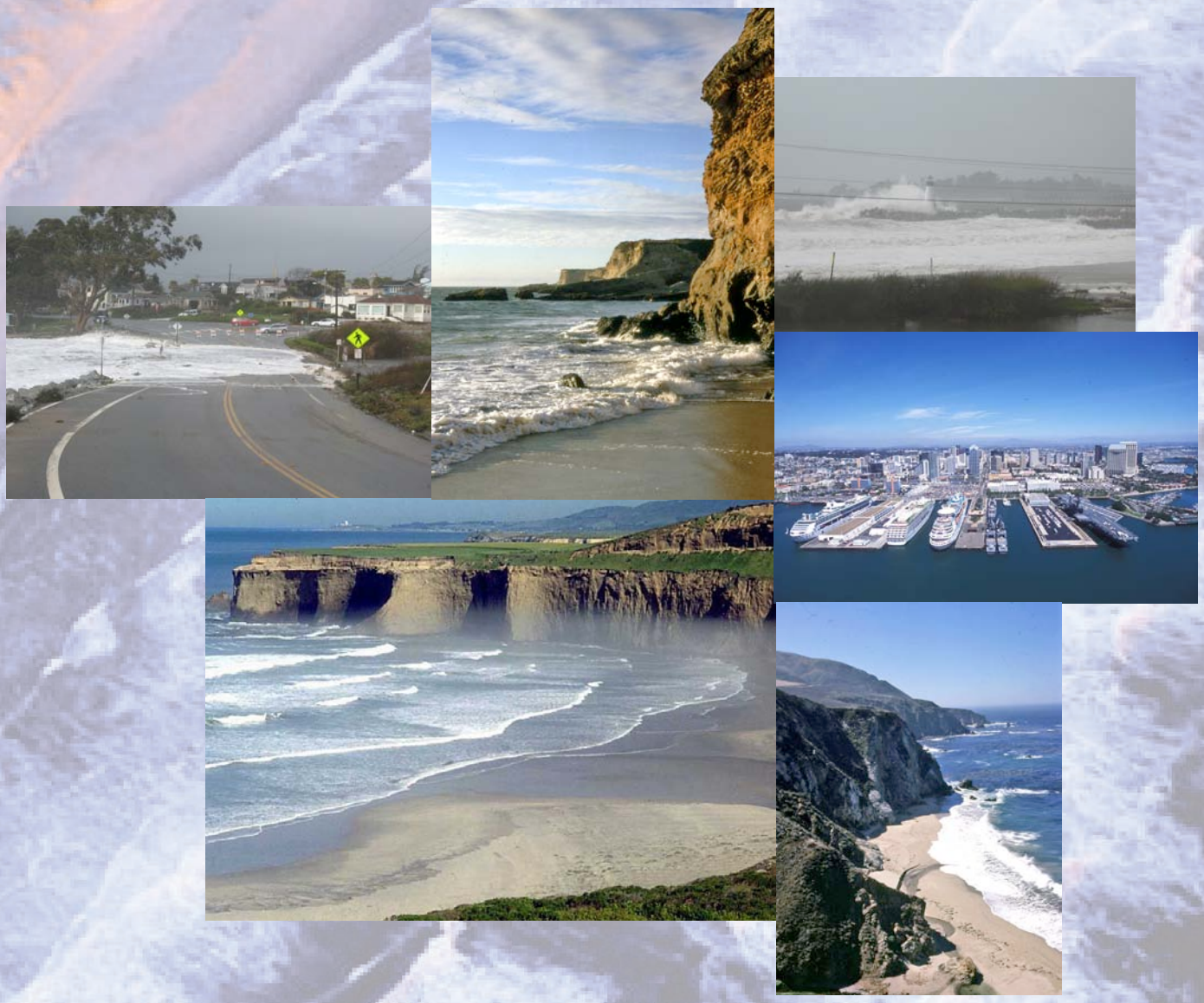
# A REPORT ON SEA LEVEL RISE PREPAREDNESS



Staff Report to the

California State Lands Commission

December 2009

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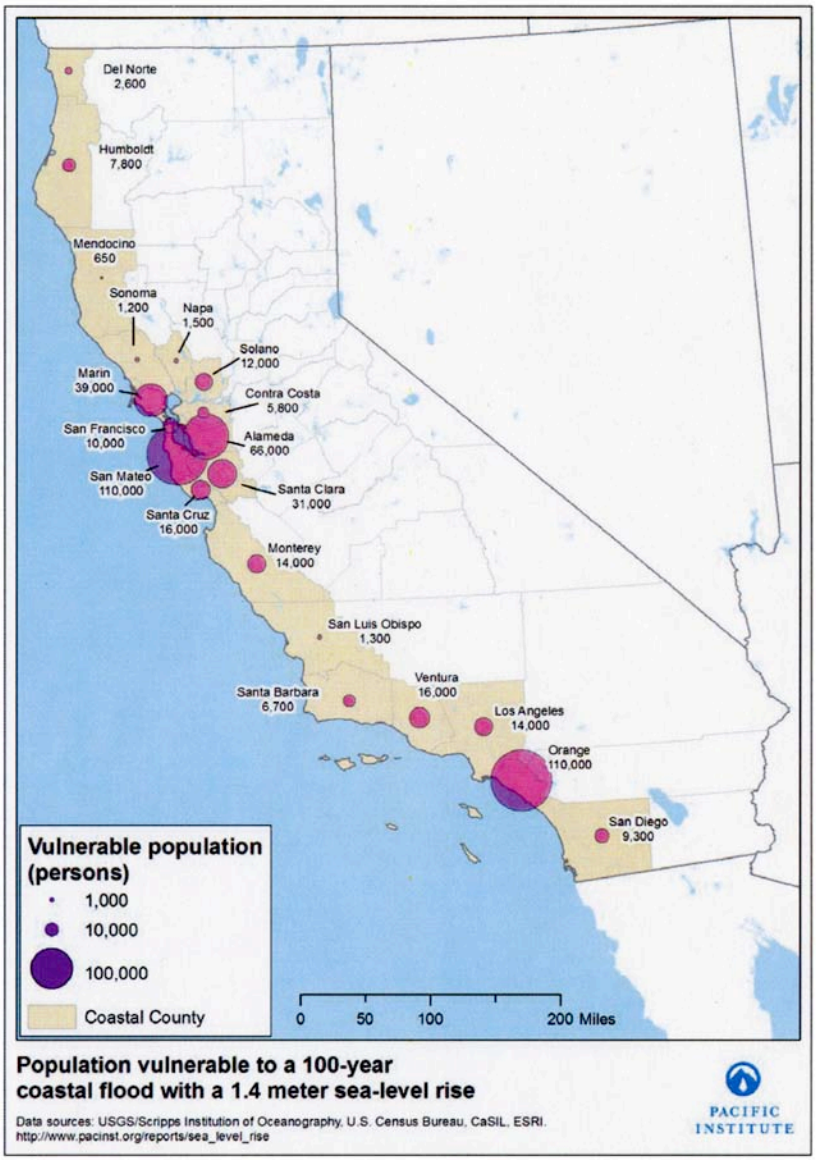
# Executive Summary

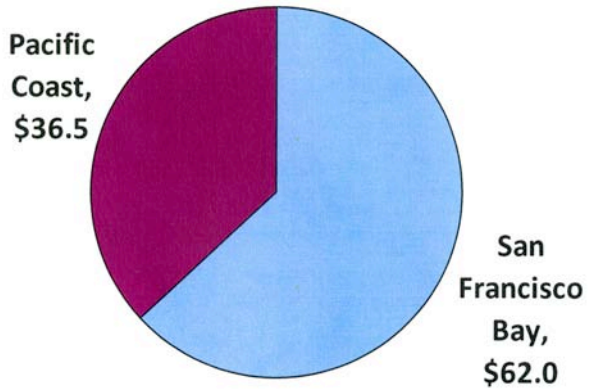



Source: *Pacific Institute Report,* 2009.

The effects of changes to the atmosphere, including climate change and sea level rise, will have global consequences for the world and the United States. According to a paper prepared by researchers from Scripps Institution of Oceanography, the University of California San Diego, the U. S. Geological Survey, Santa Clara University, the California Department of Boating and Waterways, and Hydrologic Research Center, sea level is projected to rise 16" by 2050, and 55" by 2100.[1] Efforts are underway at various international, national, and state levels aimed at developing policies, innovative approaches, and adaptation strategies to lessen the impacts of climate change and sea level rise.

Sea level rise is an issue that has far reaching consequences for California, including the lands under the jurisdiction of the California State Lands Commission (Commission). Sea level rise threatens coastal communities and infrastructure, including transportation facilities; electric utility systems and power plants; storm water systems and wastewater treatment plants and outfalls; vast areas of wetlands; and many other human and natural systems. According to a report by the California Climate Change Center, nearly half a million people, thousands of

miles of roads and railways, major ports, airports, power plants and wastewater treatment plants are at risk from a 100-year flood event as a result of a 1.4 meter (55") rise in sea level.[2] It is believed that, in the coming decades, California will face intensifying climate changes from the amount of emissions already released into the atmosphere.[3]




**Replacement value (in billions of year 2000 dollars) of buildings and contents at risk of a 100-year flood event with a 1.4 m sea-level rise, by region**

Note: Counties with borders on the Pacific coast and San Francisco Bay (e.g., San Mateo) were separated based on the shoreline affected.

Source: *Pacific Institute Report,* 2009.

California is one of the leading states in the nation in addressing the impacts of climate change, including sea level rise. In 1988, under legislative mandate, the California Energy Commission issued a report on the potential impacts of climate change in California. In the late 1990s, under a research program sponsored by the National Oceanic and Atmospheric Administration, the California Applications Program was created at the Scripps Institute of Oceanography to research various aspects of climate change. The California Energy Commission's Public Interest Energy Research (PIER) program was created in 2001 to research potential impacts of climate change in a variety of areas. Executive Orders signed by Governor Schwarzenegger in 2005 and 2008 further direct California to address global warming, climate change and sea level rise. The *2009 California Climate Adaptation Strategy* summarizes the most recent science in predicting potential climate change impacts and recommends response strategies.[4]

Lands under the Commission's jurisdiction are already vulnerable to a range of natural events, including storms and extreme high tides. While some of these lands remain undeveloped, a significant portion have been developed either pursuant to a lease from the Commission or pursuant to a legislative grant to a local jurisdiction. Increased storm intensity and sea level rise may lead to the loss of sandy beaches in some areas along the coast, while some areas may see an increase in the amount of sand deposited on the beach. This, coupled with the potential increase in shoreline protective devices, could reduce or eliminate public access along the coastline.

The Commission has an important role to play in addressing the issue of sea level rise. The primary responsibility of the Commission will most likely be focused on assuring that development of lands managed by the Commission considers the impacts of sea level rise. Without this oversight existing developments could become hazards and important public infrastructure could become threatened, which could have significant economic consequences for California.

This report has been prepared to address concerns expressed on the issue of sea level rise and the implications for California's economic and social future by members of the Commission at the Commission meeting held on June 1, 2009. The Commissioners requested that staff conduct a survey to assess the extent to which the major grantees and sublessees, and the Commission's lessees have considered the potential impacts of sea level rise on facilities located on sovereign lands.

This report summarizes the results of the survey (Appendix), and the efforts of California, federal agencies, and other coastal states to address sea level rise. The report will also discuss the legal implications of sea level rise on the state's tideland boundaries and offer recommendations to better assess the impacts of sea level rise on existing facilities, as well as future development proposals that may be considered by the Commission. The recommendations include proposed changes to the Commission's application package to incorporate a sea level rise analysis, if appropriate, as well as other actions staff can implement to lessen the impacts of sea level rise, some of which may require additional budgetary appropriations in order to achieve.

# Introduction and Background

The Commission has jurisdiction over all ungranted tidelands and submerged lands within the state. Such lands include, but are not limited, to the beds of more than 120 navigable rivers and sloughs, nearly 40 navigable lakes, tidal bays, inlets, straits, lagoons and estuaries, and the three-mile wide band of tide and submerged lands adjacent to the coast and offshore islands of the State. The Commission has certain residual and review authority for tide and submerged lands legislatively granted in trust to local jurisdictions (Public Resources Code §6301 and §6306). All sovereign lands, granted or ungranted, are impressed with the Common Law Public Trust, which governs the uses to which these lands may be put.

The California Legislature has transferred, by statute, certain sovereign lands in trust to 85 cities, counties, and harbor districts. These lands are known as "granted lands" and include the major ports of Los Angeles, Long Beach, San Diego, San Francisco, Oakland, Richmond, Benicia, and Eureka. Commission staff monitors the granted lands to ensure compliance with the terms of the statutory grants, the California Constitution and the Public Trust Doctrine.



