



WATERFRONT RESILIENCE PROGRAM UPDATE

Port Commission Agenda Item #9A

September 22, 2020



WATERFRONT RESILIENCE PROGRAM EFFORTS

Program and City Resilience Projects and Efforts



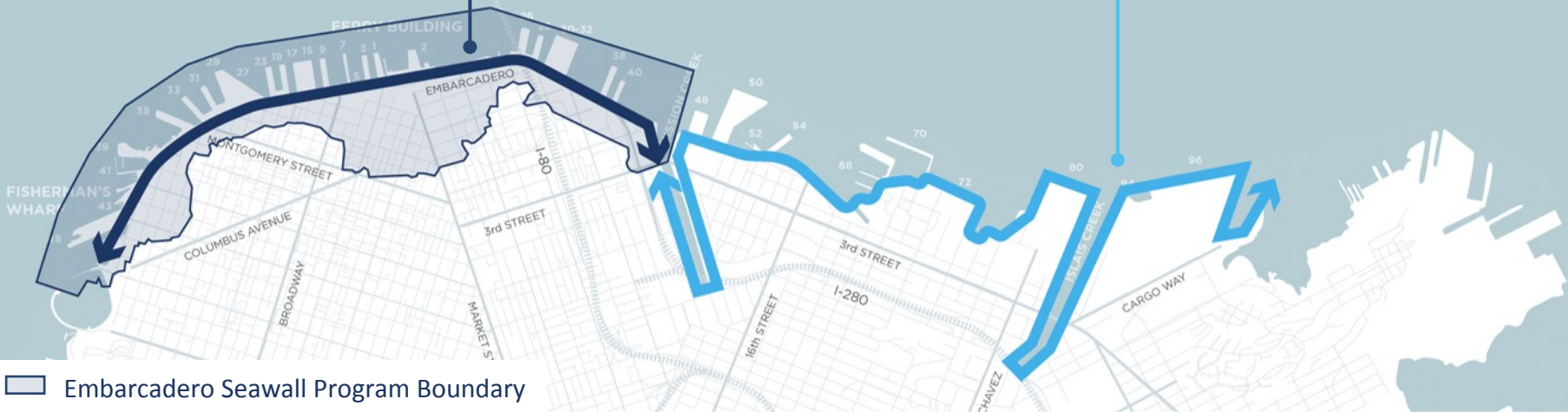
WATERFRONT RESILIENCE PROGRAM EFFORTS

Two Major Projects: Seawall and USACE

The Waterfront Resilience Program team is pursuing a common framework and advancing resilience actions along the Port's entire 7 ½ miles of waterfront.

The Port began its seismic and flood risk assessment funded by Prop A along the Embarcadero Seawall, from Fisherman's Wharf to Mission Creek...

...and soon expanded south of Mission Creek and waterfront wide via the Federal & Port-funded USACE Flood Resiliency Study and in collaboration with other city efforts



TODAY'S AGENDA

Presentation Overview



- Key findings from the Embarcadero Seawall Multi-Hazard Risk Assessment (MHRA)
- Introduction to “measures” or strategies for addressing risk along the Embarcadero waterfront
- Key priorities from community and stakeholder engagement
- Describe next steps to develop Proposition A projects

EMBARCADERO SEAWALL PROGRAM

Program Overview



- **Project Area:** Fisherman's Wharf to Mission Creek
- **Timing:** 2017 to 2021 project planning followed by implementation / construction
- **Focus:** Seismic and flood risk associated with the Embarcadero Seawall
- **Funding:** \$425 million General Obligation Bond passed in November 2018

SEAWALL EARTHQUAKE SAFETY GENERAL OBLIGATION BOND

Proposition A in November 2018 Required a Detailed Safety Assessment



- Seawall Earthquake Safety General Obligation Bond Report
- Outlines the need for a Multi-Hazard Risk Assessment (MHRA)
- Focus on critical life-safety and disaster response along the Embarcadero Seawall
- Foundation for seismic and flood risk reduction along the Embarcadero for Proposition A projects

PROPOSITION A INVESTMENT CATEGORIES

From the Seawall Earthquake Safety General Obligation Bond Report

1

Project Implementation

– including program development, Multi-Hazard Risk Assessment, planning, design, etc.

