Shoreline Adaptation Engagement Effort

Mariner Cove Workshop

March 27, 2024

5:30 pm - 7:00 pm

THE TOWN OF Corte Madera California

Team

Adam Wolff, Town Manager
Town of Corte Madera

RJ Suokko, Director of Public Works
Town of Corte Madera

Amy Lyle, Community Development Director
Town of Corte Madera

Phoebe Goulden, Climate Coordinator
Town of Corte Madera

Dave Javid, Founder & Principal
Plan to Place

Rachael Sharkland, Sr. Engagement Specialist
Plan to Place

Quentin Freeman, Engagement Specialist
Plan to Place

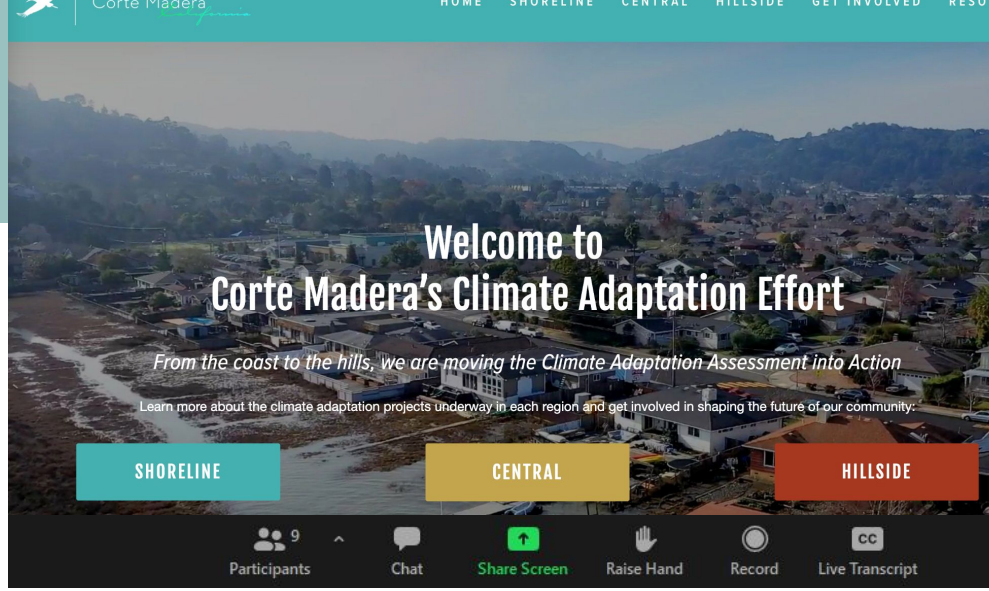
The Town of Corte Madera
Marin County California

Agenda

1. Welcome and Overview
2. Mariner Cove Vulnerabilities
3. Q&A and Discussion
4. Next Steps

Meeting Facilitation

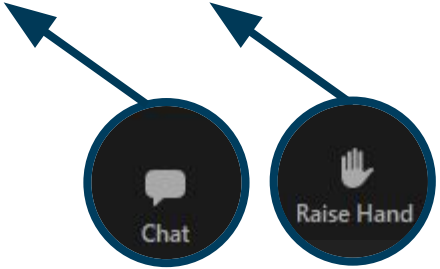
If you have comments or questions, please drop them in the chat window. Once we move into breakout rooms, you will have the opportunity to ask questions using the “Raise Hand” function.



Chat
Share your thoughts in the chat window.

Raise Hand
virtually and you will be unmuted.

Phone
Dial *9 to raise your hand if you called in to this meeting.



Participant Poll

Shoreline Adaptation Engagement Effort

Engagement Goals

- **Engage** with shoreline residents and stakeholders.
- **Share** up-to-date information about current and future flood vulnerabilities and the range of possible adaptation measures.
- **Listen** to the ideas, hopes, needs and concerns of shoreline neighborhoods and adjacent areas in the floodplain.
- **Develop** a community vision for next steps of shoreline adaptation effort in partnership with the community and Town Council.

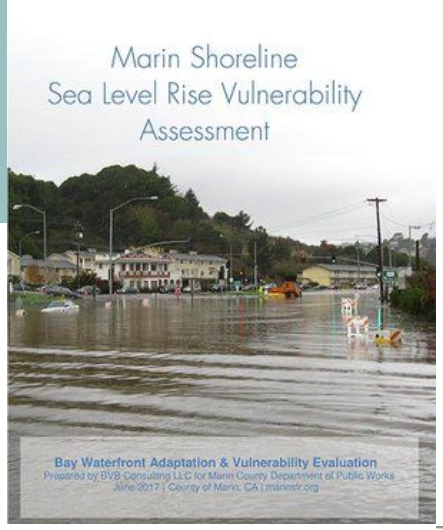
Engagement Area

Floodplain including:

- Marina Village
- Mariner Cove
- Portion of Marin Estates
- Paradise Shopping Center
- Other Commercial Properties

Previous Work Includes:

- Town-Wide Storm Drainage and Flood Control Study (2007 - being updated currently)
- Marin Shoreline Sea Level Rise Vulnerability Assessment (BayWAVE, 2017)
- Marina Village Levee Study (2017)
- Corte Madera Climate Adaptation Assessment (2021)
    - Completed in 2021 through a 2.5 year process of research and engagement




NOBLE CONSULTANTS | GEC

201 Alameda Del Prado, Suite 301
Novato, CA 94949
(415) 884-0727 Fax (415) 884-0726
Ronald M. Noble, P.E., President

July 8, 2017

Kelly Crowe, PE
Town of Corte Madera
Department of Public Works
300 Tamalpais Drive,
Corte Madera, CA 94901

RE: Marina Village Levee Improvements

SUBJECT: Preliminary Evaluation of Conditions and Improvement Measures

Dear Me Crowe:

Noble Consultants, Inc., in collaboration with Miller Pacific Engineering Group and WRA, Inc., has prepared an assessment of existing levee conditions, and recommended measures for improvement of the Marina Village Levees. These levees are subject to continuous settlement due to the underlying bay mud, and thus require routine maintenance to maintain crest elevations. Sea level rise further increases the need to raise levees to maintain current levels of coastal flood protection. Special consideration is required in this work, because the levee borders the Corte Madera Ecological Reserve wetlands which support multiple special status species. This study supports the Town of Corte Madera's (TCM) ongoing effort to improve and maintain the Marina Village levees in a manner which integrates community flood protection, bayland ecosystem support and recreational use of the levee top trail.

We look forward to responding to your comments on the draft, and any questions you may have.

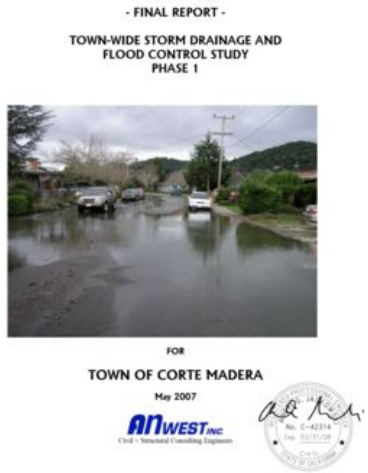
Sincerely,
NOBLE CONSULTANTS, INC.