On August 10, 2009, Commission staff sent out 104 surveys to all its major grantees and lessees of major facilities along the coast and San Francisco Bay. Of those 104 surveys, 40 responses were received. All of the survey results are included in Appendix A. The survey included questions related to identifying existing facilities and the life expectancy of these facilities; whether the respondent has considered the effect of sea level rise on its facilities; how its facilities would be impacted by a sea level rise of 16" and 55" (projected increases in sea level rise by the years 2050 and 2100); what actions the respondents were considering to address sea level rise, including an estimate of cost; and whether the respondents were considering adaptation strategies to mitigate for sea level rise. Based on the answers provided, it became apparent to Commission staff that the majority of the respondents have not yet begun to comprehensively consider the impacts of sea level rise. Those respondents that have considered sea level rise are summarized in this report.

Source: *Port of San Francisco*

Source: *Port of San Francisco*

## Grantees

The Port of San Francisco responded that its facilities have a life expectancy of 100 years. The facilities maintained by the Port of Oakland have a projected life expectancy of 50 years. Both Ports responded that its facilities would be impacted by occasional to frequent flooding based on sea level rises of 16" and 55". In addition, both Ports believe that adaptation strategies to address sea level rise in the Bay Area must be considered on a regional and state level, such as the proposed amendments to the San Francisco Bay Conservation and Development Commission's Bay Plan, a more detailed discussion of which occurs later in this Report.

The San Diego Unified Port District (SDUPD) responded that the life expectancy of its facilities span from 30 – 50 years. Many of its existing facilities would not be greatly impacted by a sea level rise of 16"; however a 55" rise in the sea level would likely result in substantial impacts and potential inundation of certain facilities in both urban and wildlife areas. The SDUPD's environmental review process requires the consideration of sea level rise for substantial modifications to existing facilities and for all new development. The SDUPD will be preparing a Climate Action Plan that will include identifying strategies to adapt to the effects of climate change and sea level rise.

The Port of Los Angeles (POLA) reported that most of its facilities are designed for a 50-year life expectancy. The Port responded that some possible flooding and wave damage would occur from a 55" rise in sea level. POLA is planning a study to identify vulnerable facilities and developing a response option analysis plan and will also be identifying sea level rise considerations in its design guidelines.

## Lessees

Several of the respondents maintain marine terminals and oil and gas facilities on sovereign lands. These lessees generally concluded that their facilities will not be impacted by sea level rise.

*Offshore Oil Island White, Long Beach*

# California Efforts

At the closing of the Governor's Global Climate Summit 2 on October 2, 2009, Governor Schwarzenegger joined 30 global leaders in signing a declaration reaffirming the Goals of the 2008 Global Climate Solutions Declaration. The declaration acknowledges the need for greater efforts in the fight against global warming, including climate change.[5]

In California, a myriad of state agencies, departments, boards, commissions, and universities are involved in California's efforts in addressing climate change and sea level rise. This report will summarize some of the major efforts underway in California.

***Executive Order S-13-08***

On November 14, 2008, Governor Schwarzenegger signed Executive Order S-13-08 to create statewide consistency in planning for sea level rise. The executive order calls for, among other things, the completion of a Sea Level Rise Assessment Report, the consideration of sea level rise scenarios for the years 2050 and 2100, and the development of a Climate Adaptation Strategy.



- The Sea Level Rise Assessment Report will be drafted by an independent panel of experts and completed by December 1, 2010. The report will advise how California should plan for future sea level rise and include information on sea level rise projections, impacts on state infrastructure, and a discussion of future research needs.

- The consideration of sea level rise scenarios for the years 2050 and 2100 shall be conducted by all state agencies under the administration that are planning construction projects in areas vulnerable to sea level rise. The purpose of considering these scenarios is to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. These scenarios should be considered by the relevant state agencies before the final Seal Level Rise Assessment Report is released.

- The Climate Adaptation Strategy will summarize the best known science on climate change impacts to California, assess California's vulnerability to the identified impacts and then outline solutions that can be implemented within and across state agencies to promote resiliency. A 161 page

discussion draft of the Climate Adaptation Strategy, which was developed by the California Natural Resources Agency's Climate Action Team, was released on August 3, 2009 and went through a 45 day public comment period. The discussion draft, among other things, recommends the establishment of a Climate Adaptation Advisory Panel to further assess the state's climate change risks, the consideration of project alternatives that avoid significant new development in areas prone to sea-level rise, and changes to water use policies.

### *California Climate Change Portal*

The California Climate Change Portal is an on-line website containing information on the impacts of climate change on California and the state's policies relating to global warming. It is also the home of the California Climate Change Center, a "virtual" research and information website operated by the California Energy Commission through its Public Interest Energy Research (PIER) Program. The website originally was created in 1998 by the California Energy Commission (CEC) and was expanded into a website Portal to combine the CEC's efforts with input from other state agencies.



### *Climate Action Team*

The Climate Action Team (CAT) was established pursuant to Executive Order S-3-05 signed by Governor Schwarzenegger on June 1, 2005. The CAT is lead by the Secretary of the California Environmental Protection Agency (CalEPA) and includes the Secretary of the Business, Transportation, and Housing Agency, the Secretary of the Department of Food and Agriculture, the Secretary of the Resources Agency, the Chairperson of the Air Resources Board, the Chairperson of the Energy Commission, and the President of the Public Utilities Commission. The members of the CAT coordinate statewide efforts to implement global warming emission reduction programs and the state's Climate Adaptation Strategy. The CAT is also responsible for reporting on the progress made toward meeting the statewide greenhouse gas (GHG) targets that were established in the executive order and further defined under the Global Warming Solutions Act of 2006 (Chapter 488, Statutes of 2006).

To date, the CAT has released three reports pursuant to the mandates of Executive Order S-3-05. The first Assessment Report was released in March 2006, followed by the 2008 Assessment Report, which recommended the development of new climate and sea-level projections. The March 2009 Draft *Biennial Report*, is the latest assessment and includes a discussion on proposed adaptation strategies developed by the Ocean Protection Council and the San Francisco Bay Conservation and

Development Commission to address climate change impacts in coastal areas for existing development, new development and ecosystems. For existing development these strategies include rolling easements, relocating structures from high-risk areas, government purchases of vulnerable properties, seawalls and levees, and planned retreat. Strategies for new development include the use of new building materials, and new designs that help protect development from flooding and storm surges, smart growth and clustered development, mandatory setbacks to restrict development in vulnerable areas, and development of expendable or movable structures in high-risk areas. Ecosystem strategies include regional sediment management planning, beach nourishment, creation of "buffer zones" to allow for wetland migration, creation of new wetlands, and the creation of Marine Protected Areas.[6]

### *California Resources Agency*

The California Resources Agency has a key role in promoting and implementing climate change policies. Pursuant to Governor Schwarzenegger's Executive Order S-13-08, the California Resources Agency was directed to ask the National Academy of Sciences (NAS) to convene an independent panel made up of state, national and international experts to complete the first California Sea Level Rise Assessment Report. The final Sea Level Rise Assessment Report will advise how California should plan for future sea level rise. The report should include: (1) relative sea level rise projections specific to California, taking into account issues such as coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge and land subsidence rates; (2) the range of uncertainty in selected sea level rise projections; (3) a synthesis of existing information on projected sea level rise impacts to state infrastructure (such as roads, public facilities and beaches), natural areas, and coastal and marine ecosystems; and (4) a discussion of future research needs regarding sea level rise for California. The Report is to be completed as soon as possible, but no later than December 1, 2010.

As previously mentioned, in August 2009, the Resources Agency released the *2009 California Climate Adaptation Strategy Discussion Draft (CCAS)*. The CCAS proposes a comprehensive set of recommendations to inform and guide California decision makers in developing policies that will protect the state, its residents and its resources from a range of climate change impacts, including sea level rise.

The Commission, the Ocean Protection Council, California Coastal Conservancy, California Coastal Commission, Department of Fish and Game, State Parks, and the Bay Conservation and Development Commission, as members of the Climate Adaptation Working Group, contributed to the Ocean and Coastal Resources section of the CCAS. The working group identified six priority strategies in addressing climate adaptation for state agencies. The strategies include both near-term (actions which can be initiated or completed by 2010, with statutory or regulatory changes,

and long-term actions (those that will require support from and collaboration with multiple state agencies or that require significant legal or regulatory changes). Three of the strategies deal specifically with sea level rise.[7]

***Strategy 3 State Agencies Should Prepare Sea-Level Rise and Adaptation Plans***

Near-term – By September 2010, the State Lands Commission and other state agencies responsible for the management and regulation of resources and infrastructure subject to potential sea-level rise should prepare agency-specific adaptation plans, guidance, and criteria, as appropriate.

Long-term – State agencies should regularly update, modify, and refine these adaptation guidance documents and plans based on new information.

***Strategy 4 Support Local Planning for Addressing Sea-Level Rise Impacts***

Near-term – The Ocean Protection Council, in consultation with other state resource agencies will coordinate public outreach programs and work to identify possible funding sources to assist state agencies and local governments in revising state and local plans. All State agencies should encourage local jurisdictions to incorporate adaptive strategies when updating plans. Finally, by 2011, or after development of guidance and when funding is secured, all coastal jurisdictions, in coordination with the California Coastal Commission and the San Francisco Bay Conservation and Development Commission, should begin development of amended Local Coastal Plans and general plans that include climate change impacts.



***Strategy 5 Complete a Statewide Sea-Level Rise Vulnerability Assessment Every Five Years***

Long-term action: The Ocean Protection Council, in coordination with other state agencies, should produce a coastal and ocean vulnerability assessment every five years that builds upon existing efforts by the California Energy Commission and other agencies.

***California Coastal Commission***

In 2001, staff of the California Coastal Commission (CCC) prepared a report intended to provide information about sea level rise and to investigate possible effects to California's coast from sea level rise. The report discusses various actions that can be taken in response to sea level rise including hard engineering (seawalls, revetments, breakwaters, levees, etc.), soft engineering (beach nourishment or buffer areas), accommodation/adaptation and retreat.

The CCC's regulatory process currently requires setbacks, review of engineering designs, establishment of wetland buffers, assumption of risk notification to property owners and prohibitions on future seawalls for new developments. The CCC has participated in studies on shoreline change which has led to an improved understanding of shoreline retreat and erosion. The CCC is also coordinating with the California Coastal Conservancy to encourage acquisition of property in high risk areas.[8]

CCC staff consider sea level rise in most applications for projects along the coast -- either for the design of shoreline protection or for the siting of new development. In many cases, project proponents are asked to look at the consequences of a range of sea levels in an effort to understand if and when a property may be really at risk from rising sea level.[9]

A recently approved amendment to the Crescent City Local Coastal Program (LCP) recommends modifications to the LCP's Land Use Plan LUP to address the threat of rising sea level. One of those recommended modifications would "require that all geological, geo-technical, engineering and hydrologic evaluations include in their analyses the effects of sea level rise." The city of Redondo Beach is considering a similar amendment to its LCP.[10]



### *California Energy Commission*

Since 1988, the California Energy Commission (CEC) has played an important role in coordinating activities addressing climate change. The CEC's activities include a number of efforts supporting the California Global Warming Solutions Act of 2006, serving as a member of the CAT and various subgroups, providing policy guidance and monitoring international, national and regional developments that impact clean energy and climate change.[11]

One of the CEC's programs is the Public Interest Energy Research Program (PIER). The PIER program was created in 2001, to research potential impacts of climate change in a variety of areas. One of those research efforts is a March 2009 Paper prepared by the Pacific Institute, *The Impacts of Sea-Level Rise on the California Coast*. This Paper states that, over the past century, sea level has risen nearly eight inches along the California coast, and that modeling scenarios suggest substantial increases in sea level over the coming century. The Paper concludes that sea level rise will inevitably change the character of the California coast, and that adaptation strategies must be evaluated, tested, and implemented if the risks identified are to be reduced or avoided.[12]

### *California Ocean Protection Council*

The Commission is a member of the Ocean Protection Council (OPC). The OPC was created pursuant to the California Ocean Protection Act which was

signed into law in 2004 by Governor Arnold Schwarzenegger.

The OPC will establish policies to guide agencies responsible for ocean protection and will help coordinate California's efforts to adapt to the ocean impacts of climate change. The OPC is working to determine potential impacts along the coast due to sea level rise, including impacts to public infrastructure.[13]

***Delta Protection Commission***

Under the guidance of the Delta Vision Blue Ribbon Task Force, the Delta Protection Commission is in the process of updating its 1995 Land Use and Resource Management Plan which will include policies and recommendations for action that can be taken by local and state government to address the impacts of climate change on the Delta.[14]

***San Francisco Bay Conservation and Development Commission***

The potential impacts to the San Francisco Bay Region based on the current estimates of projected sea level rise will be significant. Impacts include loss of valuable real estate, critical public infrastructure, and natural resources. Since the late 1980s, the San Francisco Bay Conservation and Development Commission (BCDC) has been studying and developing policies to address sea level rise.

