



LEVEE PROTECTION PLANNING AND IMPROVEMENTS PROJECT

Improving Today and Preparing for Tomorrow

San Mateo County Association of Realtors
August 8, 2017



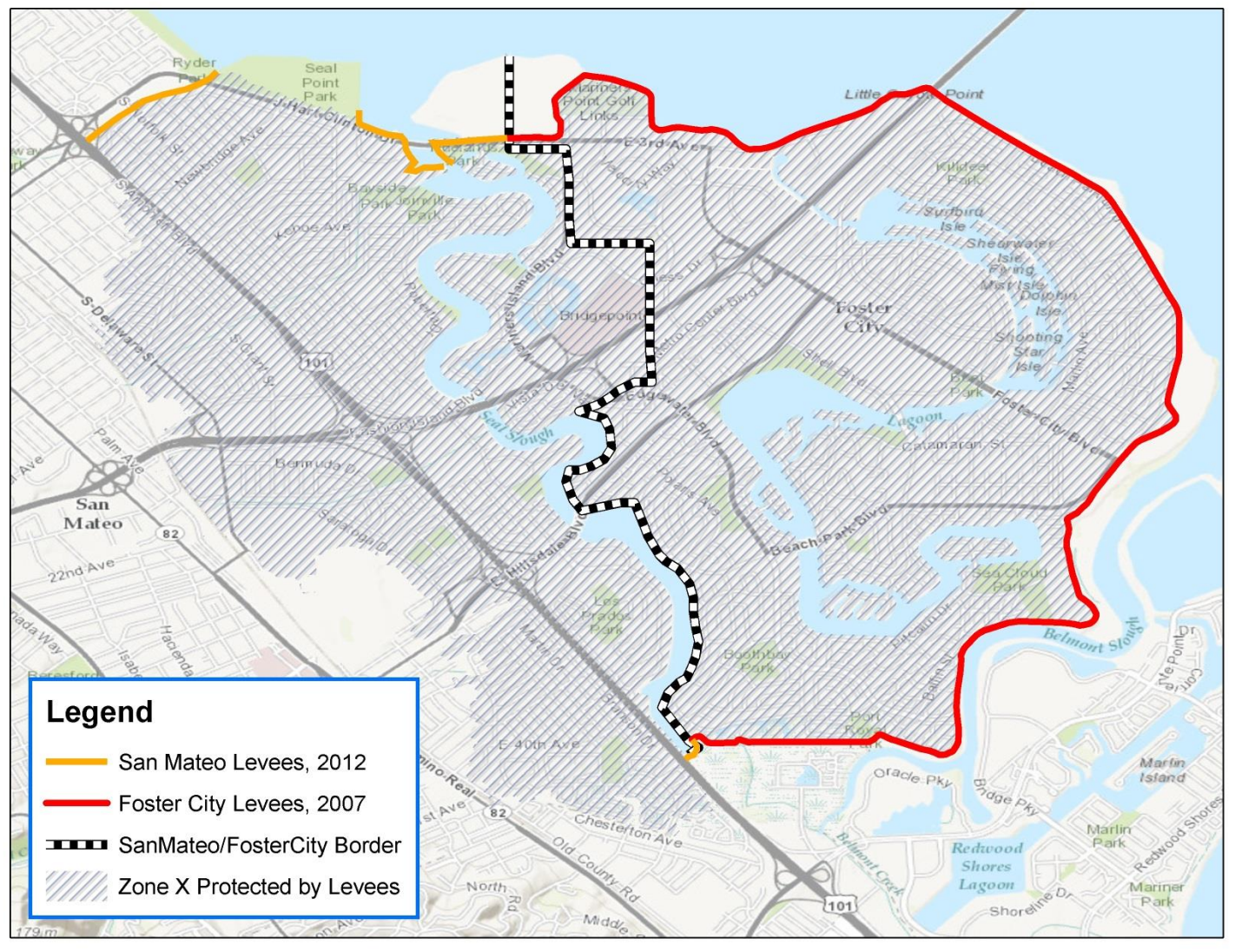
Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS

Presentation

- Need for Levee Improvements
- City Council Direction
- Proposed Levee Improvements
- Accomplishments to Date
- Remaining Schedule