Rachel Z. Kamman, P.E.
Principal Engineer/Hydrologist

Attachments

Celebrating 29th Anniversary

Coastal • Engineering • Economics • Energy • Environmental • GIS • Planning • Transportation


- FINAL REPORT -

TOWN-WIDE STORM DRAINAGE AND FLOOD CONTROL STUDY
PHASE 1

FOR

TOWN OF CORTE MADERA

May 2007

ANWEST INC
Civil • Structural Consulting Engineers


The Corte Madera
Climate Adaptation Assessment
A Roadmap to Resilience
May 2021

THE TOWN OF CORTE MADERA
MARIN COUNTY CALIFORNIA

Corte Madera Shoreline Adaptation
Community Engagement Timeline

We are here

Spring 2021
Corte Madera Climate Adaptation Assessment Completed

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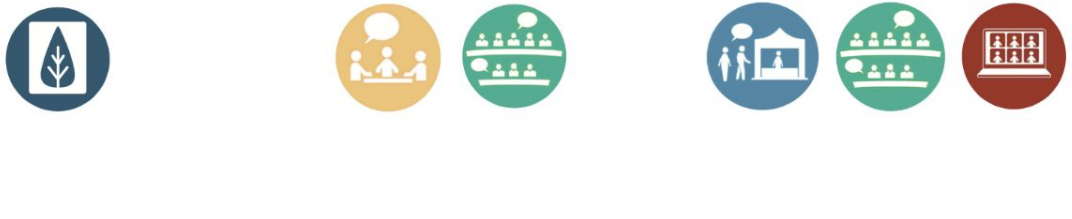

- Climate Adaptation Assessment Published
- Flood Board & Town Council Meetings
- Community Survey
- Stakeholder Meetings
- Pop-Ups
- Virtual Community Workshops

Engagement So Far

10.26.23 - 11.20.23 | Stakeholder Meetings

12.11.23 | Flood Board Meeting

1.10.24 | King Tide Pop Ups: Marina Village and Mariner Cove

2.28.24 | Marina Village Virtual Workshop

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Marin County California

12.11.23 Flood Board Meeting

- Attendance:
  10 community members in person, 30 on Zoom
- Comments reflected a desire for an iterative process that is customizable to different geographic conditions, rather than a one size fits all approach

Feedback Heard at January 10th King Tide Pop Up

Concerns

- Impact of raised berms w/trails on privacy
- Existing flood management infrastructure needs maintenance/upgrades
- More information needed to understand different flood mitigation strategies
- Existing flood experiences in several areas

Opportunities

- Support for the Town to evaluate near-term and implementable flood mitigation strategies
- Support for the Town to consider a “phased approach” with respect to timing and implementation area
- Appreciation expressed that the Town’s efforts are not driven by Caltrans


Elevation Map
Corte Madera - Paradise Drive North Commercial
Marina Village Levee
(8.3 ft at lowest point)
Calif Highway Patrol
101
San Clemente Creek
Channel Dr
Golden Hind Passage
Seamast Passage
Ebbtide Passage
The Sanitary Pump Station
7.2 ft at concrete foundation
Yolo St
Edgemar Way
Echo Ave
Harbor Dr
Key Largo Course
Seawolf Passage
Pacific Queen Passage
Prince Royal Passage
Diamond Head Passage
Staghound Passage
Triangle Marsh
The Cove School
Town of Corte Madera Fire Station #13
Paradise Shopping Center
Spindrift Passage
Paradise Dr
Windward Dr
Koch Rd
Elevation*
12+ ft
11-12 ft
10-11 ft
9-10 ft
8-9 ft
7-8 ft
6-7 ft
<6 ft
Data Source: LIDAR 2019, via County of Marin, MarinMap.org
*NAVD88

Mariner Cove Vulnerabilities

What are the causes of flooding in shoreline neighborhoods?

Flooding contributors include:

- Settlement (Subsidence)
- Sea Level Rise
- Storm Drain Infrastructure no longer adequate
- Stormwater Runoff
- King Tides
- Extreme High Tides
- El Niño
- Wind Wave Events
- Etc.

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Marin County California

Mariner Cove was built on filled marshland in the 1950s

Bay Mud Thickness (ft.)	Settlement to Date (1958-2006) (ft.)	Estimated Future Settlement (100 years) (ft.)	Total Calculated Settlement from 1958 (ft)
50	4.6	0.7	5.3
70	4.1	1.8	6.1
90	3.5	2.2	6.7

Figure 3.1. Calculated and estimated settlement of residential development in Marina Village and Mariner Cove based on bay mud thickness below the infrastructure. Table adapted from Town-Wide Storm Drainage and Flood Control Study – Phase I, 2007.

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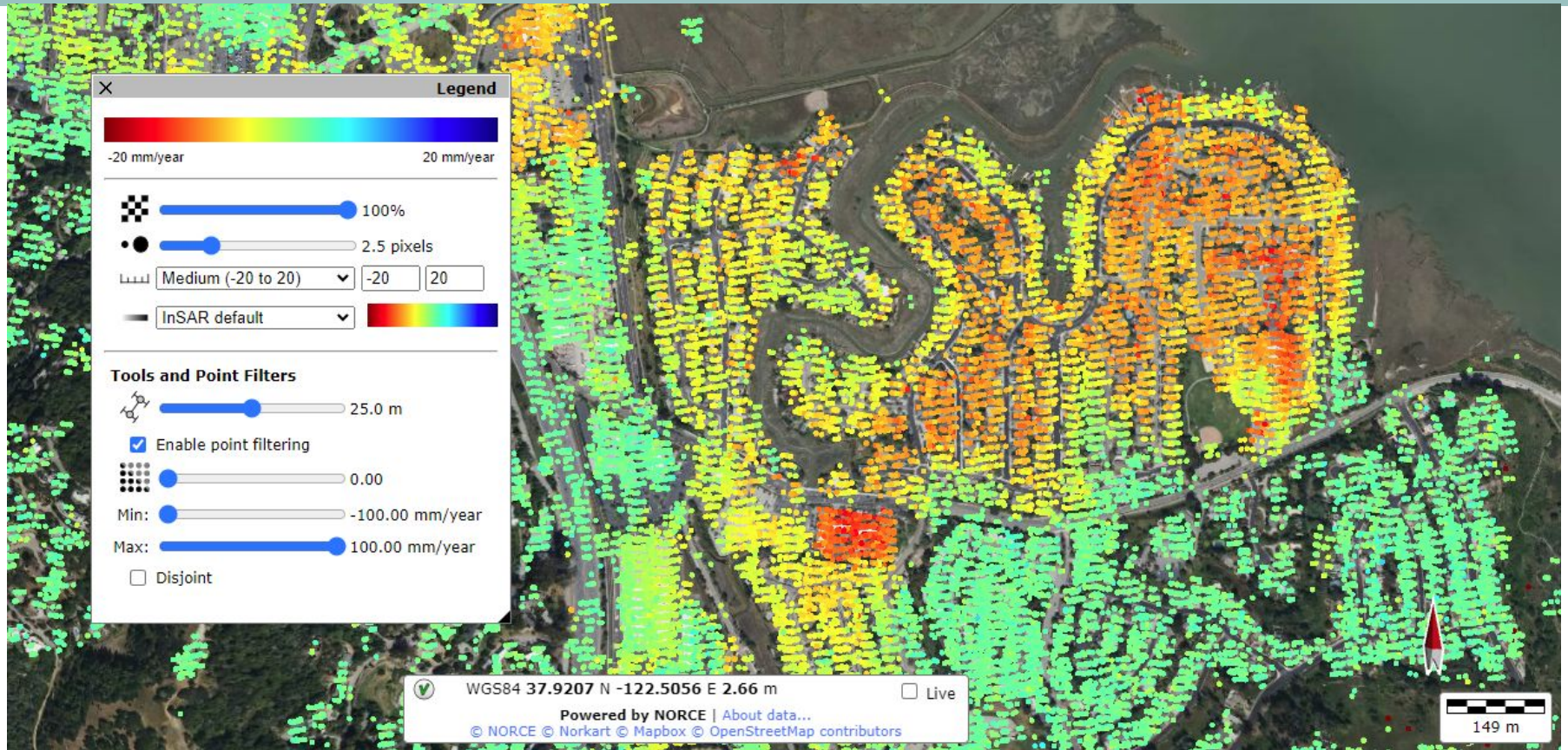
Marin County California