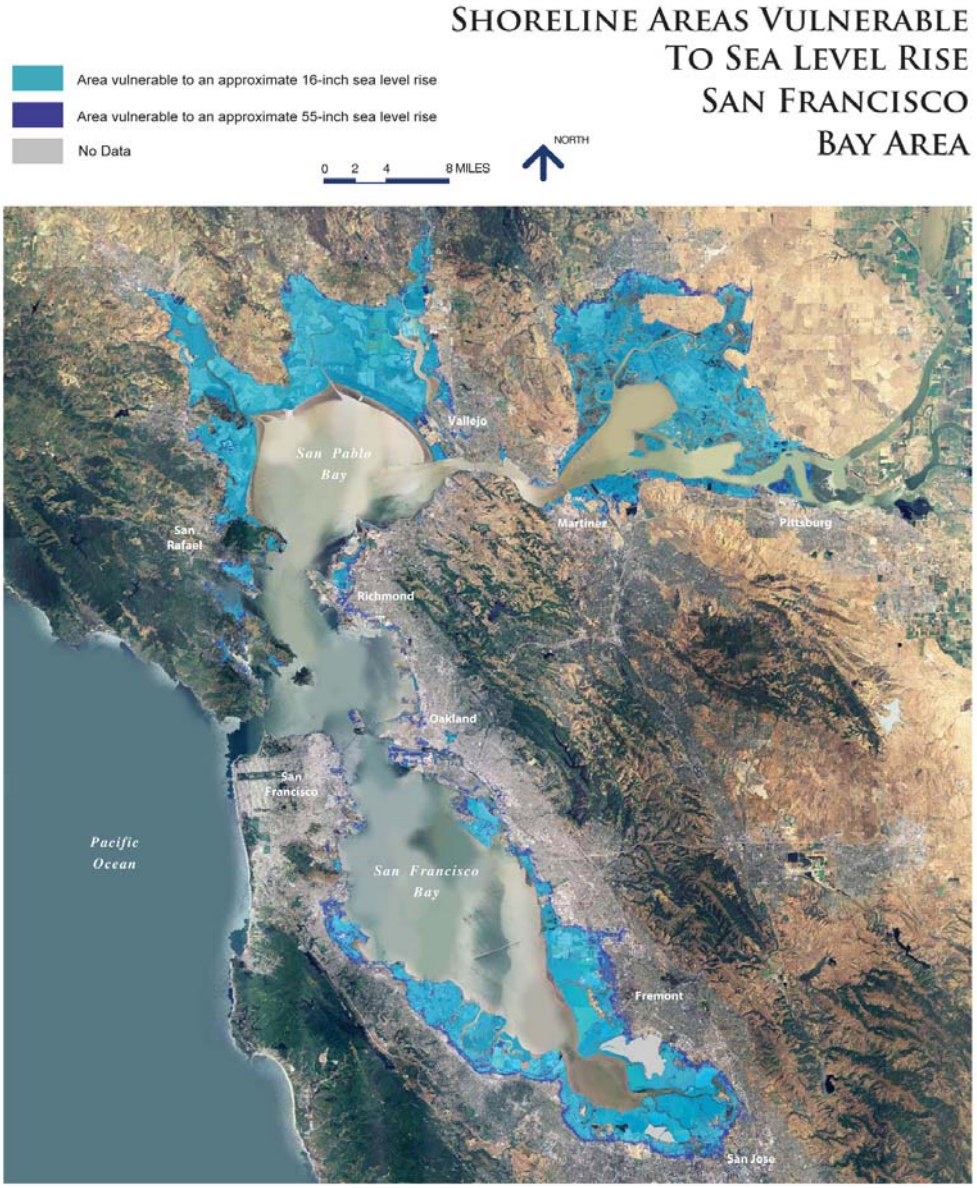
In 2006, BCDC released a series of maps depicting the lands most vulnerable to sea level rise. Using data provided by the United States Geological Survey, BCDC has updated its sea level rise maps that show the low-lying areas around the Bay that are most in danger from projected sea level rise scenarios of 16" and 55".[15]

In response to its 2008 Strategic Plan, BCDC staff issued a staff report on February 27, 2009 titled "Using the Public Trust Doctrine to Adapt to Climate Change in San Francisco Bay," [16] which examines the relationship between the takings clause of the United States Constitution and the Public Trust Doctrine. The staff report concluded that while the Public Trust Doctrine does not give BCDC additional regulatory authority, it can be used to support decisions made by BCDC in its efforts to address the impacts of climate change and sea level rise.

Through its Climate Change Planning Project, BCDC has developed draft findings and policies on climate change and a background report that reflects the current state of knowledge regarding the potential impacts of climate change on the region. The draft staff report issued April 7, 2009, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*,[17] identifies vulnerabilities in the Bay Area's economic and environmental systems, as well as the potential impacts of climate change on public health and safety. The information in the Report provided the basis for BCDC staff's proposed revisions to the San Francisco Bay Plan, which, as of this writing, are under consideration by BCDC.

Earlier this year, BCDC sponsored an international design competition, *Rising Tides*, in an effort to solicit innovative design concepts that address the various design challenges for both existing and future development that is unique to San Francisco Bay.

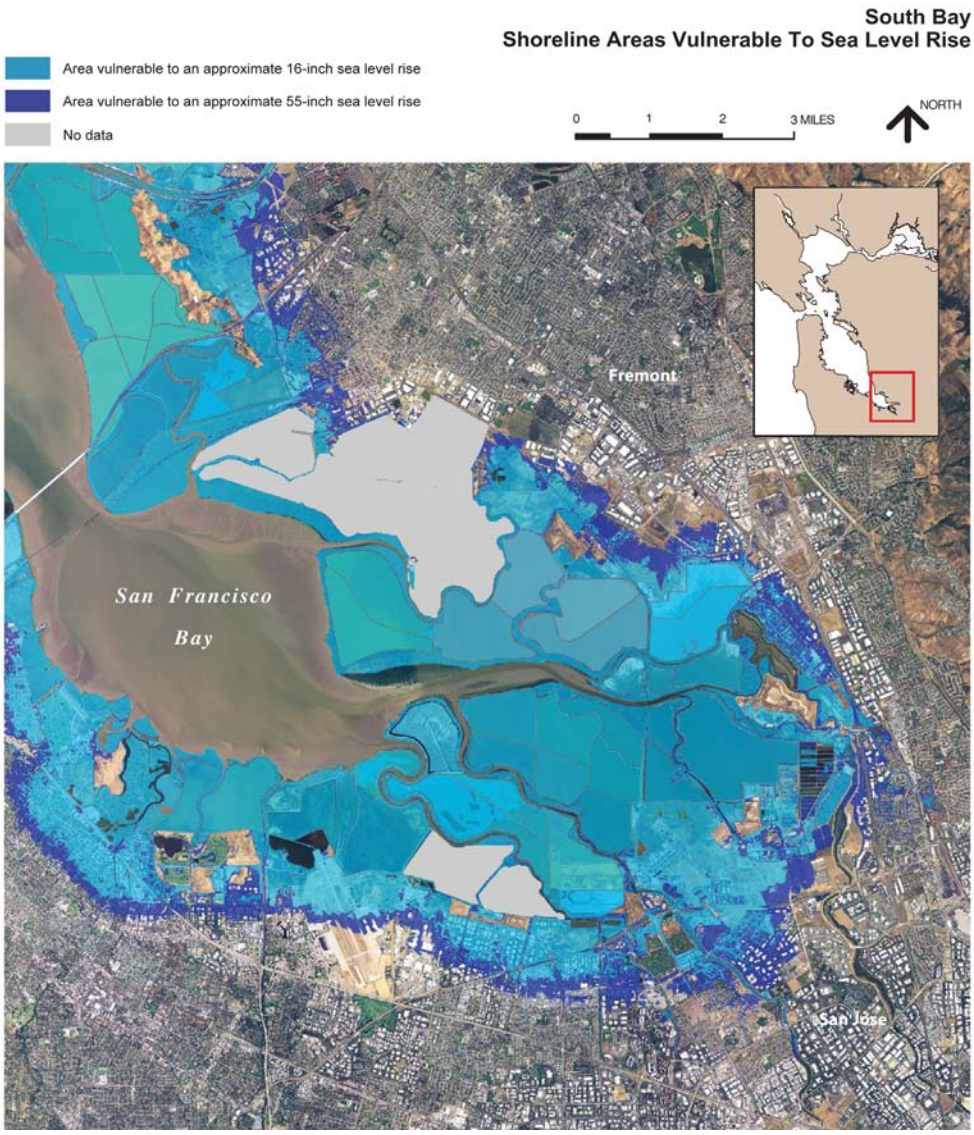
BCDC has formed a partnership with the Netherlands and in late September, at a symposium held in San Francisco, a group of Dutch experts presented strategies to address sea level rise in San Francisco Bay and the Sacramento-San Joaquin Delta. The Dutch strategies focus on determining what types of development should exist in specific areas. High economic value development could continue to exist with the help of levees and seawalls. In other areas, the Dutch suggest "tidal embracing development", involving urban tidal canals or parking lots with underground storm water retention.[18]




Source: *San Francisco Bay Conservation and Development Commission*

Source: Inundation data from Knowles, 2008. Additional salt pond elevation data by Siegel and Bachand, 2002. Aerial imagery is NAIP 2005 data.

DISCLAIMER: Inundation data does not account for existing shoreline protection or wave activity. These maps are for informational purposes only. Users, by their use, agree to hold harmless and blameless the State of California and its representatives and its agents for any liability associated with its use in any form. The maps and data shall not be used to assess actual coastal hazards, insurance requirements, or property values or be used in lieu of Flood Insurance Rate Maps issued by the Federal Emergency Management Agency (FEMA).




Source: *San Francisco Bay Conservation and Development Commission*

Source: Inundation data from Knowles, 2008. Additional salt pond elevation data by Siegel and Bachand, 2002. Inundation data does not account for existing levees or other shoreline protection. Aerial imagery is NAIP 2005 data.

### *Department of Water Resources*

The Department of Water Resources (DWR) is an active member of the state's Climate Action Team. The DWR is responsible for investigating and responding to global climate change as it affects water resources and delivery systems through statewide water planning as set by the California Water Plan. An integrated approach to the Department's activities will allow priorities to be set based on statewide strategic water plans to meet present and future beneficial uses. Formal stakeholder involvement in the Water Plan Advisory Committee will be useful in assisting local agencies responding to climate change impacts by facilitating the dissemination of climate change information and modeling studies.[19]

In October 2008, the DWR released its report, *Managing an Uncertain Future Climate Change Adaptation Strategies for California's Water*, which proposes

adaptation strategies for state and local water managers in the face of a changing climate. The report recommends that the state establish an interim range of sea level rise projections for short-term planning purposes. It also supports the convening of a scientific panel of the National Research Council to provide expert guidance and recommends that the DWR, in collaboration with other state agencies, develop long-range sea level rise scenarios and response strategies to be included in the California Water Plan Update 2013.[20]

### *California Department of Transportation*

Under the direction of the Business, Transportation, and Housing Agency, the California Department of Transportation (Cal Trans) participates as a member of the Climate Adaptation Working Group. Cal Trans and the CEC developed the infrastructure adaptation strategies included in the state's Climate Adaptation Strategy. Those strategies include assessing environmental impacts from climate change in siting and re-licensing of new energy facilities; developing a detailed climate vulnerability assessment and adaptation plan for California's transportation infrastructure; incorporating climate change vulnerability assessment planning tools, policies, and strategies into existing transportation and investment decisions; developing transportation design and engineering standards to minimize climate change risks to vulnerable transportation infrastructure; assessing environmental impacts from climate change in rehabilitating the transportation system and siting of new transportation projects; and incorporating climate change impact considerations into disaster preparedness planning for all transportation modes.[21]

# Federal Efforts

## United States Policy

The U.S. Congress is considering proposals that plan for sea level rise. Most notably, H.R. 2454 (Waxman-Markey) and S. 1733 (Kerry-Boxer), which are commonly referred to as the "cap-and trade" bills, create a National Climate Change Adaptation Program to increase the overall effectiveness of federal climate change adaptation efforts. These bills include specific sections that provide climate change safeguards for natural resources conservation as well as funding for states that carry out adaptation activities.

The Coastal Zone Management Act (CZMA) was passed by Congress in 1972 to address high growth in coastal areas. A 1996 amendment to the CZMA administered by the National Oceanic and Atmospheric Administration (NOAA), called for greater coastal resource management and balancing economic development with conservation. These goals are met through state management coastal programs. These two programs include the National Coastal Zone Management Program and the National Estuarine Research Reserve System. The 1996 amendment also established the Coastal Zone Enhancement Program that allows states to request funding to amend their coastal programs. The CZMA does mention sea level rise and calls for states to "anticipate and plan for sea-level rise ...",[22] but lacks specifics on how states can accomplish this.



