



Planning Commission Staff Report – Hearing on March 7, 2019

County of Ventura • Resource Management Agency • Planning Division

800 S. Victoria Avenue, Ventura, CA 93009-1740 • (805) 654-2478 • <http://vcrma.org/planning/>

Subject: PLANNING COMMISSION WORK SESSION ON SEA LEVEL RISE IMPACTS, VULNERABILITIES, AND ADAPTATION IN VENTURA COUNTY (PL17-0147)

A. PROJECT INFORMATION

1. **Applicant:** County of Ventura, 800 S. Victoria Ave, Ventura, CA 93009
2. **Project Location:** The coastal areas of unincorporated Ventura County.
3. **Request:** The Planning Division requests that your Commission hold a work session that includes review and consideration of two sea level rise reports and public comments. The Sea Level Rise Vulnerability Assessment Report (Vulnerability Assessment) and the Public Review Draft Sea Level Rise Adaptation Strategies Report (Draft Adaptation Report) represent a starting point to engage the County and community stakeholders on the potential impacts of sea level rise and future strategies to reduce these impacts. Responses from your Commission will be useful as input to help focus planning efforts, pending direction from the Board of Supervisors later in 2019. A list of questions for your Commission is provided at the end of this staff report.
4. **Background:**

Today's work session is intended to discuss the Vulnerability Assessment and the Draft Adaptation Report produced as part of the VC Resilient Coastal Adaptation Project (VC Resilient Project). These reports and the input received during this hearing will be used to draft potential LCP policies for sea level rise. The grant that funded these efforts directs that this Planning Commission hearing function as a work session to inform and engage your Commission and the public on sea level rise, including potential regulatory and adaptive strategy options and their fiscal impacts.

The informational items before your Commission do not represent a final plan, but rather are tools to begin a conversation on how best to adapt to sea level rise in the County unincorporated areas. The best available science to date was used to complete the two reports. There is no one-size fits all approach to increasing community resiliency. Geographic location and existing conditions will be major factors in determining the suitability of any given strategy. Some adaptation strategies will be appropriate for publicly owned beaches and facilities, others more suitable for critical infrastructure. Some strategies should be considered in the near term, others require engineering and financing studies to determine their suitability. Many of the potential strategies would require future grant funding and careful evaluation of land use, zoning, and legal considerations. The intent of the VC Resilient Project is not to provide solutions but to better understand potential exposure and vulnerabilities in the

unincorporated areas, and to generally set the foundation for continued sea level rise planning in Ventura County.

Local Coastal Program Planning Grant

This VC Resilient Project was undertaken after a successful application to the Coastal Commission and California Coastal Conservancy for a Local Coastal Program Planning Grant. On November 15, 2016, the Board of Supervisors authorized Planning Division staff (Staff) to execute the grant agreement with an in-kind contribution for staff time. The VC Resilient Project began in March 2017 and is scheduled to extend through September 2019. It includes the preparation of a Vulnerability Assessment (Exhibit 2), an Adaptation Strategies Report (a draft version is in Exhibit 3), and development of policies for the Local Coastal Program (LCP). If directed by the Board of Supervisors, future grants will be pursued for funding to adopt and certify sea level rise policies in a formal Local Coastal Program (LCP) update at a later time.

Although a comprehensive LCP update to address sea level rise is beyond the scope of this phase of the VC Resilient Project, the goal is to develop preliminary policies that are a step forward in actively planning for sea level rise to protect coastal resources and to minimize impacts to residents, businesses, and visitors.

The County's Coastal Zone

The Ventura County coastline is approximately 43 miles long, with the unincorporated areas extending about 29 miles. The Coastal Area Plan divides the coast into three geographic sub areas: North Coast, Central Coast, and South Coast as shown in Exhibit 4. The North Coast extends 12.3 miles from Rincon Point to the City of Ventura. The Central Coast's 2.8 miles primarily consist of the Hollywood Beach and Silverstrand Beach communities, and the South Coast covers 14.1 miles from the Point Mugu Naval Air Weapons Station to Leo Carrillo State Park. The coastal zone consists of the following geographical areas (also see map in Exhibit 4):

- North Coast Subarea: The steep slopes of the Ventura foothills abut the northern portion of the coastal zone between Rincon Point and the Ventura River. The North Coast is characterized by the close proximity of Highway 101 and the Union Pacific rail line to the ocean. Intermittent strips of land lie between Highway 101 and the coastline, but that land is occupied by six residential communities, two small County beach parks, and the Rincon Parkway. The North Coast is home to about 750 residents, and segments of the population that could be disproportionately vulnerable to exposure from sea level rise including the 25% seniors (65 and over), 35% renters, and 10% Hispanic residents.
- Central Coast Subarea: The central part of the coastal zone is situated between the cities of Ventura, Oxnard and Port Hueneme. Unincorporated areas within the Central Coast subarea primarily consist of wide sandy beaches and active agricultural fields located inland from the coastline. McGrath State Beach, the wetlands of Ormond Beach, and the residential beach communities of Hollywood and Silverstrand are located along this coastline. Adjacent to the shoreline lies the West Montalvo Oil Field, and two residential neighborhoods of Hollywood by the

Sea and Silverstrand. The Central Coast has about 3,200 residents, and segments of the population that could be disproportionately vulnerable to exposure from sea level rise include the 14% seniors (65 and over), 48% renters, and 14% Hispanic.

- South Coast Subarea: The South Coast subarea includes Naval Base Ventura County, agricultural land, and mountainous terrain in the Santa Monica Mountains National Recreation Area. Point Mugu provides day use and camping recreational facilities. A narrow strip of land lies between the Santa Monica Mountains and the ocean, and is primarily occupied by the Pacific Coast Highway, but also includes small beaches and shoreline residential development at the Solromar community. The South Coast is home to about 750 residents and segments of the population that could be disproportionately vulnerable to exposure from sea level rise include of which 18% seniors (65 and over), 41% renters, and 17% Hispanic.