Levee System Overview

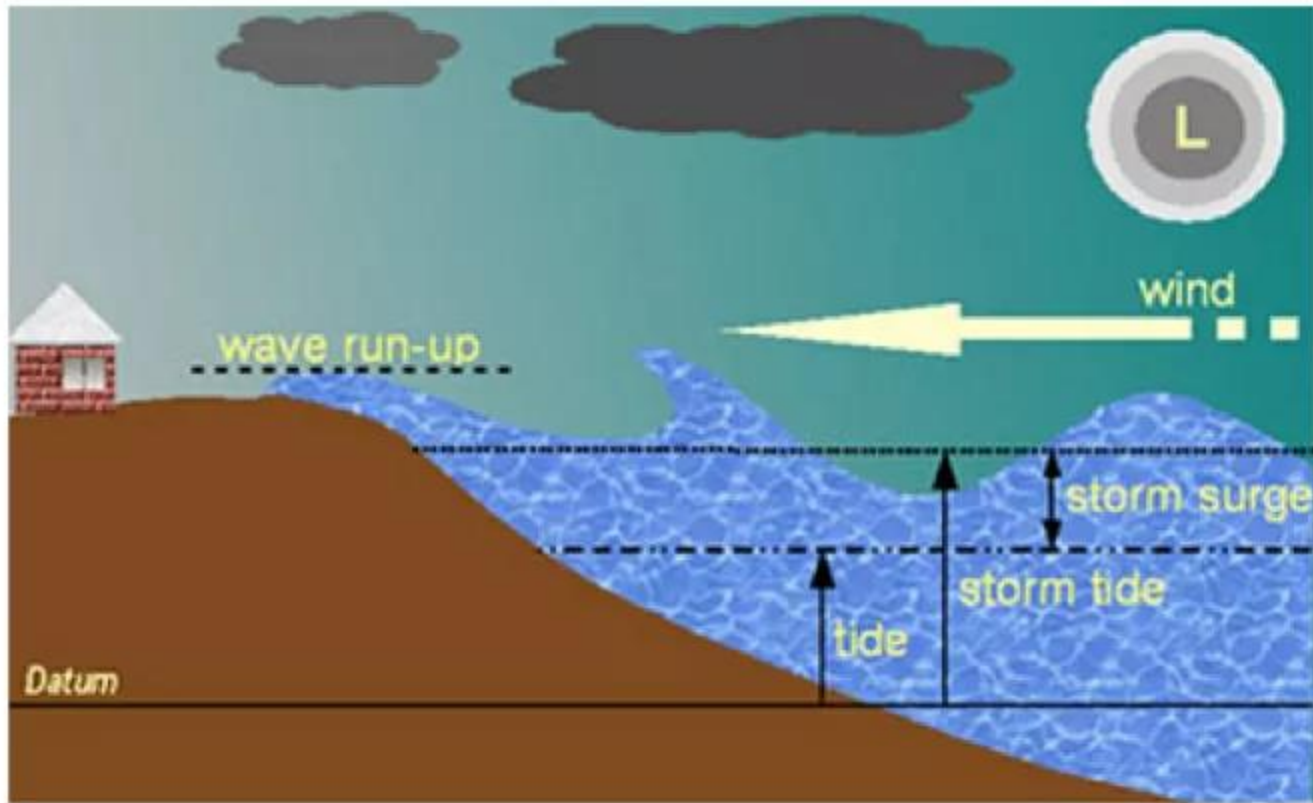


Typical Levees in Foster City

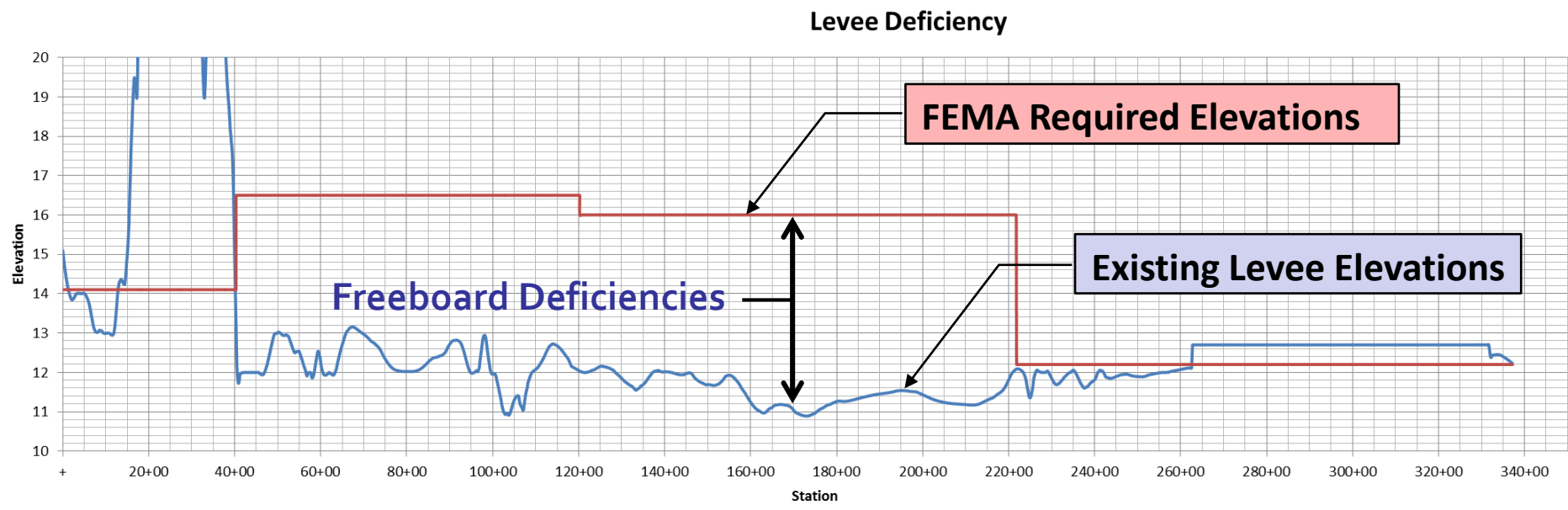


FEMA Coastal Flood Hazard Study (2014)

Maximum vertical elevation reached by the sea:
Combination of the wave set-up that is induced landward of the
wave breaking zone and wave run-up



Levees do not meet requirements for FEMA accreditation.



- No Deficiency
- Freeboard Deficient



What will happen if the levee is not improved?

- ❑ Properties will be placed within a Special Flood Hazard Area.
 - 9,000 parcels in Foster City
 - 8,000 parcels in San Mateo
- ❑ Those with federally backed mortgages, and others at the discretion of their lender, would be required to carry flood insurance.
 - Premiums could be thousands of dollars per year.
- ❑ Substantial property improvements are prohibited in high-risk flood areas without elevating above the base flood elevation, which would be as much as 5 feet deep in some locations.
- ❑ Property values could substantially drop.

Google earth

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City Council Direction

- ❑ City Council direction is to not let this happen.
- ❑ The levee is Foster City's most important asset.
 - Protects city from flooding
 - Access to regional recreational amenity
- ❑ On May 8, 2017 Council directed City staff to:
 - Further develop and analyze the **“2050 sea level rise and future adaptation strategy [levee] design.”**
 - Submit design to the appropriate regulatory agencies for processing.
 - Proceed with a 30-Year General Obligation Bond for the Levee Protection Planning and Improvements Project. (CIP 301-657)

Google earth

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Regulatory Environment

- ❑ Levee improvement project requires numerous permits.
- ❑ The State recognizes that Sea Level Rise (SLR) is a significant threat.
- ❑ BCDC requires resilience through design to the high range of 2050 SLR.
- ❑ Both RWQCB and BCDC require risk assessments and adaptation strategies to address 2100 SLR.