Subsidence is Ongoing

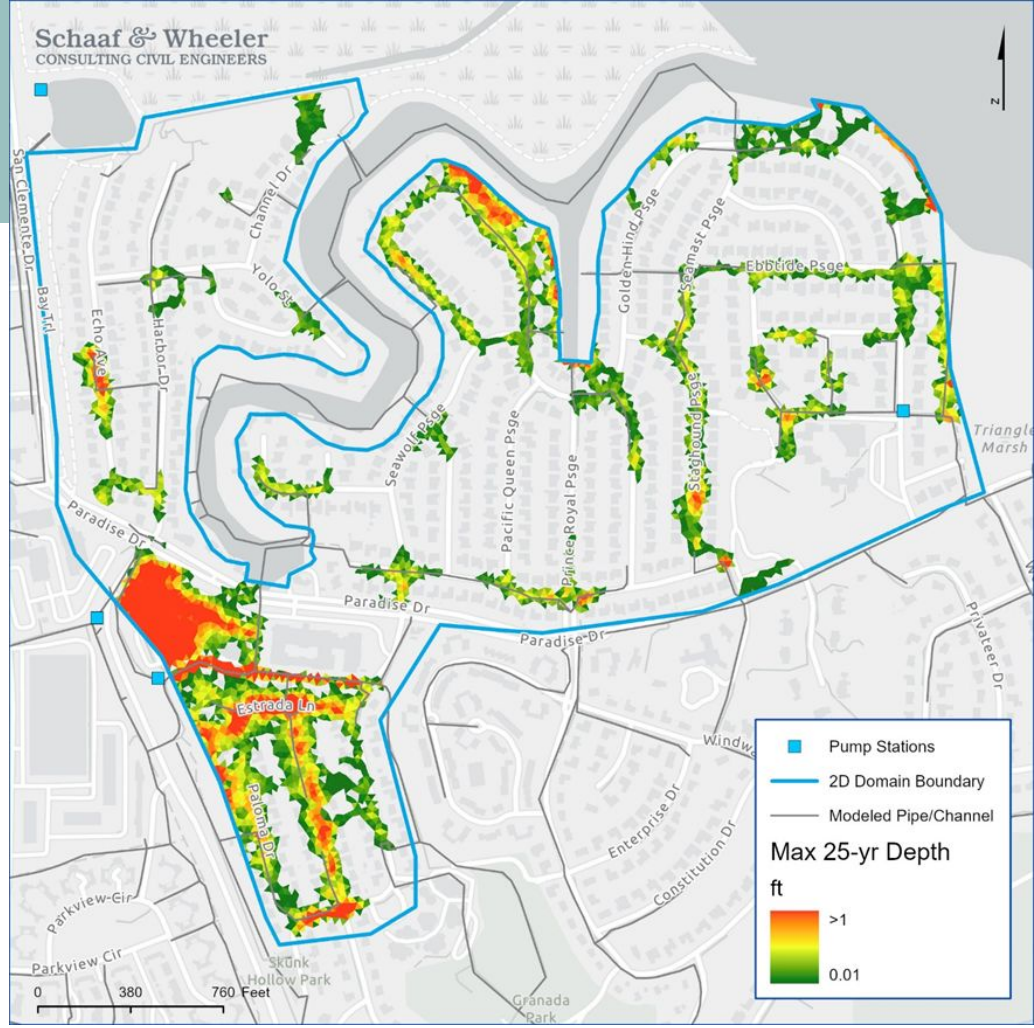


Golden Hind Passage, January 21, 2023
High Tide: 7.5ft NAVD88 at 11am
Photo Credit: Roy Wolford

Seawolf Passage, October 24, 2021, 3pm
Tide: 7.1ft NAVD88 at Richmond Station
Rainfall: 2.97” on 10/24

Storm Drain Master Plan Update

Model results of expected flooding in Mariner Cove and Marin Estates from a 25-year storm (2D Result from MIKE+ with Tidal Boundaries)