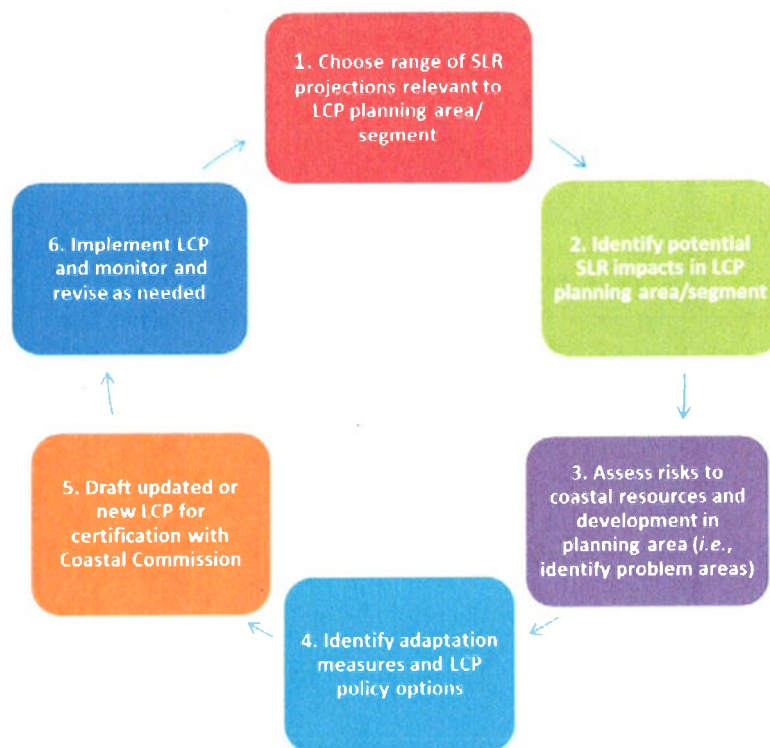
State Guidance on Sea Level Rise

There are two recent State sea level rise guidance documents that are intended to help coastal jurisdictions throughout California in sea level rise planning. These are the State of California Sea Level Rise Guidance Year 2018 Update, adopted by the Ocean Protection Council (OPC) in 2018, and the Sea Level Rise Policy Guidance, certified by the Coastal Commission in 2015. A third document, the Coastal Commission's Residential Adaptation Policy Guidance is pending certification after additional public outreach that is scheduled in early 2019.

The 2018 OPC update to the State of California Sea Level Rise Guidance reflects advances in sea level rise science and addresses the needs of state agencies and local governments as they incorporate sea level rise into their planning, permitting, and investment decisions. The updated Guidance provides: (1) a synthesis of the best available science on sea level rise projections and rates for California based on foundational modeling work completed as part of the 4th California Climate Assessment; (2) a methodology for state agencies and local governments to evaluate those projections and related hazard information in decision-making; and, (3) a list of preferred coastal adaptation approaches.

In August 2015, the Coastal Commission adopted the Sea Level Rise Policy Guidance to aid jurisdictions in addressing sea level rise in LCPs, coastal development permits, and regional adaptation strategies. The document outlines specific issues that policymakers and developers may face as a result of sea level rise, such as extreme weather events, challenges to public access, vulnerability, and maintaining consistency with the California Coastal Act. This policy guidance document also lays out six recommended planning steps to incorporate sea level rise into LCPs. The process leads to development of strategies to reduce identified vulnerabilities and inform further adaptation planning (Figure 1). The two reports completed to date address Steps 1 through 3 and provide initial input on Step 4.

**Figure 1:
California Coastal Commission Guidance for including Sea Level Rise into
Local Coastal Programs**



The policy guidance places strong emphasis on combining existing coastal hazards (storm surge and high tides) with sea level rise into LCP planning, and using adaptation strategies known as “soft” or “green” strategies because they mimic or enhance natural processes and defenses. Nature-based strategies are preferable to “gray” or “hard” strategies that rely on engineered methods, such as seawalls, revetments, and other types of coastal armor, that increase the rate of beach erosion.

Sea Level Rise Science

Recent improvements to the scientific projections of future sea level rise effectively downscale global climate change model projections to more regional California projections that include a range of climate variables and probabilities. Several of the key climate change impacts are likely to include increased temperature, uncertain precipitation changes, wildfire, and accelerating sea level rise due to ocean expansion and polar ice loss.

Much of the scientific advancement in recent years has been in understanding the contribution and rate of ice melt to global sea levels. The rate at which ocean levels rise will largely depend on the rate of melting of the ice. The uncertainties associated with the rate at which ice melts is largely responsible for a wide range in sea level rise

projections in the latter half of the century. Recent science has found that the rate of ice melt has been accelerating. One recently discovered cause for this acceleration results from the melting of the sea ice surrounding the continents. Sea ice has historically buttressed the land ice from rapid melting. As the sea ice disappears, the rate of melting on the continents has been accelerating. Discovery of this new ice melt mechanism, particularly in Antarctica, has identified the potential for an extreme sea level rise scenario (H++ Scenario) that projects more than 10 feet of sea level rise by 2100 (DeConto and Pollard 2016).

Sea level rise can be measured using data collected by tide gauges, although there is vertical land uplift on the North and South Coasts of the County, and subsidence on the Central Coast, that dampen or heightened the exposure of land uses to sea level rise along the coast. Ventura County is situated between the Santa Barbara and the Santa Monica tide gauges. The nearest is the Santa Barbara tide gauge, which reports the local sea level rise rate of approximately 1.01 millimeters per year, with a sporadic historical record. The Santa Monica gauge, in comparison, has fewer gaps in data and shows a higher rate of sea level rise of 1.51 millimeters per year with a longer, more consistent record that averages about a half an inch per decade (Figure 2).

Figure 2:
Plot showing Sea Level Rise Trend from the Santa Monica Tide Gauge

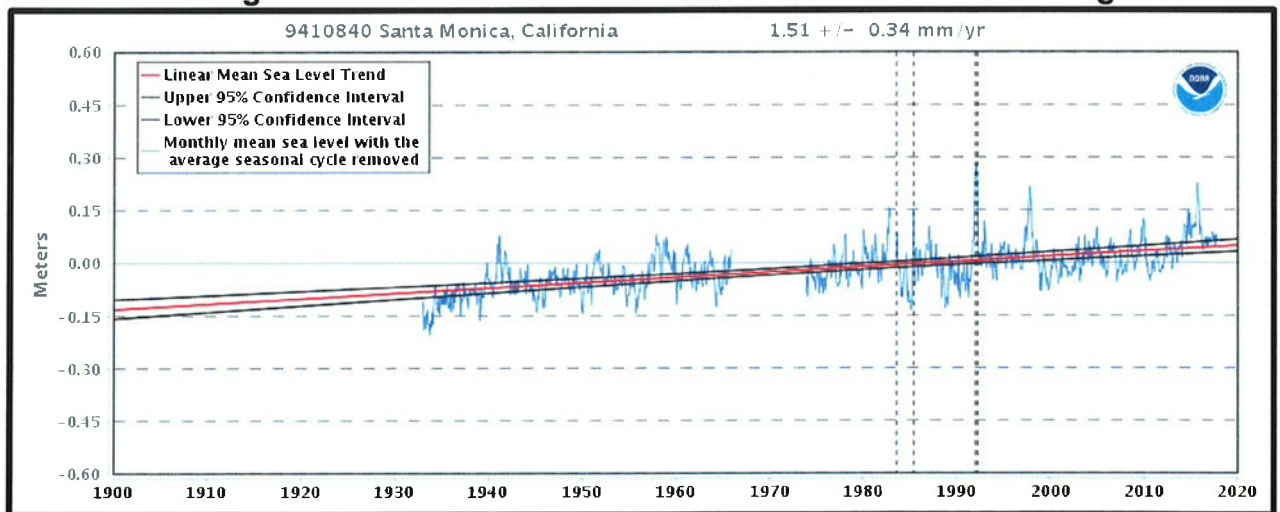
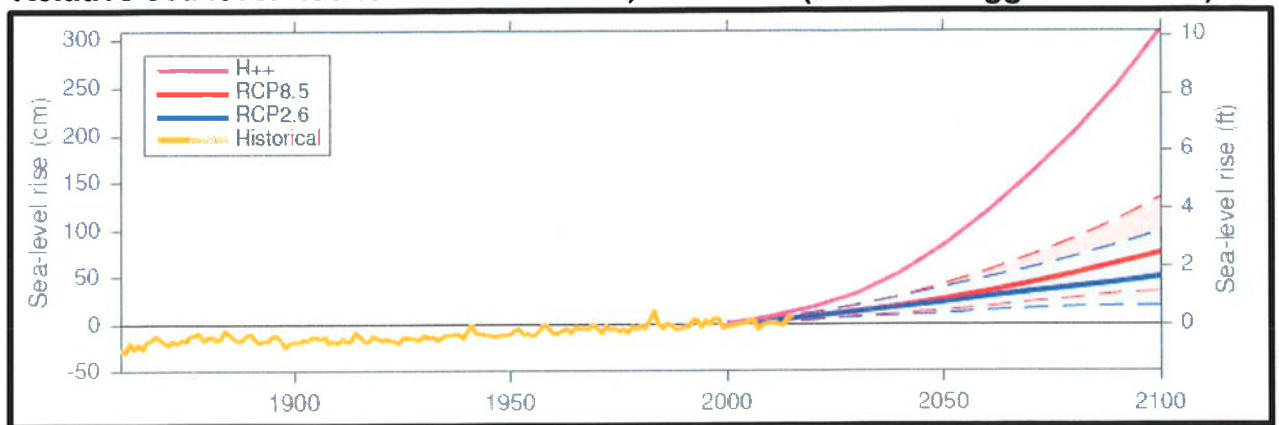