### *Department of the Interior*

On September 14, 2009, Ken Salazar, the Secretary of the Interior signed Secretarial Order No. 3289, *Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources*. The Order establishes a framework through which the Department's bureaus will coordinate climate change science and resource management strategies to address the impacts of climate change on tribal lands and the nation's natural and cultural resources. The framework will establish:

- a new Climate Change Response Council within the Office of the Secretary that is responsible for coordinating a strategy among the Department's agencies and bureaus to increase scientific understanding and development of effective adaptive management tools;

° eight regional Climate Change Response Centers to synthesize existing climate change data and management strategies, help resource managers implement those strategies, and conduct public outreach;

° a network of Landscape Conservation Cooperatives that will coordinate with the Department and federal, state and local agencies and partners and the public to develop landscape-level strategies to manage climate change impacts.[23]

The Order suggests possible acquisition of upland habitat and creation of wetlands and other natural filters and barriers to protect against sea level rise and storm surges, and the possible relocation of certain iconic and culturally historic structures.[24]

***U.S. Global Change Research Program***

The U.S. Global Change Research Program (USGCRP) coordinates and integrates federal research on changes in the global environment and the implications for society. It began as a presidential initiative in 1989, and was mandated by Congress in the Global Change Research Act of 1990 (P.L. 101-606), which called for "a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change."[25]

Thirteen departments and agencies participate in the USGCRP. Pursuant to the Global Change Research Act of 1990, the USGCRP is required to prepare annual reports to Congress detailing its achievements and progress. The latest report titled *Our Changing Planet: The U.S. Global Change Research Program for Fiscal Year 2010*[26] was submitted to Congress in October 2009.



## Other Federal Agencies

In January 2009, the U.S. Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS), and the National Oceanic and Atmospheric Administration (NOAA), with additional contributions from the U.S. Department of Transportation, released a report addressing the issues of sea level rise. The report, titled *Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region*, provides a detailed assessment of the effects of sea level rise and examines multiple opportunities for governments and coastal communities to plan for and adapt to rising sea levels. Although the issues apply to coastal regions nationwide, the report focuses on the mid-Atlantic region of the United States, where rates of sea level rise are moderately high, severe storms are fairly common, and a large extent of critical marsh habitat, high population densities, and infrastructure exist in low-lying areas.[27]

One part of adapting to sea level rise is amending flood insurance policies, provisions and plans. The National Flood Insurance Plan (NFIP) contains provisions that restrict certain types of flood proofing in certain Federal Emergency Management Area (FEMA) zones. Incorporating sea level rise considerations into the NFIP would allow rates to reflect changing risk and allow local governments to effectively manage coastal floodplains. FEMA and the National Academy of Sciences supported a study by the Heinz Center recommending to Congress that insurance rates reflect the risks from coastal erosion.[28]

### *National Oceanic and Atmospheric Administration*

The National Oceanic and Atmospheric Administration (NOAA) is a key participating agency in the USGCRP. NOAA's Office of Coastal Resource Management (OCRM), provides national leadership, strategic direction and guidance to state and territory coastal programs and estuarine research reserves. Through its support, either directly or through its partners, the OCRM is helping coastal or ocean managers address the causes and impacts of climate change. The OCRM distributes the CZMA Climate Change and Coastal Hazards E-News Update to keep state and territory coastal program managers and climate change/coastal hazards staff informed about climate change. NOAA also maintains an interactive website, which shows regional trends in sea level, including direction and magnitude of change figures for specific locations.[29]

The OCRM provides coastal managers with information about shoreline management techniques emphasizing "alternative" shoreline management techniques including soft, non-structural, hybrid, or planning and policy approaches. Its online website includes general resource information, case studies and links to other useful resources.[30]

### *U.S. Environmental Protection Agency*

The U.S. Environmental Protection Agency's (EPA) climate change programs and activities are an integral part of the EPA's mission to protect human health and the environment. EPA's Climate Change Web site offers the public the most current and accurate information on the broad issue of climate change.[31]

### *U.S. Geological Survey*

The U.S. Geological Survey (USGS) provides scientific information in an effort to reduce loss of life and property from natural disasters.[32] The USGS is creating a vulnerability index of coastal environments that will aid in determining how coastal environments might physically change due to sea level rise. This Coastal Vulnerability Index (CVI) will be used for long-term resource management plans, national park facilities planning, and assessing long-term threats to cultural and iconic resources. Pilot plans have already been completed for Cape Code National

Seashore in Massachusetts, the Gulf Islands National Seashore in Mississippi and Florida, and Olympic National Park in Washington.[33] In California, the National Park Service is beginning a planning process to adapt the parking and visitor access facilities at the Point Reyes National Seashore to accommodate potential impacts of sea level rise.

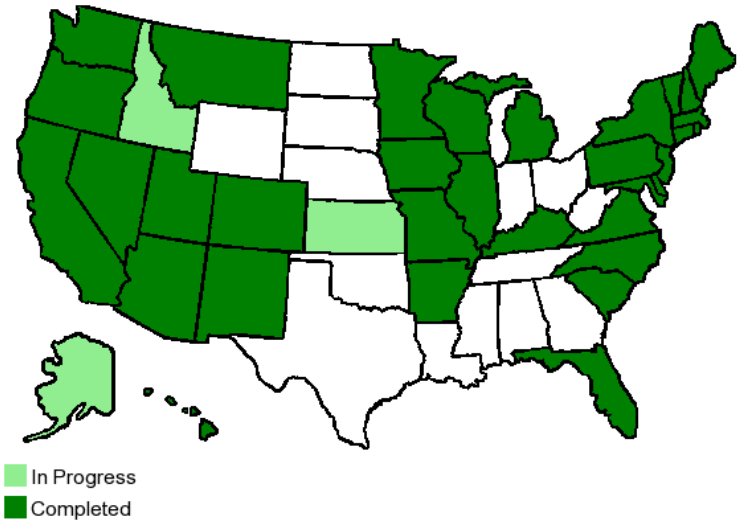
### *U.S. Army Corps of Engineers*

The mission of the U.S. Army Corps of Engineers (Corps) is to, "provide vital public engineering services in peace and war to strengthen our Nations security, energize the economy, and reduce risks from disasters."[34] The Corps is responsible for the design and construction of dams, canals, and flood protection projects.

On July 1, 2009, the USACE issued Circular No. 1165-2-211 which requires that potential sea level rise changes are to be considered in every Corps coastal activity as far inland as the extent of estimated tidal influence. Future sea level rise projections must also be incorporated in the management, planning, engineering, design, construction, operation and maintenance of its projects.[35] The policy will help levee districts plan for the projected gradual changes in sea levels.

# Other Coastal States

Many coastal states are taking steps to address the potential impacts of sea level rise. Governors of several states, including Florida, Louisiana, Maryland, New Jersey, New York, South Carolina, Virginia, and Washington have issued Executive Orders establishing various climate change commissions and advisory committees to consider the potential effects of global climate change, including sea level rise. According to the Pew Center on Global Climate Change, some 36 states have completed or are in the process of completing comprehensive Climate Action Plans. The plans detail steps that the states can take to reduce their contribution to climate change.[36] This report will summarize some of those various state efforts.




**Climate Action Plans**
Source: *Pew Center on Global Climate Change*

On September 18, 2006, the Governors of California, Oregon and Washington announced the *West Coast Governors' Agreement on Ocean Health*.[37] The Agreement launched a proactive regional collaboration to protect and manage the ocean and coastal resources along the entire West Coast, as called for in the recommendations of the U.S. Commission on Ocean Policy and the Pew Oceans Commission. The West Coast states will focus initial efforts, in collaboration with the federal government, on a West Coast-wide assessment of shoreline changes and anticipated impacts to coastal areas and communities due to climate change over the next several decades, and work together to develop actions to mitigate and adapt to the impacts of climate change and related coastal hazards. One of the major tasks identified will focus on the issue of global and local sea level rise and the development of adaptation strategies to address impacts from sea level rise, guidance for coastal adaptation planning, and identification of information and research need for coastal adaptation.

On September 14, 2007, Governor Sarah Palin signed Administrative Order No. 238, officially forming the Alaska Climate Change Sub-Cabinet. The Sub-Cabinet is charged with preparing and implementing an Alaska Climate Change Strategy. This will be a transparent document which deals with state policies for anticipated climate change. The Sub-Cabinet's strategy will discuss building the state's knowledge of the actual and foreseeable effects of climate warming in Alaska; developing appropriate measures and policies to prepare communities in Alaska for the anticipated impacts from climate change; and providing guidance regarding Alaska's participation in regional and national efforts addressing causes and effects of climate change.[38]

On June 4, 2009, Governors of the states of Delaware, Maryland, New Jersey, New York, and Virginia signed the *Mid-Atlantic Governors' Agreement on Ocean Conservation*. The Agreement establishes the Mid-Atlantic Regional Council on the Ocean and will include representatives from each state and the appropriate federal agencies. The Agreement recognizes that the states in the Mid-Atlantic region will benefit by participating in a concerted regional effort focused, initially, on developing an integrated approach to the assessment of infrastructure vulnerability, as well as a collective undertaking to frame sea level rise adaptation strategies to address infrastructure, critical coastal habitat and shoreline management needs.[39]



In Connecticut, the Adaptation Subcommittee of the Governor's Steering Committee on Climate Change (GSC) is assessing the impacts of climate change on infrastructure, natural resources and ecological habitats, public health, and agriculture and will recommend adaptation strategies in accordance with the requirements of Public Act 08-98. The Subcommittee will report to the GSC by early January 2010 on climate change impacts, and by mid-2010, the Subcommittee will report to the legislature on recommendations for changes to programs and laws that would enable state and local governments to adapt to such impacts.[40] Connecticut's Coastal Program has recommended a Habitat Restoration Committee to create new strategies in addressing estuarine restoration that include avoiding restoration of tidal wetlands adjacent to lands where sea inundation could occur. The state is also working to acquire high-resolution digital elevation maps that can be used in coastal hazard planning.[41]

Florida Governor Charlie Crist established the Action Team on Energy and Climate Change (Action Team) by signing Executive Order 07-128 on July 13, 2007. On October 15, 2008, the Action Team submitted its final report on Florida's Energy & Climate Change Action Plan. The Report includes policy recommendations that will provide a framework for climate change adaptation strategies to guide Florida over the coming years and decades. The Action Team recommends that:

- local, state, and regional comprehensive plans be amended based on the best available data, include goals, objectives, and policies that will prepare the state for adapting to the future impacts of climate change, such as sea level rise.
- future policies should use incentives to encourage desired actions, including encouragement not to repeat past decisions that will leave new development exposed to sea level rise and other climate change consequences.
- local governments should review their coastal management elements to determine necessary amendments to make their coastal areas (especially the coastal high - hazard area) resilient to the future impacts of climate change, including sea level rise.
- Florida statutes, regulations, policies, and the Florida Administrative Code should be reviewed by the Florida Attorney General to determine potential conflicts between private property rights and the state and local governments' responsibility to protect communities.[42]

In 2008, the Florida Legislature established the Energy and Climate Commission (Commission). The Commission holds a variety of responsibilities, including administering financial incentive programs; completing annual assessments of Florida's Energy and Climate Change Action Plan; and providing recommendations to the Governor and the Legislature. The Commission will also work cooperatively with other state entities, including the Florida Public Service Commission, the Florida Department of Environmental Protection, the Florida Department of Community Affairs, and the Florida Energy Systems Consortium, to develop state energy and climate change policies and programs, including adaptation strategies.[43]

The state of Maine prohibits the building of structures that have been damaged by storms if there is a reasonable expectation that the new construction could be damaged in the next 100 years.[44] On April 23, 2009, the Maine Legislature signed a Resolve to Evaluate Climate Change Adaptation Options for the State. The Resolve requires the state's Department of Environmental Protection (Department) to create a stakeholder group consisting of representatives from state government, business, industry, trade, and nongovernmental organizations to evaluate options and actions available to prepare for and adapt to the most likely impacts of climate change. The Department is to report recommendations to the Joint Standing Committee on Natural Resources by February 27, 2010. The report may include proposals for legislation that may be considered by Maine's Legislature.[45]

Maryland's Commission on Climate Change (Commission) was formed pursuant to a 2007 Executive Order and is charged with preparing the state's Climate Action Plan. The principal charge of the Commission is to develop a Plan of

Action (the Climate Action Plan) to address the drivers of climate change, to prepare for its likely impacts in Maryland, and to establish goals and timetables for implementation. The Plan was released in August 2008, and includes specific priority policy recommendations to address short-term and long-term adaptation and response measures, planning and policy integration, education and outreach, performance measurement, and where necessary, identifies new legislation and/or modifications to existing laws. The Plan presents the final priority policy recommendations in support of the Commission's vision for protecting Maryland's future economic well-being, environmental heritage and public safety.[46]

The State of Maryland's Coastal Program has an interactive web portal (Shorelines Online) that houses information and data on coastal hazards management and sea level rise. The Coastal Program also works with local governments to integrate various data and mapping into land use planning changes and amendments.[47]

In August 2008, Massachusetts Governor Deval Patrick signed into law the Global Warming Solutions Act (GWSA), making Massachusetts one of the first states in the nation to move forward with a comprehensive regulatory program to address Climate Change. The GWSA created the Climate Change Adaptation Advisory Committee to study and make recommendations on strategies for adapting to climate change. The Advisory Committee's report will be presented to the Legislature by December 31, 2009.[48]