From Draft Corte Madera Storm Drain Master Plan

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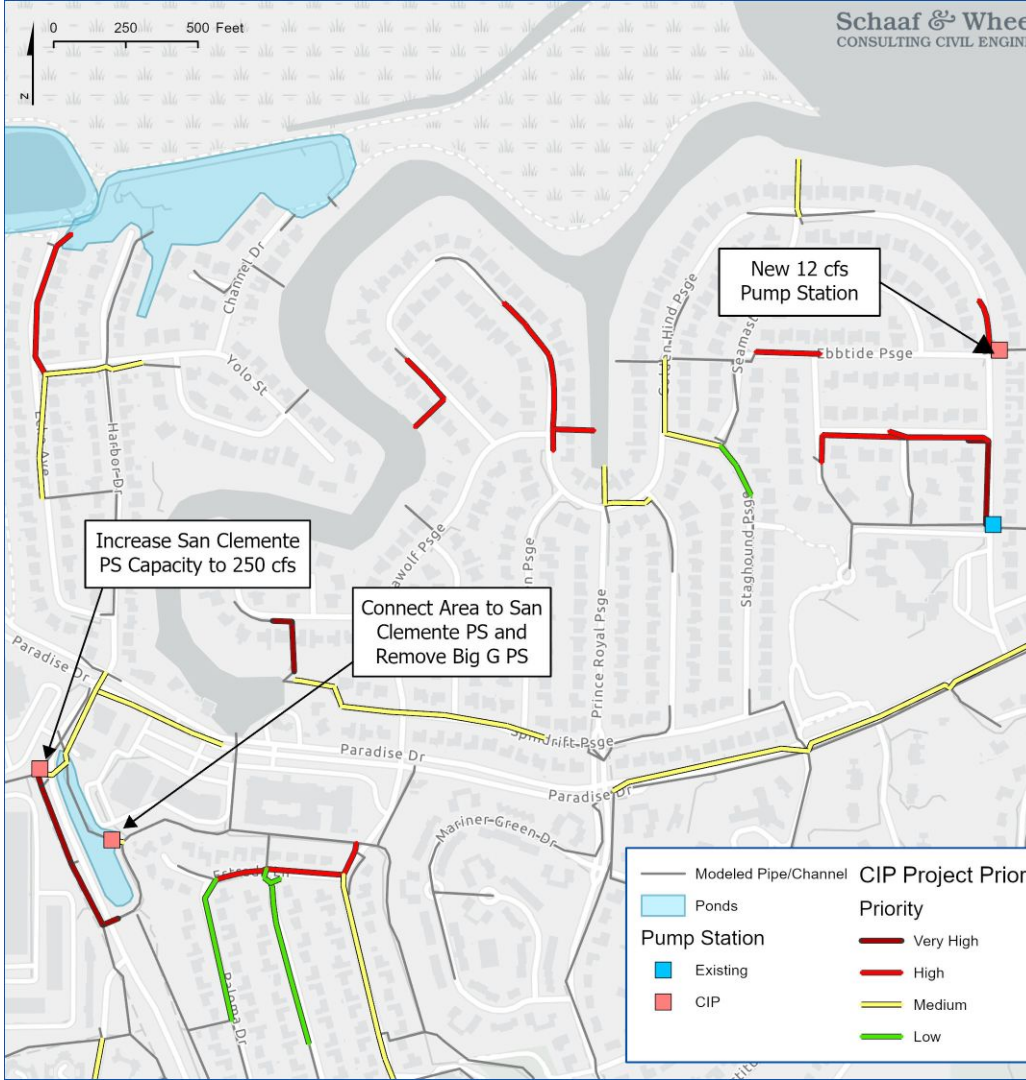
Marin County California

All the color-coded lines shown are recommended CIP projects, however based off current budget scenarios, only “very high” priority projects would be considered in next 10 years.

The proposed new pump station at Golden Hind Psge and Ebbtide Psge is high priority and would be budgeted in 10-20 years



Introduction of Flood Visualization Tool

In Fall of 2023, the Town hired Virtual Planet Technologies, LLC to develop renderings of flooding impacts for Corte Madera.

