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November 4, 2021

TO: California Coastal Commissioners and Interested Public

FROM: John Ainsworth, Executive Director
Madeline Cavalieri, Statewide Planning Manager
Kelsey Ducklow, Environmental Scientist

SUBJECT: **Recommended Final Draft of “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone”**

SUMMARY OF STAFF RECOMMENDATION

Staff is recommending **adoption** of new sea level rise planning guidance titled “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone.” A draft of the guidance document was released on August 16, 2021, followed by a 6-week public review period. A total of 23 comment letters were received (included in the [Correspondence](#) for this item), with most comments falling into categories related to: (1) the role of the Guidance, its relationship to other agency information and requirements, and its application in specific circumstances; (2) the specific infrastructure types discussed in the Guidance; (3) H++ and other sea level rise projections; (4) adaptation strategies; (5) model policies; and (6) costs and funding. A variety of edits were made to address these comments, as described in this staff report. Additional responses to common questions, concerns, or other recommendations are also provided. Although various edits were made to clarify, correct, add context, and emphasize certain portions of the document, the proposed Final Draft of the Guidance does not fundamentally alter the content or recommendations of the prior draft that was brought to the Commission in August 2021. This Recommended Final Draft version of the [Critical Infrastructure Guidance](#) is available on the Commission’s website.

Much of the existing infrastructure that allows people to access, recreate, live, and work in coastal communities was not designed to be resilient to the threats of climate change and sea level rise, which present unprecedented challenges that must be met with proactive adaptation. The goal of the Critical Infrastructure Guidance is to promote resilient coastal infrastructure and protection of coastal resources by providing local governments, asset managers, and other stakeholders with policy and planning

information to help inform sea level rise adaptation decisions that are consistent with the California Coastal Act.

The Guidance addresses two main types of critical infrastructure – transportation and water – and presents key considerations for successful infrastructure adaptation planning. The Draft Guidance presented five key considerations, including (1) coordinated planning, (2) environmental justice, (3) phased adaptation, (4) adaptation costs and funding, and (5) nature-based adaptation strategies. In response to public comments, staff is recommending the addition of an additional key consideration related to tribal consultation and coordinating critical infrastructure planning with California Native American Tribes.

The Guidance also provides details on the expected impacts of sea level rise on transportation and water infrastructure, describes the regulatory framework that applies to adaptation planning for infrastructure, provides model policies that can be used by local governments as a tool for updating Local Coastal Programs (LCPs), provides case studies of successful approaches to infrastructure adaptation, and gives direction to asset managers on how to develop infrastructure adaptation projects that can help to ensure resilience while protecting resources consistent with the Coastal Act.

Development of the Critical Infrastructure Guidance was supported by grant funding from the Nation Oceanic and Atmospheric Administration (NOAA) and helps to fulfill objectives in the Coastal Commission’s 2021-2025 Strategic Plan.

Adoption of the Critical Infrastructure Guidance would not represent a regulatory action. Instead, the Guidance would be adopted as interpretive guidelines pursuant to Public Resources Code section 30620. The Guidance is advisory and provides recommendations for how local governments can address sea level rise issues in Local Coastal Programs (LCPs) consistent with the Coastal Act. Adoption would convey the Commission’s recognition of sea level rise as an important consideration when ensuring resilient coastal infrastructure within the context of the Coastal Commission’s planning and regulatory processes.

Staff is recommending **adoption** of new sea level rise planning guidance titled “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone”

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[Note that the proposed final version of “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone” is available on the Coastal Commission’s [website](#)]

I. MOTION AND RESOLUTION

Motion:

I move that the Commission adopt “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone” pursuant to the staff recommendation.

Staff Recommendation of Approval:

Staff recommends a **YES** vote on the foregoing motion. Passage of this motion will result in the adoption of new sea level rise guidance, “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone,” as interpretive guidelines. The motion passes only by affirmative vote of a majority of the Commissioners present.

Resolution of Approval:

The Commission hereby adopts “Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone” as interpretive guidelines pursuant to Public Resources Code section 30620.