The New York State Legislature created the Sea Level Rise Task Force in 2007, which is charged with applying the best available science to evaluate ways to protect New York's remaining coastal ecosystems and natural habitats, and increase coastal community resilience in the face of sea level rise. The final report, due by January 1, 2011, will include an assessment of the anticipated impacts of sea level rise; recommendations to provide more protective standards for coastal development, wetlands protection, shoreline armoring and post-storm recovery; recommendations of measures to protect and connect habitats to facilitate range shifts, protect and restore critical habitats and ecosystem services; identification and monitoring of climate change effects on natural biota; integrate climate change adaptation strategies into state environmental plans; and recommendations on regulatory and/or statutory alterations to respond to sea level rise.[49]

North Carolina is preparing a risk assessment and mitigation strategy study to evaluate the potential changes in coastal flooding hazards due to sea level rise and changes in storm frequency and intensity associated with climate change in coastal North Carolina. The primary goal of this study is to inform state and federal policy makers on the subject of the sea level rise impacts and foster development of risk management policy.[50]

Oregon's Governor Ted Kulongoski established the Governor's Climate Change Integration Group (Group) in May 2006. The Governor's charge to the

Group is to continue and expand on the work of the Global Warming Advisory Group to develop a climate change strategy for Oregon that provides long-term sustainability for the environment, protect public health, consider social equity, create economic opportunity, and expand public awareness. In January 2008, the Group published its final report titled *A Framework for Addressing Rapid Climate Change*. The report proposes that Oregon takes steps toward developing a framework that will assist individuals, businesses, and governments to incorporate climate change into their planning processes.[51]

Washington Governor Christine O. Gregoire has directed the state's Department of Ecology to evaluate the potential impacts of sea level rise on the state's shoreline. A progress report is to be provided to the Governor by December 31, 2010.[52] The state formed a Climate Advisory Team (CAT) in response to Executive Order 09-05. In February 2008, the CAT published an interim report, *Leading the Way on Climate Change: The Challenge of Our Time*. The interim report includes strategies for incorporating climate change and its impacts into planning and decision making processes. Specific sea level rise strategies include revising state land use, shoreline, and flood control planning statutes and regulations, and clarifying the State Environmental Policy Act (SEPA) to effectively address sea level rise and other climate change impacts; incorporating climate change considerations into emergency planning; incorporating best available sea level rise and other climate change data and information into state and local government planning to promote resiliency of ecological systems and communities; incorporating future sea level rise concerns and other climate change impacts in prioritization for funding, design, and post-project operation and maintenance.[53]

# California State Lands Commission

## Sea Level Rise and Sovereign Boundaries

As sea level continues to rise, it will have an impact on California's sovereign lands and shoreline boundaries. Under the Equal Footing Doctrine, as a fundamental right upon its admission to the Union on September 9, 1850, California took title, in trust as a sovereign state on behalf of its citizens, to the beds of all tidal and navigable waterways within its borders, not previously conveyed by the Spanish or Mexican government. California holds its navigable and tidal waters in a sovereign trust for the public.[54] These sovereign lands or Public Trust lands include tide and submerged lands including those adjacent to the coast and offshore islands of the State and within bays, rivers, streams, sloughs, inlets, straits, estuaries, lagoons, and lakes. As a result of the unique nature of these lands, there are no patents, lists or other documents conveying sovereign lands from the federal government to the State. These lands may only be used for public purposes consistent with the provisions of California's Common Law Public Trust Doctrine.



The societal concept of a public commons regarding waters and access to them, as reflected in what is today referred to as the Public Trust Doctrine, as well as the fact of sea level rise and adaptation to it, have been aspects of human interaction with the intersection of land and water for thousands of years. Emperor Justinian (533 CE) is credited with first codifying, in *Corpus Juris Civilis: Institutes 2.1*, certain ancient and accepted concepts of natural law in described by Gaius in the 2nd Century of the common era. These legal precepts included *"By the law of nature these things are common to mankind – the air, running water, the sea and consequently the shores of the sea."*[55]

Generally, sea level rise is not a recent phenomenon and has been occurring for more than 12,000 years, since the last ice age. This is evidenced by the archaeological record left of early Native American sites offshore of the current California coast.[56]

On tidal waterways, by various statutory and judicial decrees, the landward boundary between sovereign tidelands and the adjacent uplands in California is defined by the ordinary high water mark (OHWM), except for areas affected by fill or artificial accretion, whether the location is in San Francisco Bay, Malibu or San Diego Bay. Cal. Civ. Code § 670 and § 830. The United States Supreme Court has held, with some limited exceptions, that individual states have the right to define the boundaries of and interests in land held in trust for the public.[57]

California's coastal water boundaries are ambulatory, changing as the shoreline erodes or accretes under natural conditions. The common law doctrines of accretion, erosion, and avulsion generally govern changes to water boundaries. Accretion and erosion are "gradual and imperceptible" gains and losses to an upland property, respectively. A boundary marked by a water line is a shifting boundary, going landward with erosion and waterward with accretion.[58] Such changes effectively alter the property boundary, the rationale being that a riparian property owner stands to gain as often as they stand to lose from such gradual, imperceptible changes. Avulsion, on the other hand, is a swift or rapid change in the location of a waterway, typically induced by a flooding event. Changes wrought by avulsion generally do not affect property boundaries. "The augmentation of existing upland by gradual natural accretion alters the boundary of that upland accordingly. When such augmentation occurs as a result of sudden avulsion or by accretion caused by the works of man, however, the boundary is not altered."[59] These rules have been codified under Cal. Civ. Code §§ 1014 and 1015 for rivers and streams and applied by the Courts to tidal and open coast shorelines.[60]

Like avulsion, under California law "artificial" accretion caused by human action does not alter tidal water boundaries: "in a controversy between the state, or its grantees, and the upland owner, artificial accretions belong to the state, or its grantees, as the owner of the tidelands."[61] The rationale for this rule is partly grounded in the policy that certain sovereign public lands cannot be conveyed into private ownership, whether by grant or by artificial means.[62] Natural, gradual and imperceptible changes, which result in accreted lands, generally, are the only way in which an upland property owner may claim ownership of formerly submerged or tidal land. In order to permanently fix a water boundary between the State and an upland owner, the natural shoreline must no longer exist and the State and the upland owner must either enter into an agreement establishing an agreed boundary or litigate the boundary through a quiet title action.

Regardless of whether human activity contributes to the increased levels of greenhouse gases in the atmosphere, which in turn contributes to climate change and an increase in the rate of the rising sea levels, the increase in the rise of the sea remains in the eyes of the law gradual and imperceptible – sea level rise, even taking into account the increase in the rate of the rise, while measureable over periods of years, is still not noticeable or detectable by the naked eye. As such, the current rubric of statutory law and case law governing coastal boundaries in California remains valid and effective in determining the boundaries between California's sovereign ownership of its waterways and the uplands along tidal waterways. As has been the case generally throughout California's legal history, coastal boundaries and the State's sovereign ownership should continue to move with ever shifting sands and seas. But Commission staff should continue to analyze each project on a case by case basis, in determining the boundary between the State's sovereign ownership and uplands along California's coastline and tidal waterways.

## Recommendations

Commission staff has compiled a list of proposed recommended actions for Commission consideration.

1. Direct staff to continue giving careful consideration to the effects of sea level rise, including impacts to hydrology, soils, geology, transportation, recreation, and other resource categories in all environmental determinations. Direct staff to recommend feasible alternatives, project modifications, mitigation, or a combination of these measures, to avoid or reduce significant impacts.

2. Direct staff to undertake an inventory of existing leases to identify improvements/infrastructure vulnerable to projected sea level rises of 16" and 55".

3. Direct staff to add a request for information concerning the potential effect of sea level rise on the proposed project to the Commission's Surface Leasing Application Form, Part III, Section B: Assessment of Environmental Impacts. If applicable, require applicants to indicate how they plan to address sea level rise and what adaptation strategies are planned during the projected life of the project.



4. Consider amending the Commission's Application Package to require that all new coastal development projects consider the implications of and include adaptation strategies for projected sea level rises of 16" and 55", depending on the projected life expectancy of the project.

5. Where appropriate, staff should recommend project modifications that would eliminate or reduce potentially adverse impacts from sea level rise, including adverse impacts on public access.

6. Adopt engineering design standards requiring major facilities to withstand a defined storm event, such as a 100-year storm, taking into account sea level rise over the life of the project.

   The Commission is addressing the effects of rising sea level on marine oil terminals through a revision to its Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS). A revision to the 2007 California Code of Regulations, Title 24, Part 2, California Building Code, Chapter 31F, Marine Oil Terminals includes a new Section 3103F.5.3.4 Sea Level Rise (SLR), which will require all marine oil terminals to consider the predicted sea level rise over the remaining life of the terminal. Upon approval

by the California Building Standards Commission, the revisions should go into effect January 1, 2011.

7. Include a provision in future leases requiring Lessees to comply with any provisions or standards that may be adopted by any regulatory agency that addresses sea level rise.
8. Continue to monitor changes from sea level rise in California and coordinate with and seek advice and expertise from other federal, state, or local agencies on this issue.
9. Give careful consideration to future Boundary Line Agreements and Title Settlements. Include a standard provision in such agreements stating that the Public Trust easement will move with submergence or when subject to the ebb and flow of the tide.
10. Collect current information on the mean high tide line including, if necessary, conducting boundary surveys along the coastline and bays, and possibly some inland waterways.
11. Evaluate structures (wharves, docks, levees, breakwaters, piers, seawalls, flood control structures, etc.) subject to the ocean environment for structural integrity and potential hazards as sea levels rise.
12. Continue to evaluate offshore platforms in state waters based on American Petroleum Institute Recommended Practices.
13. Send the proposed changes to the Commission's Application Package addressing sea level rise to all grantees for their consideration and use.
14. Provide copies of this Report to the survey recipients for their consideration and use and post the Report on the Commission's website.
15. Report back to the Commission in one year on the progress made by Commission staff and its grantees.

It is important to note that additional budget appropriations may be necessary in order for Commission staff to implement Recommendations 2, 10, and 11. Commission staff does not anticipate the need for legislation at this time. However, Commission staff may make further recommendations, including legislation, depending upon the annual review recommended by staff of progress made to address sea level rise.

# Conclusions

The survey results confirm that the Commission's major grantees and lessees are just beginning to address the issue of sea level rise. It is clear that sea level rise will impact sovereign lands under the jurisdiction of the California State Lands Commission. One of the most significant impacts will be to property boundaries from the resultant changes in the elevation of the mean high tide line. In areas with coastal bluffs, sea level rise may increase bluff retreat rates due to higher high tides, storm surges, and continued bluff exposure to wave action. The erosion of coastal bluffs could lead to an increase in demand for shoreline protective devices. All of these impacts could result in a reduction or elimination of public access along the coastline. Potential impacts to the San Francisco Bay/Delta area can result from a rise in sea level and the resulting saltwater intrusions into estuaries, wetlands, freshwater systems and groundwater aquifers. Projected rises in sea level can be expected to compound the vulnerability of Delta islands to levee failure and increase upstream backwater flooding.

The recommendations included in this report are based on what is currently known about climate change and potential sea level rise. The Commission and its staff should continue to coordinate with and seek advice from key stakeholders, including federal, state, and local agencies. Through its participation with other state agencies and departments in developing California's Climate Adaptation Strategy, the Commission will be in the forefront of efforts to mitigate the impacts of climate change and sea level rise on the lands and natural resources under its jurisdiction.

# Appendix

STATE OF CALIFORNIA — ARNOLD SCHWARZENEGGER, *Governor*

**CALIFORNIA STATE LANDS COMMISSION**
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

**PAUL D. THAYER,** *Executive Officer*
(916) 574-1800 FAX (916) 574-1810
*California Relay Service from TDD Phone* **1-800-735-2929**
*from Voice Phone* **1-800-735-2922**

***Contact Phone:*** **(916) 574-1892**
***Contact FAX:*** **(916) 574-1925**

August 10, 2009

Dear Grantee/Lessee/Sublessee:

Subject: Sea Level Rise

As you are probably aware, the California State Lands Commission (Commission) has jurisdiction over sovereign lands underlying the State's navigable waterways. Such lands include, but are not limited to, the beds of more than 120 navigable rivers and sloughs, nearly 40 navigable lakes, and the three-mile wide band of tide and submerged lands adjacent to the coast and offshore islands of the State. All sovereign lands, granted or ungranted, are impressed with the Common Law Public Trust.

These sovereign lands are vulnerable to a range of natural events, including storms, extreme high tides, and rising sea levels. While some of these lands remain undeveloped, a significant portion have been developed either pursuant to a lease from the Commission or pursuant to a legislative grant to a local jurisdiction.

As such, staff of the Commission has been asked to assess the extent to which major users of state-owned sovereign lands have considered the potential impacts of sea level rise on facilities that are located on sovereign lands and has prepared the attached survey questionnaire in an effort to gather this information. If you could, please take a few moments to answer those survey questions applicable to your operations. If the facilities are subleased, it would be helpful if a copy of the questionnaire could be forwarded to each sublessee for additional response.

It would be appreciated if the survey response could be returned by September 10, 2009, by mail or email to:

Jane E. Smith
Public Land Management Specialist
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202
(smithj@slc.ca.gov)

For your convenience, the questionnaire is also available on the Commission's website at www.slc.ca.gov. If you have any questions, please contact Jane Smith at (916) 574-1892. Thank you, in advance, for your participation.