2

Earthquake

Improvements – life safety “measures” including retrofits and replacements

3

Flood Protection Measures

– flood “measures” to enhance, protect, and adapt

4

Mitigation and

Enhancement – public access enhancements, transportation improvements, etc.

EMBARCADERO SEAWALL PROGRAM SCHEDULE

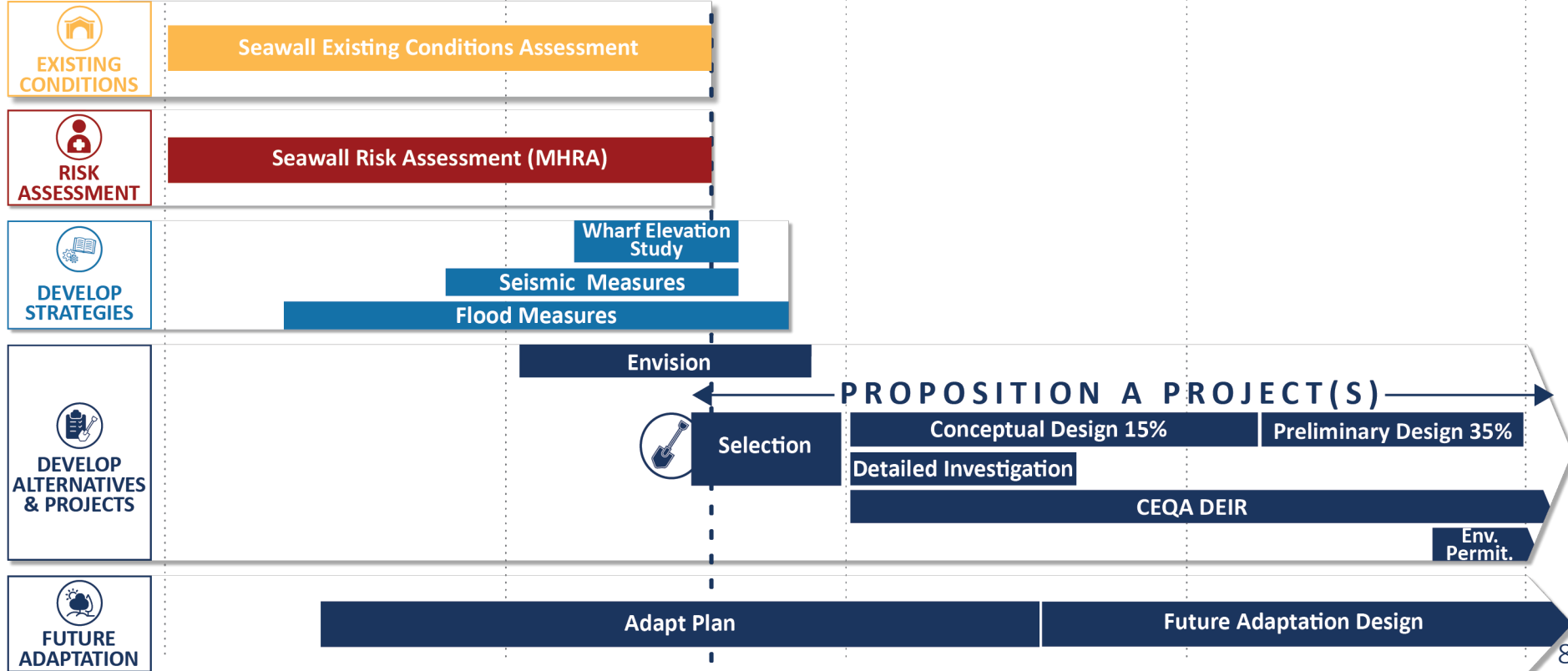
September 2020

2019

2020

2021

2022



EMBARCADERO SEAWALL PROGRAM SCHEDULE

2023 2024 2025 2026 2027

PROPOSITION A PROJECT(S)

Design Completion 100%

Construction

CEQA
DEIR

CEQA FEIR

Environmental Permitting

Adapt Plan
(5-yr cycle)

