

# CALIFORNIA COASTAL COMMISSION

## SEA LEVEL RISE ADAPTATION PLANNING

### ADDRESSING SEA LEVEL RISE IN LOCAL COASTAL PROGRAMS

Monterey Bay  
National Marine  
Sanctuary  
Advisory Council Meeting  
Cambria, CA | 6/25/18

City of Pacifica



Photo Credit: Kelsey Ducklow

**Kelsey Ducklow**  
Climate Change Analyst



CALIFORNIA  
COASTAL  
COMMISSION

# OUTLINE

- Coastal Commission and Sea Level Rise Planning
- CCC Sea Level Rise Policy Guidance (2015, 2018 Update)
- Projects and Planning in the Central Coast region
- Research and Coordination Efforts
- Questions?



# COASTAL HAZARDS

- **Inundation** – increased extent of permanently wet areas
- **Erosion** – increased erosion of bluffs, dunes, and beaches
- **Flooding** – increased extent of storm floods (temporarily wet)
- **Saltwater intrusion** – invasion of saltwater into freshwater aquifers

# COASTAL HAZARDS



**Flooding at  
Ledbetter  
Beach, Santa  
Barbara**



# COASTAL HAZARDS

Public coastal accessway in Bolinas, CA



# COASTAL HAZARDS

Sunset Beach, CA



# COASTAL HAZARDS



## Bluff erosion in Isla Vista

Phyllis Griffman

Slide 7 6/25/18  
California Coastal Commission



# COASTAL HAZARDS



**Bluff erosion at Lands  
End in Pacifica**



# COASTAL HAZARDS



**Bluff erosion at Lands  
End in Pacifica**



# COASTAL HAZARDS

Pasture flooding near  
Liscom Pasture, Arcata

# COASTAL HAZARDS

## Wastewater outflow at Ocean Beach, San Francisco



# COASTAL HAZARDS

## Mandalay Generating Station in Oxnard, CA



# COASTAL HAZARDS

## Highway 1 at Surfer's Beach, Half Moon Bay



# COASTAL HAZARDS

Highway 101 at Rincon Beach in Santa Barbara



# COASTAL HAZARDS

## Ports of LA and Long Beach



ISS006-E-35329

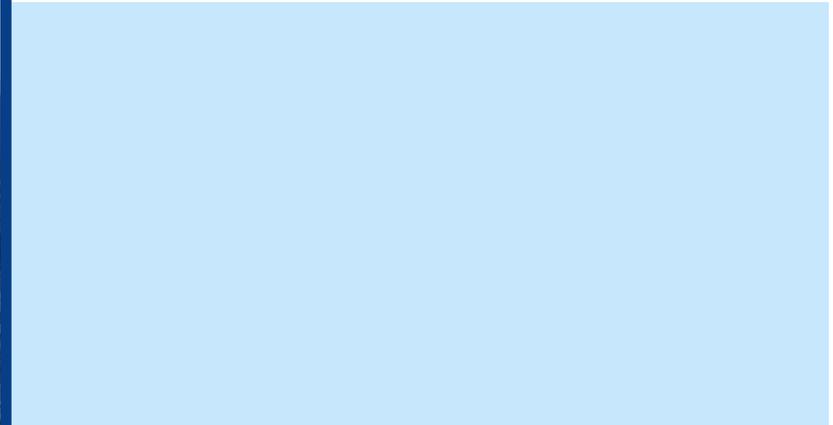
Image courtesy of the Image Science and Analysis Laboratory, NASA Johnson Space Center.