II. DISCUSSION

A. Background

“Critical Infrastructure at Risk: Sea Level Rise Planning Guidance for California’s Coastal Zone” is a product of a NOAA Federal grant Project of Special Merit¹, which is a grant program intended to support development of innovative projects that improve coastal management programs and address national priorities. The Guidance follows up on, and is meant as a companion document to, the Commission’s [Sea Level Rise Policy Guidance](#) (originally adopted in 2015 and updated in 2018 to reflect best available science), which set forth broad principles related to planning for sea level rise. This Critical Infrastructure Guidance provides a more in-depth discussion of sea level rise risks and adaptation approaches specifically related to certain types of critical infrastructure. It also provides model policies that are meant to serve as a starting point from which local jurisdictions can develop LCP policies appropriate for local conditions. In this way, the Critical Infrastructure Guidance is also a companion to the

¹ Coastal Commission staff work on this Guidance has been supported by financial assistance from grant agreement NA17NOS4190173 under the Coastal Zone Management Act of 1972, as amended, and administered by the Office for Coastal Management, National Oceanic and Atmospheric Administration (NOAA)

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Commission's [Draft Residential Adaptation Guidance](#), which includes similar information and draft recommendations focused on and appropriate for residential development.²

This Guidance also supports the achievement of multiple goals and objectives in the Coastal Commission's [2021-2025 Strategic Plan](#). Most specifically, this Guidance partially fulfills Objective 4.3.1, which calls for completing coastal adaptation policy guidance to support and inform LCP updates on addressing sea level rise for residential development and critical infrastructure development. It also supports fulfillment of other goals and objectives related to coordinating with state agencies, local governments, and other stakeholders to understand vulnerabilities of key infrastructure assets, to develop adaptation priorities that can be integrated into LCPs and/or guide decision-making for CDPs, and to increase public awareness and participation in climate change and sea level rise adaptation planning.

The Critical Infrastructure Guidance recognizes that infrastructure is the foundation on which California's thriving coastal economy is built. Yet much of the existing infrastructure that allows people to access, recreate, live, and work in coastal communities was not designed to be resilient to the threats of climate change and sea level rise, which present unprecedented challenges that must be met with proactive adaptation. The goal of the Guidance is to promote resilient coastal infrastructure and protection of coastal resources by providing local governments, asset managers, and other stakeholders with policy and planning information to help inform sea level rise adaptation decisions that are consistent with the California Coastal Act.

The Critical Infrastructure Guidance focuses on transportation and water infrastructure. Chapters 1-3 discuss background information, including a general discussion on sea level rise science, the regulatory framework that applies to adaptation planning for infrastructure, and the unique challenges of sea level rise planning for critical infrastructure. Specifically, Chapter 3 of the Guidance notes that the purpose and role critical infrastructure plays in our communities and the physical characteristics of these assets magnify the consequences of inaction while at the same time increasing the scale, complexity, time, and costs associated with adaptation.

Building on this discussion, Chapter 4 of the Critical Infrastructure Guidance describes five key topics that should be considered to address the unique challenges of planning for critical infrastructure and to successfully develop practical and implementable solutions that ensure equity among coastal communities. The Guidance includes a description of each of these topics as well as recommendations for planning. The key considerations include:

1. Coordinated planning
2. Environmental justice

² The Draft Residential Adaptation Guidance has gone through two rounds of public comment and was presented to the Commission in August 2017, but it has not yet been finalized or adopted by the Commission.

3. Tribal consultation
4. Phased adaptation
5. Adaptation costs and funding
6. Nature-based adaptation strategies

Chapters 5 and 6 discuss transportation and water infrastructure, respectively, specifically touching on highways, rail, wastewater, stormwater, and water supply infrastructure. Each chapter includes a brief discussion of statewide vulnerabilities, the relevant regulatory and governance frameworks, and some more specific adaptation considerations for each type of critical infrastructure.

The Guidance also includes a number of appendices that provide additional detailed information. Appendices discuss topics including relevant Coastal Act policies, steps for sea level rise adaptation planning, statewide infrastructure vulnerabilities, case studies of critical infrastructure adaptation projects that have already been undertaken, nature-based adaptation strategies, the cost savings associated with proactive adaptation, and relevant transportation planning documents.