FUTURE ADAPTATION (FLOOD AND SEISMIC) DESIGN AND CONSTRUCTION

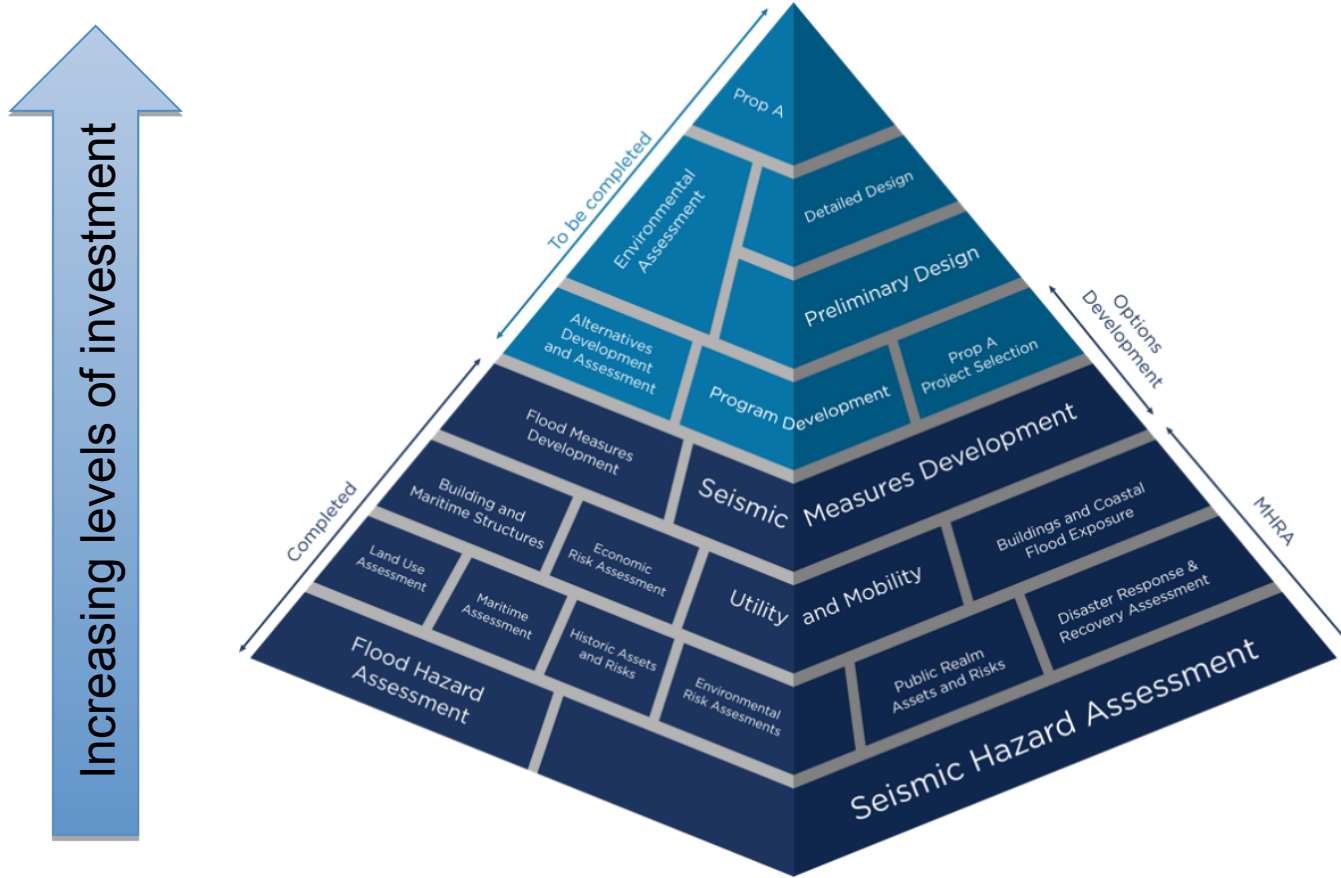


DEVELOP
ALTERNATIVES
& PROJECTS



FUTURE
ADAPTATION

WATERFRONT RESILIENCE PROGRAM DEVELOPMENT



An aerial photograph of San Francisco, California, showing the city's dense skyline of skyscrapers in the background. In the foreground, the iconic blue clock tower of the Ferry Building is prominent, along with the building's facade featuring a series of arches. The waterfront area is visible, including a pier and some construction activity. A dark blue semi-transparent box is overlaid on the left side of the image, containing white text.