## Breaching of breakwater at Long Beach Harbor



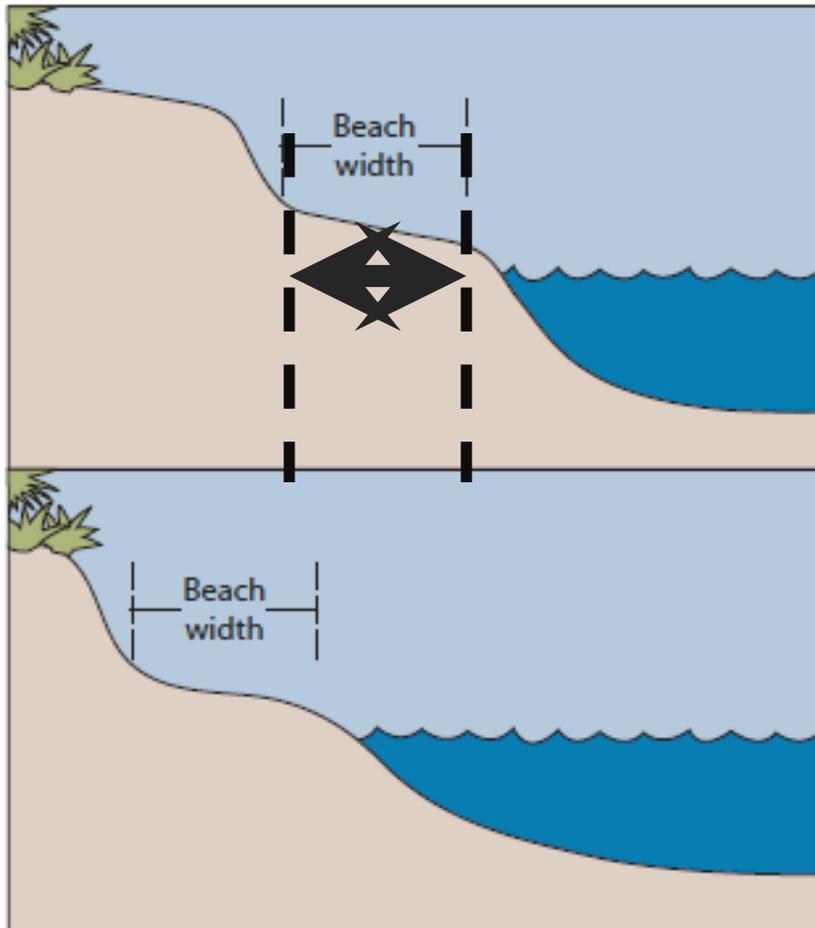
# ADAPTATION OPTIONS

## PROTECTION

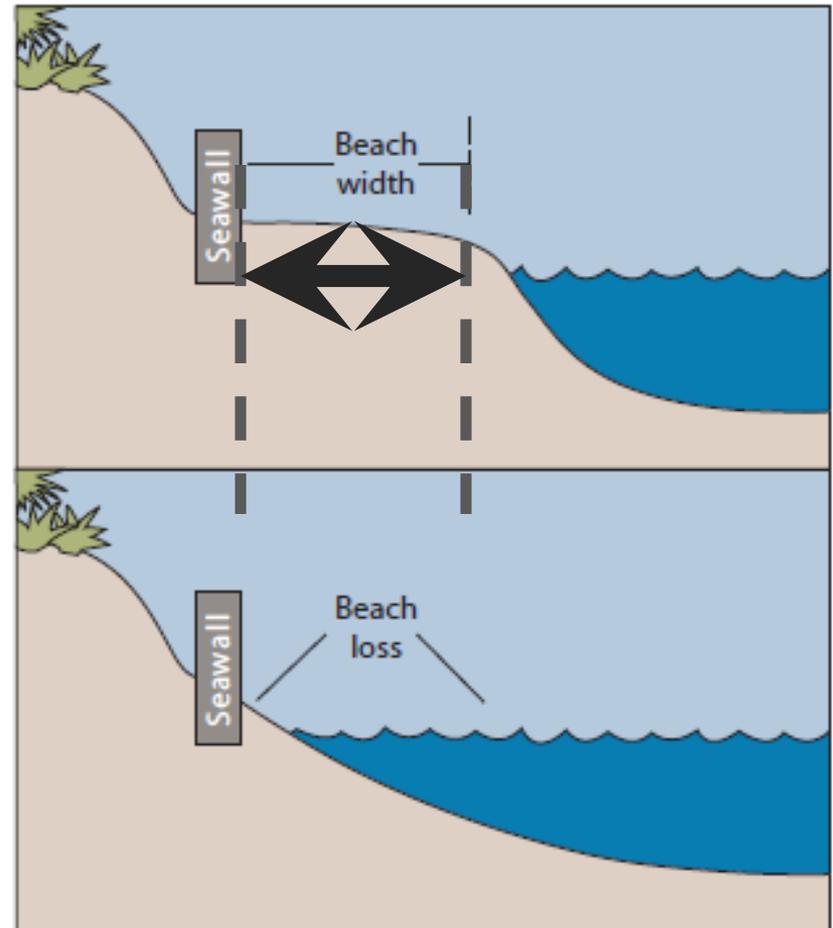


# PASSIVE EROSION LEADING TO LOSS OF BEACH

## Normal Beach Retreat

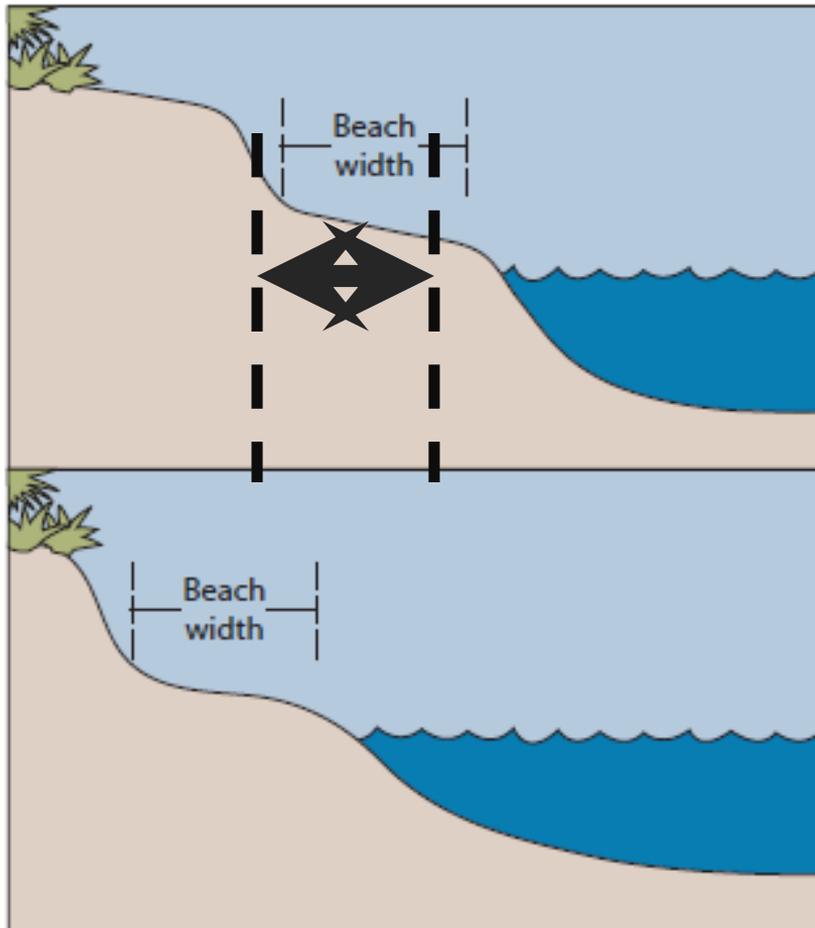


## Blocked Beach Retreat

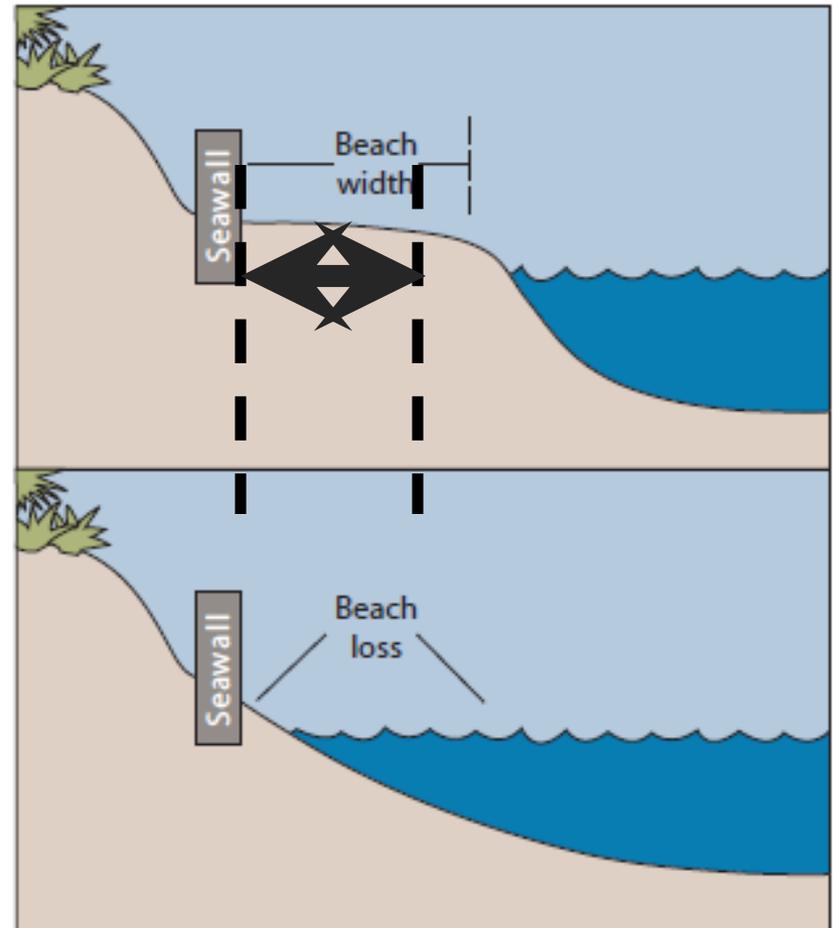