Notably, Appendix B includes example policy language that can be used when developing new or updated LCPs to help implement the recommendations in the Critical Infrastructure Guidance. The model policies are split up between transportation policies and water infrastructure policies, and cover common topics like planning processes, best available science and appropriate hazards analyses, siting and design of new infrastructure, and implementing specific adaptation strategies. The example language also covers specific topic areas like environmental justice, scenic Highway 1, and groundwater change. Importantly, the model policies are offered as a tool that local governments may choose to use as a starting point from which to make edits or otherwise develop policies that are appropriate for local conditions and priorities. They are not a checklist of items the Coastal Commission would expect to see in an LCP. The model policies could be rewritten in any number of ways to account for specific goals or to implement other initiatives, provided that they are still consistent with the Coastal Act.

B. Document Development

As discussed above, the Critical Infrastructure Guidance was developed with the support of NOAA grant funding. Prior to beginning development of the Guidance itself, Commission staff released a survey to gather input to guide the content of the document, in part due to recognition that timing, available funding, and staff capacity would necessarily limit the scope of the Guidance. Specifically, staff sought to understand priorities in terms of what assets were most vulnerable to sea level rise as well as what type of information for sea level rise planning would be most useful to stakeholders.

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Altogether, staff received 90 responses to the survey. About half of the respondents noted that roads in their communities are vulnerable now to coastal hazards, and about a third said the same of storm and wastewater infrastructure. Both wastewater infrastructure and roads were highlighted as priorities to be addressed in the Guidance by more than half of respondents.

The top three most commonly cited topics for what type of information for sea level rise planning would be most useful included more information on developing and implementing phased adaptation approaches, information on adaptation strategies in general, including the pros and cons of different strategies, and guidance on using natural infrastructure for adaptation.

In response to these surveys, as well as other internal and external coordination, staff chose to focus on transportation infrastructure and water infrastructure, including highways, local roads, rail, wastewater, stormwater, and water supply assets. This focus is also reflective of the types of projects the Commission most commonly sees.

The development of the Critical Infrastructure Guidance was guided by a steering committee of internal staff members, including staff with legal, enforcement, engineering, ecology, and district planning and permitting expertise, as well as the sea level rise team. This group was instrumental in determining statewide priorities from a Commission perspective, and in shaping the Coastal Act policy analysis and model policy language.

Because this document focuses on transportation and water infrastructure, Caltrans and the State and Regional Water Resources Control Boards were key partners in developing those respective guidance topics. Coordination with these partners influenced the development of the transportation and water chapters, along with model policies, and these agencies provided comments on multiple iterations of the Guidance. A larger group of state agencies, including the Ocean Protection Council, State Lands Commission, State Parks, Coastal Conservancy, Office of Planning and Research, San Francisco Bay Conservation and Development Commission, and Department of Insurance, as well as local government partners (including the Commission's Local Government Working Group, representing the League of California Cities and the California State Association of Counties) also reviewed or offered comments on early iterations of the draft Guidance.

The draft Guidance was released on August 16, 2021, followed by a 6-week public review period. A total of 23 comment letters were received, resulting in a variety of edits as discussed in the following section. A final draft version of the [Critical Infrastructure Guidance](#) is available on the Commission's website and is presented here for recommended adoption by the Coastal Commission.

C. Response to Comments

Commission staff received 23 comment letters, included in the [Correspondence](#) for this item. Some of these comments resulted in specific changes to the Guidance, as described in the first section below.

Most commonly, comments fell into several broad categories including: (1) the role of this Critical Infrastructure Guidance, its relationship to other agency information and requirements, and its application in specific circumstances; (2) the specific infrastructure types discussed (or not discussed) in the Guidance; (3) H++ and other sea level rise projections; (4) adaptation strategies; (5) model policies; and (6) costs and funding. Changes related to these topics are discussed in the relevant sections below, along with broader responses to the questions, concerns, or other recommendations raised in the comment letters.

A limited number of comments were outside the scope of the Critical Infrastructure Guidance, as described at the end of this section, but may be appropriate for consideration in ongoing coordination among the Coastal Commission, other state agencies, local governments, asset managers, and other stakeholders.

