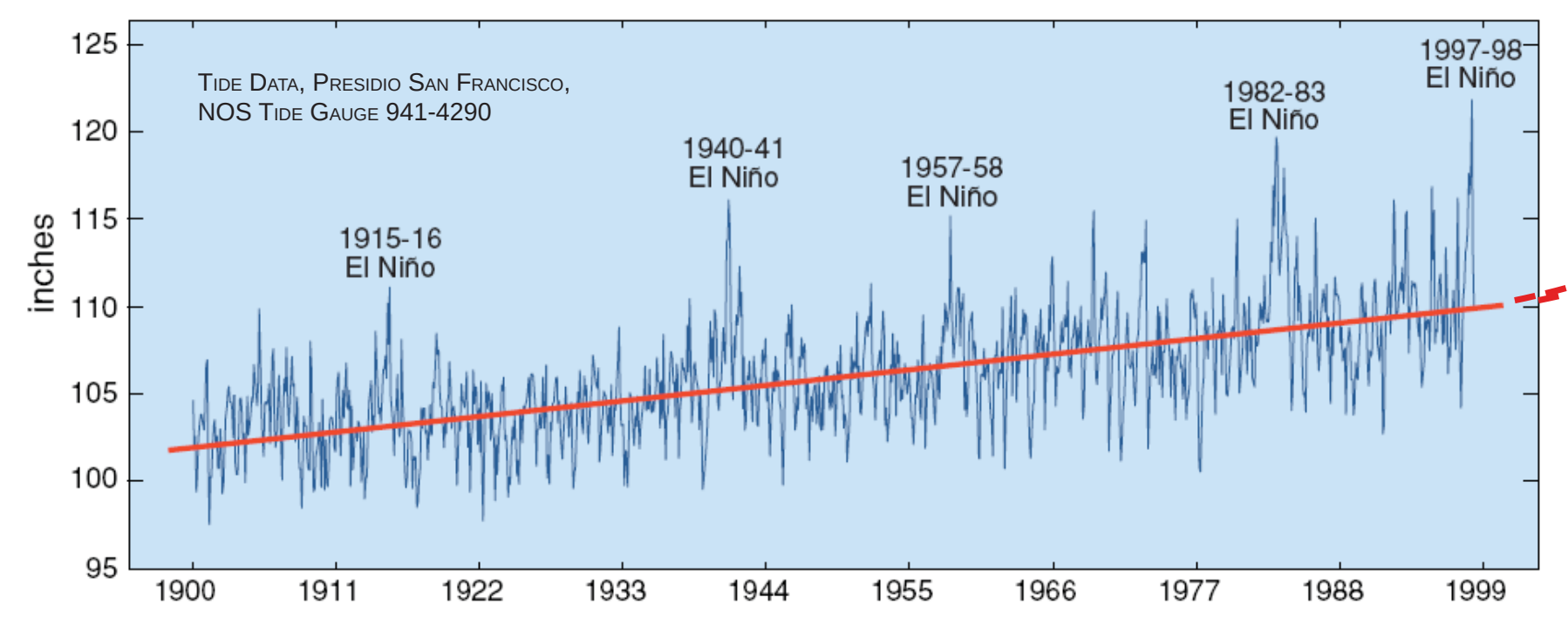
station 1.5 coastal dynamics climate change

rate of sea level change measured at san francisco is about 8 inches in last 100 years



recent sea level rise

the rate of rise is anticipated to go up exponentially

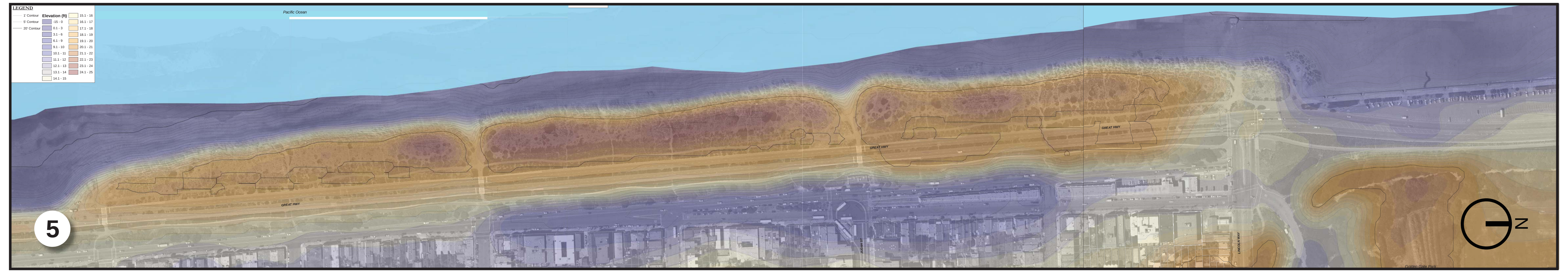
state guidance suggests sea level rise could reach:

14 inches by 2050
and
55 inches by 2100

Year		Average of Models	Range of Models
2030		7 in (18 cm)	5-8 in (13-21 cm)
2050		14 in (36 cm)	10-17 in (26-43 cm)
2070	Low	23 in (59 cm)	17-27 in (43-70 cm)
	Medium	24 in (62 cm)	18-29 in (46-74 cm)
	High	27 in (69 cm)	20-32 in (51-81 cm)
2100	Low	40 in (101 cm)	31-50 in (78-128 cm)
	Medium	47 in (121 cm)	37-60 in (95-152 cm)
	High	55 in (140 cm)	43-69 in (110-176 cm)

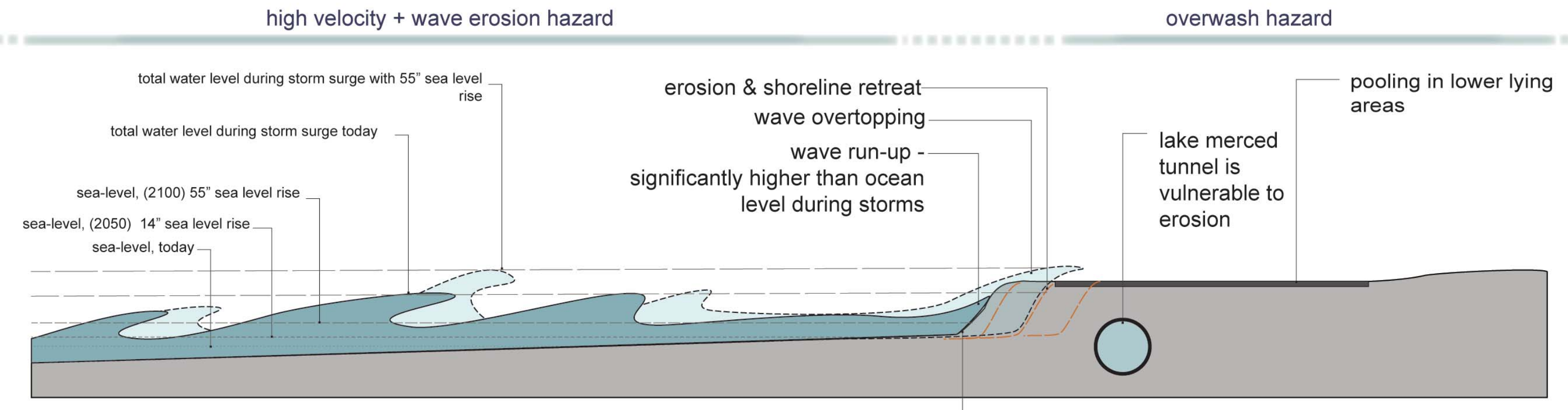
① future sea level rise (SLR)

SOURCE: state of california sea-level rise interim guidance document, october 2010



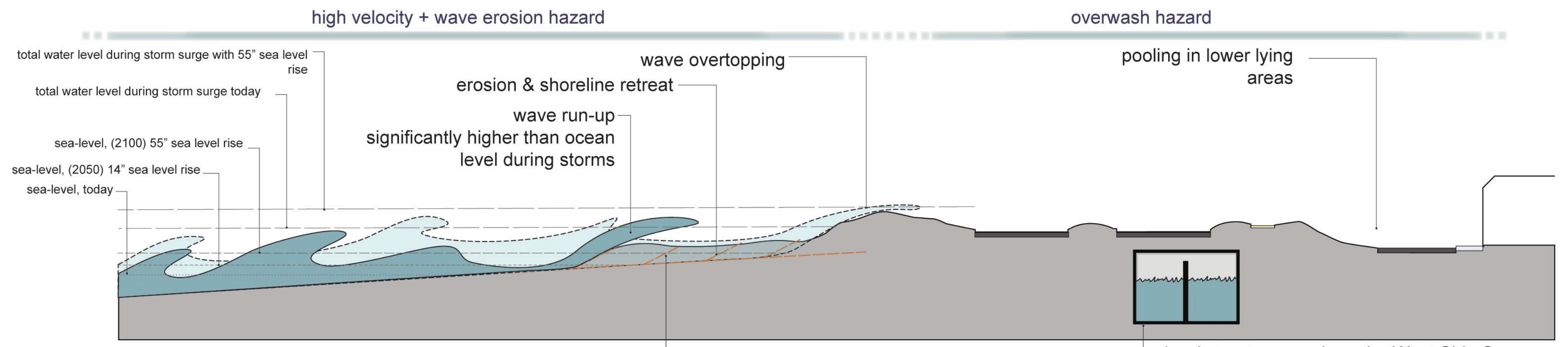
elevation map of central dunes area

② seawall overtopping



soft bluff = bluff recedes rapidly, little change in toe elevation (relative to water levels)
armored bluff = erosion potential increases, toe elevation decreases (relative to water levels)