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## Normal Beach Retreat

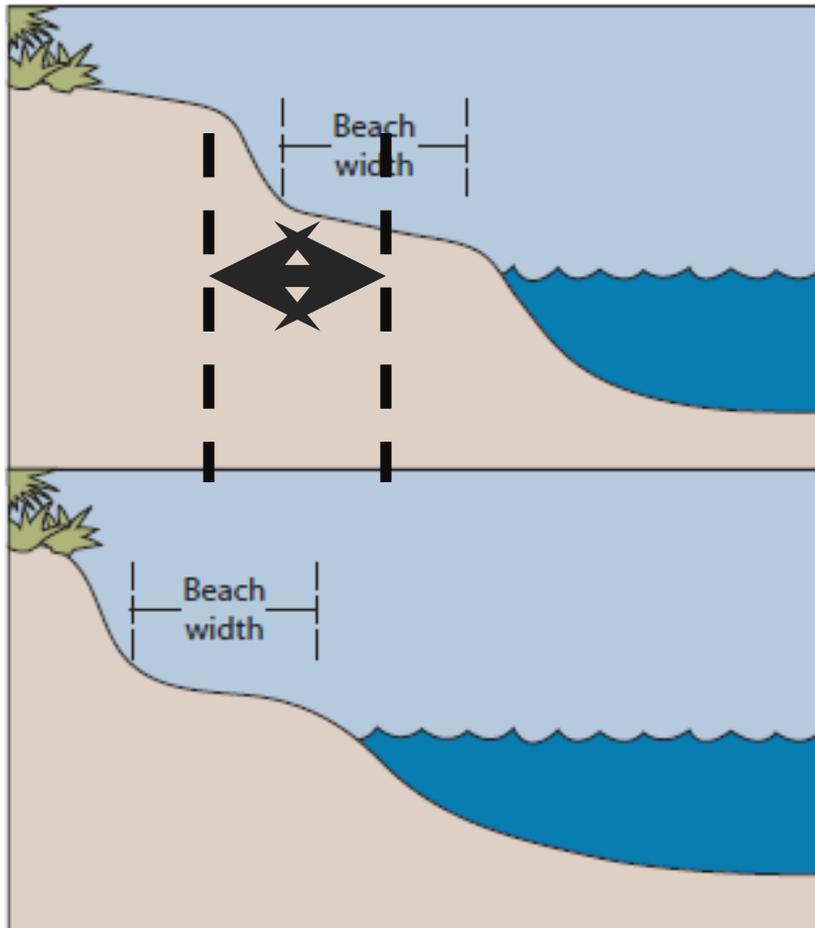


## Blocked Beach Retreat

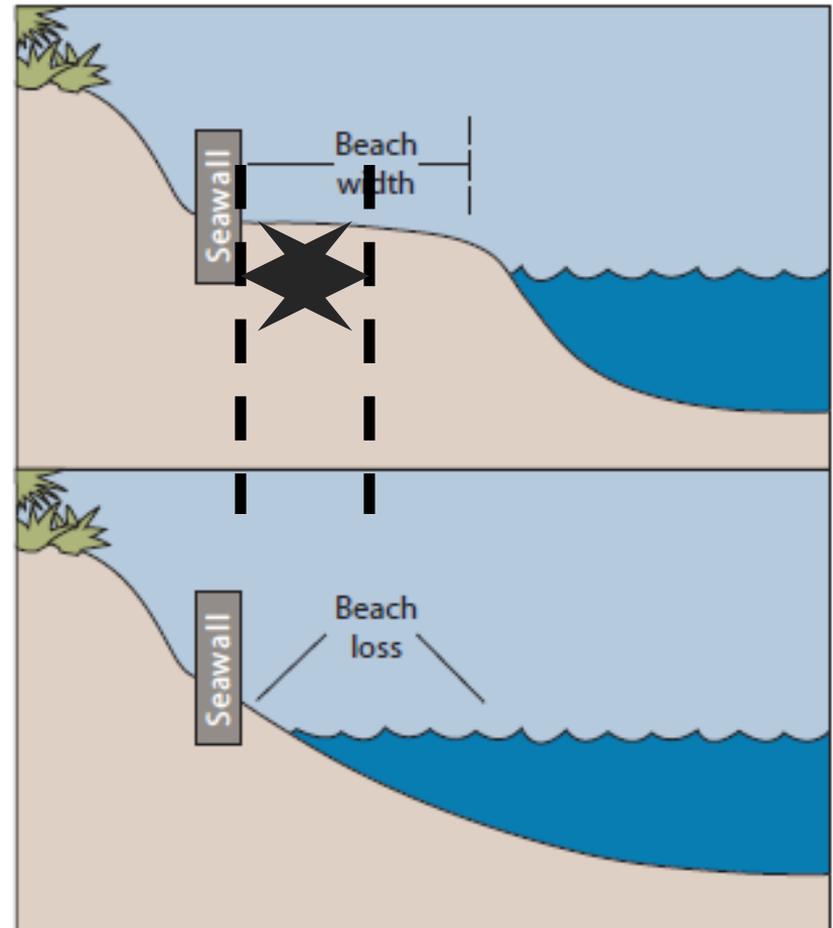


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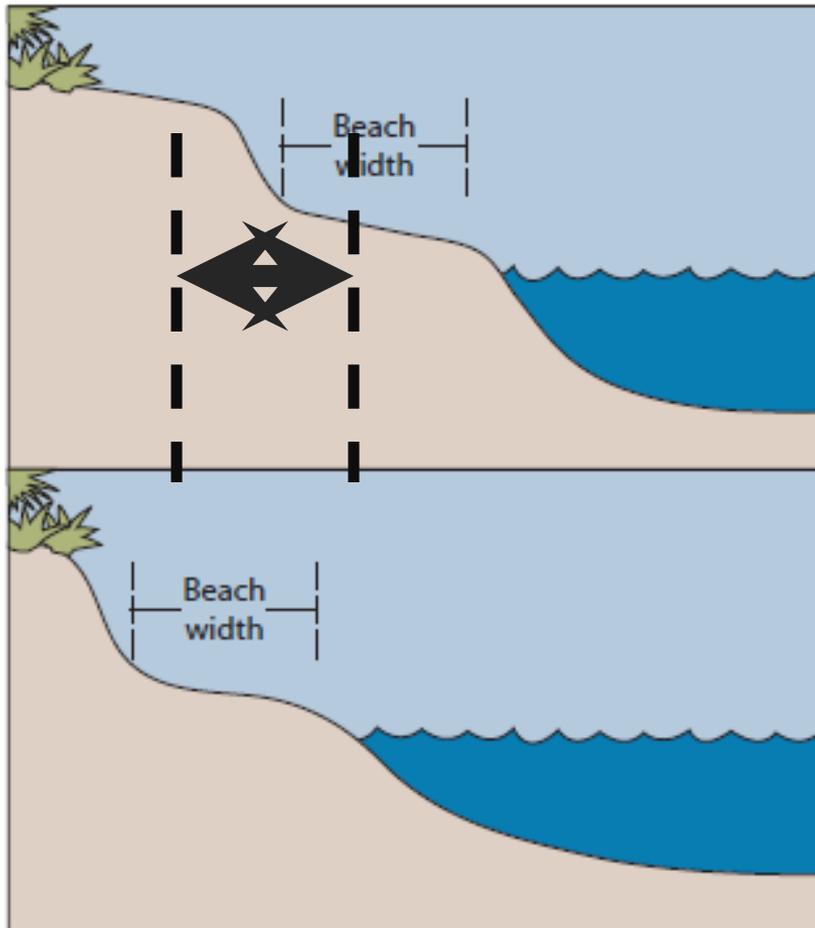