Google earth



Policies for a Rising Bay Project Final Report

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

NOVEMBER 1, 2016



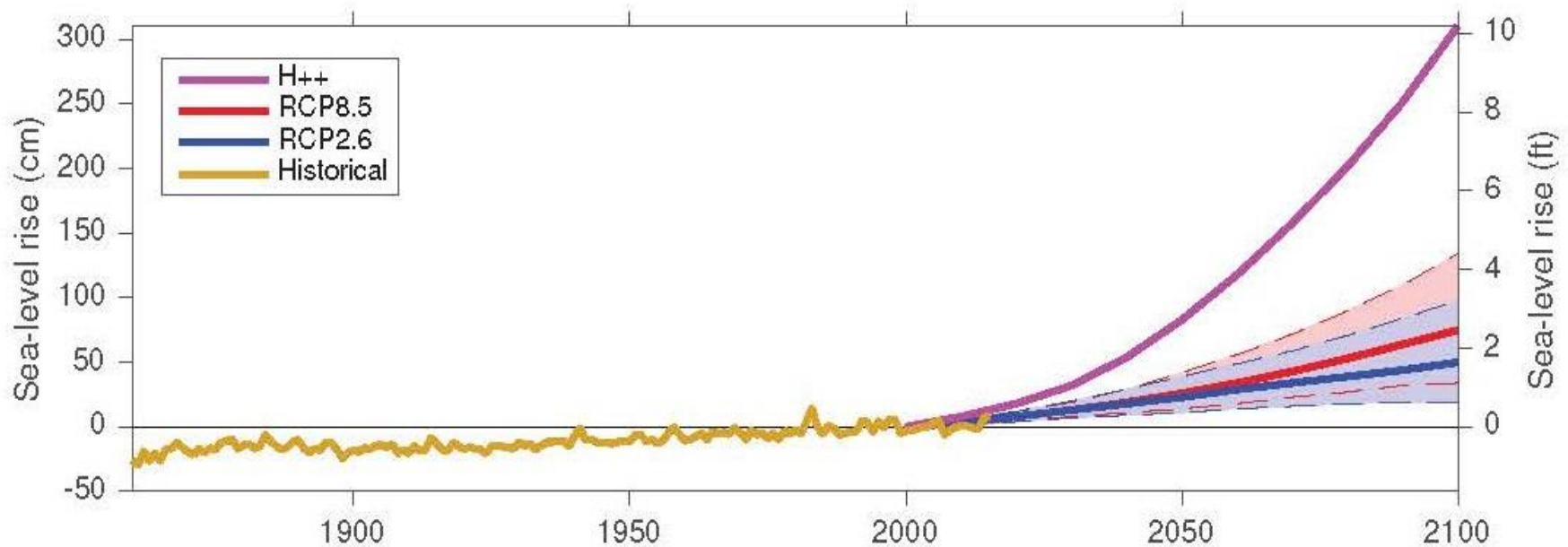
CALIFORNIA
Water Boards

STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

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Current Sea Level Rise Predictions

(b) Relative sea level in San Francisco, California



California Ocean Protection Council, Rising Seas in California: An Update on Sea-Level Rise Science, April 2017.

Sea Level Rise Predictions – April 26, 2017

Year	“Likely Projection” Published in 2012 (feet)	Range of SLR Published in 2012 (feet)	Sea Level Rise Predictions April 26, 2017			
			67% Confident “Likely” (feet)	95% Confident (feet)	99.5% Confident (feet)	Extreme “H++” (feet)
2030	0.5	0.2 – 1.0	0.3 – 0.5	0.6	0.8	---
2050	0.9	0.4 – 2.0	0.6 – 1.1	1.4	1.9	---
2100	3.0	1.4 – 5.5	1.6 – 3.4	4.4	6.9	10.0
2150	---	---	2.8 – 5.8	7.7	13.0	22.0

2017 SLR estimates presented in the table reflect a future in which there are no significant global efforts to limit or reduce emissions.

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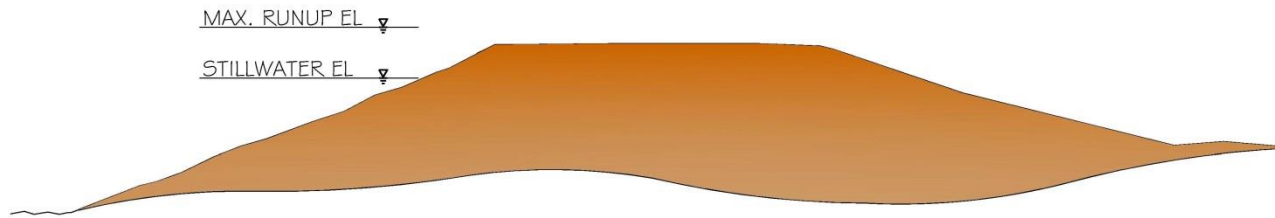
2017 SLR estimates presented in the table reflect a future in which there are no significant global efforts to limit or reduce emissions.

The proposed improvement project assumes 2 feet of sea level rise and provides resilience through 2050 with 99.5 percent confidence.

Proposed Levee Improvements

Raise the Existing Earthen Levee

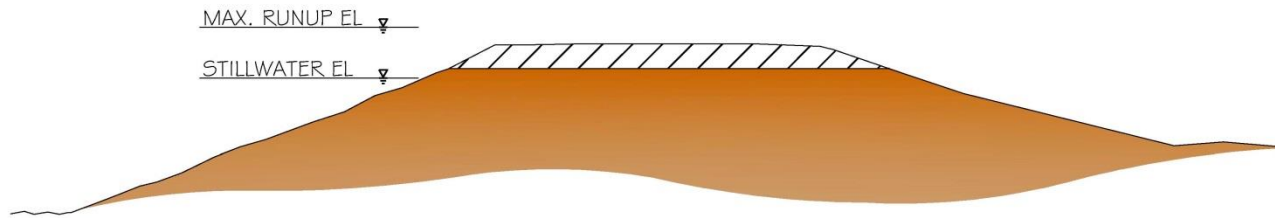
Used for roughly 15 percent of the improved six miles



Proposed Levee Improvements

Raise the Existing Earthen Levee

Used for roughly 15 percent of the improved six miles

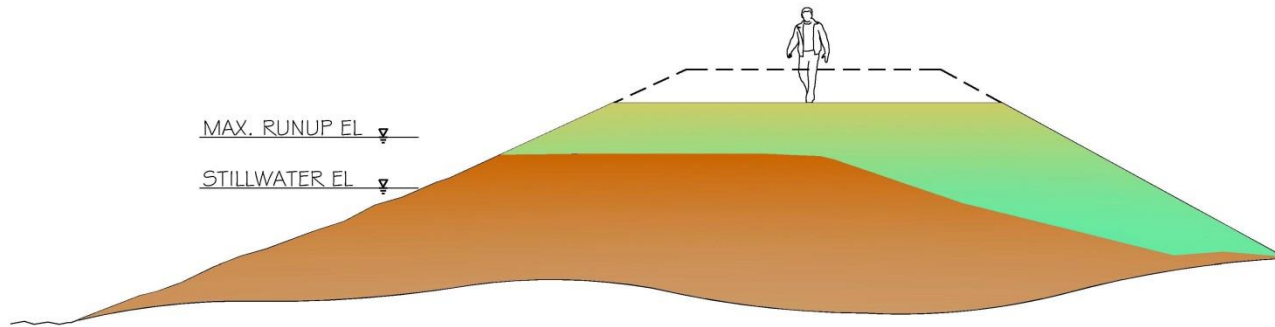


Top foot of soil (plus or minus) is removed.