Partners

Virtual Planet

LINCOLN INSTITUTE OF LAND POLICY

The Nature Conservancy

City of Santa Cruz

County of Santa Barbara, California

Stanford University

SANTA CRUZ PUBLIC LIBRARIES

Save Our Shores

Turner Station Conservation Teams

OCEAN PROTECTION COUNCIL

PARADISE RECREATION & PARK DISTRICT

AQUARIUM OF THE PACIFIC

Caltrans

AMBAG

9º CURTA BRASÍLIA

FIU FLORIDA INTERNATIONAL UNIVERSITY

FLORIDA ATLANTIC UNIVERSITY

Middlebury Institute of International Studies at Monterey

Oceans360

WPB WEST PALM BEACH

swandive

THE TOWN OF CORTE MADERA
MARIN COUNTY CALIFORNIA

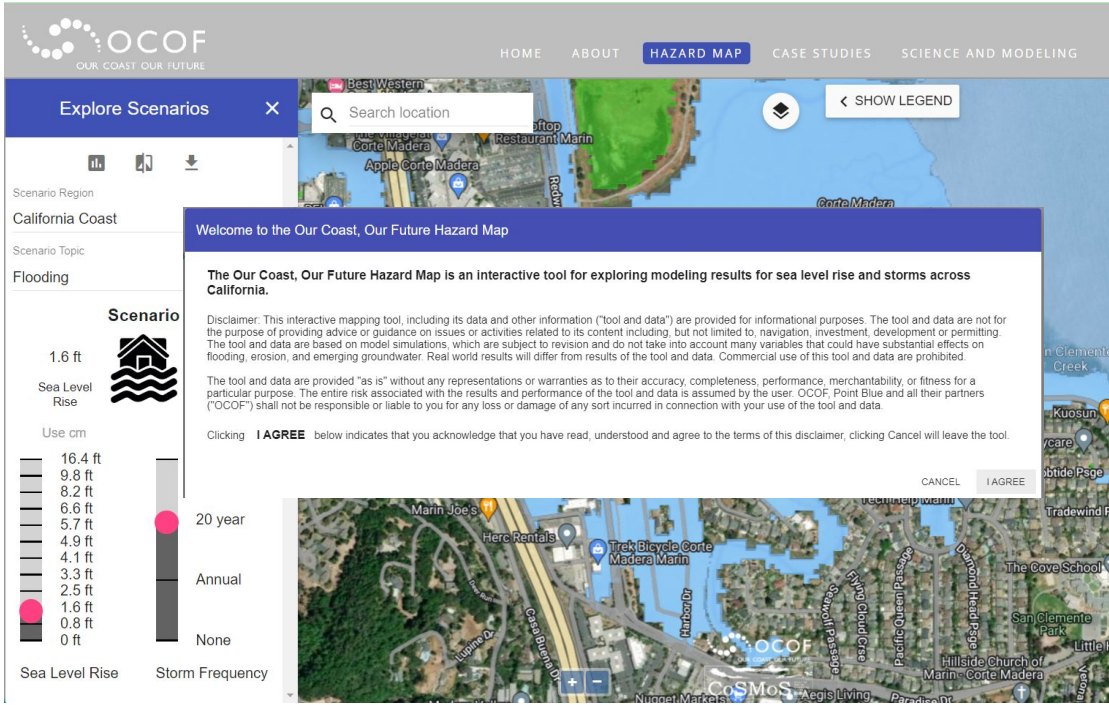
UNIVERSITY OF CALIFORNIA SANTA CRUZ

LAND TRUST OF SANTA CRUZ COUNTY

https://virtualplanet.tech/

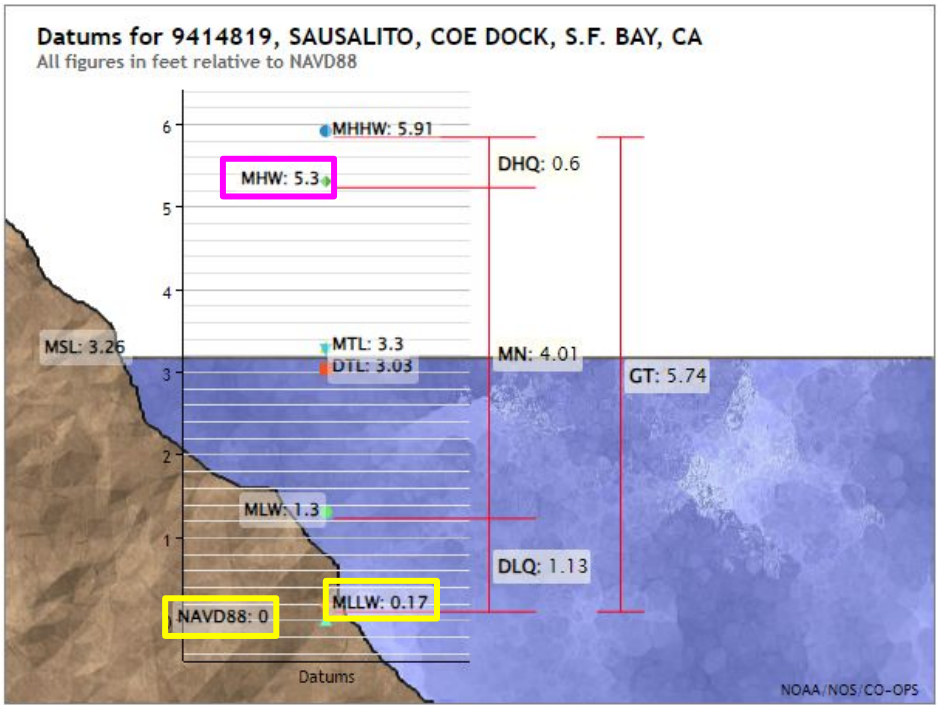
Background of Visualization Tool

- Based on the Coastal Storm Modeling System (CoSMoS) created by the United States Geological Survey (USGS) & Pacific Coastal and Marine Science Center
- CoSMoS uses "mean high water" (MHW) as their vertical datum
- In efforts to make the CoSMoS model more useful to our residents, we have converted this datum to North American Vertical Datum of 1988 (NAVD88), which is the official survey datum for the Conterminous United States and Alaska



https://ourcoastourfuture.org/

1.6 feet of sea level rise in the CoSMoS model is within the range of a King Tide today



- Per the NOAA website and based on the Sausalito secondary tidal station, the difference in elevation between MHW and NAVD88 is 5.3 feet
- +1.6 feet Sea Level Rise in CoSMoS is equivalent to 6.9 feet NAVD88 for the Sausalito station.
- The same conversion for Point San Quentin (MHW = 5.17 + 1.6 feet SLR), yields a value of 6.77 feet NAVD88
- The difference between NAVD88 and "mean lower low water" (MLLW) used in most tide charts is 0.17 feet or 2.04 inches

https://tidesandcurrents.noaa.gov/stations.html?type=Datums

Shoreline Flood Explorer Corte Madera

The Town of Corte Madera
Marin County California

Q&A/Comment Guidelines

The Town is committed to creating a safe and inclusive environment. We will not tolerate speech or actions that disrupt a public meeting or may be perceived as aggressive, demeaning, or harmful towards staff, consultants, or other meeting participants. Staff will be monitoring this meeting and ensuring that everyone is participating respectfully. If staff determines that a meeting participant is acting in a disruptive or disrespectful manner, they will be muted and given a warning. If the behavior continues, they will then be removed.

The Town of Corte Madera
Marin County California

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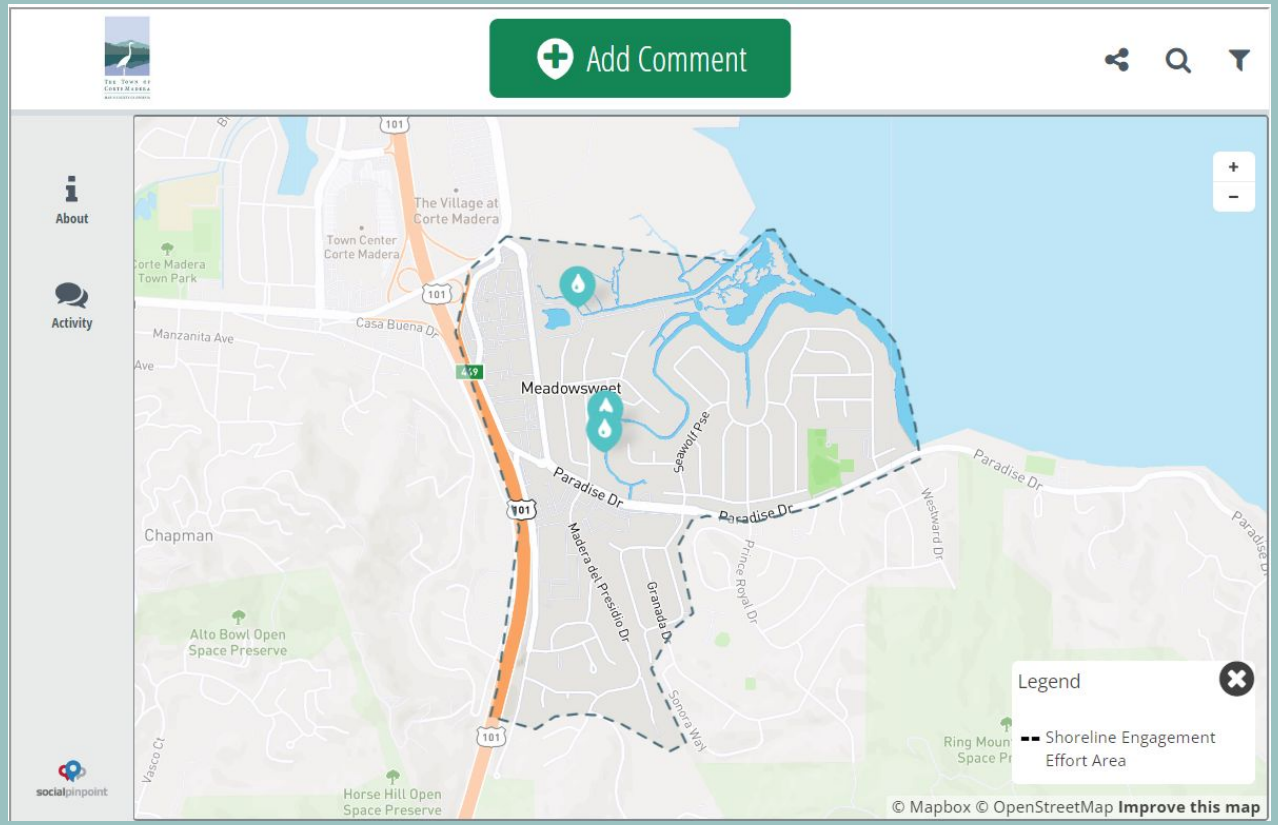
Collaborative Flood Mapping



Next Steps

Contribute to the Collaborative Flooding Map!