Lastly, there are some instances where specific recommendations or language edits were not made as suggested. This was generally the case where staff felt that the proposed edits were already adequately addressed in other places in the Guidance, where the level of detail didn't match surrounding information or wasn't necessary for general audiences, or otherwise as discussed in the topic-specific sections below.

Specific Changes to the Guidance

A number of comment letters provided minor suggestions or language edits that amounted to corrections for typographical errors, updated hyperlinks, and updated descriptions, particularly where projects, planning efforts, documents and so on have been completed or updated since the draft Guidance was initially written. These changes were generally made as recommended.

Some comment letters also provided language or recommendations to clarify certain topics, particularly including where sister agencies or other stakeholders provided additional information relevant to topics under their purview. These changes were also largely made as recommended. For example, Caltrans recommended adding additional references about the importance of incorporating climate change planning (and the applicability of this Critical Infrastructure Guidance) in corridor and regional transportation plans, and clarification that infrastructure projects that will be built later this century will need to plan beyond the commonly cited planning horizon of 2100.

Additionally, the State Water Resources Control Board (SWRCB) and other stakeholders with an interest in water infrastructure (such as the California Association of Sanitation Agencies) provided a number of specific edits that were incorporated into the Guidance, including noting that water infrastructure lifespans are generally based on historic hydrologic patterns which will likely change in the future (and therefore

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estimated lifetimes should change as well); clarifying the interrelated role of the Water Board and NPDES permitting in reducing point source pollution and the work of the Coastal Commission's water quality policies in reducing nonpoint source pollution; recognizing that adaptation alternatives for avoiding low-lying areas, such as increasing pumping, carry their own challenges; and more explicitly noting that planners need to consider the various impacts of different adaptation options on coastal resources.

Comments were also received from the California Indian Environmental Alliance. In general, these comments recommended ensuring that California Tribes have meaningful engagement opportunities; that the Commission work with California Tribes as partners and support them through technical capacity improvements and data-sharing; and recognizing and incorporating Tribal Knowledge and Tribal Science into the planning process. These changes were also largely made as recommended. For example, early tribal consultation during the planning and decision-making process was emphasized throughout the Guidance. Similarly, Tribal Resiliency Plans were added as a critical resource that local governments should consider to ensure cohesive adaptation planning for sea level rise. In addition, tribal consultation was added as a key consideration in Chapter 4 to further emphasize the importance of coordinating with California Tribes. Specific recommendations include seeking tribal input and consulting with tribes as early as possible; incorporating Tribal Knowledge and Tribal Science; increasing opportunities for co-management of coastal resources; and avoiding disproportionate burdens to tribes.

Finally, in response to a comment from the League of California Cities, Commission staff added a callout box in the Water Infrastructure chapter (Chapter 6) regarding public entities' duty to maintain water infrastructure and service (similar to a box that was already included in the Transportation Chapter). The callout box explains that public entities may have a duty to maintain water supply and wastewater services, and to maintain adequate water infrastructure. The callout box recommends that public entities research and consider any applicable legal duties when planning for how to address the effects that sea level rise may have on water infrastructure.

Role and Applicability of the Critical Infrastructure Guidance

Commission staff received several comment letters with questions or recommendations for clarifications regarding how this Critical Infrastructure Guidance (and related Coastal Commission work) fits in with other statewide laws, guidance, sister agency requirements, and other efforts. Chapter 2 of the Guidance (Sea Level Rise Planning and Background) includes a section on "Regulatory Environment and Guidance" which describes a number of relevant stakeholders, laws, executive orders, and guidance documents and explains how the Guidance fits into the existing body of adaptation planning work.

More broadly, the Commission has generally offered interpretive guidance on sea level rise planning that is meant to provide information on how statewide recommendations can be carried out within the context of the Coastal Act and Coastal Commission (and local governments with certified LCPs) planning and permitting processes. For example,

the Commission's Sea Level Rise Policy Guidance (2018 Update) describes how to incorporate the best available science and recommendations laid out in the OPC State Sea-Level Rise Guidance into LCP and CDP processes. This Critical Infrastructure Guidance continues this effort, providing more detailed information on how adaptation planning for critical infrastructure can be incorporated into Coastal Act contexts.