Figure 3:
Relative sea level rise for San Francisco, California (source: Griggs et al. 2017)



Based on tidal reference data, historical rates of sea level rise are estimated to be about half an inch every decade, or approximately half of the global average. Given the existing rate of greenhouse gas emissions (GHG) and the long-term time scales and feedback mechanisms, this historic linear trend of sea level rise will not remain but rather the rates will accelerate in the future logarithmically, resulting in an increasingly upward curve. An example of the projected sea level rise acceleration is shown for the San Francisco tide gauge in Figure 3. Since the rates of GHG emissions, glacier ice melt, and ocean expansion may change, multiple scenarios have been modeled, and these are shown in the red, blue, and purple colored curves.

The State guidance was recently updated to include a probability of occurrence at a time in the future based on the scientific uncertainties associated with sea level rise sources. Table 1, below, compares the scenarios used in the Vulnerability Assessment (Coastal Resilience 2012) with the latest scientific numbers (Griggs et al. 2017) and shows the probability of occurrence based on the latest science. More specifically, the table shows that there is relatively low probability that sea level rise will exceed 8 inches by 2030 (one-half of 1 % probability), and 58 inches by 2100 (less than 5% probability), although sea level rise will nonetheless exceed these amounts eventually. A higher probability amount of 16 inches was selected for 2060. While this amount is not assigned a discrete probability, it is along the upper cusp of the range of sea level rise estimates that were assigned a 66% chance of occurrence by 2060.

State guidance suggests using higher sea level rise amount projections for advanced planning of major infrastructure projects, such as bridges, airports, and wastewater treatment facilities, that have an extended lifetime of use. There is a tradeoff in that the higher sea level rise projections were assigned a relatively low probability of occurrence by the identified years. The guidance suggests using lower sea level rise amounts that have a higher probability of occurrence by the identified years when planning for projects with shorter lifetimes— e.g., for uses such as parking lots and trails. For context, FEMA uses 1% annual chance storm data as the basis for its National Flood Insurance Program.

Table 1: Probabilities of Sea Level Rise Scenarios used for VC Resilient

Estimated Year	Amount of Sea Level Rise (inches)	Probabilities
2030	8"	There is a 0.5% (less than 1%) probability that sea level rise exceeds 8 inches by 2030
2060	16"	There is 66% probability that sea level rise is between 7.2 inches and 15.6 inches by 2060
2100	58"	There is more than 5% probability SLR exceeds 49.2 inches by 2100

¹ Probabilities based on Santa Barbara tide gauge and the "High Emissions" scenario (OPC Guidance 2018).

VC Resilient Project Methodology

This section describes the methodology used to develop the two reports included in Exhibits 2 and 3.

Vulnerability Assessment Report

For the Vulnerability Assessment, the sea level rise projections from two widely-used models described below were overlaid onto a geographic information system (GIS) database that was assembled using data from the County in order to quantify the potential vulnerabilities. The GIS database included information for the location of the following "sectors" or resource assets that would experience some vulnerability and risk due to sea level rise and coastal flooding:

- Land Use Parcels and Structures
- Agriculture
- Wastewater
- Stormwater
- Water Supply
- Public Access, Recreation, and Trails
- Roads and Parking
- Public Transportation
- Oil and Gas Infrastructure
- Hazardous Materials
- Critical Services
- Natural Resources
- Vulnerable Populations

Projections of future coastal hazards and sea level rise were modeled as part of a separate project called the Coastal Resilience Ventura Project (The Nature Conservancy, County of Ventura, and Environmental Science Associates, 2012). Coastal Resilience Ventura was the primary source for sea level rise projections used

for the Vulnerability Assessment, although several other primary data sources were also used, as listed below:

- Coastal hazards modeling analysis results (Environmental Science Associates 2012),
- FEMA effective and preliminary flood maps (FEMA 2012, FEMA 2017);
- Revised cliff erosion distances from CoSMoS 3.0 (USGS 2017);
- Spatial and locational resource sector and infrastructure data available from the County of Ventura, State of California, and The Nature Conservancy;
- Economic and attendance data from the County of Ventura and California State Parks; and
- 2010 Census data was used for the social vulnerability analysis in Appendix C of the Vulnerability Assessment.

2017 CoSMoS 3.0

The Coastal Storm Modeling System of the USGS (CoSMoS) provides projections of coastal flood hazards and cliff erosion for the area between Point Conception in Santa Barbara County and the U.S.–Mexico border. The model uses downscaled global climate models and considers factors such as long-term coastal shoreline change, stream inputs, winds, and varying sea level rise scenarios to produce hazard projections for every 9.8 inches (0.25 meters) of sea level rise. Results map a dynamic wave run up extent (differing from FEMA and Coastal Resilience maximum wave run up) and account for various sea level rise, storm frequencies and uncertainties. An interactive web mapping portal called “Our Coast Our Future” shows the results of the CoSMoS model.¹

CoSMoS is intended to support policy and planning through application in vulnerability assessments, hazard mitigation plans, and LCPs. The cliff erosion data from CoSMoS was incorporated in the Vulnerability Assessment for the South Coast subarea. In the Draft Adaptation Report, the tidal and storm flooding modeling from CoSMoS was compared to the Coastal Resilience model results.