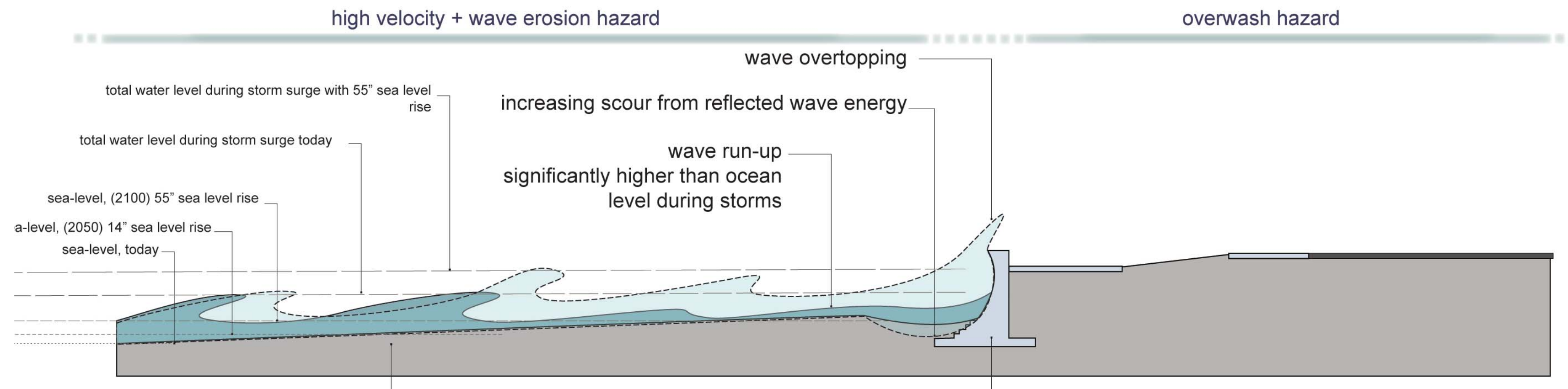
④ diagrammatic bluffs section



dunes offer some protection but are vulnerable to erosion during storm events, resulting in shoreline recession

hard structures such as the West Side Sewer Transport box can offer some berming protection but can be vulnerable to erosion and, if exposed, prevent natural beach and dune formation

③ diagrammatic dunes section



the wide (and expanding) beach in front of the O'Shaughnessy seawall means water rarely reaches this seawall, but can in extreme storm events

seawalls limit shoreline movement. This can protect important assets but changes beach and dune formation, can result in scour at base, and beach loss

④ diagrammatic seawall section

map legend

- project boundary

ROADS + PATHS
- ▬ the great highway (1929)

SEAWALLS
- ▬ noriega seawall (1968-1993)
- ▬ taraval seawall (1940)
- ▬ o'shaughnessy seawall (1915-1922)

REVETMENTS
- ●●●●●● rock stabilization treatment
- ●●●●●● emergency repair area (2010)

TOPOGRAPHICAL FEATURES
- dunes
- bluffs
- low-lying areas

STRUCTURES
- sewer pipes
- major sewer infrastructure
- wastewater treatment facility
- ■ buildings

coastal features for climate change planning

beach erosion and loss

beach rising and expanding

④ recent infrastructure likely to face increasing coastal hazard

④ armoring can protect resources, but changes shoreline movement patterns, dune and beach formation, and can result in beach loss

⑤ dunes offer some protection but will erode over time due to increasing wave run-up levels and frequency

inland low-lying areas are vulnerable to overwash ③

⑤ see detail above

sea level rise

will cause the shore to recede landward

"how much?
-it depends"

① sea level rise is likely to reach 55 inches by 2100, with significant ramifications for Ocean Beach

/ storm events may become more frequent and severe

/ the relationship between sea level rise, erosion, and shoreline movement is complex + dynamic

② / during storm events, wave action can far exceed sea level

③ / rising seas and storm surges change the shape and elevation of beaches, bluffs and dunes

④ / the presence of seawalls + other hard structures limits shoreline dynamics: this can protect important assets, but changes beach and dune formation and can result in beach loss

⑤ / existing dunes + infrastructure will offer some protection -- for a time, but coastal hazards will increase

/ impacts to the dunes, bluffs, roadway, & infrastructure -- *and eventually to private property* -- will become more frequent and severe

/ the coast is changing, and we have some understanding of how -- but how much and how fast is uncertain several studies are underway to address these questions