Relatedly, a number of comment letters included questions about how this Guidance would apply in specific situations, recommending that clarifications or more detail be added to define certain standards or to update permitting processes, or otherwise encouraging the Commission to allow for flexibility and review of projects on a case-by-case basis. For example, staff received comments about the proposed Poseidon Desalination project; concerns about the feasibility of various adaptation approaches for Highway 101 or individual wastewater treatment plants; and recommendations to include objective standards for defining hazard risks, examples of appropriate triggers and thresholds for phased adaptation, and specific requirements for completing environmental justice impact analyses.

As stated throughout the Guidance, the Commission will continue to review plans and projects on a case-by-case basis and will coordinate with relevant local governments, agencies, asset managers, and other stakeholders on these efforts. The Guidance does not constitute new regulations nor is it a checklist that can be a substitute for consultation with Coastal Commission staff and other relevant parties. Instead, it provides recommendations for how to address sea level rise consistent with the Coastal Act, including with respect to understanding sea level rise vulnerabilities, analyzing potential impacts to coastal resources and communities, and evaluating adaptation strategies. It is understood that not all recommendations, adaptation approaches, and other topics discussed in the Guidance will be applicable in all cases, and that specific decisions made will reflect local conditions and goals as consistent with the Coastal Act and other relevant legal standards. As such, providing more detailed information on specific standards or describing how adaptation planning should be carried out for specific projects, sites, or assets is outside of the scope of the Critical Infrastructure Guidance. Several clarifications have been made to the Guidance to further emphasize this, particularly as it relates to sea level rise projection scenarios, adaptation strategies, and the model policies as described below.

Lastly, several comments relate to the Commission's definition of "existing development" as pertaining to structures lawfully in existence prior to the effective date of the Coastal Act and what this definition means for the shoreline protection policies of the Coastal Act. The Critical Infrastructure Guidance reflects the Commission's position on this topic as described in the CCC Sea Level Rise Policy Guidance, which was first adopted in 2015 and updated in 2018. Commission staff will continue to work with local governments and other stakeholders on a case-by-case basis to determine appropriate approaches for implementing these policies. Similarly, a comment from the North County Transit District (NCTD) objects to the Guidance's position on federal preemption and consistency related to railroads. As noted by the NCTD, the position in the Guidance reflects past Commission statements, including as presented in a currently pending proceeding before the Surface Transportation Board. As with other topic-

specific questions and comments, issues of preemption are complex and fact-specific, and the Commission will continue to work with NCTD and other rail agencies and operators on planning and permitting for rail-related activities to the extent permitted by law.

Critical Infrastructure Types Included in this Guidance

A related set of comments was about the types of infrastructure discussed, or not discussed, in this Guidance. For example, numerous comments asked why desalination plants weren't specifically addressed, why there was a greater focus on highways and state roads than on local roads, how this could relate to other types of infrastructure, and how to plan for other types of development that are often interconnected with critical infrastructure, such as parklands, visitor-serving uses, or coastal-dependent uses.

Due to limited timing and staff capacity, this Guidance could not discuss all possible types of critical infrastructure or related and interconnected development. Instead, Staff chose to focus specifically on transportation and water infrastructure, primarily because the Coastal Commission has already had to address coastal hazards, sea level rise impacts, and adaptation planning issues for these types of critical infrastructure on an increasingly routine basis, pointing to an ongoing and critical need for more information on these topics. Commission staff also released a survey prior to beginning work on this project to gather feedback about the most pressing issues related to adaptation planning for critical infrastructure facing local governments, asset managers, and other stakeholders. These survey responses confirmed staff's understanding of statewide planning needs, as roadways, wastewater treatment plants, and stormwater infrastructure were the most commonly cited infrastructure types in terms of both high vulnerability as well as the desire for guidance on planning.