2012 Coastal Resilience Ventura

The Coastal Resilience Ventura Project was a pilot project in California funded by The Nature Conservancy and the County of Ventura. The climate change modeling effort was built on Pacific Institute work done in the 2nd California Climate Assessment (Revell et al. 2011). It projects the impacts of sea level rise and storm-caused coastal erosion on the Central Coast, and coastal flooding and tidal inundation in the entire County. Additional work was completed to evaluate potential sensitive habitat impacts. The coastal hazard modeling considered varied scenarios of sea level rise, wave climate, and sand supply. This model provides much of the hazard identification used in the Vulnerability Assessment and Draft Adaptation Report. The web mapping application provides an interactive visualization tool.² This tool allows users to explore the risks of

¹ Source: <http://data.pointblue.org/apps/ocof/cms/>

² Source: www.maps.coastalresilience.org/California

different scenarios of coastal hazards—such as sea level rise, storm surges, and inland flooding—at a variety of spatial scales.

Economic Analysis

Quantitative data from the Vulnerability Assessment was collected to determine properties at risk to coastal erosion, coastal flooding, and tidal inundation. Agriculture crop types grown in coastal areas today were evaluated for potential losses due to potential future tidal inundation and coastal flooding. Losses were also estimated for roads and trails due to erosion, coastal flooding, and tidal flooding. Finally, potential beach losses were quantified in terms of declining recreational value that could result from losses in annual attendance due to beach erosion.

Additional economic analysis was completed for the Draft Adaptation Report. This analysis estimated the costs of dune restoration, standards for seawall design, and infrastructure improvements to stormwater systems. These results were compared to the economic analysis in the Vulnerability Assessment and are included in Appendix B of the Draft Adaptation Report (Exhibit 3).

Draft Adaptation Strategies Report

The results of the Vulnerability Assessment were used to develop the Draft Adaptation Report. The Draft Adaptation Report was compiled through a six-step process, as described below:

1. The process began with a review of vulnerable areas that would be affected first by tidal inundation. Tidal inundation was the selected indicator because, although many areas may be flooded by storms, areas that are tidally inundated will be permanently changed and potentially unusable. Also, the probabilities assigned in the State guidance, are only applicable to sea level rise and not coastal storm frequency, so an approach that focuses on tidal inundation allows for a more precise assessment of risks.
2. Research was conducted to identify potential adaptation strategies that could be applicable to the land uses identified in the vulnerable areas. Additional consideration was given to strategies that are already being applied or considered in the County or by other jurisdictions.
3. After compilation of the best available adaptation strategies, a coastal hydrologist on contract provided recommendations for each planning subarea.
4. The updated list of strategies was reviewed during meetings with staff in other agencies including the Watershed Protection District, Transportation Department, Harbor Department, Agricultural Commissioner, Caltrans, and the California Department of Parks and Recreation to determine whether any additional strategies could be identified, which strategies could apply to vulnerable public facilities, and which strategies would be compatible to the missions of these other agencies.
5. After the interviews, a limited economic analysis was conducted for adaptation strategies that could be applied to public resources that are vulnerable. The estimated cost of increasing coastal resilience using these strategies was

contrasted with the value of the assets to be protected. (The economic analysis is summarized in Appendix B of the Draft Adaptation Report.)

6. Lastly, all of the adaptation information gathered through the process was summarized and discussed with the Planning Division management team.

The attached Adaptation Report in Exhibit 3 is a public review draft, and will be updated after the Planning Commission hearing, following a 30-day public comment period.

Summary of Coastal Vulnerabilities

The Vulnerability Assessment provided a quantitative assessment of land use acreages, numbers of structures, length of roads and pipes, vulnerable populations, and other sectors. The models described above were used to evaluate these sectors in comparison to the potential for rising tides and coastal storm flooding associated with a 1% annual chance storm (100-year storm). The portions of the Assessment pertaining to the Central Coast subarea also included Santa Clara River fluvial flooding and beach erosion. Bluff erosion was included in the analysis of South Coast hazards. The hazards were combined to show the extent of potential exposure if rising tides coincide with large coastal storm events.

1. Areas Vulnerable to Rising Tides

Based on the results of modeling, rising tides associated sea level rise will be a nuisance in the short term, are projected to begin to affect land uses in the next few decades, and will fundamentally change the coastline within the next few generations. The effects will be exacerbated by coastal storms and rain events that are described in the next section. The unincorporated areas that will be exposed to rising tides the soonest were identified for prioritization when developing the adaptation strategies. This is described in more detail in the Summary of Adaptation Strategies section, below.

According to the sea level rise models, by 2030, there is 0.5% (less than 1%) probability that 8 inches of sea level rise will affect the following areas:

- North Coast beaches at La Conchita, Oil Piers, Rincon Parkway, Mondos, and Solimar;
- The beach and sand dunes near the jetty at Hollywood Beach;
- The southern Arnold Road areas near Ormond Beach;
- The confluence of the Calleguas Creek and Revolon Slough;
- The State Park campsites at Thornhill-Broome Beach; and
- South Coast State Beaches at Sycamore Cove and Yerba Buena.

By approximately 2060, there is about 66% probability that the additional areas affected by 16 inches of sea level rise will include the following³:

³ As shown in Table 1 above. There is greater than 50% probability that 16 inches of sea level rise will occur by 2060.

- Beach loss effects become more noticeable, with narrow beaches on the North Coast being tidally inundated daily, and large beach widths are reduced by about 20%;
- Rincon Point, the only unarmored segment of the North Coast, experiences tidal flooding;
- Silverstrand Beach near the Hobie and Kiddie Beaches in the Channel Island Harbor experiences daily flooding; and,
- Broader agricultural areas near Arnold Road, where drains, and culverts located inland of Ormond Beach experience tidal flooding.

By 2100, there is less than 5% probability that five feet of sea level rise will continue to impact beaches and begin to severely affect developed areas:

- Large beaches at Hollywood Beach and Silverstrand Beach are half of today's width. Thin beaches and coves on the North and South Coasts are inundated daily;
- The shoreline armor on the North Coast is overtopped, first at Hobson Beach Park then at various residential communities, along the Rincon Parkway, and at Faria Beach Park;
- On the Central Coast, the peninsula and streets at Hollywood Beach become regularly flooded, and nearly all of the Silverstrand Beach neighborhood is inundated; and,
- On the South Coast, the homes on pilings are located deeper into the surf zone and the bluffs near Leo Carrillo could be eroded up to Pacific Coast Highway.