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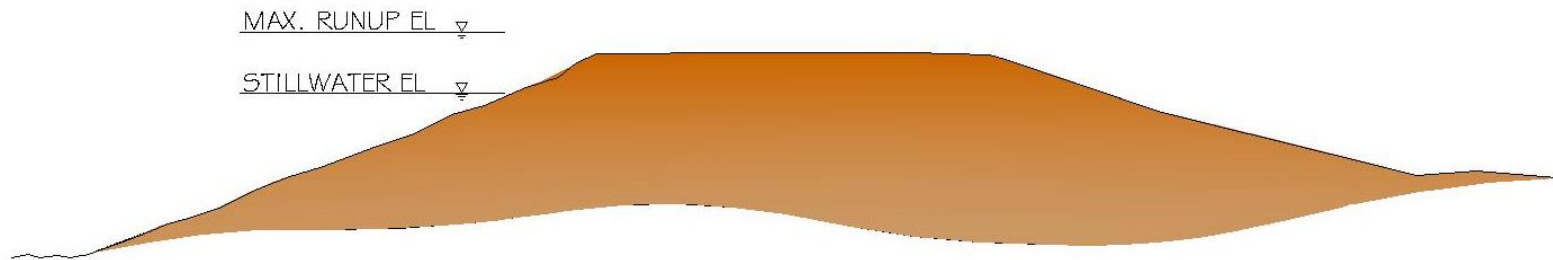


Engineered fill added to levee to meet FEMA requirements plus 2 feet of sea level rise with allowance for settlement.

Proposed Levee Improvements

Add or Replace Structural Floodwall

Used for roughly 15 percent of the improved six miles

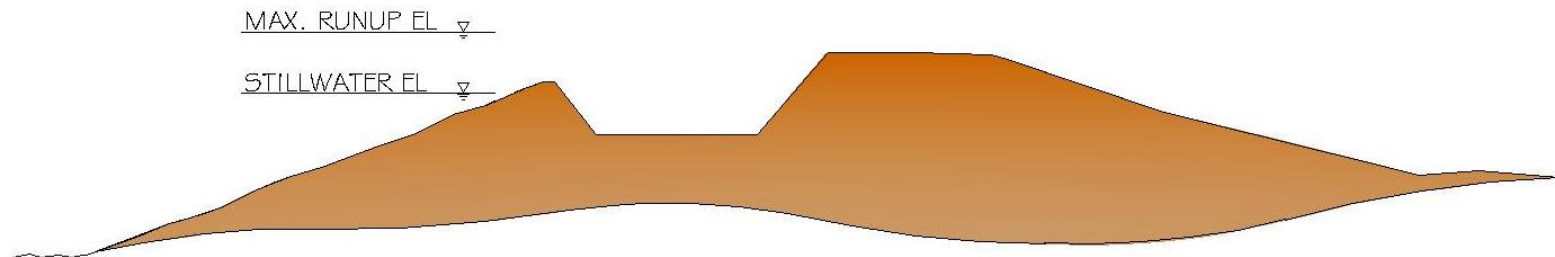


Used in constrained rights-of-way where there is insufficient space for a raised earthen levee and the existing level of flood protection is not compromised during construction.

Proposed Levee Improvements

Add or Replace Structural Floodwall

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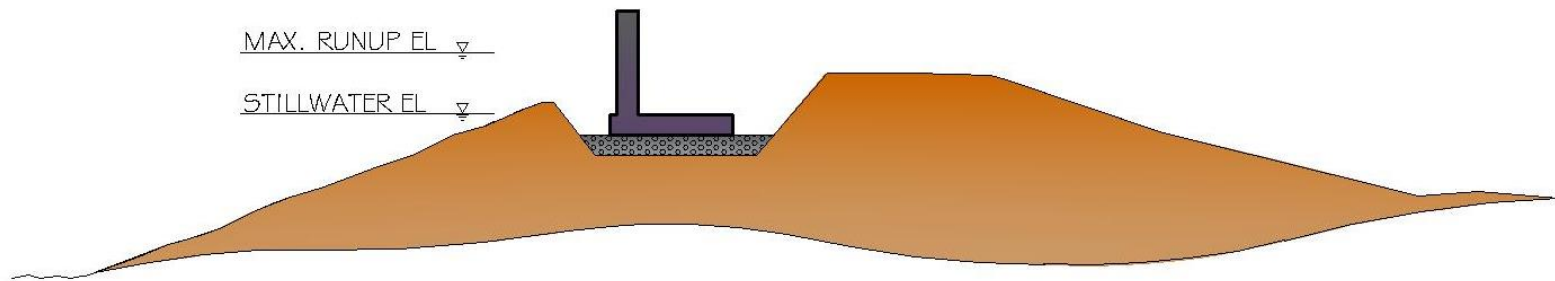


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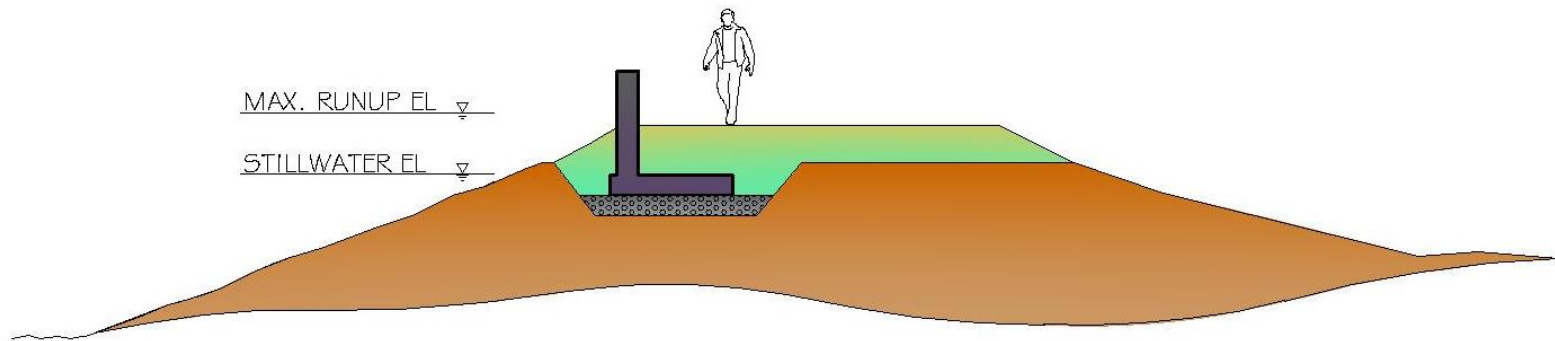