Website: https://cortemaderaadapts.org/shoreline

Contact: cmadapts@tcmmail.org

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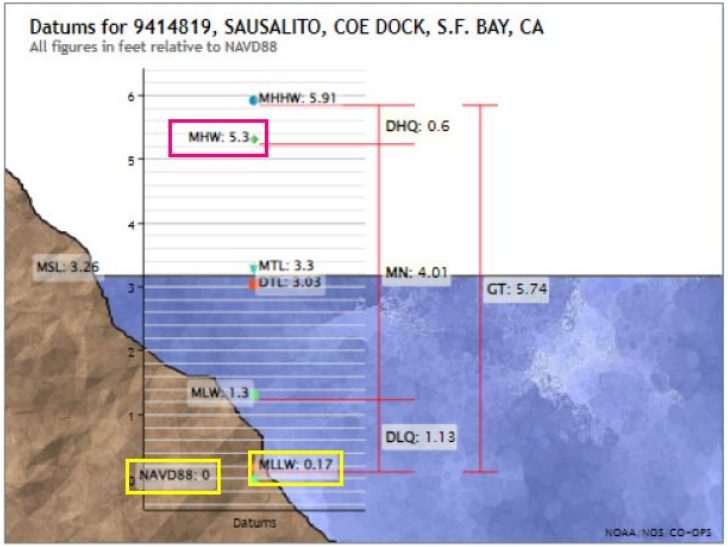
Backup Slides

CoSMoS Model Assumptions



https://tidesandcurrents.noaa.gov/datums.html

- Per the NOAA website and based on the Sausalito secondary tidal station, the difference in elevation between MHW and NAVD 88 is 5.3 feet

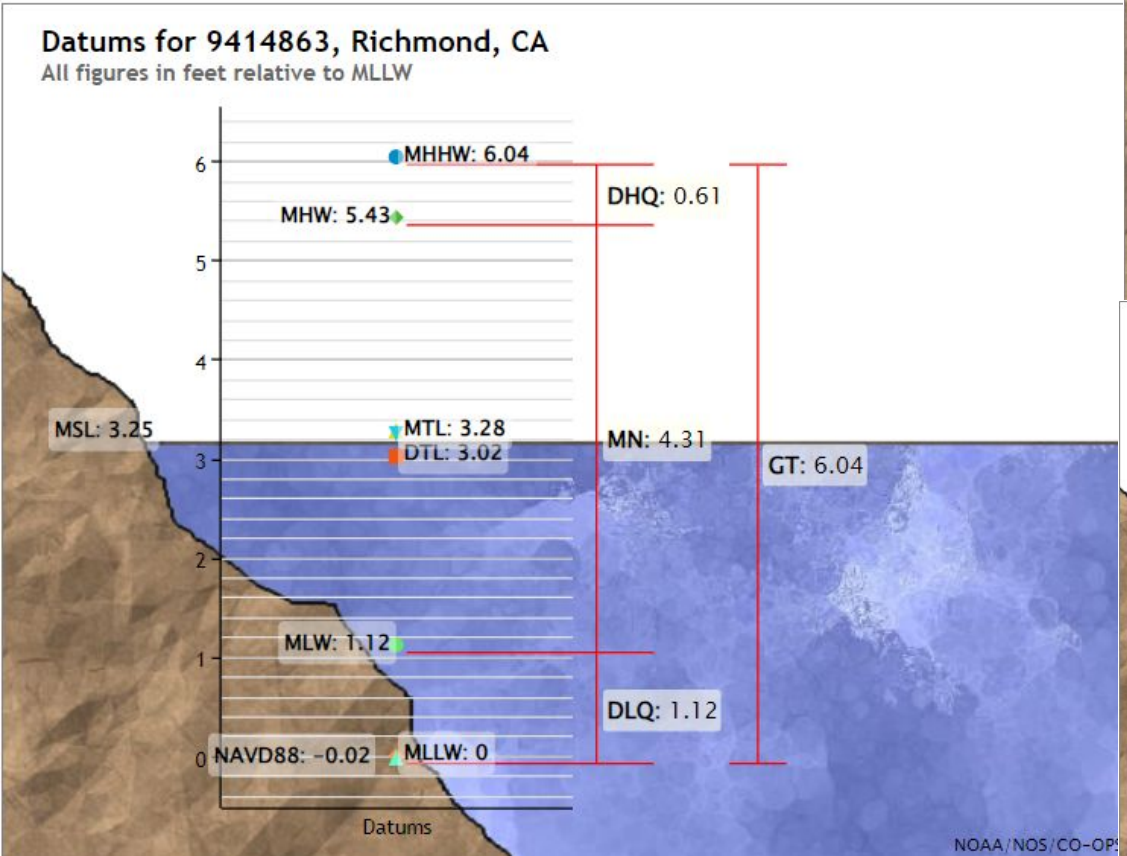
- Likewise a +1.6 foot Sea Level Rise forecast in CoSMoS is equivalent to 6.9 feet NAVD 88 for the Sausalito station.

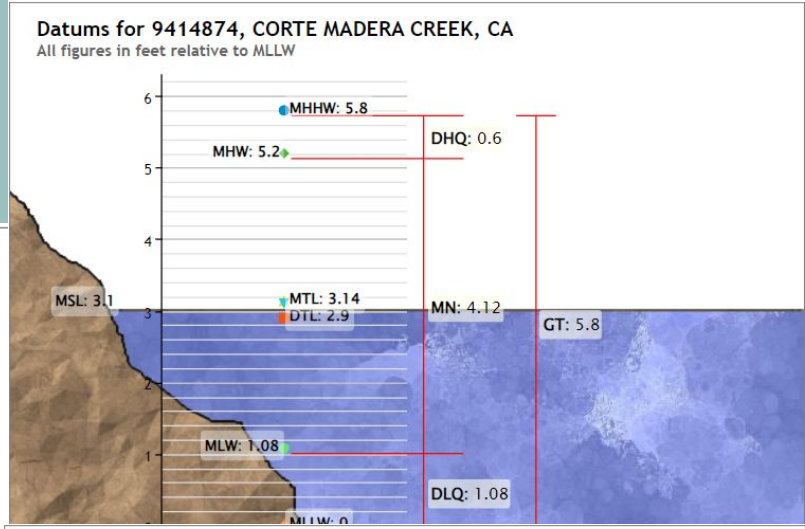
-Likewise the same conversion for Point San Quentin (MHW = 5.17 + 1.6 feet SLR), yields a value of 6.77 feet NAVD 88