2. Areas Vulnerable to Storm Flooding and Erosion

The Vulnerability Assessment revealed widespread exposure when coastal storms coincide with rising tides. Areas along the North, Central, and South coasts of the County are documented to have been exposed to coastal storms that took lives, damaged bridges, threatened residences, and flooded public spaces in 1969, 1980, 1983, and 1995. While it is highly unlikely that the widespread extent of exposure shown in the Vulnerability Assessment is possible during one storm event given the various angles of the coastline and seasonal ocean swell directions, large swells have been known to hit more than one coastal area at the same time.

The erosion caused by high-energy swells as shown in the Vulnerability Assessment will cut swaths into beaches. Generally, the coastline can rebound from the 10-year and 20-year severe coastal storms that cause flooding and erosion, even if they become more frequent. Beaches and dune habitats recover, roads are habitually restored, and the public spaces can be cleared. But when the beaches are eroded during large surf events combined with sea level rise, inland areas will experience more exposure to hazards.

Between now and about 2030, the effects of approximately 8 inches of sea level rise with a 1% annual chance storm could temporarily disrupt and damage the following areas:

- Narrow beaches and coves on the North and South Coast are flooded and likely to be eroded. Beaches on the Central Coast are affected by erosion and overtopped by large waves;
- All existing residential communities located oceanside of Highway 101 on the North Coast are vulnerable to coastal storm hazards;
- A slant-drilling oil facility downshore from McGrath State Beach; in addition, oil wells and agricultural lands inland of McGrath could be flooded by the Santa Clara River;
- The Calleguas Creek and Revolon Slough area may become extensively flooded. Agriculture, the Country Sunshine mobile home park, and commercial facilities along Pacific Coast Highway could be flooded by the Revolon Slough;
- Agriculture and the Agromin green waste processing facility near Ormond Beach could be flooded due to erosion and coastal storm waves;
- Over three miles of Pacific Coast Highway on the South Coast is likely to be flooded, along with campsites at Thornhill-Broome Beach in Point Mugu State Park; and,
- In the Solromar community, homes on pilings and residences behind shoreline armor could be flooded by large waves today and will become more vulnerable over time.

By about 2060, the effects of approximately 16 inches of sea level rise with a 1% annual chance storm could temporarily disrupt and damage the following areas:

- Strawberry fields inland of the Seacliff community become vulnerable to coastal storm hazards; and,
- A tsunami evacuation route, and the only egress road for the Silverstrand community, near Hobie Beach at Channel Islands Harbor, could be flooded for 12 or more hours.

By about 2100, the effects of approximately 48 inches of sea level rise with a 1% annual chance storms could temporarily disrupt and damage the following areas:

- At Rincon Point, residences and the small estuary are flooded by coastal storms and the creek outflow;
- The first row of houses located inland of Highway 101 in La Conchita are exposed;
- At Hollywood Beach, storm waves combined with rising tides overtop the beach and flow through the developed areas of the peninsula;
- Along the Santa Clara River, fluvial river flooding caused by rain events can mix with rising tides and flood agricultural areas inland of McGrath State Park and around the McGrath Lake area;
- Exposure of Pacific Coast Highway on the South Coast increases to over 10 miles; and,
- The day use facilities and parking at Sycamore Cove in Point Mugu State Park become flooded and shelter trees for Western monarch butterfly roost sites could be increasingly exposed.

3. Positive Findings Regarding Vulnerabilities

The following summarizes positive findings from the Vulnerability Assessment. Generally, some of the County's residents and coastal resources may not be vulnerable until 5 feet or more of sea level rise occurs (approximately year 2100 or later).

- There are no airports, wastewater treatment facilities, or power plants in the County's jurisdiction that are vulnerable with up to 5 feet of sea level rise. Though it should be noted that Point Mugu Naval Air Weapons station, under federal jurisdiction, is susceptible to sea level rise impacts.
- There are no critical facilities such as Fire stations or Sheriff stations at risk with up to 5 feet of sea level rise. Although Fire Station number 25 on the North Coast and Hollywood Elementary School at Hollywood Beach could be vulnerable to coastal storm flooding combined with 5 feet of sea level rise.
- No oil and gas infrastructure is exposed to coastal erosion along the Central or South Coasts.
- The inland sand dunes (backdunes) and freshwater habitats are not particularly vulnerable to sea level rise and there is still time to design and implement adaptation strategies for other inland sensitive habitats.
- While residential structures may be vulnerable to erosion and coastal flooding, there is time to plan for the effects of tidal inundation, which are projected to occur with 5 feet of sea level rise. No densely populated disadvantaged communities are directly exposed to coastal hazards with up to 5 feet of sea level rise.

Summary of Adaptation Strategies

There are many useful examples of adaptation practices used around the world, including nearby jurisdictions such as the Surfer's Point Managed Retreat project at the City of Ventura. There are generally three strategies for sea level rise adaptation: protect, accommodate, or retreat. Each strategy has inherent benefits and shortcomings:

- **Protect:** This strategy generally involves use of devices and structures that are proven to be effective but also alter the natural shorelines and are likely increase the rates of beach erosion. Wide beaches and sand dunes are natural protection approaches.
- **Accommodate:** This strategy generally involves preparing for periodic flooding and conducting clean-up and repairs after flood events. For example, new development and streets can be designed to withstand periodic flooding. Accommodation will increase clean-up and repair costs as sea level rise exacerbates storm flooding.
- **Retreat:** This strategy would conserve public beaches but is likely to require complex processes to remove or relocate existing shoreline development in order to allow beaches and other coastal features to migrate inland.

The protection, accommodation, or retreat strategies can include any of the following types of approaches to address sea level rise:

- **Natural Approaches:** existing features that are formed and change over time in response to natural processes (e.g. coastal sand dunes);

- Nature-based Approaches: engineered systems that mimic natural approaches but include design features (e.g. cobble-based sand dunes);
- Structural Approaches: engineered structures designed to minimize flooding and erosion (e.g. seawalls);
- Regulatory Approaches: amendments to the County's LCP to add policies, development and design standards.

Section 3.2 in the Draft Adaptation Report (Exhibit 3) describes a tool box of strategies that Planning Staff determined could be appropriate for the areas projected to be exposed. Some could be applied countywide and others would work best for a particular area. Direct and cumulative impacts, and long term adaptative capacity were also discussed. For easy reference, the strategies were assigned numbers in the report that are shown below in parentheses. Possible countywide strategies include:

- Coastal Hazard Overlay Zone (CW-1);
- Real Estate Disclosures (CW-2);
- Standards to Elevate New Development (CW-3);
- Interjurisdictional Conservation Planning for Vulnerable Focal Species (CW-4);
- Adaptive Management Planning for Sensitive Habitats (CW-5);
- Sediment Management (CW-6);
- Opportunistic Sediment Placement (CW-7);
- Voluntary Managed Retreat (CW-8);
- Regulatory Mechanisms for Accommodation and Retreat (CW-9); and
- Bridges, Roads, and other Major Infrastructure Design (CW-10).

The potential North Coast strategies include any of the strategies listed above, as well as the following:

- Continued Use of Armor (NC-1); and
- Sand Retention with Non-Permanent Perpendicular Cross-Shore Features (NC-2).