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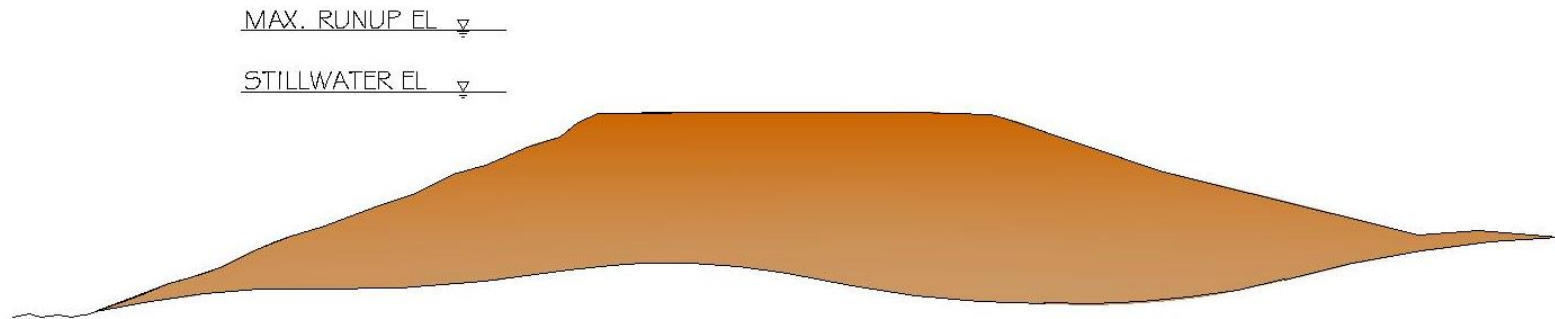


Used in constrained rights-of-way where there is insufficient space for a raised earthen levee and the existing level of flood protection is not compromised during construction.

Proposed Levee Improvements

Hybrid Design

Used for roughly 70 percent of the improved six miles

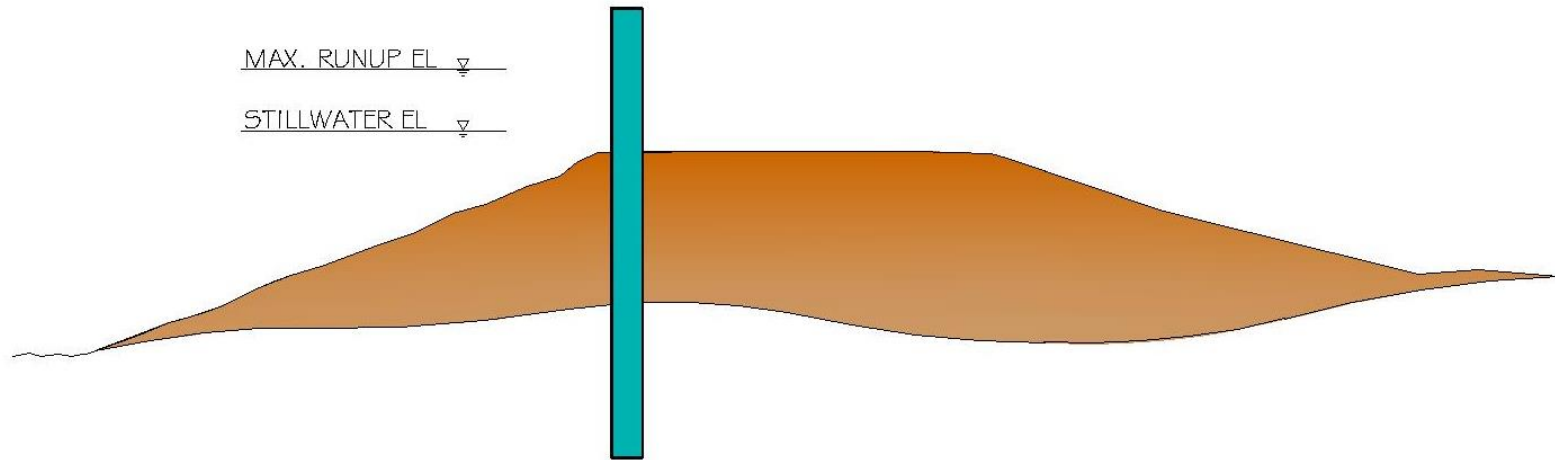


Used in constrained rights-of-way where the existing level of flood protection would be compromised during construction by building a conventional flood wall.