As such, the Guidance is focused on transportation and water infrastructure, and is reflective of the Commission's experience with planning for these infrastructure types. For example, close coordination with Caltrans staff over the past several years, including to specifically advance sea level rise planning for highways and other transportation assets has resulted in a number of case studies and planning concepts that are discussed in the Guidance. However, as noted in the Introduction (Chapter 1) of the Guidance, staff believes that many of the concepts addressed in the Guidance could be applicable to other types of critical infrastructure or other development. This is specifically true for development that shares similar characteristics with transportation and water infrastructure, such as large and complex systems, cross-jurisdictional and networked assets, provision of public benefits, and other factors discussed in Chapter 3 of the Guidance. Minor clarifications to this effect were added to the Introduction of the Guidance.

Relatedly, although the Guidance doesn't provide specific direction on how to address other types of development and land uses that are interconnected with critical infrastructure, the importance of considering these other assets and uses in adaptation planning is reflected throughout the document. For example, many of the Key

Considerations discussed in Chapter 4 of the guidance relate to taking a holistic approach to adaptation planning that considers a variety of coastal resources and community needs and goals rather than focusing solely on a single project or asset. Such a holistic approach is also reflected in the language of many of the model policies in Appendix B. More broadly, as discussed above, the Commission recognizes that adaptation planning will look different everywhere, in part because of the variety of other considerations that must be balanced with critical infrastructure planning, including other relevant site- or community-specific assets and land uses.

Sea Level Rise Projections and the H++ Scenario

Commission staff received a number of questions and comments related to sea level rise projections, particularly the H++ scenario. These included questions and comments about what H++ is, where it came from, and why it does not have an associated probability; comments about the sources of uncertainty associated with the H++ scenario and how that uncertainty is characterized in recent International Panel on Climate Change (IPCC) reports; and various comments on the appropriateness and feasibility of siting and designing development to avoid hazards associated with H++ over their anticipated project lives.

Chapter 2 (Sea Level Rise Planning and Background) of the Critical Infrastructure Guidance addresses many of these subjects. Its central recommendation is to use the current best available science on sea level rise scenarios and adaptation planning in California. Currently, this best available science is provided in the State of California Sea-Level Rise Guidance (OPC 2018) and is reflected in the Coastal Commission Sea Level Rise Policy Guidance (CCC 2018). These documents present probabilistic sea level rise projections as well as the H++ scenario, and they recommend which set of projections to use in various planning contexts based on level of risk aversion. Updates to this science and the associated recommendations are expected in the future as research on climate change and sea level rise continues.

Chapter 2 also addresses many of the comments and questions regarding the science behind H++ sea level rise scenario and its utility in planning. It explains that the State Sea-Level Rise Guidance (OPC 2018) recommends that the H++ scenario be considered in the context of high consequence projects with a design life beyond 2050 that have little to no adaptive capacity, would be irreversibly destroyed or significantly costly to relocate/repair, or would have considerable public health, public safety, or environmental impacts should this level of sea-level rise occur, such as critical infrastructure. Chapter 2 also explains that the absence of a probability for the H++ scenario is not because the probability is so low that scientists could not identify it; rather, it is because the climate models used to generate the probabilities had not yet incorporated the mechanisms of extreme ice sheet melt from recent research that gave rise to the H++ scenario. This could change in the future as science advances.

Some commenters pointed out that both the IPCC Ocean and Cryosphere in a Changing Climate report and the IPCC Sixth Assessment Report (AR 6) describe the deep uncertainty around the mechanisms of marine ice sheet instability that underpin

the H++ scenario, and some suggest that H++ should therefore not be used in adaptation planning. AR6, the most recent of these two IPCC reports, separates sea level rise projections based on this marine ice sheet instability because of this deep uncertainty and distinguishes them from a set of probabilistic scenarios. These probabilistic scenarios were developed considering the climate processes in whose projections IPCC have at least medium confidence. The separate scenario associated with marine ice sheet and cliff instability is not dismissed or characterized as inappropriate for planning; rather, it is characterized as a low likelihood but high impact possibility. Because the California State Sea-Level Rise Guidance advises consideration of the H++ scenario as a precautionary approach, no change has been made to the overall recommendation to consider the H++ scenario. However, minor edits were made to Chapter 2 to describe the findings of the IPCC reports.