The potential Central Coast strategies include any of the countywide strategies listed above, as well as the following:

- Re-Establish Native Coastal Dune Habitat (CC-1);
- Dredge Sediment Reutilization for Beach Nourishment (CC-2); and
- Storm Drain Improvements for Streets at Hollywood Beach and Silverstrand Communities (CC-3).

The potential South Coast strategies include any of the countywide strategies listed above, as well as the following:

- Continued use of Armor (SC-1);
- Standards for Bluff Setbacks (SC-2);
- Continued use of Pilings (SC-3);
- Sand Retention with Non-Permanent Perpendicular Cross-Shore Features (SC-4);
- Sediment Bypassing Around Point Mugu (SC-5); and

- Horizontal Levees (Ormond Beach and Revolon Slough/ Calleguas Creek areas, SC-6).

Finally, high priority areas for adaptation of County-owned facilities and public infrastructure include:

- Sand retention at thin beaches and coves with public access;
- Dune restoration and drainage improvements at Hollywood Beach;
- Flood-proofing at Silverstrand, near Hobie Beach;
- Accommodation or protection from tidal inundation for roads and other infrastructure at inland areas of Ormond Beach;
- Accommodation of flooding at Calleguas Creek and the Revolon Slough;
- Accommodation and possible relocation of the campsite at Thornhill-Broome Beach; and,
- Accommodation and protection of new bridges being planned at Harbor Boulevard over the Santa Clara River, and at Pacific Coast Highway over Sycamore Creek.

Section 3.6 in the Draft Adaptation Report (Exhibit 3) concludes with a few examples that outline how some of the strategies listed above can be woven into an adaptation plan. Figure 4 below presents a case study for sediment retention at Silverstrand Beach. It could be combined with storm drain modifications to the Silverstrand neighborhood, as shown in Figure 5, to employ an approach that combines accommodation with natural protection. Coordination with the Harbor Department, US Navy, and Port of Hueneme would also be required for a complete resiliency plan for Silverstrand. Other case studies for Hollywood Beach and the Rincon Parkway are included in the Draft Adaptation Report.

Figure 4: Hypothetical Implementation Timeline Case Study for Silverstrand Beach Sediment Management

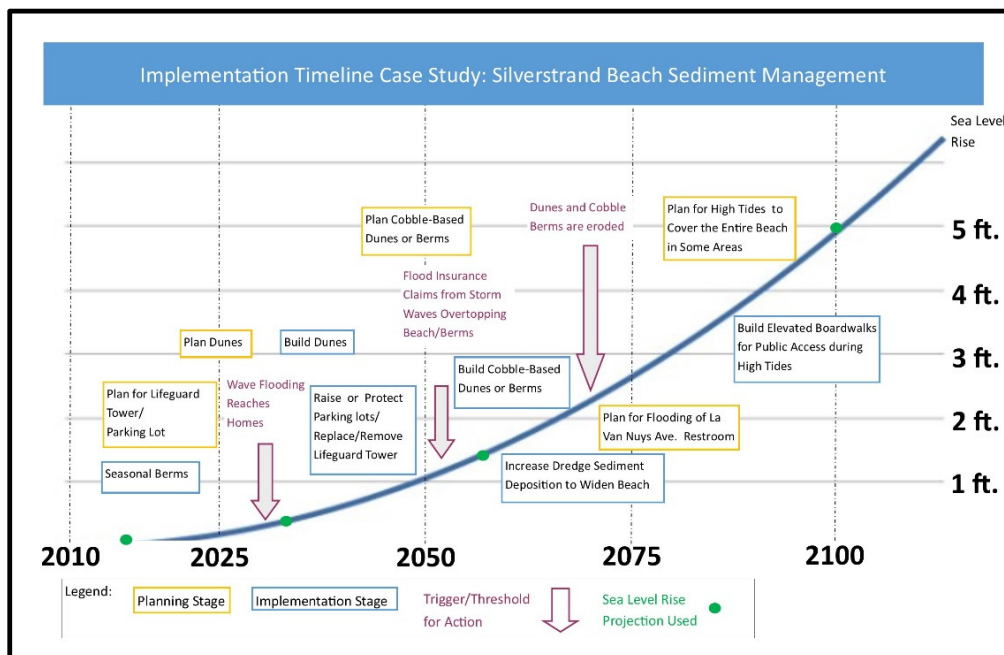
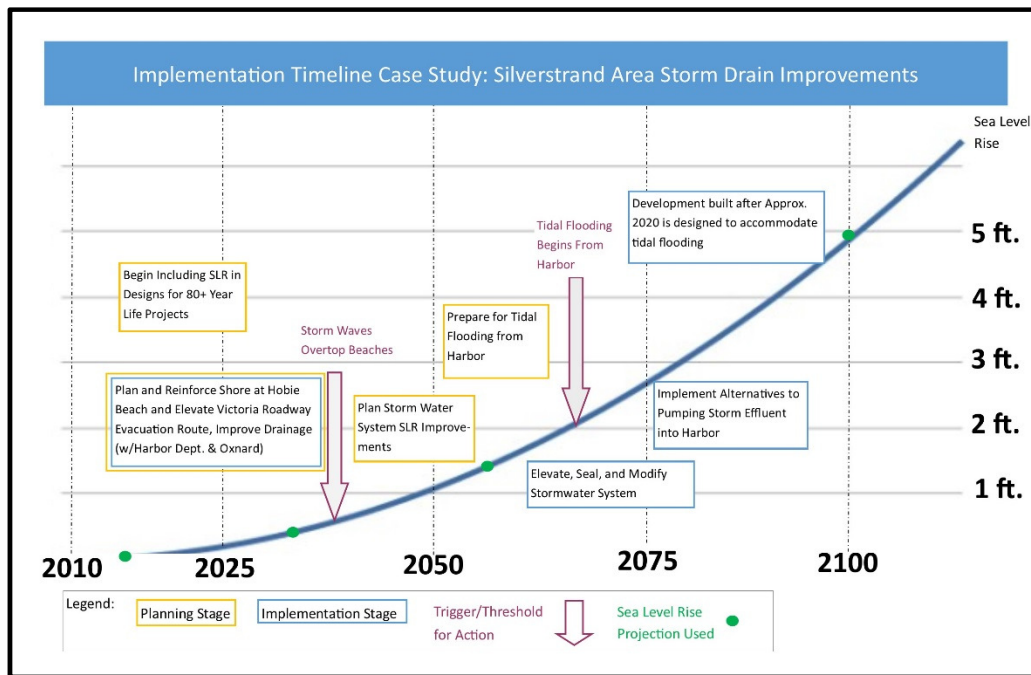


Figure 5: Hypothetical Implementation Timeline Case Study for Silverstrand Storm Drain Improvements



B. PLANNING PROCESS AND PUBLIC COMMENTS

This is a summary of the planning process. The public outreach conducted to date primarily consisted of a series of workshops that provided opportunities for members of the public, as well as technical experts and stakeholder groups, to participate in the development of the Vulnerability Assessment. A public comment and review period will also occur after this work session for the Draft Adaptation Report.