Proposed Levee Improvements

Hybrid Design

Used for roughly 70 percent of the improved six miles

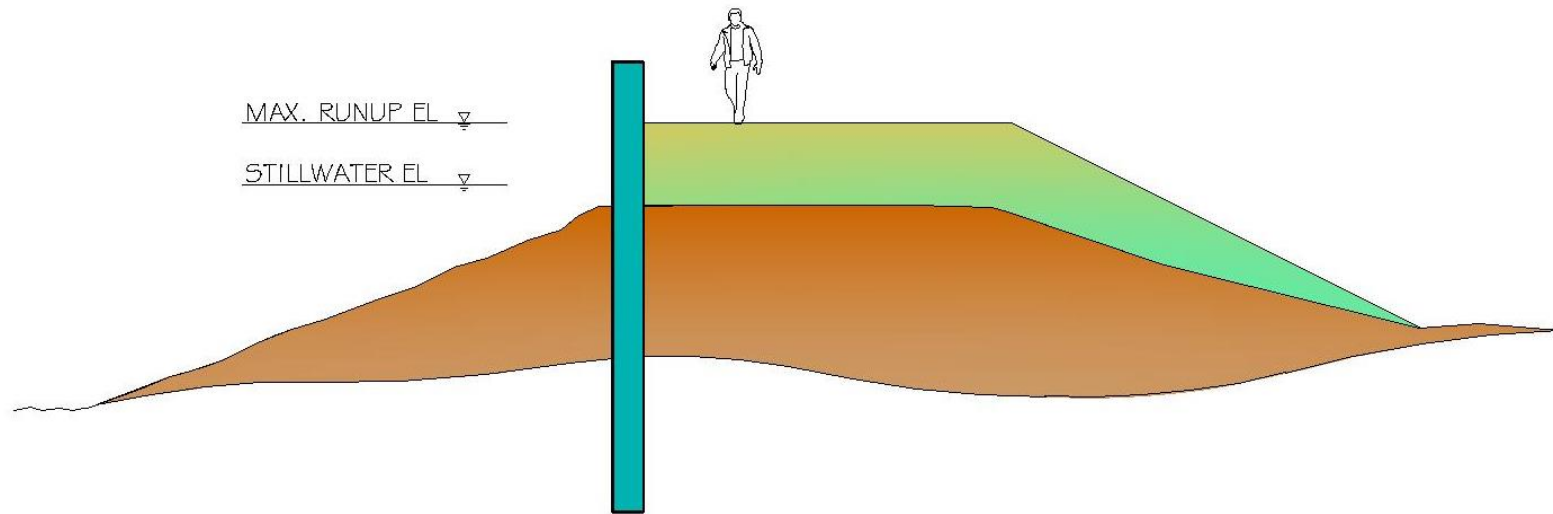


Flood protection is provided once sheet pile is driven to structurally-required depth.

Proposed Levee Improvements

Hybrid Design

Used for roughly 70 percent of the improved six miles



Fill to widen Bay Trail and maintain relatively short adjacent wall.

How much will this cost?

Project Alternative	Estimated Cost
1. FEMA Accreditation Only ¹	\$60 million
2. 2050 SLR ²	\$90 million
3. 2100 SLR ³	\$170 million

1. Does not meet regulatory requirements for permitting.
2. Assumes 80-year project life, possibly with future adaptation.
3. Not selected.

Google earth

1 mi

Project Benefits

FEMA Accreditation!

- 9,000 parcels in Foster City
- 8,000 parcels in San Mateo

Bay Trail Improvements

- Widened to meet current Bay Trail Guidelines (18 feet)
- Better access to Trail and Bay (ADA-compliant)

New Native Landscaping

New Trail Amenities

Google earth

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Ongoing Design Concerns

☐ Aesthetics

- Views from adjacent properties and streets
- View from Bay and across Belmont Slough

☐ Graffiti

- Sheet piling fascia
- Coatings

☐ Disruption During Construction

- Bay Trail detour
- Noise and vibration (potential for “silent press” method)
- Existing utilities within levee footprint

Google earth

1 mi

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Google earth

1 mi



View 1

View 3

View 13

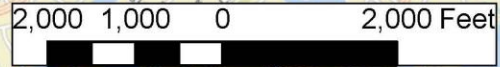
View 5

View 14

View 6

View 9

View 12



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View 1 – East Third Avenue



EXISTING LEVEL
FIN. 2020 SLY
TRAIL EXISTING

Existing View

View 1 – East Third Avenue



Proposed View

View 3 – Lincoln Center Drive



Existing View

Google earth

1 mi

View 3 – Lincoln Center Drive



Proposed View

1 mi

View 13 – Bridgeview Park



Existing View

View 13 – Bridgeview Park



Proposed View

View 5 – Beach Park Boulevard



Existing View from Sanderling Street

Google earth

1 mi

View 5 – Beach Park Boulevard



22.0 NWD 88
21.0
20.0 TRAIL 2100
19.0
18.0
17.0
16.0 TRAIL 2050
15.0 TRAIL EXISTING

NWD 88 22.0
21.0
20.0 TRAIL 2100
19.0
18.0
17.0
16.0 TRAIL 2050
15.0 TRAIL EXISTING

Proposed View from Sanderling Street

Google earth

1 mi

View 5 – Beach Park Boulevard



Existing View from Second Story

View 5 – Beach Park Boulevard



Proposed View from Second Story

View 14 – Beach Park Boulevard



Existing View from Swordfish Street

Google earth

1 mi

View 14 – Beach Park Boulevard



Proposed View from Swordfish Street

Google earth

1 mi

View 14 – Beach Park Boulevard



Existing View from Second Floor

View 14 – Beach Park Boulevard



Proposed View from Second Floor

View 6 – Beach Park Boulevard



Existing View from Foster City Boulevard

View 6 – Beach Park Boulevard



Proposed View from Foster City Boulevard

Google earth

1 mi

View 9 – Sea Cloud Park



22.0 NAVD 88

21.0

20.0

19.0

18.0

17.0

16.0

15.0

14.0

13.0

12.0 EXISTING LEVEL

11.0

10.0 TRAIL EXISTING

09.0

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Existing View

View 9 – Sea Cloud Park



22.0 NAVD 88

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17.0

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14.0

13.0

12.0

11.0

10.0

09.0

08.0

EXISTING LEVEL

TRAIL EXISTING

TRAIL 2050 SLR

Proposed View

View 12 – Port Royal Park



Existing View

View 12 – Port Royal Park



NAVD 89 2

EXISTING LEVEL

TRAIL EXISTING

TRAIL 2050 SLR

Proposed View

Adaptation to Future Sea Level Rise

The project as designed is resilient to predicted sea level rise through 2050 with 99.5 percent confidence. How can it be adapted to possibly higher sea level rise, particularly beyond 2050?

- ~~Build another project in the future if and when it is needed~~
- Build a project designed for 2100 high range SLR now
- Adapt to rising sea level over time
 - Foundation depth for 2100 SLR now; add wall height later
 - Future anchor walls
 - Future offshore solutions

View 3 – Lincoln Center Drive

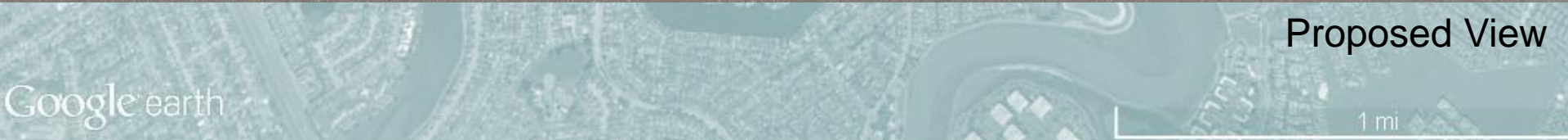


Existing View

Google earth

1 mi

View 3 – Lincoln Center Drive



Google earth

Proposed View

1 mi

View 3 – Lincoln Center Drive



View of Floodwall if Set to 2100 SLR

Google earth

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Adaptation to Future Sea Level Rise