Sincerely,

Barbara Dugal, Chief
Land Management Division

Attachment
cc: Jane Smith

| Questions | Response: City of Benicia |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | (1) First Street Promenade, (2) Fishing Pier, (3) East Fifth Street Pier, Marina |
| What is the estimated remaining life expectancy of these facilities? | (1)-Indefinite, (2)-10 years, (3)-Indefinite |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Yes. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | BCDC |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 16"- No effect, 55"- Damage to 5th Street Pier |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | 5th Street Pier will need repair or, more likely, demolition. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | Tens of thousands of dollars to modify/remove. No plans for new construction. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Not Necessary |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No additional shoreline development anticipated. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Possibly levee construction in selected areas. |

| Questions | Response: City of Capitola |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Capitola Wharf |
| What is the estimated remaining life expectancy of these facilities? | With continued maintenance and piling replacement, the structure could reasonably be expected to last another 20-50 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | A 16"-55" rise in sea level would not compromise use of this structure although the damage caused by storm events could be anticipated to increase as wave action would break higher on the structure. |
| Have you observed any impacts to your facilities from sea level rise? | No |
| What actions are you considering to address sea level rise on existing or proposed facilities? | N/A |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | To mitigate sea level rise, the structure would need to be rebuilt at a higher elevation. The cost would be in the millions. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Not yet |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Not at this time. |

| Questions | Response: Carmel Area Water District |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Watershed Facilities |
| What is the estimated remaining life expectancy of these facilities? | 50 plus years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | We view this as a regional or higher issue. District will not fund protection until situation clarifies. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | 16"- no impact, 50"- no dry weather impact |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | No. |
| Have you observed any impacts to your facilities from sea level rise? | Facilities are designed for 100 year flood. Access to facilities would need modification. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | Modifications cost unknown. New facilities would cost approximately 100 million dollars. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | N/A |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No unmet needs |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |

| Questions | Response: City of Carpinteria |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Pier, crude oil and natural gas transmission lines, electrical transmission lines |
| What is the estimated remaining life expectancy of these facilities? | 30 years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 16" - probably no effect 55" - require pier deck to be raised |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Yes, City is in the process with a Army Corps storm wave damage reduction study. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Not at this time. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | 55" sea rise would flood low lying areas at high tide. The City would need major government assistance in this scenario. |

| Questions | Response: City of Hermosa Beach |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Pier |
| What is the estimated remaining life expectancy of these facilities? | We will maintain in perpetuity. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | We are most concerned about beach front facilities and homes. We'll probably be able to deal with 16" but 55"!!! |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this time. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | We have not, but seawalls may not handle 55" rise! |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Not at this time. |
| | This survey has certainly quantified the seriousness of the situation. |

| Questions | Response: City of Laguna Beach |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | None |
| What is the estimated remaining life expectancy of these facilities? | |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | |
| Have you observed any impacts to your facilities from sea level rise? | |
| What actions are you considering to address sea level rise on existing or proposed facilities? | |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | |

| Questions | Response: City of Long Beach |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Facilities exist on land, container piers and terminals. |
| What is the estimated remaining life expectancy of these facilities? | Estimated life of facilities is 25 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Timeline for projected sea level rises exceed economic life of facilities. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | No. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

| Questions | Response: Petro-Diamond Terminal, Long Beach |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Petro-Diamond Terminal Company 1920 Lugger Way Long Beach, CA / POLB - Channel 2 - Pier B |
| What is the estimated remaining life expectancy of these facilities? | 50 years + |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No, motems in process. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Little impact |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None yet - Depends on outcomes of Motems Analysis |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No - Dock is property of Port of Long Beach |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |

| Questions | Response: Port of L.A. |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Automobile (1), Breakbulk (3), Dry Bulk (2), Liquid Bulk (7), Passenger/Ferry (2), Warehouse (4), 7,500 acres (4,300 land/3,200 water), 17 Marinas (3,800 recreational boat slips), 270 Berths, 43 miles of Waterfront, 1 Recreational Beach, 1 Fishing Pier |
| What is the estimated remaining life expectancy of these facilities? | Estimated life varies per facility and use. Most facilities are designed to a 50 year life. In practice these structures will and have a longer useful life. While some structures are approaching 100 years of port service, many of the current container terminals range in age between 30-70 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Sea level rise was considered during preparation of the Port's 2020 Plan (late 1980's). At that time it was recommended not to consider the effect of sea level rise because the design life of the facilities and equipment was less than the expected time frame for sea level rise to make any impact on operations. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | Unknown |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | No major impacts anticipated with a 16" rise. Possible flooding and wave damage at a 55" rise. Other potential impacts may occur due to a rise in ground water (uplift forces on tanks) and negative effects on depth sensitive plant life. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | We are currently planning to conduct a study to identify vulnerable facilities and develop a response option analysis plan. We will also be identifying sea level rise considerations in our design guidelines. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Not at this time. We will wait for completion of our vulnerability and option analysis before modifying our permits. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Not at this time |

| Questions | Response: Metropolitan Water District of Southern, CA |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | N/A |
| What is the estimated remaining life expectancy of these facilities? | N/A |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | N/A |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | N/A |
| Have you observed any impacts to your facilities from sea level rise? | N/A |
| What actions are you considering to address sea level rise on existing or proposed facilities? | No facilities that may impacted by rising sea levels. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | Cost estimates have not been done as there has been no action taken to address sea level rise on proposed Metropolitan facilities. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | N/A |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | The effects of sea level rise have not been evaluated because Metropolitan does not have existing facilities nor proposed that would or were anticipated to be affected. |

| Questions | Response: City of Monterey |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Three wharves, Marina, Cannery Row commercial district |
| What is the estimated remaining life expectancy of these facilities? | N/A |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Not to date |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | N/A |
| Have you observed any impacts to your facilities from sea level rise? | N/A |
| What actions are you considering to address sea level rise on existing or proposed facilities? | City is working with a regional workgroup to determine the impacts of coastal erosion and as level rise. Workgroup includes: National Marine Sanctuary, CA Coastal Commission, subject matter experts, public utility reps, local government reps. Group published an initial study, "Coastal Regional Sediment Management Plan for Southern Monterey Bay." |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | N/A |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Land use controls, structural changes, nonstructural changes |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |

| Questions | Response: City of Newport Beach |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Mostly residential (75%) & commercial (25%). Almost all of these properties are on private waterfront property. |
| What is the estimated remaining life expectancy of these facilities? | Difficult to estimate, due to hundreds of property owners around the harbor. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Yes. Our Harbor Area Management Plan (soon to be adopted) addresses sea level rise. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | Projections based on various reports, suggesting a 1-3' rise by 2100. |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Possible flooding over most of our bulkheads which are to a mean low low water when coupled with storm surge. |
| Have you observed any impacts to your facilities from sea level rise? | Not definitively |
| What actions are you considering to address sea level rise on existing or proposed facilities? | Considering changing our design standards for bulkhead height in the coming years. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Increase seawall height. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Yes, See #7. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |

| Questions | Response: Port of Oakland |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | The Port of Oakland (Port) owns and controls approximately 19 miles of waterfront. All the Port's lands are used for airports and related purposes, seaport marine terminals and related purposes, railroad terminals, roadways, utilities, marinas, parks, offices, and other commercial-related businesses, such as Jack London Square and the Airport Business Park. Some of the property on which Oakland International airport, the seaport's marine terminals, and other facilities are located is owned by the City of Oakland, acting by and through its Board of Port Commissioners (the "Port"), subject to a trust imposed pursuant to more than a dozen tideland grants from the State of California. Other property was acquired using money generated from trust land. Where answers to survey questions are different for the Port's three business lines (Seaport, Airport and Commercial Real Estate (CRE)), each is addresses in a separate bullet point. |
| What is the estimated remaining life expectancy of these facilities? | • Seaport: Remaining life expectancy varies, since facilities were originally built and renovated at different times. Wharves, for example, generally are assigned a 50 year asset life. However, some have been rebuilt prior to the end of their useful life due to changes in marine industry. The use of containers to ship cargo, for example, was introduced to the Port less than 50 years ago. Nearly all of the wharves and terminals have been rebuilt to accommodate the change in equipment and technology required by containerization. • Airport: Remaining life expectancy of Airport facilities (runways, aprons, terminal buildings, etc. also varies, with some facilities already past their asset life. The maximum asset life is approximately 50 years. • CRE: Varies, depending on year and type of construction. Most structures and improvements in the CRE area have an asset life shorter than 50 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | •Seaport: To some degree. Wharves and container cranes are designed to accommodate some variation in sea level rise (tidal ranges and moderate storm surge) and different ship configurations. Port staff is monitoring the studies and reports prepared by the State of California's Climate Action Team and by the San Francisco Bay Conservation and Development Commission (BCDC). • Airport: Effects on the main South Field runway are being studied. According to the 2009 draft "Improvements Strategy Report for Perimeter Dike, Oakland International Airport" (ISR), by URS Corporation, it is estimated that the dike can support 36 inches of sea level rise at Mean High High Water (MWWH). The ISR for the perimeter dike evaluated flood, seepage, stability, and seismic, as well as sea level rise issues. •CRE: It is not known at this time. BCDC is developing a Climate Change Adaptation Strategy that will address impacts to the shoreline. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | For discussion purposes, Port staff is using a projection of 55" in sea level rise by 2100. This represents the high end range of projcted sea level rise as presented in the State of California's "DRAFT 2009 Climate Action Team Biennial Report to the Governor and Legislature" (March 2009). |

| Questions | Response: Port of Oakland |
|---|---|
| How would these facilities be impacted by a sea level rise of 16" and 55"? | • Seaport – According to the BCDC draft staff report, "Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline", April 7, 2009, Bay Area ports are most vulnerable in terms of their broader logistics chain, with difficulty moving goods via highways and rail. Flooding of low-lying areas is expected to impact regional goods movement. The region's ports are projected to experience moderate flooding of 4-20% of total acreage. See the enclosed map of the Port of Oakland area, which is excerpted from the BCDC draft staff report (p. 75, Figure 2.6, Central Bay Transportation Network and Shoreline Priority Use Areas Vulnerable to Sea Level Rise). • Airport – The dike can currently support 36" of sea level rise at MHHW (7 ft). • CRE – It is not known at this time. BCDC is developing a Climate Change Adaptation Strategy that will address impacts to the shoreline. |
| Have you observed any impacts to your facilities from sea level rise? | No impacts of sea level rise are yet apparent in Port facilities. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | •Seaport: Port staff are monitoring current sea level rise projections. As facilities are redeveloped, engineers will consider the effect of sea level rise over the life of each project. • Airport: Per the ISR for Perimeter Dike, recommendations for improvements include raising portions of the dike that are lower than 12ft (still water level plus two feet) and raising portions of the dike crest (total water plus two feet). • CRE: None at this time. Project life of CRE facilities is generally less than the sea level rise planning horizon. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | •Seaport: No. •Airport: Estimated costs for improvements to the perimeter dike will encompass flood protection, stability, seismic safety, and sea level rise. •CRE: No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | •Seaport: Not yet. Best practices regarding such strategies have not yet been developed for shoreline-dependent industries. •Airport: Other ideas have been discussed, but they are more involved and costly than shoring up the dike. •CRE: Not yet. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | The Port of Oakland does not issue development permits to tenants and entities within its planning jurisdiction. While sea level rise is not yet addressed in such permit, it may be in the future. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | • Seaport – Accurate and updated projections about the timing and scale of sea level rise are best provided by state, national and international agencies. Best management practices concerning treatment of sea level rise in long-range planning and project-specific design and construction should be developed and promulgated by national and international bodies. •Airport – Yes. One obstacle is getting other property owners that are adjacent/upstream from the Oakland International Airport to address sea level rise issues that could impact the airport. For example, if San Leandro does not improve their perimeter dike, OAK could be flooded in the south-eastern portion of the airport. Funding for sea level rise-related improvements will be important. •CRE – Yes. One obstacle is getting other property owners that are adjacent/upstream from the Port to address sea level rise issues that could impact the Port property. |

| Questions | Response: City of Oceanside |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Breakwaters (2), fishing pier (1) including restaurant, restroom & bait shop, storm drain outlets |
| What is the estimated remaining life expectancy of these facilities? | Breakwater - 30 years, Fishing Pier & Buildings - 20 years, Storm Drains - 10 years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 16" - probably no impact, 55" - possibly some wave run-up |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

| Questions | Response: Orange County, Dana Point Harbor |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Two marinas (2,400 slips, visitor docks, boat launch, surface boat storage, boat rental, shipyard, fuel dock, yacht clubs, beach area with non-motorized vessel hand launch, Ocean Institute (Education & research facility), Sailing & Events Center, Retail, restaurants, offices, sports fishing, harbor, patrol, commercial fishing, fishing pier, park areas, parking, roads, bridge |
| What is the estimated remaining life expectancy of these facilities? | A 75 year design life for the concrete structures and 100+ for breakwater. U.S. Army Corps of Engineers would have best info for Design Life of the facilities contained in the Breakwater and Quay Wall. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Not at this time. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Qauy Wall and Launch Ramp at 10 MLLW (Approx 7.28' Elevation) The Breakwater is at 14 MLLW (approx 11.28' Elevation) Extreme High Tide in the 8' range therefore existing approx 2 feet of freeboard. So an increase of 16" leaves approx 8" of freeboard and a 55" rise over tops by approximately 31" at an extreme high tide of 8'. |
| Have you observed any impacts to your facilities from sea level rise? | Not at this time. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this time. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Not at this time. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Not at this time. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Not at this time. |