The Planning Division provided public notice regarding the Planning Commission work session in accordance with the Government Code (§65091) and the CZO (§8181-6.2 et seq.). A legal noticed was published in the *Ventura County Star*, and adjacent cities and coastal agencies were notified. In addition, notification was sent out to the Ventura County interested parties list for coastal zone amendments and updates (600+ individuals). Finally, public review drafts of the two reports were made available on the Planning Division website.

1. California Coastal Commission Coordination

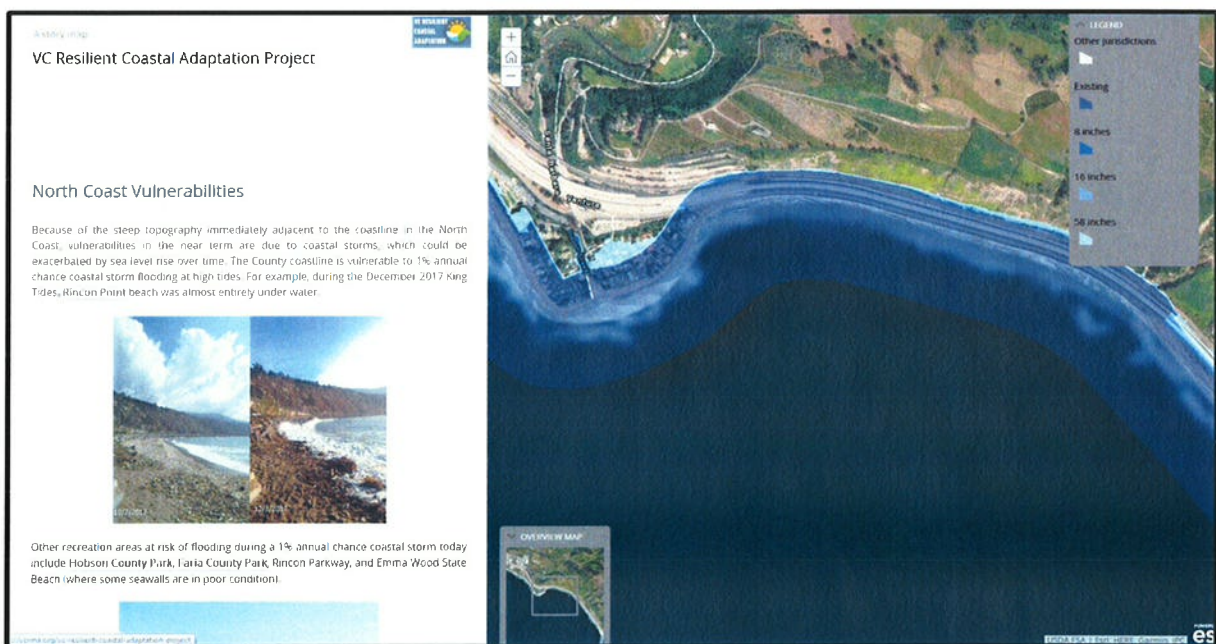
During these meetings, a positive and constructive dialogue between the Planning Division and Coastal Commission staff helped ensure that the project was conducted in a manner consistent with State guidance and with adequate public input. That process was initiated in March 2017 and was followed by a series of check-in meetings for the selection of sea level rise models and projections, review of the Vulnerability Assessment, and the Draft Adaptation Report.

2. Public Outreach

The grant scope of work for this project included one round of public outreach after release of the Vulnerability Assessment, as well as coordination with federal, state and county agencies. Additional opportunities for public input will occur during this work session, and before the Board of Supervisors hearing that is tentatively scheduled for late summer of 2019. Future public hearings and/or workshops on sea level rise LCP amendments will be held if another grant is obtained to pursue the next phase of this project.

Public information materials prepared for the overall VC Resilient Project included public workshop materials such as slideshows, posters, and a frequently asked questions flyer (Exhibit 5). A website was created under the Planning Division page with useful information about the project and it included a link to sign-up for the project notification list. An interactive GIS Story map was also developed to allow easy viewing of the sea level rise maps.⁴ (Figure 6). This application allows the user to scroll through a text narrative describing the results of the Vulnerability Assessment while viewing the sea level rise maps.

Figure 6
Image of the GIS Story Map Application



Ten e-mails with written comments were received from the public and outside agencies during the public outreach for the Vulnerability Assessment. Caltrans, the US Navy, and SoCal Gas each submitted comment letters calling for more coordination. The US Navy also suggested including more information about the

⁴ The GIS Story Map application is viewable at vcrma.org/vc-resilient-coastal-adaptation-project.

economic value that the base provides to the county. SoCalGas requested additional analysis of potential exposure to natural gas lines. Five comments were received from residents in North Coast communities that expressed support for shoreline armor, sediment retention, and beach nourishment projects, all of which are addressed in more detail in the Draft Adaptation Report (Exhibit 3).

After the close of the Vulnerability Assessment comment period, an archaeology consultant requested additional analysis of cultural resources because coastal erosion could expose Native American historic villages, shell middens, and cemeteries. Outreach to a notification list of Native American contacts was conducted during the Vulnerability Assessment data gathering phase, but no responses were received. Based on the fact that there is a high likelihood of potential sea level rise exposure of cultural and archaeological resources along the coast, additional analysis of cultural resources should be included on a list of topics for future sea level rise studies. This list should also include more analysis about the harmful effects of sea level rise on groundwater, methods to improve resiliency of agriculture, interjurisdictional habitat conservation planning, and the vulnerability of the Channel Islands.

Another round of outreach is included with this Planning Commission work session, including a 30-day period for public review and comment on the Draft Adaptation Report. Additional e-mail notices will periodically be sent to the list of interested parties when new website information or reports are available.

3. Natural Resources Working Group

A Natural Resources Working Group was created and tasked with selecting and assessing the vulnerability of plants, animals, and habitats. The Working Group consisted of 35 federal, State, and local biologists, botanists, and ecologists who are subject-matter experts on the County's flora and fauna and met five times between June 2017 and September 2018. The Working Group selected "focal species" that were both potentially vulnerable to sea level rise and have life history characteristics that could provide the most guidance to help inform and implement adaptation strategies for the natural resources evaluated.

C. Planning Commission Work Session Discussion

Today's work session is intended to discuss the findings of the Vulnerability Assessment and the possible adaptation approaches summarized in the Draft Adaptation Report. While discretionary entitlement projects are evaluated for consistency with the State's sea level rise policies, VC Resilient represents a formal beginning of planning for sea level rise in Ventura County by compiling adaptation options. This initial effort could not cover all of the resources, assets, and vulnerabilities on the coast. Thus, it's anticipated that future efforts may reach further to address issues such as cultural and historical resources, seawater intrusion into groundwater tables, the potential effects on agriculture, and other critical areas, if directed by the Board of Supervisors.