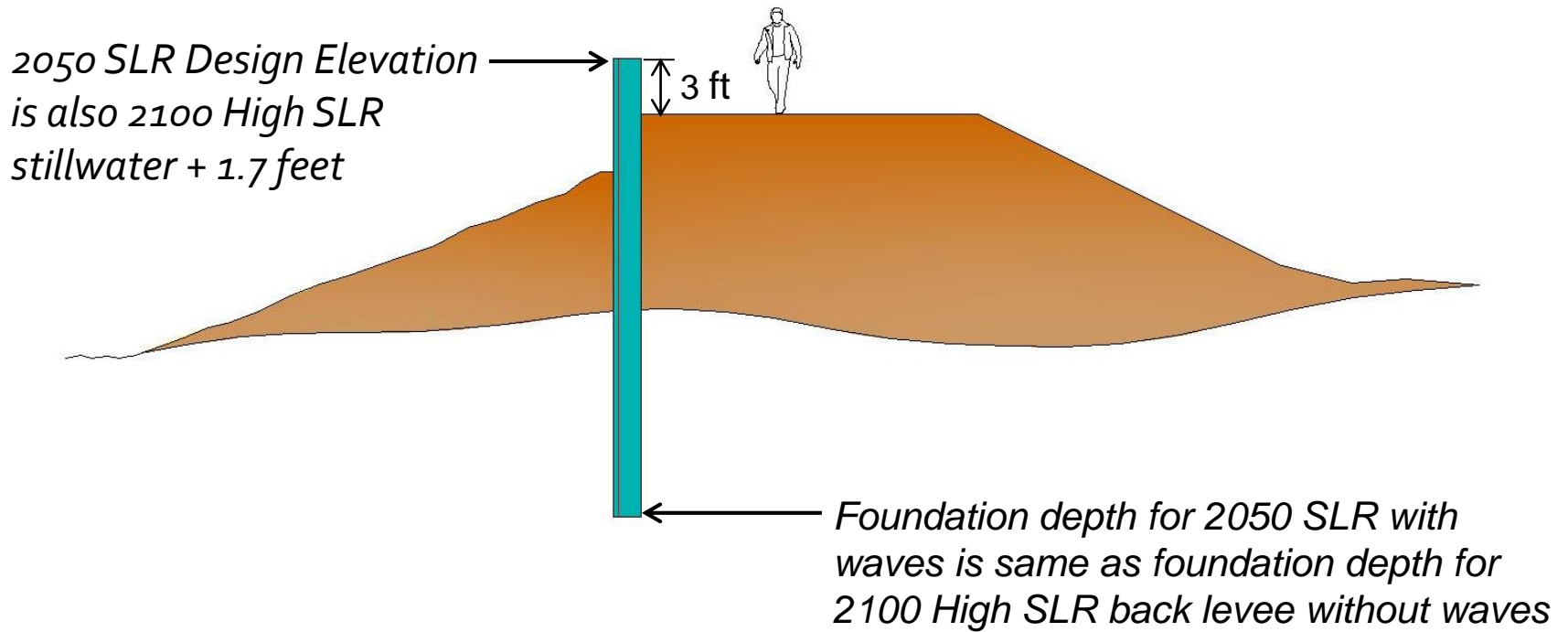
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Google earth

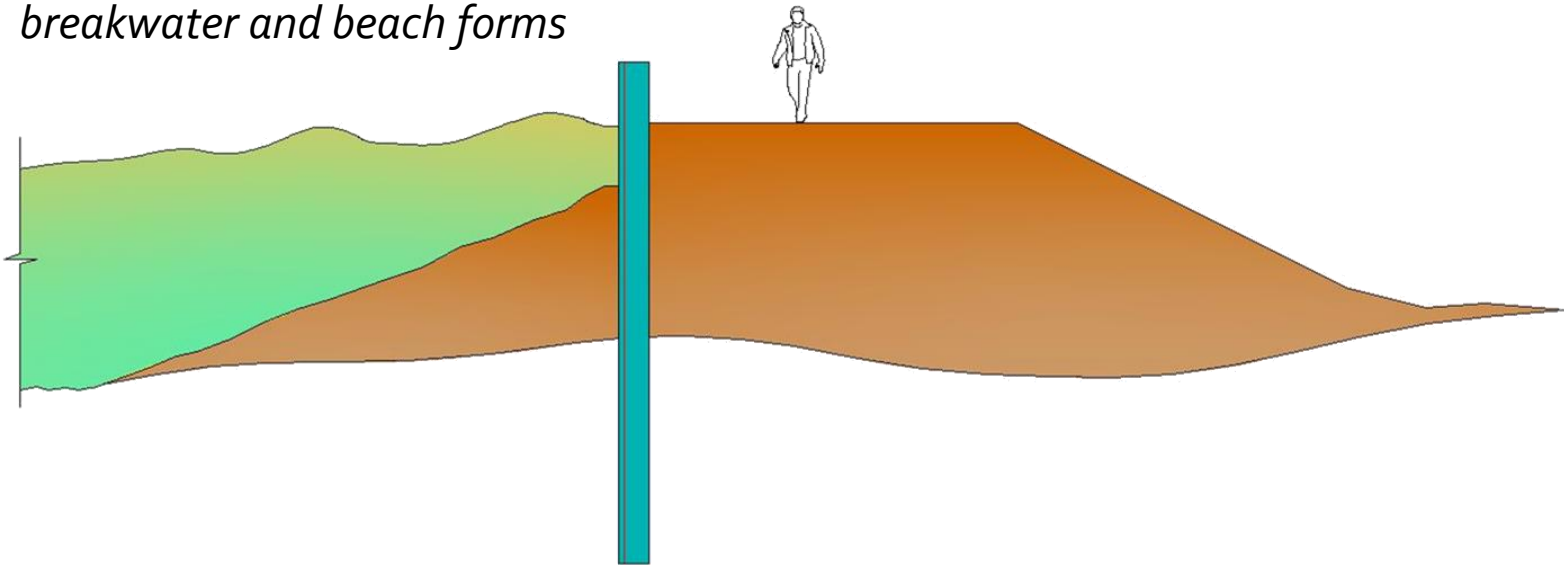
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Those Darn Waves....