## Blocked Beach Retreat

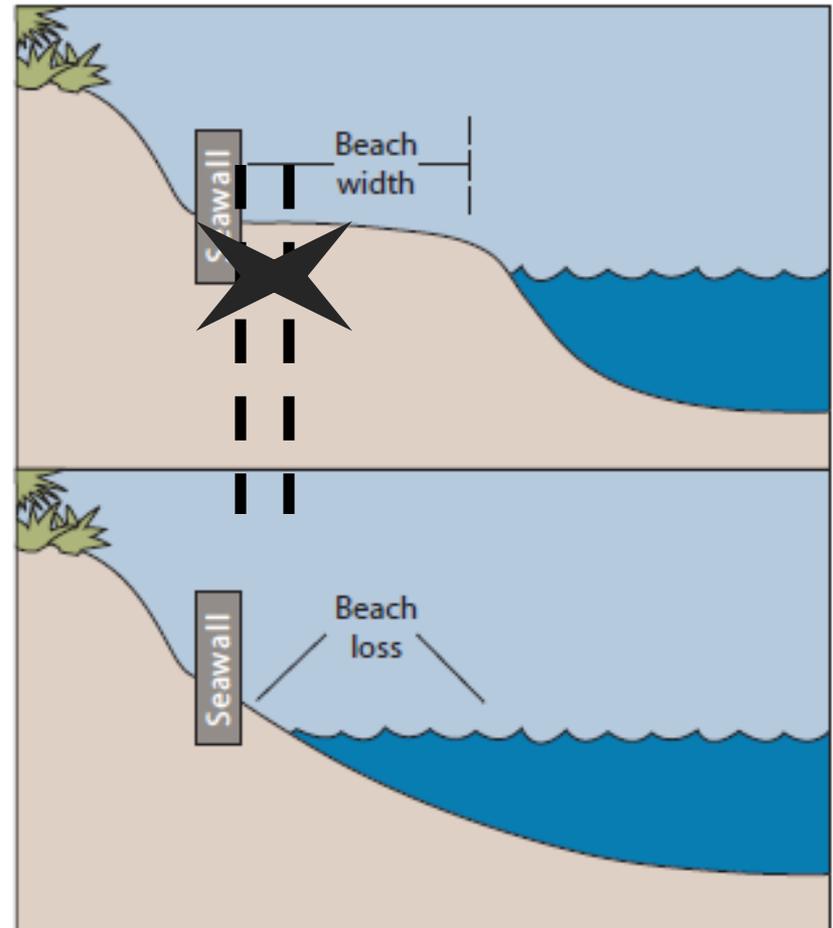


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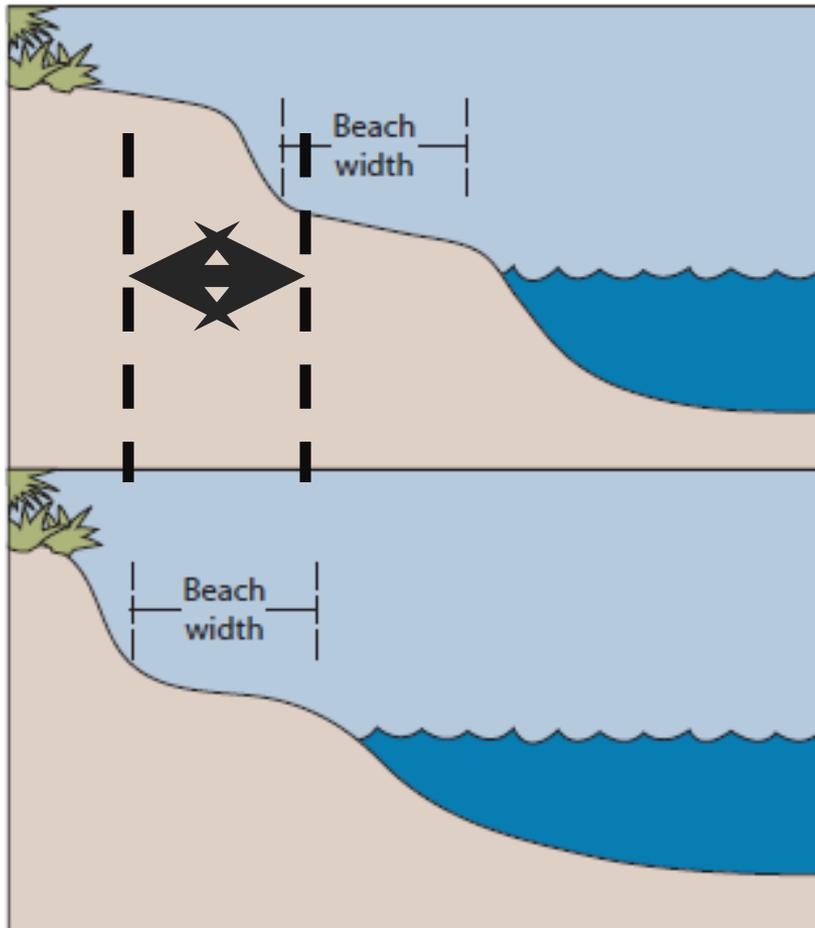


