDs are only utilized when they protect priority development and uses, and only when all coastal resource impacts are appropriately mitigated. HAZ-15 states that new SPDs shall only be allowed where required to protect public recreational facilities, public-infrastructure, and coastal-dependent development in critical danger from erosion, and shall not be constructed to protect non-coastal-dependent private development. HAZ-15 also lays out a preference for non-structural or soft approaches such as vegetation, and states that these options shall be prioritized over hard structures. HAZ-16 lays out details for ensuring that unavoidable impacts to coastal resources from SPDs will be appropriately mitigated. HAZ-14 states that repair and maintenance of existing SPDs shall only be allowed if required to protect public recreational facilities, public-infrastructure, or coastal-dependent development. HAZ-17 states that new development associated with or protected by an existing SPD shall assess the efficacy of the existing SPD, including assessing whether or not the device is still required. Further, if the assessment indicates that the existing SPD can be removed or modified, or if there are greater coastal resource benefits from removal or modifications of the SPD, then such removal or modifications shall be required as a condition of approval for the new development. This policy also states that in all cases, SPDs shall be authorized only until the time when the qualifying development being protected is no longer present or no longer requires armoring.

- **Hazard response:** Several LUP policies touch on the potential need for existing (or new) development to be modified or removed to address coastal hazards. For example, HAZ-10 states that public recreational access facilities and coastal-dependent development shall address existing related facilities and infrastructure (such as stormwater or sewer infrastructure) adjacent to the project site as applicable and feasible to ensure that this infrastructure can better withstand or accommodate sea level rise and other coastal hazards. HAZ-10 also states that such coastal-dependent development and public access or recreational development in shoreline areas shall be designed such that it can be removed without significant damage to shoreline or bluff areas. HAZ-11 states that existing development or uses that are below the 20 foot elevation (not including open space, low-intensity public recreational and access facilities, or coastal dependent or coastal related structures) should be relocated or removed when they become threatened or when they are redeveloped. Additionally, as noted in the above bullet, several policies suggest removing shoreline protective devices when they are no longer required and/or if there are less damaging options available.

- **Future adaptation:** LUP policy HAZ-6 calls for future adaptation planning, and particularly for using a future update to the Coastal Parks Plan to implement various adaptation strategies for addressing anticipated impacts to public access and other coastal resources. This policy does not currently provide a time horizon for when such adaptation planning would occur, but does lay out a variety of topics and possible adaptation strategies that should be considered. These include requiring existing or planned development to be relocated to safer areas and restoring shoreline areas to their natural condition; modifying land uses allowed in hazardous areas and updating siting and design standards to better protect coastal resources; updating standards for determining erosion rates; ensuring long-term, function and connectivity of existing recreation and access resources; and requiring modifications to existing shoreline protective devices to ensure that such devices have the least impact on coastal resources as possible. The City has indicated that an update to the Coastal Parks Plan is a priority, and has proposed undertaking that effort after the LCP is certified.

- **Coastal Hazards Overlay:** Section 23.90.140 of the Implementation Plan (IP) establishes a coastal hazards overlay zone that implements the LUP policies described above. This zone currently includes the area below the 20-foot elevation (as measured from the mean high tide elevation), but specific policies state that it will be re-evaluated with the trigger described in LUP policy HAZ-2 (3 inches of sea level rise above the next tidal epoch mean high tide elevation), and approximately once every 5 years thereafter. This section calls out additional actions the City shall undertake in the future including establishing an inundation elevation based on sea level rise projections below which new habitable development shall not be allowed; completing studies to better understand flooding and erosion hazards, particularly for the Asilomar Dunes area; installing emergency response and warning signage; monitoring and reporting on changes in sea level based on data from the Monterey Tide Gauge; and updating the LCP every five years.

  This section also provides more detail on development allowed in the hazards overlay zone as well as more detail on policies related to shoreline protective devices (consistent with the LUP policies described above). For example, subsections state that the LCP shall be updated to change the land use designation within areas subject to sea level rise or storm surge when it is determined that sea level rise poses an impending and significant risk to vulnerable land uses and that property owners are responsible for demolition and removal of debris from structures that have been condemned as in danger from natural hazards. Policies also state that new development shall not rely on a shoreline protective device and shall include “no future armoring” and “removal and restoration” conditions should the development become threatened by coastal hazards. Additionally, subsection D(7) states that if at-risk trails and viewpoints cannot be feasibly relocated within 10 years, the City may, as an interim measure, construct walls up to 36 inches high approximately 2 feet seaward of these features to reduce wave overtopping onto trails and viewpoints (if consistent with the other LUP and IP policies governing SPDs).

Overall, the LCP lays out an initial set of policies to ensure the safety of new development and to address sea level rise impacts identified in the 2015 vulnerability assessment while also addressing the limitations and shortcomings of that assessment by clearly explaining the need for

future updates and identifying a set of next steps and potential triggers for future changes. In this way the City lays out an adaptive approach, as recommended by the Commission's Sea Level Rise Policy Guidance, that accounts for current vulnerabilities and best available science and information but that also ensures future steps will be taken to improve adaptation planning and to address the evolving understanding of potential sea level rise impacts and best management practices.

Importantly, the City's proposed policies also respond to the particular built and natural environment context in Pacific Grove where the overwhelming majority of shoreline land is public recreational and open space in nature, and where the underlying granitic landform is fairly resistant to erosion. This context is unlike most coastal zone jurisdictions that instead include significant private development at the shoreline interface, which presents its own set of issues and challenges for adaptation planning, as well as those that include larger bluff areas that introduce their own set of complications. In contrast, Pacific Grove's fairly uniform shoreline setting allows for policies that can appropriately recognize that context, and provide policies specific to it that can continue to ensure that the vision for the shoreline is maintained through the LCP in the future.

Next Steps

As of January 2017, the City of Pacific Grove has made significant progress towards completing certification of an updated LUP and a new IP. The City, Coastal Commission staff, and members of the public and other stakeholders have engaged in iterative review and comment on draft documents, and the City will next take the LUP and IP to the City Council, with the submittal to the Coastal Commission to follow in mid-2017. Commission staff will continue to coordinate with the City throughout the local adoption process as well as upon submittal.

Further, as identified above, policies within the draft LCP call for future efforts to update the Coastal Parks Plan as a tool to implement additional sea level rise adaptation strategies, as well as to eventually update the LCP as necessary to reflect evolving science and impacts from sea level rise. Prior to the update of the Coastal Parks Plan, the City should consider doing a targeted vulnerability assessment that better identifies the likely timing of impacts to park land and associated trails and amenities, as well as a fiscal analysis that assesses the costs and benefits of different adaptation approaches.

Although there is still significant work ahead to complete the certification of the LCP, as well as future efforts to implement adaptation strategies, the City of Pacific Grove provides a strong example of phased sea level rise adaptation planning through the development of a Local Coastal Program.

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