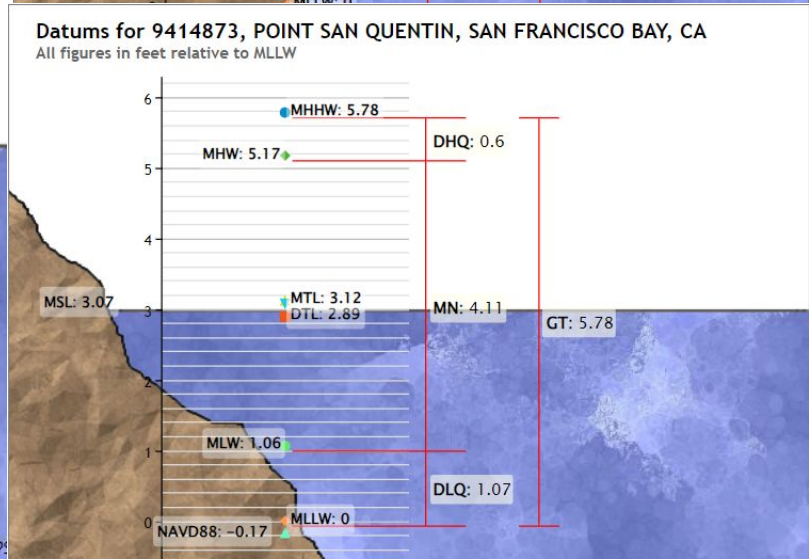
-The difference between NAVD 88 and "mean low low water" used in most tide charts is 0.17' or 2.04"

Therefore, for our mapping tool are assuming that a CoSMoS +1.6 feet of sea level rise scenario for Point San Quentin Station (6.77' NAVD 88 or 6.6' MLLW) is within range of a "King Tide"

Tidal Datums







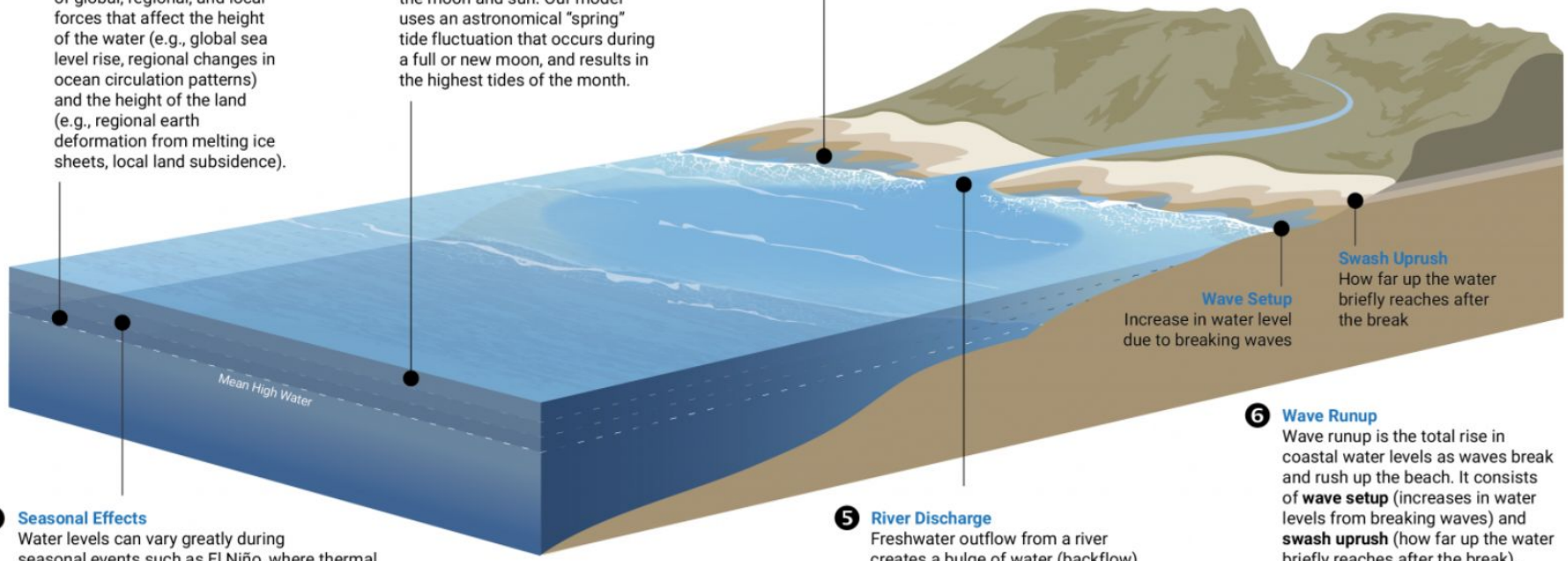
Total Water Level

Total Water Level = ❶ Relative Sea Level + ❷ Tides + ❸ Storm Surge + ❹ Seasonal Effects + ❺ River Discharge + ❻ Wave Runup

❶ **Relative Sea Level Rise**
Local sea level changes over time because of a combination of global, regional, and local forces that affect the height of the water (e.g., global sea level rise, regional changes in ocean circulation patterns) and the height of the land (e.g., regional earth deformation from melting ice sheets, local land subsidence).

❷ **Tides**
Tides reflect the regular rise and fall of the sea surface at the shore in response to forces exerted by the moon and sun. Our model uses an astronomical "spring" tide fluctuation that occurs during a full or new moon, and results in the highest tides of the month.

❸ **Storm Surge**
During a storm, seawater can rise significantly above normal levels as a storm's low-atmospheric pressure causes sea level to rise, and winds push water onshore. Storm surge is measured as the height of the water above the normal predicted tide.