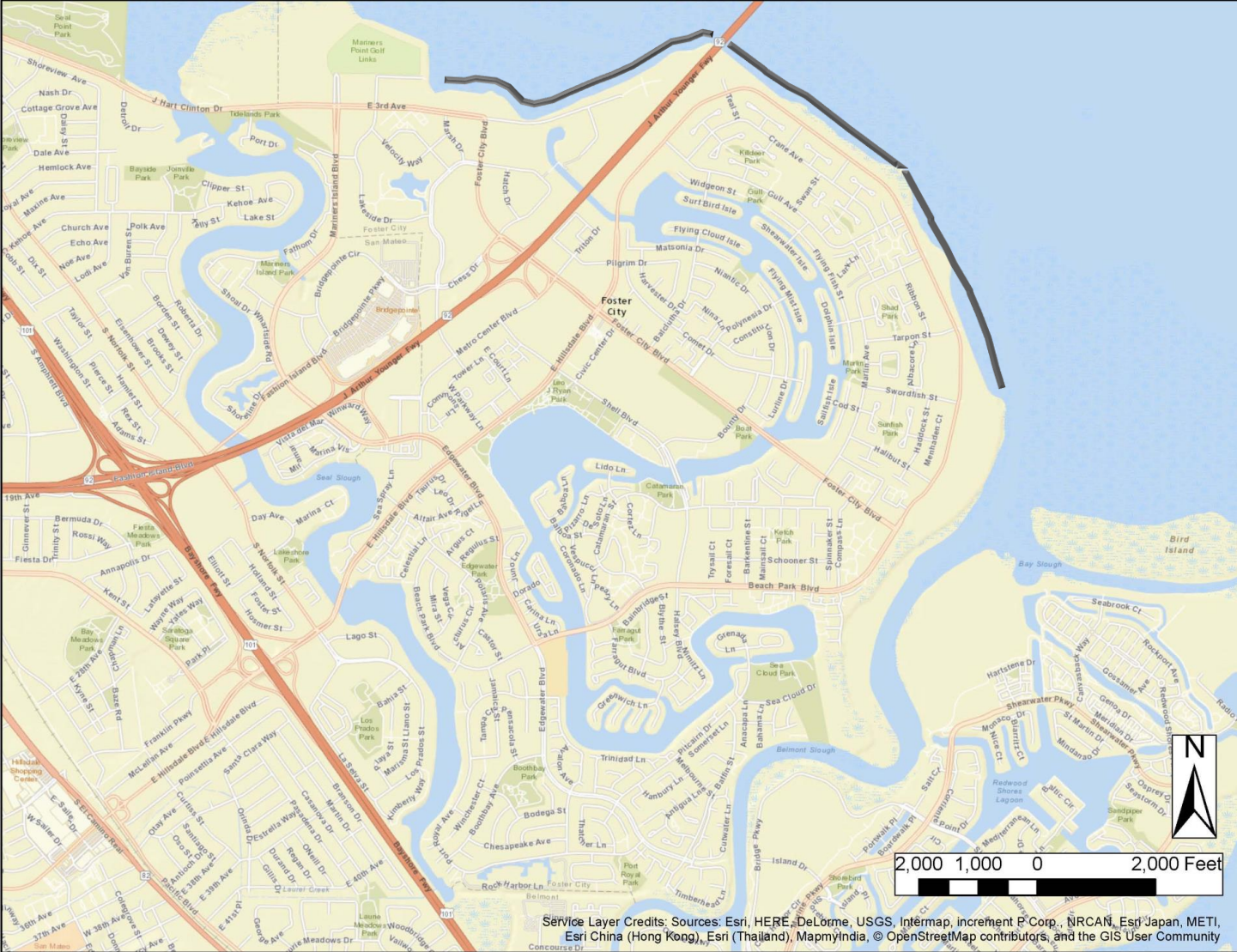


Adaptive Construction in Future

Adaptively build up offshore breakwater and beach forms



Future Adaptation to Rising Sea Levels



Future Adaptation



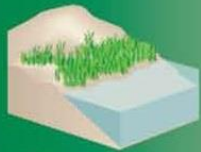
Source: NOAA

GREEN - SOFTER TECHNIQUES

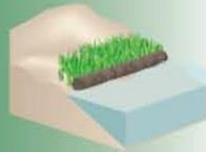
GRAY - HARDER TECHNIQUES

Living Shorelines

Coastal Structures



VEGETATION ONLY -
Provides a buffer to upland areas and breaks small waves. Suitable for low wave energy environments.



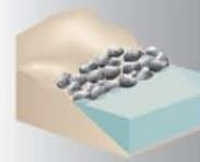
EDGING -
Added structure holds the toe of existing or vegetated slope in place. Suitable for most areas except high wave energy environments.



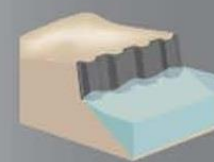
SILLS -
Parallel to vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.



BREAKWATER -
(vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.



REVETMENT -
Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with existing hardened shoreline structures.



BULKHEAD -
Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for high energy settings and sites with existing hard shoreline structures.

Future Adaptation

Why don't we pursue constructing a living shoreline (LS) now?

Regulatory Challenges

- Lack of LS data
- Beneficial Fill
- Suitable Materials
- Construction Methods/ Timing
- Sequential permits
- Long timeframes
- High cost



Source: California Coastal Conservancy

Project Accomplishments to Date

July 2014	FEMA Completes Coastal Flood Study (CCAMP)
August 2014	City Surveys Existing Levees
March 2015	Detailed Evaluation of CCAMP Results
July 2015	Levee Protection Planning Study
August 2015	Presentation to Regulatory Agencies and Government Officials
October 2016	Basis of Levee Design
November 2016	Draft Environmental Impact Report
April 2017	Final Environmental Impact Report
May 2017	Council Directs Staff to Proceed with Design
July 2017	Begin Ballot Measure Polling
August 2017	60% Design Documents

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Remaining Schedule

September 2017	Update Regulatory Agencies and Government Officials
Fall 2017	Submit Regulatory Permit Applications
Fall 2017	Obtain FEMA Approval of Design
March 2018	Complete 90% Design Documents
March 2018	Ballot Measure Resolution of Necessity
April 2018	Adopt Ordinance for Ballot Measure
June 2018	Ballot Measure for Voter Approval
August 2018	Advertise for Bid
October 2018	Award Construction Contract
January 2019	Begin Construction
Summer 2021	Project Completion

Google earth

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