Finally, Chapter 2 of the guidance also discusses the range of ways H++ can be incorporated either into the siting and design of projects or into commitments to long-term, phased adaptation planning, based on feasibility and the site-specific circumstances of individual projects and planning contexts. Language specifically notes that while complete avoidance of hazards over the life of the project in question is often most protective of coastal resources, such avoidance, particularly for the H++ scenario, may not be feasible and/or site-specific factors may make it more appropriate to use a phased adaptation approach. This section also highlights the difference between understanding and planning for extreme amounts of sea level rise and specifically siting and designing a project today that avoids impacts associated with the H++ scenario. Further, two boxes in this section provide examples of how the H++ scenario has been integrated into project analyses and adaptation planning as well as a description of tools available to facilitate this work. The intent of these boxes is to provide information and guidance on how H++ can be analyzed and – depending on the various site-specific factors that impact feasibility and Coastal Act consistency – be incorporated into adaptation planning processes.

Adaptation Strategies

Commission staff received numerous comments related to adaptation strategies. These comments ranged from general statements that the Commission should be flexible in allowing different strategies in different circumstances, to concerns about the relative emphasis placed on certain strategies, such as too great a focus on nature-based approaches or an overreliance on shoreline armoring, to caution about the feasibility of specific adaptation strategies in specific cases, such as managed retreat in urbanized areas or the use of soft approaches for protecting critical assets.

As a general response, the Commission recognizes that adaptation strategies will be considered on a case-by-case and location-specific basis and implemented based on the requirements of the Coastal Act and in a way that takes into account local circumstances. In general, the Coastal Act and California Environmental Quality Act require that adaptation approaches be the least-environmentally damaging feasible alternative, and the Critical Infrastructure Guidance reflects this requirement by recommending avoidance of hazards, prioritization of nature-based approaches (both

soft and hybrid strategies), use of shoreline armoring, and mitigation of unavoidable impacts in certain circumstances as applicable and feasible based on a variety of site- and project-specific factors.

The Coastal Commission's Sea Level Rise Policy Guidance (2018) includes a chapter describing a variety of adaptation options that can be used for critical infrastructure and other types of development, and Appendix C of the Critical Infrastructure Guidance describes a process that can be used to analyze and select appropriate adaptation strategies, which can include protection, accommodation, retreat, hybrid, and phased strategies. Consideration of the importance and essential nature of vulnerable infrastructure along with various community needs and goals is a key part of this process. Further, Appendix E includes several case studies that demonstrate how a range of adaptation strategies, including shoreline armoring, nature-based strategies, hybrid approaches, and phased adaptation, have been used in the past.

A more detailed discussion of nature-based adaptation strategies is included in the Critical Infrastructure Guidance due to the relative newness of these strategies, particularly on the West Coast and as an option for protecting critical infrastructure, as compared to a longer history of using hard structures like shoreline armoring. This emphasis on nature-based strategies also reflects recent statewide goals and direction to expand the use of these approaches. Likely in response to the focus on these approaches, Commission staff received numerous comments related to nature-based adaptation strategies, particularly around the feasibility of implementing such strategies.

The guidance was updated with clarifying language to address a number of these comments, including updating the model policies to indicate that the term nature-based adaptation strategies refers to soft strategies and hybrid armoring; that feasibility assessments for implementing nature-based adaptation strategies should consider coastal squeeze and other climate change impacts; recognition that nature-based adaptation strategies may not be a feasible option in some cases; and encouraging local governments to analyze and monitor the co-benefits provided by nature-based adaptation strategies.

While the guidance recognizes nature-based adaptation strategies as an important option that may reduce the impacts of coastal flooding and erosion in addition to the many co-benefits of utilizing such strategies, Chapter 4 discusses a number of important factors and challenges to consider when implementing nature-based adaptation strategies. The discussion of nature-based adaptation strategies in this guidance serves to introduce the concept as a potential option that coastal managers should consider. However, as discussed above, the selection of the most appropriate adaptation strategy will be on a case-by-case basis and a range of adaptation options should be analyzed, including protection, accommodation, retreat and/or hybrid or sequenced strategies. The Guidance recognizes that in some cases, shoreline protection devices may be necessary during certain periods of time while also noting that shoreline protective devices may have adverse impacts to coastal resources. In all cases, adaptation strategies need to be fully evaluated for potential impacts to coastal

resources and applicability and feasibility for providing protection to critical infrastructure.