## Blocked Beach Retreat

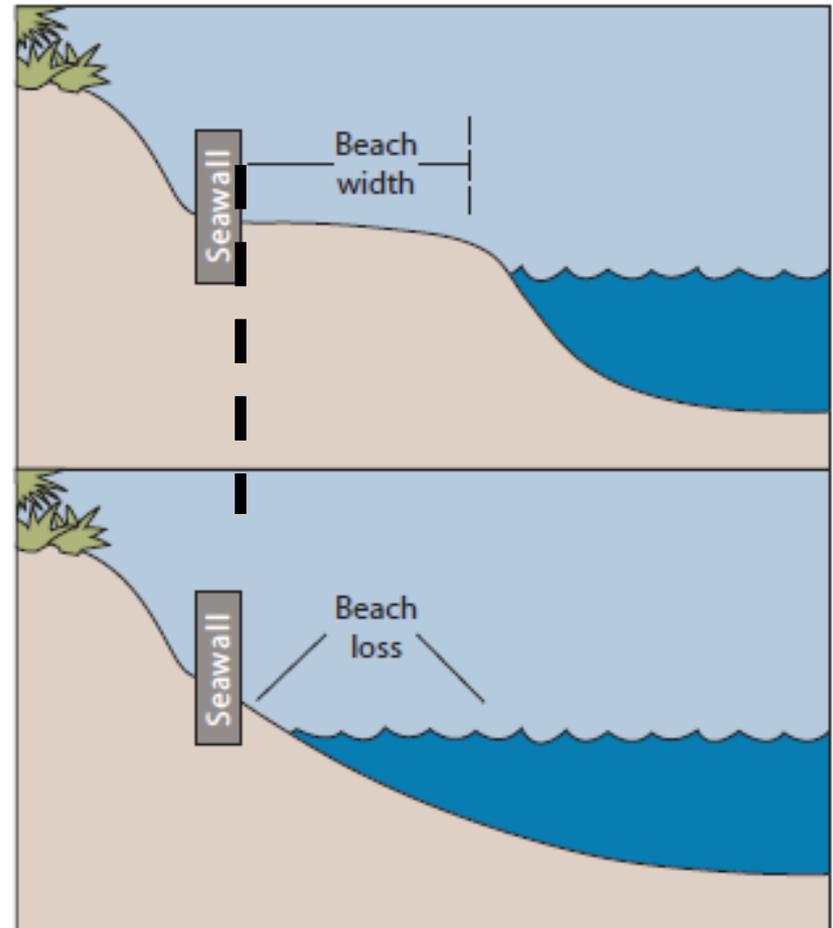


# PASSIVE EROSION LEADING TO LOSS OF BEACH

## Normal Beach Retreat



## Blocked Beach Retreat



# ADAPTATION OPTIONS

## NOURISHMENT & SEDIMENT MANAGEMENT

Beach nourishment, Goleta Beach 2010



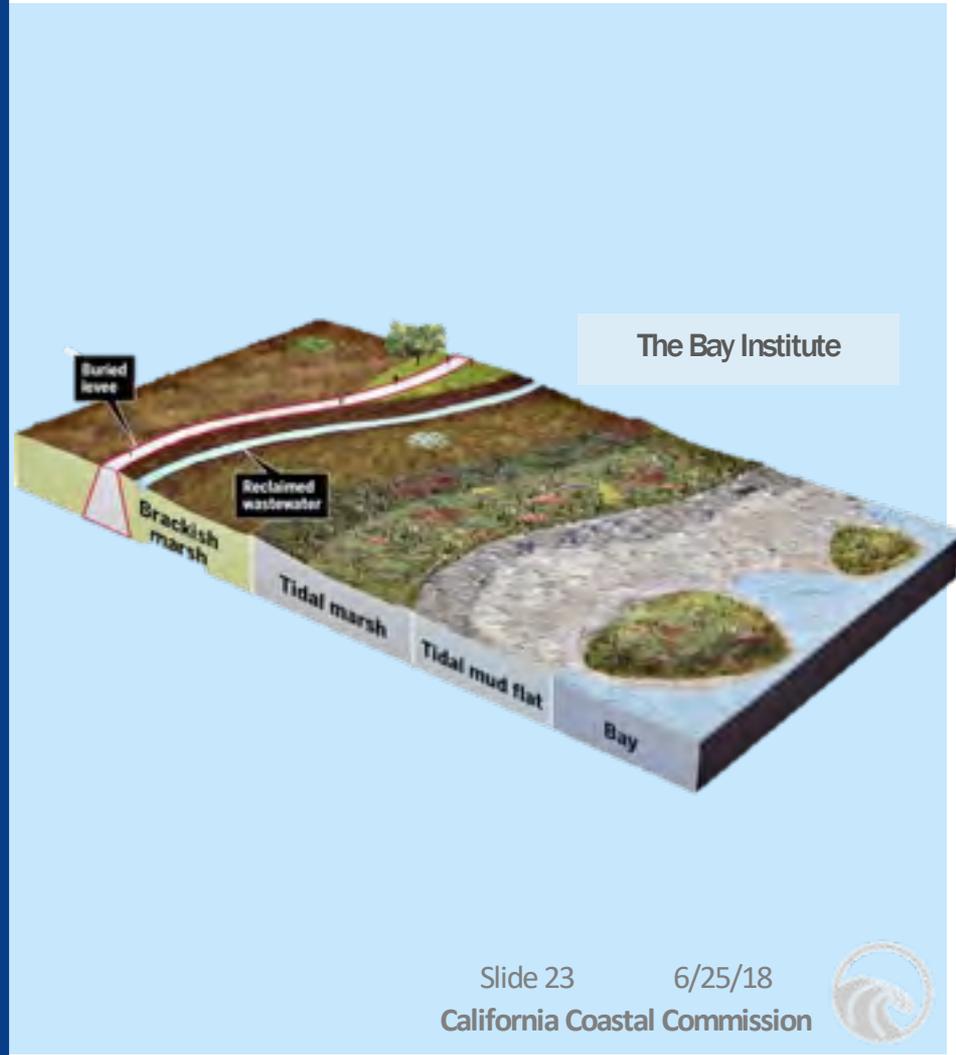
Sediment Augmentation, Seal Beach NWR



# ADAPTATION OPTIONS

## NATURAL INFRASTRUCTURE

Center for Coastal Resources Management, VIMS



# BACKGROUND COASTAL ACT POLICIES

**Special Communities**



**Habitat**



**Wetlands**



**Wildlife**



**Public Access**



**Agriculture**



**Scenic Views**



**Priority Land Uses**



# BACKGROUND

## COASTAL ACT POLICIES

- **Section 30253: New Development shall...**
  - Minimize risks to life & property
  - Assure stability & structural integrity
  - Neither create nor contribute to erosion
  - Assure no protective devices needed for life of structure
  - Minimize energy consumption and vehicle miles traveled



# BACKGROUND

## COASTAL ACT POLICIES

- **Section 30235:**  
**Shoreline Protection allowed for...**
  - Coastal dependent uses
  - Public beaches
  - Existing (pre-Coastal Act) structures
  - **IN DANGER FROM EROSION**
- **With MITIGATION to offset:**
  - Loss of beach and sand
  - Other unavoidable impacts (e.g., to public access, recreational opportunities)



California Coastal Records Project



# SEA LEVEL RISE POLICY GUIDANCE

## Chapters

1. Introduction
2. Guiding Principles
3. Sea Level Rise Science
4. Consequences of SLR
5. Addressing SLR in LCPs
6. Addressing SLR in CDPs
7. Adaptation Strategies
8. Legal Context
9. Next Steps



## CALIFORNIA COASTAL COMMISSION SEA LEVEL RISE POLICY GUIDANCE

*Interpretive Guidelines for Addressing  
Sea Level Rise in Local Coastal Programs  
and Coastal Development Permits*



UNANIMOUSLY ADOPTED – AUGUST 12, 2015

# SCIENCE UPDATES

## Rising Seas in California

AN UPDATE ON SEA-LEVEL RISE SCIENCE



APRIL 2017

## State of California Sea-Level Rise Guidance

2018 UPDATE



# SCIENCE UPDATES

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)				H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE	1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...	5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
				Low Risk Aversion	Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.4	0.3 - 0.5	0.6	0.8	1.0
	2040	0.6	0.4 - 0.8	0.9	1.2	1.7
	2050	0.8	0.5 - 1.1	1.3	1.9	2.7
Low emissions	2060	0.9	0.5 - 1.2	1.5	2.3	
High emissions	2060	1.0	0.7 - 1.4	1.8	2.6	3.8
Low emissions	2070	1.0	0.6 - 1.4	1.9	3.0	
High emissions	2070	1.3	0.9 - 1.8	2.3	3.4	5.1
Low emissions	2080	1.2	0.7 - 1.7	2.3	3.8	
High emissions	2080	1.6	1.1 - 2.3	2.9	4.4	6.6
Low emissions	2090	1.3	0.8 - 2.0	2.7	4.6	
High emissions	2090	2.0	1.3 - 2.8	3.5	5.5	8.2
Low emissions	2100	1.5	0.9 - 2.3	3.1	5.5	
High emissions	2100	2.3	1.5 - 3.3	4.3	6.9	10.1
Low emissions	2110*	1.6	1.0 - 2.4	3.3	6.1	
High emissions	2110*	2.5	1.7 - 3.4	4.4	7.2	11.8
Low emissions	2120	1.7	1.0 - 2.7	3.8	7.3	
High emissions	2120	2.8	2.0 - 4.0	5.2	8.5	14.0
Low emissions	2130	1.9	1.1 - 3.0	4.2	8.3	
High emissions	2130	3.1	2.2 - 4.5	5.9	9.9	16.4
Low emissions	2140	2.0	1.1 - 3.2	4.7	9.5	
High emissions	2140	3.5	2.4 - 5.1	6.7	11.3	18.9
Low emissions	2150	2.1	1.1 - 3.6	5.3	10.8	
High emissions	2150	3.8	2.6 - 5.7	7.6	12.9	21.8