As previously described, the Vulnerability Assessment is primarily a science-based analysis of what is exposed and how sensitive these assets are to sea level rise, with minimal discussion on adaptation strategies. The Draft Adaptation Report, in contrast, presents options to date for increasing community resiliency. However, identifying the specific adaptation solutions most appropriate in each coastal subarea and for each resource sector will require further collaboration with stakeholders and input from technical experts as part of an overall adaptive management approach. Likewise, many of the proposed strategies could be applied to private lands, but more public outreach and coordination would be required to develop those strategies.

While the goal of the grant for the first phase of VC Resilient was to complete the Vulnerability Assessment and Draft Adaptation Report, Planning staff realized there was a strong interagency coordination component to planning for sea level rise. Like the County, other agencies that would be natural partners in adaptation planning, such as the US Navy and Caltrans, are in the early stages of similar efforts. It's clear that interagency coordination remains a critical factor in the success of strategies that tackle the regional threat of sea level rise. In addition, feasibility studies will likely be necessary first steps in assessing many of the proposed adaptation alternatives. Aside from determining the appropriate timing for implementation, the environmental impacts, regulatory constraints, funding mechanisms, and even engineering feasibility will need to be further assessed before moving forward on many of the proposed strategies.

Recognizing these realities, this work session is intended to gather feedback from your Commission and to provide an opportunity for public input before completion of the Draft Adaptation Report. Unfortunately, there is no straightforward solution to sea level rise--particularly as the specific timing and magnitude of impacts is very difficult to predict. With that in mind, it's not expected that your Commission will have answers or input on all of the issues raised. However, in order to demonstrate the complexity of the issue and to encourage discussion, talking points for a discussion are provided below:

Discussion Topic 1: Retreat or Protect Approach to Sea Level Rise

One important question for the future will be whether to retreat or protect assets along the County's coast as the sea level rises? Historically, many jurisdictions, including the County, Caltrans, and State Parks, used shoreline armoring in the form of rock revetments and seawalls for protection of resources. There are no specific policies advocating for armor in the County's LCP, so this practice likely evolved as it was the most cost-effective method for protection at the time. The understanding that sea level rise and armoring would erode beaches is relatively new; thus, much of the County's existing armoring predates this new understanding.

More recently, discussion and controversy have been sparked up and down the State's coastline regarding when to protect or retreat in response to sea level rise, for both public and private resources. State agencies such as the California Coastal Commission and the Ocean Protection Council have published policy guidance that concludes protective shoreline armor negatively impacts public beaches by increasing erosion. They have drawn a nexus, or a correlation, between the prevalence of shoreline armor and the loss

of public beaches. However, many beach-front residents need shoreline armor to protect their property and contend that they have a right to protect their property from hazards. Transportation agencies such as Caltrans generally cite the high fiscal costs to remove or realign roadways for retreat, and the infeasibility in some regions. For example, there would be few cost-effective alternatives for retreat of the Pacific Coast Highway and Highway 101 on the North and South Coasts of Ventura County.

At this time, the Draft Adaptation Report recommends methods to address the initial increases in sea level by using natural protections such as sand dunes and cobble-based sediment retention devices. If the current scientific projections are accurate, this would provide protection through the General Plan Update horizon of 2040. Here are two talking points your Commission may consider providing input on:

Talking Point (1): After approximately 2040, strategies that reach beyond sediment retention and beach nourishment may be needed. Knowing this, prior to future General Plan updates, the County plans to “hold the line” and maintain its facilities such as beach parks and public roads for as long as feasible, but should the County eventually consider relocating these facilities further inland to conserve beaches?

Discussion Topic 2: Approach to Adaptation

Economic analyses in both sea level rise reports revealed that some adaptation strategies such as dune restoration are relatively inexpensive compared to the value of the existing development that the dunes would protect; however, strategies for beach nourishment and transporting cobble from watershed basins would cost millions of dollars.

Talking Point (2): Regarding whether to pursue new adaptation strategies, should the County explore forming a technical advisory committee comprised of subject matter experts to review and prioritize potential adaptation strategies?

Talking Point (3): Should the County focus first on the protection of County-owned public assets, where the County has jurisdiction?

Talking Point (4): Should the County take on a lead role in coordinating a diverse array of stakeholders from both the public and other governmental agencies to facilitate regional adaptation projects?

Discussion Topic 3: Storm Hazards and Sea Level Rise

State guidance to use the best available sea level rise science includes models that show both coastal flood hazards (i.e., 1% annual chance storm) and the rate of sea level rise. The Vulnerability Assessment revealed that all of the County’s coastline is vulnerable to coastal storm flooding, although it is unlikely that all of the coastline would flood simultaneously due to the disparate angles of the shoreline. The Draft Adaptation Report looked at areas that could be affected by tidal inundation without storms and used that information to back-into recommendations for strategies that buffer the coast from storms and coastal flood hazards, such as sand berms and dunes, while addressing sea level rise.

While implementation of the strategies would help, storms will cause damage and leave debris that often requires repairs and clean up. Ideally, adaptation strategies will reduce post-storm costs as well as help prepare for sea level rise. But to be cost effective,

successive clean-up from many storms needs to equal or exceed the costs of more expensive adaptation strategies such as stormwater system upgrades or shoreline groins. The extent to which maintenance is continued until adaptation strategies are triggered will depend upon decisions made by multiple agencies at the County and direction provided by the Board of Supervisors. It also will depend to a large extent upon the availability of emergency funding from the State and Federal government.

Talking Point (5): Should the frequency of clean-up and repairs from coastal storm damage be factored into decisions on when to implement new adaptation strategies for sea level rise, or should other measurable triggers like beach widths and tidal gauge data be used?


D. PUBLIC NOTICE

This work session was publicly noticed in the *Ventura County Star* on February 24, 2019. In addition, an e-mail notification was sent to the County's interested parties list for coastal amendments (approximately 600 contacts) and the meeting was publicized on the Planning Division website.

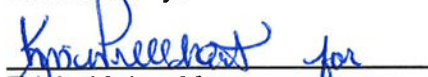
This staff report was reviewed by County Counsel. The Board of Supervisors hearing to consider the VC Resilient Project and draft LCP policies is tentatively scheduled for September 2019.

If you have any questions concerning the information above, please contact Aaron Engstrom, Case Planner at (805) 654-2936 or Aaron.Engstrom@ventura.org. You may also contact Tricia Maier, Long Range Planning Manager, at (805) 654-2464 or via e-mail at Tricia.Maier@ventura.org.


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EXHIBITS

- Exhibit 2: Sea Level Rise Vulnerability Assessment with Map Atlas (Appendix A)
- Exhibit 3: Public Review Draft Sea Level Rise Adaptation Strategies Report
- Exhibit 4: Map Showing Coastal Planning Subareas
- Exhibit 5: FAQ Sheet Developed for Public Outreach on the Sea Level Rise Vulnerability Assessment