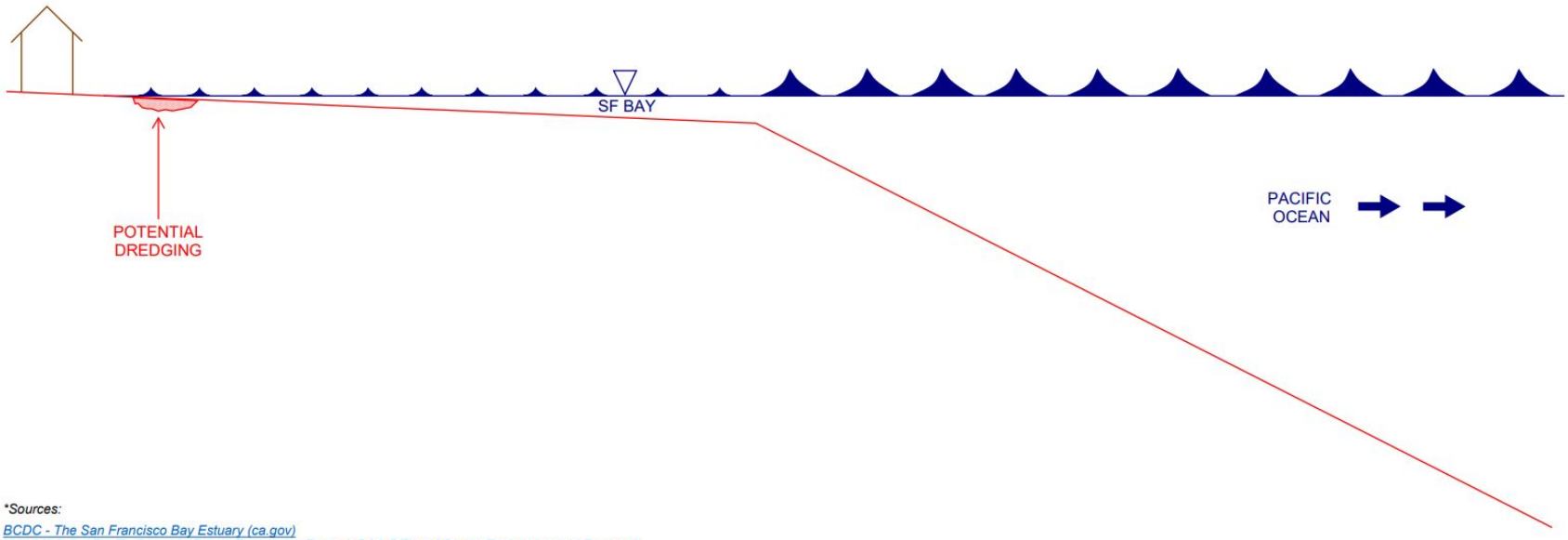


❹ **Seasonal Effects**
Water levels can vary greatly during seasonal events such as El Niño, where thermal expansion (warmer water increasing in volume) and changes to ocean circulation cause coastal water levels to rise.

❺ **River Discharge**
Freshwater outflow from a river creates a bulge of water (backflow) where the river and ocean meet, increasing local water levels.

❻ **Wave Runup**
Wave runup is the total rise in coastal water levels as waves break and rush up the beach. It consists of **wave setup** (increases in water levels from breaking waves) and **swash uprush** (how far up the water briefly reaches after the break).

	Approx. Surface Area* (Sq. Miles)	Approx. Volume per 1-Inch of water surface area (cubic yards)
San Francisco Bay	550	47,048,611
Pacific Ocean	60,000,000	5,132,575,757,576
All Oceans	139,000,000	11,890,467,171,717



*Sources:

BCDC - The San Francisco Bay Estuary (ca.gov)
How big is the Pacific Ocean?: Ocean Exploration Facts: NOAA Office of Ocean Exploration and Research
How much of the ocean has been explored? : Ocean Exploration Facts: NOAA Office of Ocean Exploration and Research

100-Year Storm/Flood Events

- "100-year flood" - a flood that statistically has a 1-percent chance of occurring in any given year.
- "100-year storm" - a *rainfall event* that statistically has a 1-percent chance of occurring in any given year.
- A 100-year storm does not necessarily cause a 100-year flood
  - Depends on factors such as rainfall distribution, soil saturation prior to rainfall, and size of watershed
- The average number of years between floods of a certain size is the recurrence interval or return period. The actual number of years between floods of any given size varies a lot because of the naturally changing climate.
- “20-year storm” - a rainfall event that statistically has a 5% chance of occurring in any given year

USGS, “The 100-Year Flood”, 2018

Sea Level Rise Scenarios

- Draft State of California Sea Level Rise Guidance: 2024 Science and Policy Update was released in January 2024
- Based on updated science & better understanding of sea level rise
- “Statewide, sea levels are most likely to rise 0.8 ft (Intermediate Scenario) by 2050.”
- Risk tolerance should inform which scenario to plan for

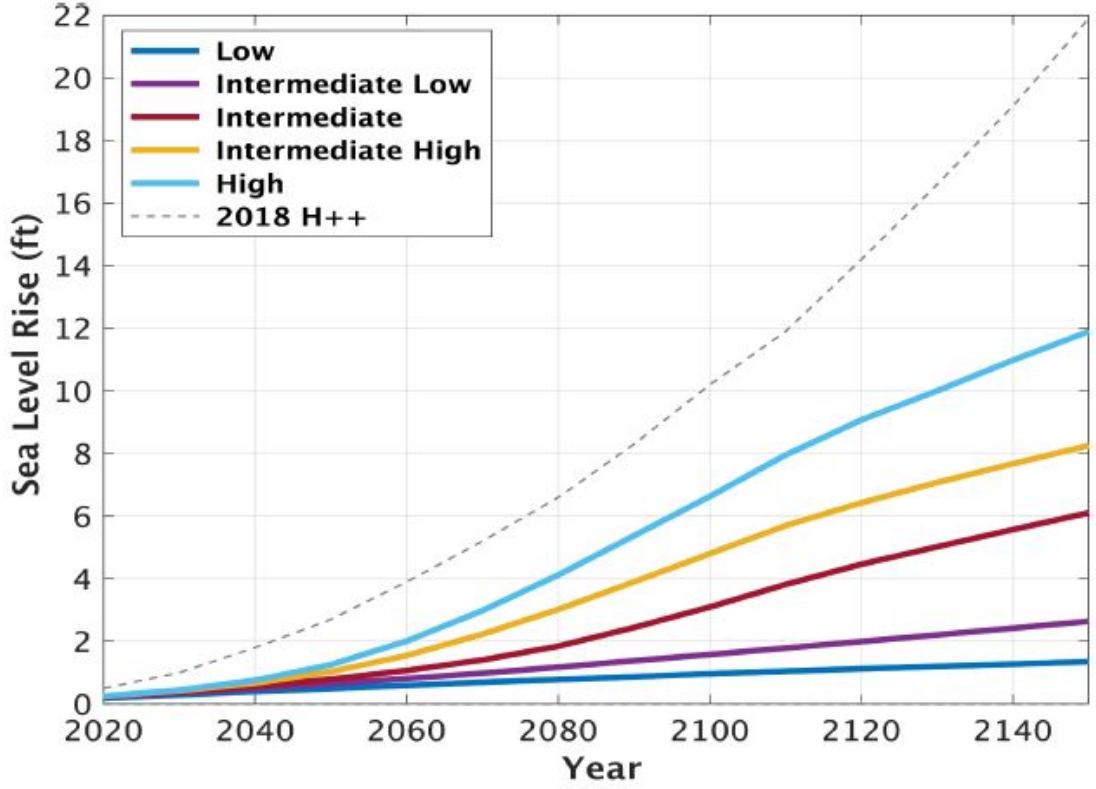


Figure 2.3. Sea Level Scenarios from 2020 to 2150, in feet, with a baseline of 2000. For comparison, the H++ from the 2018 California Sea-Level Guidance is included illustrating that this scenario is above scientifically plausible sea level rise for all dates.

Settlement Data

Bay Mud Thickness (ft.)	Settlement to Date (1958-2006) (ft.)	Estimated Future Settlement (100 years) (ft.)	Total Calculated Settlement from 1958 (ft)
50	4.6	0.7	5.3
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