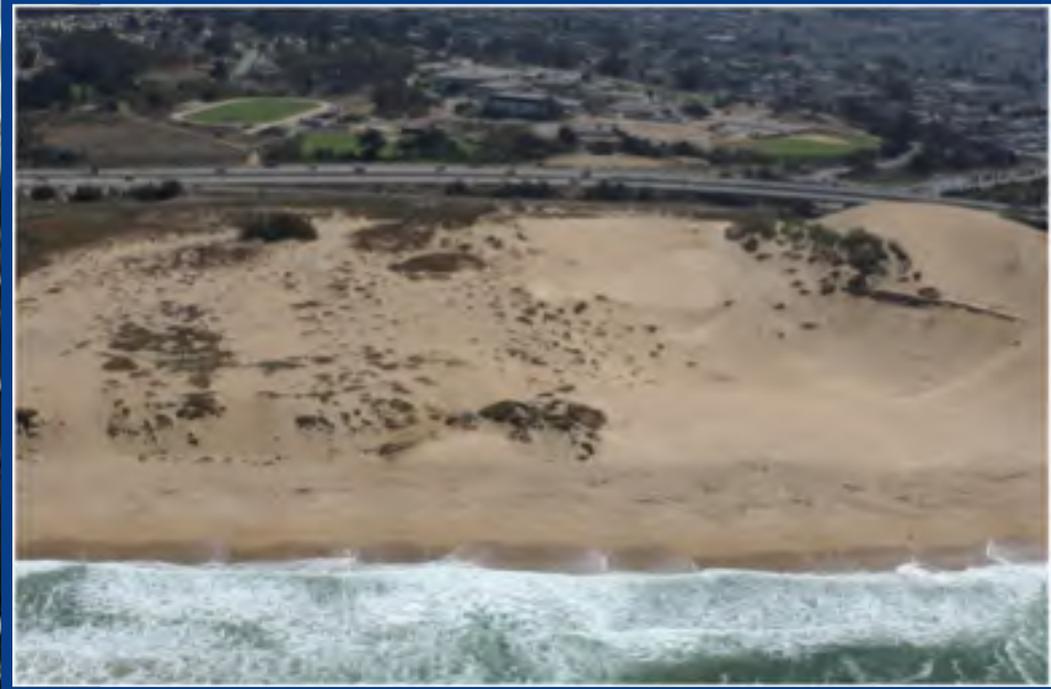
# CENTRAL COAST PROJECTS



**Project Denial  
Morro Bay Wastewater  
Treatment Plant**

California Coastal Records Project

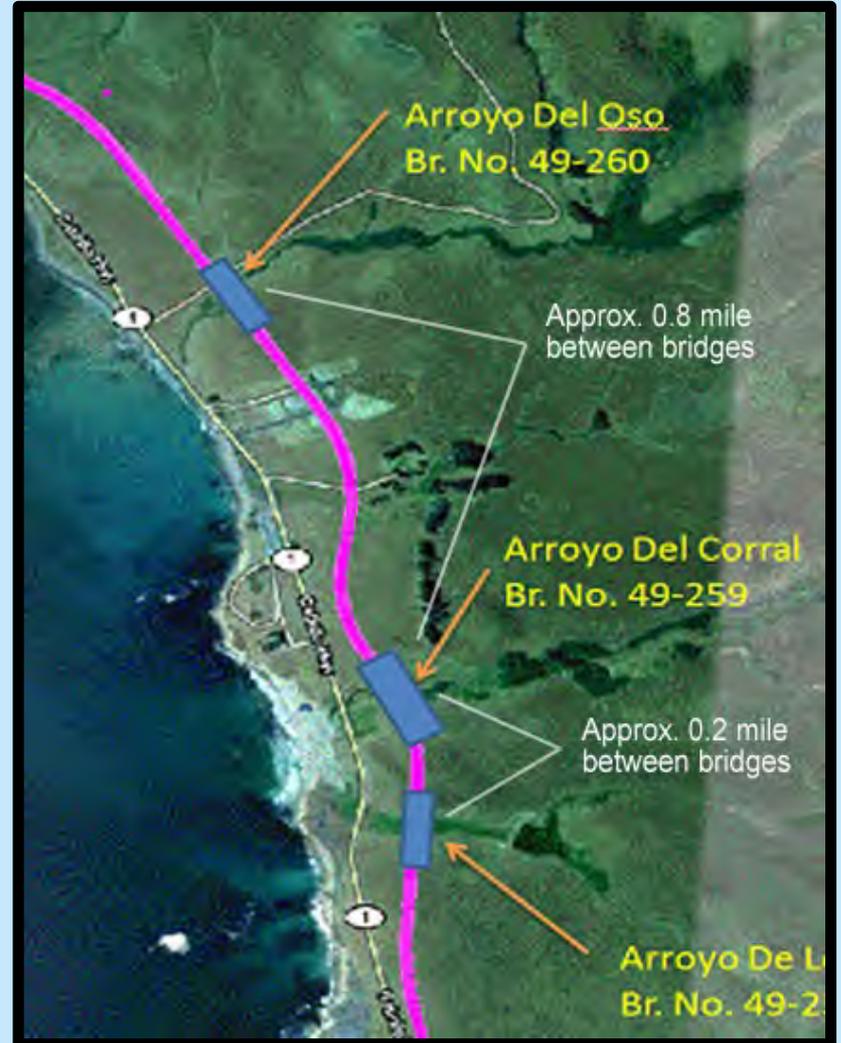
# CENTRAL COAST PROJECTS



**Monterey Bay Shores Resort  
Monterey, CA**

# CENTRAL COAST PROJECTS

## Hwy. 1 Realignment Piedras Blancas, CA



# CENTRAL COAST PROJECTS

**Hwy. 1 Realignment  
Surfer's Beach  
Half Moon Bay, CA**



# CENTRAL COAST PROJECTS

California Coastal Records Project

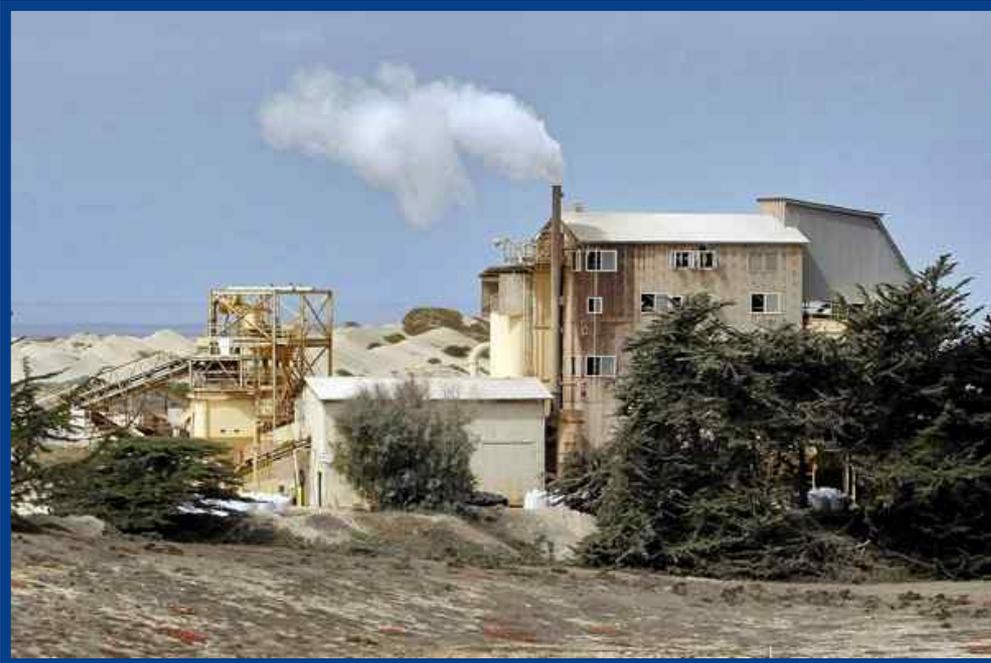
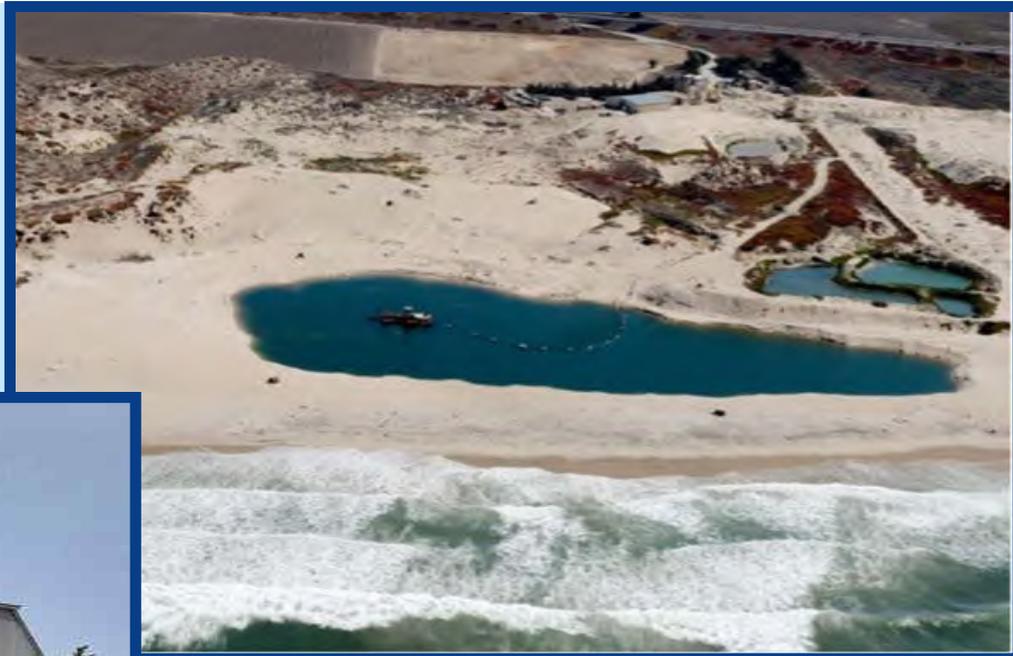