| Questions | Response: Orange County (OC Parks) |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Marina facilities at Newport Dunes and Sunset Aquatic Marina. Floating dock systems with bulkhead shore protection at various locations in Newport Beach and ecological preserve at Upper Newport Bay. |
| What is the estimated remaining life expectancy of these facilities? | Original construction of the seawall structures occurred in the late 1960's/early 70's. Given an estimated design life of 50 years, many of the structures are showing wear and will be due for rehabilitation in the next 5 to 10 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Yes. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | Sea level rise was estimated at 20cm per century (CCSTWS, 2002) in the design of the existing structures. Guidelines related to predictions associated with accelerated sea level rise in 50 to 100 years have not been adopted. |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | The lease areas are home to critical habitat, recreational facilities, public infrastructure and valuable real estate. Many of the existing seawalls would be overtopped, an increase in flooding and erosion would be expected and ecosystems would change. |
| Have you observed any impacts to your facilities from sea level rise? | No. Tide gauge data from La Jolla suggest that local sea level off southern California rose more slowly than the predicted 20 cm per century since about 1980 (Flick, R.E. and L.C. Ewing, 2009). |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this point. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Not at this time. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Not at this time. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | A better understanding of the climate forecasts is needed which wold facilitate better planning and adaptation requirements. A dedicated state-wide program should be implemented to collect data to make reliable assessments and projections of mean sea level rise. Assistance would be needed for a monitoring program to observe and mark maximum runup elevations to determine locations most vulnerable to damage now, and therefore most vulnerable to SLR in the future. |

| Questions | Response: City of Pittsburg |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Four private terminals that operate within Granted Lands: Tesero Refinery, Isle Capital, USS/POSCO Industries, Dow Chemical Company |
| What is the estimated remaining life expectancy of these facilities? | All facilities in continuous operation, with no plans to cease operations. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Not to our knowledge. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | All of these facilities are well above 6' at the shoreline. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | No. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | N/A |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | N/A |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Yes, we will make sure that any future permits address the projected rise in sea level. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Not at this time. |



| Questions | City of Richmond |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Terminal 1,3 & 4 in State Lands area. |
| What is the estimated remaining life expectancy of these facilities? | Terminal 1 & 4 are beyond service life but functioning; terminal 3 is expecting to provide another additional 20 years of service. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Yes. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | BCDC; GIS maps. 1' rise model. |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 3' - tidal changes 16" - no changes 10' - above MSL 16' - no effect 55' effect: during high tide & storm surge. Some areas may experience flooding & damage due to storm surge. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | Needs further study. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | Needs further study. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Use shoreline protection structures such as rip-rap & seawalls. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No permit authority; port not a regulatory agency. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Needs further studies; SLC can provide funding. |

| Questions | Response: San Diego- Mission Beach |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Amusement rides, historic roller coaster built in 1925. |
| What is the estimated remaining life expectancy of these facilities? | Indefinite, National landmark |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Not sure. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this time. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

| Questions | Response: Youth Tennis of San Diego |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Tennis Facility |
| What is the estimated remaining life expectancy of these facilities? | 60 plus years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | N/A - We are not close enough to the sea to be affected. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | N/A |
| Have you observed any impacts to your facilities from sea level rise? | N/A |
| What actions are you considering to address sea level rise on existing or proposed facilities? | N/A |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | N/A |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | N/A |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |

| Questions | Response: Port of San Francisco |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | The Port of S.F. manages and regulates 7 1/2 miles of S.F. Bay waterfront properties including piers, wharfs, seawalls, breakwaters, waterfront buildings and sheds, ferry terminals, ballpark, marina, roadways, and elaborate utility infrastructure systems. |
| What is the estimated remaining life expectancy of these facilities? | These facilities are continuously inspected and maintained leading to a 100 + year life expectancy. A number of the Port's facilities are condemned or severely load-restricted and may not be improved . |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | The Port is participating in two working groups to examine the consequences of sea level rise, one sponsored by the S.F. Planning and Urban Research Association (SPUR) and the other by Mayor Gavin Newsom. The Port is also reviewing proposed amendments to the BCDC Bay Plan which would set forth findings related to sea level rise and construction in current or future floodplains. To date, no construction standards or restrictions to account for sea level rise have been developed by the Port. Without new flood control measures, rising sea level will eventually cause flooding of future facilities. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | The Port is familiar with the sea level rise projections provided in Question #5 below, but has not adopted a standard for building code purposes. |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | A 16" sea level rise will cause flooding of some of the Port's facilities. A 55" sea level rise will cause frequent flooding of the majority of the Port's facilities including the waterfront roadway, the Embarcadero and portions of Mission Bay. |
| Have you observed any impacts to your facilities from sea level rise? | Not to date. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | The Port is willing to participate in a Bay Area statewide working group to develop options which could be installed to mitigate the impacts of sea level rise. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No, the mitigation options need to be developed first. Since the Port has significant existing infrastructure that has been designed and constructed to yesterday's sea level elevation, sea level rise solutions requiring modification to the Port's existing structures will be very costly. Local solutions such as creating dikes or barrier walls at the water or piers edge will be costly, and difficult to install and maintain. Elevating existing structures above the anticipated sea level rise is expected to be cost-prohibitive. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Given the full nature and elevation of downtown S.F., sea level rise is a matter for Citywide analysis and planning. Given the constructed nature of the Port's waterfront, abandonment of the existing S.F. waterfront by allowing sea level rise to inundate and reclaim these lands is not a reasonable solution. Engineering solutions to sea level rise, developed through a local and/or regional planning effort, would appear to be the only option. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | The development of building code requirements will depend on State of California consensus regarding projected levels of sea level rise and coordination with regional entities such as the U.S. Army Corps of Engineers and FEMA. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | See response to #7 |

| Questions | Response: Port of San Luis Harbor District |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | 2 wood piers, travel hoist boat launch, floating docks for trailer boat launch, moorings, maintenance office, retail buildings on land filled areas |
| What is the estimated remaining life expectancy of these facilities? | 50 + years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Wave run studies conducted prior to construction of restroom facilities in 2008. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | 100 year projections from marine environmental firm. |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 16"- minimal impact 55" - serious issues to functionality of harbor district |
| Have you observed any impacts to your facilities from sea level rise? | No |
| What actions are you considering to address sea level rise on existing or proposed facilities? | Design for increased elevation at first floor level |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | We have no options for planned retreat, etc. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |

| Questions | Response: San Mateo Harbor District |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Pillar Point Harbor: 369 Berth Commercial, sport fishing, and recreational boating harbor; 3 piers (one closed for safety reasons) 40 public boat moorings and private moorings; inner protective breakwater; outer federally maintained breakwater; boat launch ramp |
| What is the estimated remaining life expectancy of these facilities? | Variable: 10-40 years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | We are doing so as part of our planning priority set. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | Pacific Institute: 1.4 meter rise by end-century. From: State C.A.T. Biennial Report, 2009 |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 16"- Hinged connections for gangways to docks and for utilities needed, shoreline erosion along inner and outer harbor shoreline and trails 55" - All future developments including new bulkheads, above 4ft. Piling extensions, raising piers, trails, parking lots, launch ramps, bulkheads |
| Have you observed any impacts to your facilities from sea level rise? | Extreme high tides now stress gangway and utility hinges. Further erosion of surface beach (outside outer breakwater) threatening highway 1 may be partially attributed to sea level rise. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | See #5 |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | Not yet but will do so: gangway & hinge retrofit |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Bulkheads & seawalls, raising certain facilities, beach nourishment and/or other methods at surfers beach and Princeton beach |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | We will do so when new relevant permits requests arise. None are presently before us. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Grants for gangway & utility connections, inner break wall, shoreline & trail |

| Questions | Response: City of Santa Barbara |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Santa Barbara Harbor included marinas, piers, wharf, breakwater, mooring area, landside parking, and commercial buildings. |
| What is the estimated remaining life expectancy of these facilities? | This question is difficult to answer without qualifying whether or not maintenance , storm and other factors are to be taken into consideration. Assuming that public agencies would continue to operate and maintain these facilities, I would estimate most facilities could easily be around 50 to 75 years from nor or maybe longer. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. Only on a preliminary conceptual basis. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | A sea level rise of 16" would likely not have any significant immediate impact overall. However, a rise of 55" would basically flood or inundate the entire area, destroying most all facilities as currently constructed. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | Nothing specific. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |



| Questions | Response: City of Santa Monica |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Santa Monica Pier, various public restroom facilities, concession stands, parking lots, bike and pedestrian paths, lifeguard stands, and storm drains. |
| What is the estimated remaining life expectancy of these facilities? | Most should last 25 years or more. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | The storm drains would become inundated with ocean water thereby reducing the capacity of the drain. Parking lots, concession stands, bike and pedestrian paths would periodically be flooded. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | None. |

| Questions | Response: City of Vallejo |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Subleased properties, water and sewage treatment, marina and boating operations, U.S. Coast Guard, Marina, Yacht Club, Ferry Terminals and Maintained Facility, Fishing Pier, White Slough, River Front Park, Vallejo Water Front Promenade, Marina Green, City Parks, Sea Walls/breaks and parking lots |
| What is the estimated remaining life expectancy of these facilities? | 1-25 years, a study would be required to access the remaining physical life of these assets with respect to current condition and guidelines being provided by the State |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Not at this time |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Improvements that is well past their life would be implemented in both scenarios, maintaince would need to be increased, and studied, remedial actions and planning guidelines will need to be addressed. |
| Have you observed any impacts to your facilities from sea level rise? | No observable changes that have immediate impact. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | Participate in regional planning efforts to evaluate potential impact and course of action. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No attempt has been made to date to project the impact of the planning guidelines and the impact on existing facilities; planning and new development of SLC impacted property. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Not at this time. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | We believe that the City's planning process will evolve to include considerations for global warming change and rising sea level. We fully expect that the change will be driven by a coordinated regional planning response due to the dynamics of the Bay, Delta, Rivers and tributaries influencing most of the City's situated on the Bay. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | Formalize planning guidelines, measure changes that may be occurring and accurately predict time table, have planning tools made available to assist Agencies in land use assessment, fully understand inter-agency strategies that have impact on other agencies, timely communication to tenants with long term leases to understand and mitigate impacts o f sea level rise, integrate city adopted planning guidelines with other agencies to assure consistency of approaches, methodology, and understanding of long term social and financial impacts. |

| Questions | Response: City of Ventura |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Ventura Pier |
| What is the estimated remaining life expectancy of these facilities? | Indefinite- At this time the City of Ventura does not foresee a time when the pier will cease to exist. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Yes. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | NOAA mean sea level trend: 1.25 +/- 1.82 mm/yr |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Increased maintenance due to wave activity |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | N/A |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No, not at this time. |

| Questions | Response: Port of San Diego |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Nearly 2,500 acres including restrooms, parks, parking lots, businesses, restaurants, marine repair, docking, mooring, sport fishing, beaches, boat launching, yacht clubs, etc. See attached list of Port District's facilities. |
| What is the estimated remaining life expectancy of these facilities? | The life expectancy varies depending on use and renovations. [For example the Broadway Pier was built in 1912 with an expected life span of 50 years. The Pier has been modified significantly twice, and fully structurally upgraded recently. Lastly it has been seismically upgraded and a new Cruise Ship Terminal building is under construction on the Pier today.] The following is a general approximation of the intended lifespan of Port properties. Buildings: 50 years, Marine Structures: 40-50 years, Landscaping: Indefinite, Railroads: 40-50 years, Pavement: 20 years, Utilities: 20-30 years, Other (playgrounds, public art, etc.): 0-30 years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No - not for unmodified use of existing facilities. Yes - for new development and substantial modifications to existing facilities. Our environmental review process requires consideration of sea level rise. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | 16 inches by the end of the century (2100) based on the *Fourth Assessment Report* (2007) and the California Climate Change Centers, *Projecting Future Sea Level* (March 2008). |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Many existing facilities would not be greatly impacted by a rise in sea level of 16" because they are currently at elevation above that (e.g. the Embarcadero areas of the urban downtown waterfront, including piers, are generally at elevations of above 18" above current sea level). There may be areas where facilities would be affected by the 16" rise in sea levels by 2050, including wildlife areas though these would likely adapt. A 55" rise in sea levels would likely result in substantial impacts and potential inundation of some facilities in both urban and wildlife areas. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | The Port is about to embark on a comprehensive Climate Action Plan that will include identifying strategies for adapting to the effects of climate change. The most notable effects of climate change for the Port is sea level rise. New developments are currently factoring a rise in sea level into the design parameters, such as raised pads. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Yes. Adaptation strategies to sea level rise, such as those listed, will be considered and prudent strategies identified as part of the comprehensive Climate Action Plan. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | Yes. Evaluation of exposure to sea level rise as an effect of climate change for new developments and substantial changes to existing facilities is part of our environmental review process. All documents undertaken by the Port in accordance with the California Environmental Quality Act include this consideration. Where the environmental review process identifies necessary measures, including addressing potential sea level rise, such measures are made and included into the Coastal Development Permit issued by the Port. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | The Port is keen to establish dialogue with the State Lands Commission regarding potential adaptation strategies. Opportunities to share research, expertise, and knowledge of examples would be of great use to the Port. |