Model Policies

A number of comments were also submitted that relate to the Model Policies (Appendix B). Comments included concerns and/or recommended edits related to the applicability and feasibility of specific policies, concerns about requiring these policies to be included in LCPs, and lack of clarity about who would be responsible for certain actions.

In limited cases, edits were made to the policy language, particularly where the intention of the policy was unclear to readers. For example, language was added in several places to clarify that nature-based adaptation strategies include both soft and hybrid approaches; that local governments should work with relevant regulatory authorities or asset managers to implement various policies; and that the goal of a Recycled Water Management Plan (Policy #46) could be maximum reuse rather than 100% reuse (a potentially unattainable goal in certain cases). Additionally, minor edits were made to the background information section to further clarify and emphasize that these policies are meant as a tool for local jurisdictions to consider as they update LCPs.

More often, though, model policy language was left unchanged. As described in the introductory and background material in Appendix B, the model policies are meant to be ideas or starting points from which to develop policies appropriate for local conditions rather than a checklist of items the Coastal Commission would expect to see in an LCP. As such, it is understood that not all policies will be applicable or feasible in all jurisdictions, and further that policies would be rewritten to account for local conditions and priorities (provided that they are still consistent with the Coastal Act). Words such as “shall” or specific time horizons have been used by staff to provide examples of how LCP policies would be written in cases where the local government determines it is necessary to require a particular development standard, but this language could be edited based on different jurisdictional goals and needs.

Adaptation Planning Costs and Funding Opportunities

Several comments related to the costs and funding opportunities associated with sea level rise impacts and planning for and implementing adaptation strategies. Specifically, some commenters voiced concerns that the studies related to the relative costs associated with mitigation and proactive planning as compared to responding to damage or other impacts (e.g., the FEMA and National Climate Assessment studies cited in Appendix G) may not be applicable for California-specific infrastructure planning issues or that various proactive measures (such as managed retreat) may not always be cost-effective. Similarly, a commenter noted that even locally specific cost-benefit analyses may leave out certain economic costs, which can skew the findings as it relates to the net benefits of specific strategies. The discussion on these studies, particularly as presented in Chapter 4 and Appendix G is meant to provide a summary of some of the studies that have been completed related to the costs and benefits of adaptation planning, but it is understood that costs and benefits will vary based on a

variety of project- and site-specific factors. Language acknowledging these issues and clarifying the intent of Appendix G has been added to the Guidance.

Relatedly, some comments related to the lack of funds for planning and implementation of adaptation strategies, particularly for large-scale nature-based adaptation strategies. Although additional detailed information on funding opportunities is outside of the scope of this Guidance, the Coastal Commission recognizes that there are funding limitations. Chapter 4 of the Guidance acknowledges the need to encourage federal and state funding for SLR adaptation, and Commission staff will continue to work with local governments, asset managers, state agencies, and other stakeholders to identify funding opportunities and prioritize expansion of funding programs.

Outside of the Scope of this Document

Lastly, Commission staff received some comments that were outside of the scope of the Guidance document, either because of a lack of detailed information on the requested topic, a lack of timing or staff capacity to address the concern, or because the comment called for a level of detail that staff felt was unnecessary for this statewide guidance. Some of these topics have been discussed in the sections above, such as project-specific questions or requests for discussion of other infrastructure types, adaptation strategies, and so on. Others include a request to document all water infrastructure vulnerabilities, beyond those already discussed; provide more details on parameters and methodologies for monitoring; provide examples of how to minimize vehicle miles travelled (VMTs) in the context of adaptation planning; form an environmental ecologist working group to advance use of nature-based strategies; provide case studies on how financing has been used for critical infrastructure adaptation planning; and include further discussion on how to carry out mitigation of impacts from shoreline armoring. While these topics were determined to be outside the scope of the Guidance at this time, Commission staff recognize the utility of this additional information and will continue to work with stakeholders on these and other topics as part of staff's ongoing efforts to support coastal resiliency planning.