**Stillwell Hall, Fort Ord  
Monterey, CA**



California Coastal Records Project

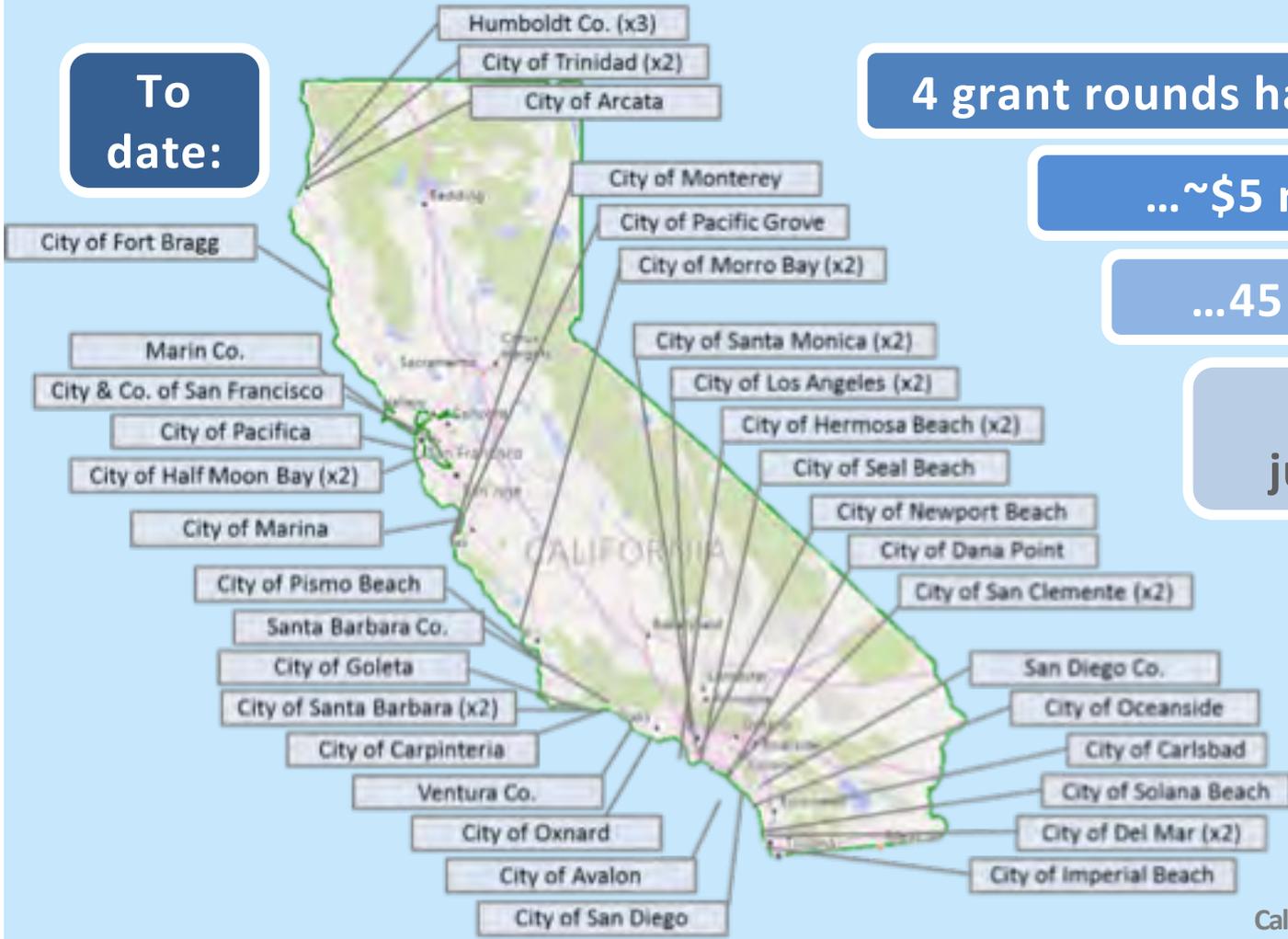
# CENTRAL COAST PROJECTS



**CEMEX Sand Mining  
Marina, CA**

# LCP PLANNING GRANTS FOR LCP UPDATES

To  
date:



4 grant rounds have awarded...

...~\$5 million for...

...45 projects to...

...34 local  
jurisdictions...

...with  
additional  
\$\$ on the  
way.



# CENTRAL COAST PLANNING

## Marin Ocean Coast Sea Level Rise Vulnerability Assessment



DRAFT

### SEA LEVEL RISE VULNERABILITY ASSESSMENT Pacifica, CA

Prepared for  
The City of Pacifica

January 2010



## Plan Half Moon Bay



### Existing Conditions, Trends, and Opportunities Assessment

Revised July 2014

### 2016 City of Monterey Final Sea Level Rise and Vulnerability Analyses, Existing Conditions and Issues Report



3/10/2016

Submitted to City of Monterey

By

Revell Coastal, LLC  
125 Pearl Street, Santa Cruz, CA 95060  
revellcoastal@gmail.com | 831.854.7873



EMC PLANNING GROUP



Planning for Success

### FINAL CITY OF PACIFIC GROVE CLIMATE CHANGE VULNERABILITY ASSESSMENT

PREPARED FOR  
City of Pacific Grove

January 12, 2015

EMC PLANNING GROUP INC.  
A LAND USE PLANNING & DESIGN FIRM

201 Lighthouse Avenue Suite C, Monterey, California 93940 Tel: 831-649-1799 Fax: 831-649-8089  
www.emcplanning.com



## ocean beach master plan

May 2012

SPUR | AECOM | ESA | FWA | Nelson\Akkers | Stonehill Design Engineers | Phil D. King PhD