| Questions | Response: Continental Maritime of San Diego (subsidiary of Northrop Grumman) |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Continental Maritime operates a shipyard on the San Diego Bay and repairs ships at its wharf and piers. The shipyard's landing area is on approximately 14 acres of filled tidelands. The yard has several office and shop buildings located at the site. |
| What is the estimated remaining life expectancy of these facilities? | Fifty (50) years of remaining life is reasonably estimated. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Yes |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | We have relied on the work of Dr. Dan Cayan of the Scripps Institute of Oceanography, here in San Diego. His projections are from 1m to 1.4m by the year 2100. |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | The datum from the top of the shipyard's quay walls, wharf and piers is 12.87' above MLLW. The extreme high tide here in San Diego Bay at our location is 7.75' and an increase of 1.33' (16") by 2050 would leave a height of 3.79'; ostensibly a safe elevation from inundation caused by extreme conditions. Along the Southern California Bight's coastline and especially in the San Diego Bay, storms surges and waves rarely have caused problems. A projection of 3.79' (55") by the year 2100 would only leave a height of .54' (6 1/2") and problems from extreme conditions would occur. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | In long range planning for yard facilities the rise in sea level is being taken into account. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | The most apparent adaptation strategy would be to raise the yard's quay walls and additional fill into the yard's land area. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | None. |

| Questions | General Dynamics, National Steel & Shipbuilding Company |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | General Dynamics, National Steel & Shipbuilding Company (NASSCO) operates a ship construction and repair facility on 81 acres of land and 47 acres of water leased from the Unified Port of San Diego. The facility includes 2 inclined building ways, 1 building dock, 6 piers, and 5912 feet of seawall, quay wall and dock gate waterfront. |
| What is the estimated remaining life expectancy of these facilities? | The overall life expectancy is indefinite. Some structures are nearing the end of their useful life while others are newly constructed and have many years of life remaining. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | The NASSCO shipyard is on average 11.5' above MLLW. An extreme high tide of 8' is still 3.5' below the shipyard's seawalls. A sea level rise of 16" (1.3') would have little or no affect to shipyard operations. A sea level rise of 55" (or 4.6') would result in an unusable shipyard without significant investment. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

| Questions | Response: Aera Energy |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Offshore oil production platform (Emmy); oil and natural gas wells and related facilities located onshore for onshore and offshore oil and gas leases. |
| What is the estimated remaining life expectancy of these facilities? | Not determined. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Assuming the survey concerns possible future sea level rise due to global warming, no. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | See Response to question 3. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | See Response to question 3. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | See Response to question 3. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | See Response to question 3. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | See Response to question 3. |

| Questions | Response: BP West Coast Products LLC (Arco Terminal within Port of Long Beach) |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Marine Terminal (Petroleum) |
| What is the estimated remaining life expectancy of these facilities? | Fifty years + |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | 16" would have minimal impact. 55" would impact loading/offloading operations because of the change in the height of ships versus the height of the on-shore facilities (chiksans), fixed fendering will likely require adjustments as well. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None currently |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | Not at this time. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | We have not addressed the issue of "sea level rise" as of yet, so we are not aware of any unmet needs. |

| Questions | Response: Chevron Estero Terminal |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Existing facilities consist of two offshore loading lines and one wastewater pipeline and associated onshore valve boxes and appurtenances, in addition to a former pier bulkhead. All facilities are "idle" and "on-hold-over status" until appropriate regulatory permits and/or approvals are received to facilitate decommissioning per the existing CSLC lease agreement. |
| What is the estimated remaining life expectancy of these facilities? | As indicated above, facilities will be decommissioned upon receipt of regulatory agency permits/approvals. This is expected to occur within the next 3 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | N/A |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this time. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | N/A |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | N/A |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | N/A |



| Questions | Response: DCOR - Oil Platforms Eva & Esther |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Offshore oil platforms Eva and Esther |
| What is the estimated remaining life expectancy of these facilities? | Based on the most recent Reserve Reports as prepared by an independent Petroleum Engineer, the economic life expectancy of Platform Eva is approximately 17 years and the economic life expectancy of Platform Esther is approximately 11 years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Given the expected economic lives of these facilities, DCOR, LLC has not considered the effect of rising sea levels on the facilities. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Because it is reasonably expected that both facilities will be removed prior to 2050, it is meaningless for us to speculate how the facilities will be impacted by the increased sea levels quoted. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None, because the estimated reaming economic lives of these facilities are less than that point in time in which we may experience a noticeable rise in sea level. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No, due to the reason specified in Answer #7 above. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No, due to the reason specified in Answer #7 above. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

| Questions | Response: Greka Rincon Island |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Rincon Island (offshore oil production facility) and connecting causeway to shore. |
| What is the estimated remaining life expectancy of these facilities? | N/A |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Rising or lower sea levels do not disturn our operations. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Not sure if there will be an impact. |
| Have you observed any impacts to your facilities from sea level rise? | Not currently. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this time. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | None at this time. |

| Questions | Response NRG Energy |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | There are three facilities: 1) El Segundo Power Station, El Segundo, CA 2) CA Encina Power Station, Carlsbad, CA 3) Long Beach Power Station, Long Beach, CA |
| What is the estimated remaining life expectancy of these facilities? | In their current configuration 1) El Segundo: 2017 2) Encina: 2020 3) Long Beach: 2017 However, any of these sites may be repowered with longer life expectancy. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | El Segundo - No impact. Lowest elevation is +20 feet above mean sealevel. Encina - Ni impact. Ground elevation for plant is +60 feet above mean sealevel. Long Beach - May be impacted as the plant elevation is 18 feet below current mean sealevel. Currently protected by an earthen dike. Redevopment would require replacement of the current dike. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | No. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | None. |

| Questions | Response: Pacific Operators Offshore LLC |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | PACOPS operates one onshore facility as located in Ventura County and within the three mile mean tide line adjacent band. PACOPS also operates two offshore oil and gas producing platforms; however these facilities are located in Federal Waters lying beyind the three mile mark. |
| What is the estimated remaining life expectancy of these facilities? | Approximately twenty years. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Remaining project lifetime projections egate the cecessity for such consideration. |
| Have you observed any impacts to your facilities from sea level rise? | No. (See item Five) |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. (See item Five) |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. (See item Five) |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No.None |

| Questions | Response: Tesoro - L.A. Refinery |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Marine Terminal |
| What is the estimated remaining life expectancy of these facilities? | 50 years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Have not considered |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None planned in short term. |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

| Questions | Response: Thums- Long Beach Harbor |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | Thums operates four (4) manmade islands in Long Beach Harbor that function as oil and gas extraction sites. Thums also leases several sites from the Port of Long Beach that function as oil extraction sites or that provide ancillary support to Thums operations (warehouse, offices, processing facilities, maintenance facilities, crew boat/barge facilities, etc.) |
| What is the estimated remaining life expectancy of these facilities? | The estimated remaining life expectancy is approximately 30 years. This estimate is based on the economic life of the operation and is dependent on numerous factors. After the end of operations, future uses/disposition of the islands would be determined by the City of Long Beach. The Port of Long Beach leases would be relinquished to the Port. |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | Not at this time. However, Thums is closely following the possible removal or reconfiguration of the Long Beach Breakwater. This breakwater shelters the islands from open wave impacts and its removal or reconfiguration could have a significant ocean impacts to the islands. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | Per question 2, the operations are estimated to end approximately 10 years before the year 2050. However, assuming the continued presence of the islands, it is reasonable to assume a 16" rise in 2050 would result in increasing threat of wave/storm damage to the islands. This would potentially require modifications to the rock perimeter of the islands and boat/dock facilities (if maintained). A 55" rise by 2100 would likely make the above rock perimeter and boat/dock facility modifications (if maintained) mandatory. The 2050 and 2100 potential impact to the former Port of Long Beach lease would be addressed by the Port of Long Beach. |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None at this time. (Per question 3, the more immediate concern is possible removal/reconfiguration of the Long Beach Breakwater). |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | N/A |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | |

| Questions | Response: Venoco, Inc. |
|---|---|
| What existing facilities are operated and maintained within granted lands or lease premises? | 1) Platform Holly, 2) Ellwood Marine Terminal, 3) Ellwood Pier, 4) Gathering Lines under Suisun Bay, 5) Gathering Lines under Grizzly Slough |
| What is the estimated remaining life expectancy of these facilities? | 1) 30 + years, 2) 5 years, 3) 30 + years, 4) 30 + years, 5) 30 + years |
| Have you or your sublessee considered the effect of a rising sea level on these existing facilities? | No. |
| If yes to 3, what sea level rise projections are you using; and on what are they based? | N/A |
| How would these facilities be impacted by a sea level rise of 16" and 55"? | No impact |
| Have you observed any impacts to your facilities from sea level rise? | No. |
| What actions are you considering to address sea level rise on existing or proposed facilities? | None |
| Have you estimated the cost of modifying existing facilities or constructing new facilities? | No. |
| Have you considered other adaptation strategies to mitigate sea level rise impacts? | No. |
| For Grantees/Public agency only; are you considering modifying your permit requirements? | None. |
| Have you identified any unmet needs? If so, can the State Lands Commission assist? | No. |

# Endnotes

[1]California Climate Change Center, Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment (Draft Paper), available at www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF.
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[3]California Natural Resources Agency, 2009 California Climate Adaptation Strategy Discussion Draft, available at www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-D.PDF.
[4]State of California, Climate Action Team Biennial Report, March 2009 (Draft), available at www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF.
[5]Office of the Governor of the State of California, 30 Global Leaders Sign Declaration In Advance of Next Climate Agreement, Oct. 2, 2009, available at gov.ca.gov/index.php?/press-release/13457.
[6]State of California, Climate Action Team, Biennial Report, March 2009 (Draft).
[7]California Natural Resources Agency, 2009 California Climate Adaptation Strategy Discussion Draft, available at www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-D.PDF.
[8]Staff of the California Coastal Commission, Overview of Sea Level Rise and Some Implications for Coastal California, June 1, 2001, available at www.coastal.ca.gov/climate/SeaLevelRise2001.pdf.
[9]Email from Leslie Ewing, California Coastal Commission, to Jane Smith, Sept. 29, 2009.
[10]Id.
[11]California Climate Change Portal (see climatechange.ca.gov).
[12]California Climate Change Center, The Impacts of Sea-Level Rise on the California Coast, May 2009.
[13]See www.climatechange.ca.gov/policies/ca_activities.html.
[14]Id.
[15]See www.sfbcdc.ca.gov.
[16]Available at www.bcdc.ca.gov/meetings/commission/2009/03-05_Public_Trust_Climate.pdf.
[17]Available at www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf.
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[19]See www.waterplan.water.ca.gov.
[20]Department of Water Resources, Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water, October 2008, available at www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf.

[21]California Natural Resources Agency, 2009 California Climate Adaptation Strategy Discussion Draft.
[22]U.S. Climate Change Science Program. Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region at 414, January 15, 2009, available at www.epa.gov/climatechange/effects/coastal/SAP%204.1%20Final%20Report%2001.15.09.pdf.
[23]U.S. Department of the Interior, Salazar Launches DOI Climate Change Response Strategy, , September 14, 2009, available at www.doi.gov/news/09_News_Releases/091409.html.
[24]Secretary of the Interior, Order No. 3289, Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources, September 14, 2009, available at www.blm.gov/pgdata/etc/medialib/blm/wy/programs/science.Par.90488.File.dat/SO_3289.pdf.
[25]www.globalchange.gov/about.
[26]Available at http://downloads.globalchange.gov/ocp/ocp2010/ocp2010.pdf.
[27]U.S. Geological Survey, "USGS Scientists Are Major Contributors to New Report on Sea-Level Rise," in Sound Waves Monthly Newsletter, March 2009, available at http://soundwaves.usgs.gov/2009/03/pubs1.html.
[28]U.S. Climate Change Science Program. Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region, January 15, 2009.
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[31]See www.epa.gov/climatechange/about.html.
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[33]E. Robert Thieler, S. Jeffress Williams, and Rebecca Beavers, Vulnerability of U.S. National Parks to Sea-Level Rise and Coastal Change. September 2002, available at pubs.usgs.gov/fs/fs095-02/fs095-02.pdf.
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[35]See Department of the Army, U.S. Army Corps of Engineers, Circular No. 1165-2-211, July 1, 2009, available at http://140.194.76.129/publications/eng-circulars/ec1165-2-211/ec1165-2-211.pdf.
[36]See www.pewclimate.org.
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