# CENTRAL COAST PLANNING

## EXAMPLE LCP SLR POLICIES

Setbacks/project design that incorporate SLR

Deed restrictions/real estate disclosures

Committing to additional planning work

Location-specific adaptation strategies

Hazard zoning overlays

Triggers for additional requirements in the future



# CENTRAL COAST PLANNING

## EXAMPLE LCP SLR POLICIES

Setbacks/project design that incorporate SLR

Deed restrictions/real estate disclosures



# CENTRAL COAST PLANNING

## EXAMPLE LCP SLR POLICIES

Committing to additional planning work



Pacific Grove, CA

# CENTRAL COAST PLANNING

## EXAMPLE LCP SLR POLICIES

Location-specific adaptation strategies



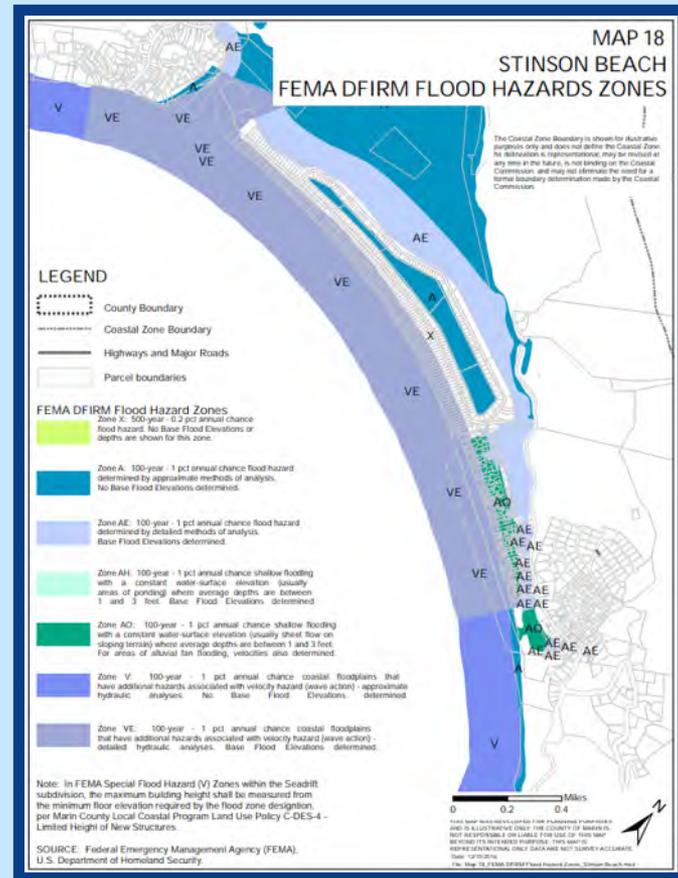
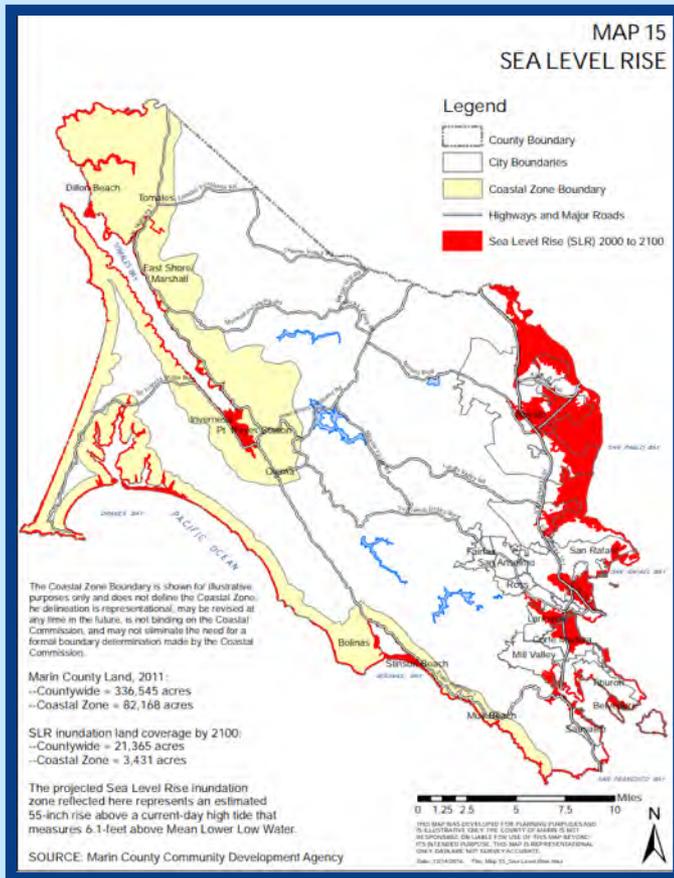
Santa Cruz County



# CENTRAL COAST PLANNING

## EXAMPLE LCP SLR POLICIES

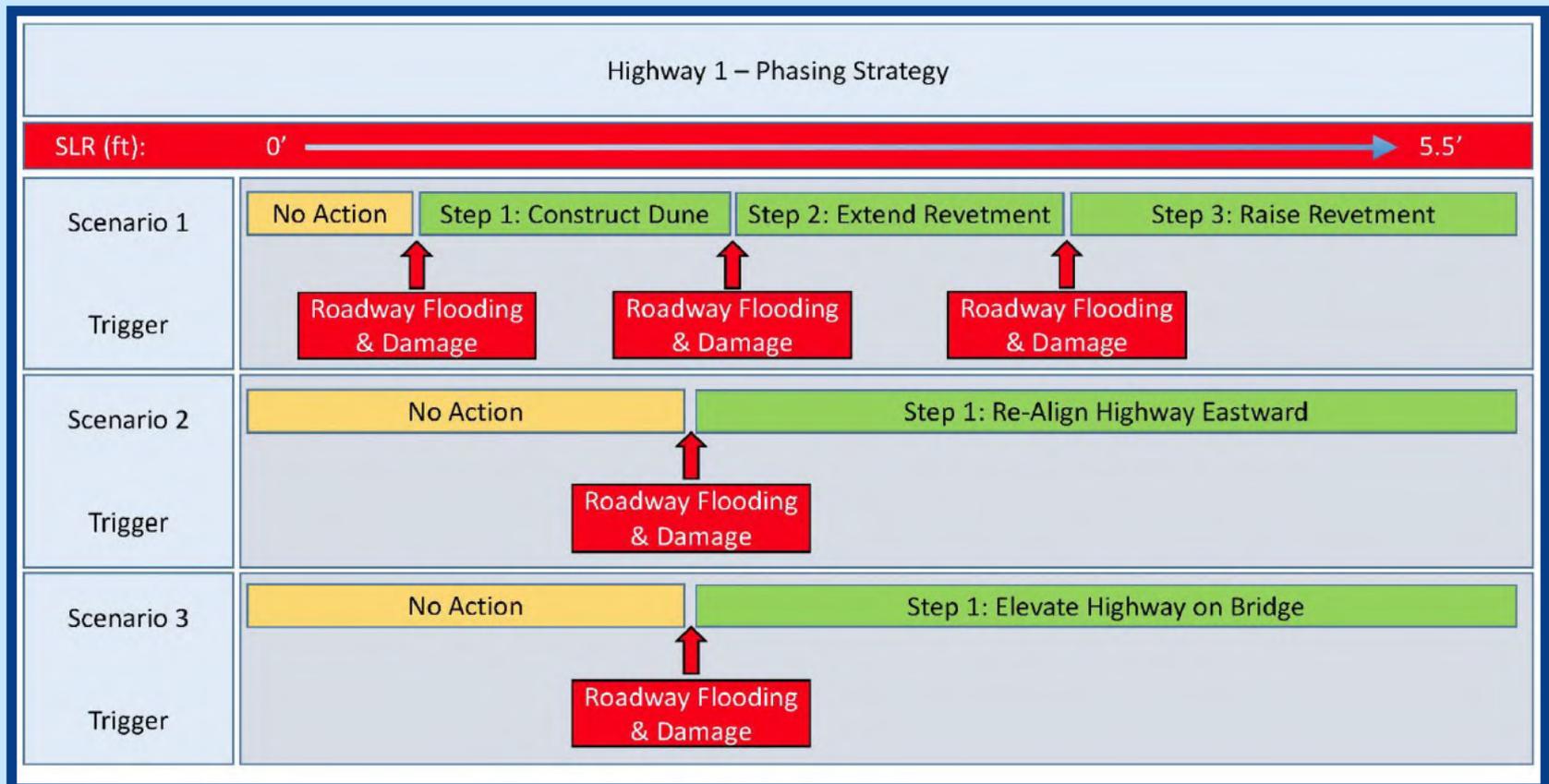
### Hazard zoning overlays



# CENTRAL COAST PLANNING

## EXAMPLE LCP SLR POLICIES

### Triggers for additional requirements in the future



# RESEARCH AND COORDINATION



## CALIFORNIA COASTAL COMMISSION RESIDENTIAL ADAPTATION POLICY GUIDANCE

*Interpretive Guidelines for Addressing Sea  
Level Rise in Local Coastal Programs*



MARCH 2018

REVISED

**Critical Infrastructure Guidance**

**State Lands Commission  
and the Public Trust**

**LHMP, General Plan,  
and LCP alignment**

**THANK YOU!**



[coastal.ca.gov/climate/slr](https://coastal.ca.gov/climate/slr)

[kelsey.ducklow@coastal.ca.gov](mailto:kelsey.ducklow@coastal.ca.gov)