What have we learned?

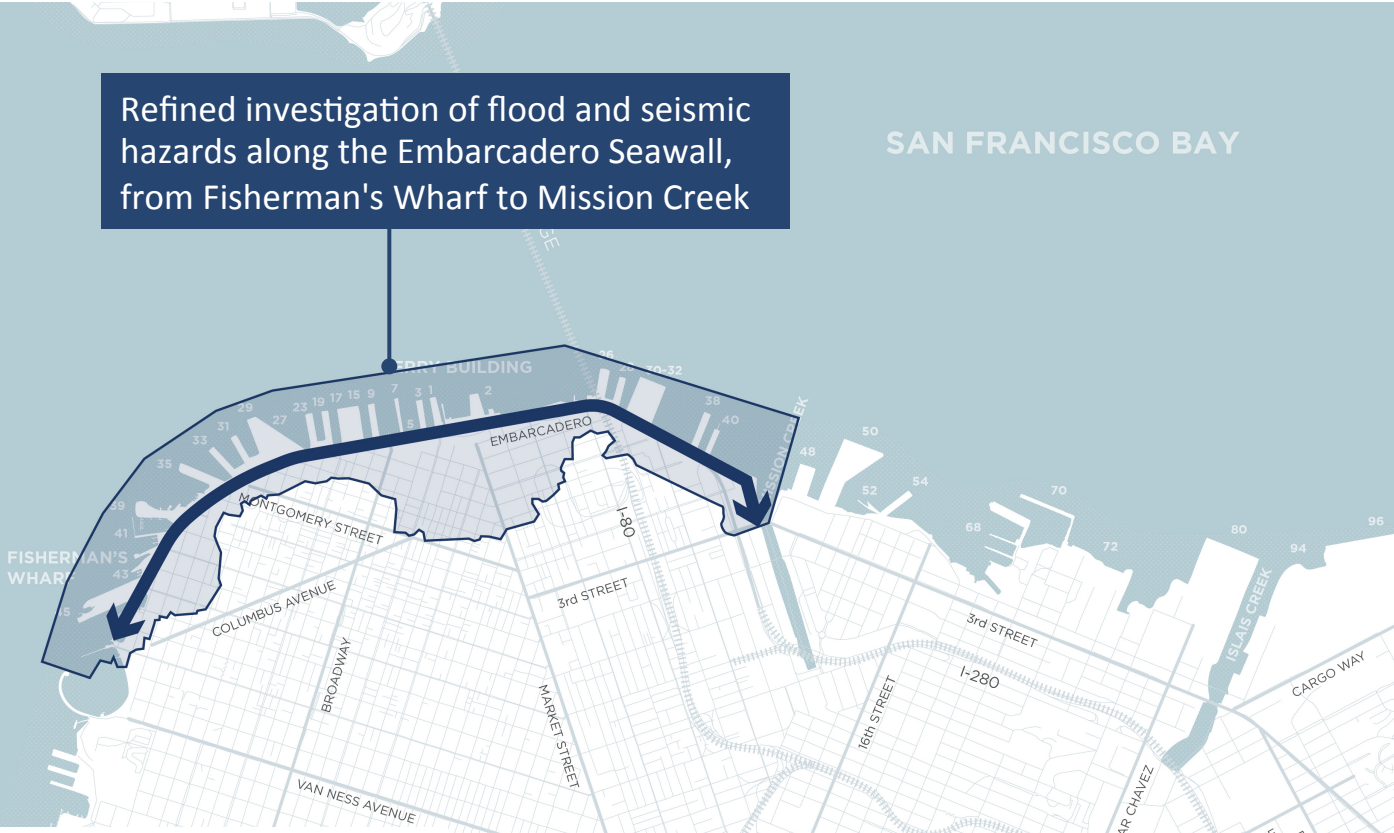
Key Findings from the Multi-Hazard
Risk Assessment (MHRA)

WHAT IS THE MULTI-HAZARD RISK ASSESSMENT (MHRA)?

Proposition A Required a Detailed Safety Assessment of the Embarcadero

Refined investigation of flood and seismic hazards along the Embarcadero Seawall, from Fisherman's Wharf to Mission Creek

SAN FRANCISCO BAY

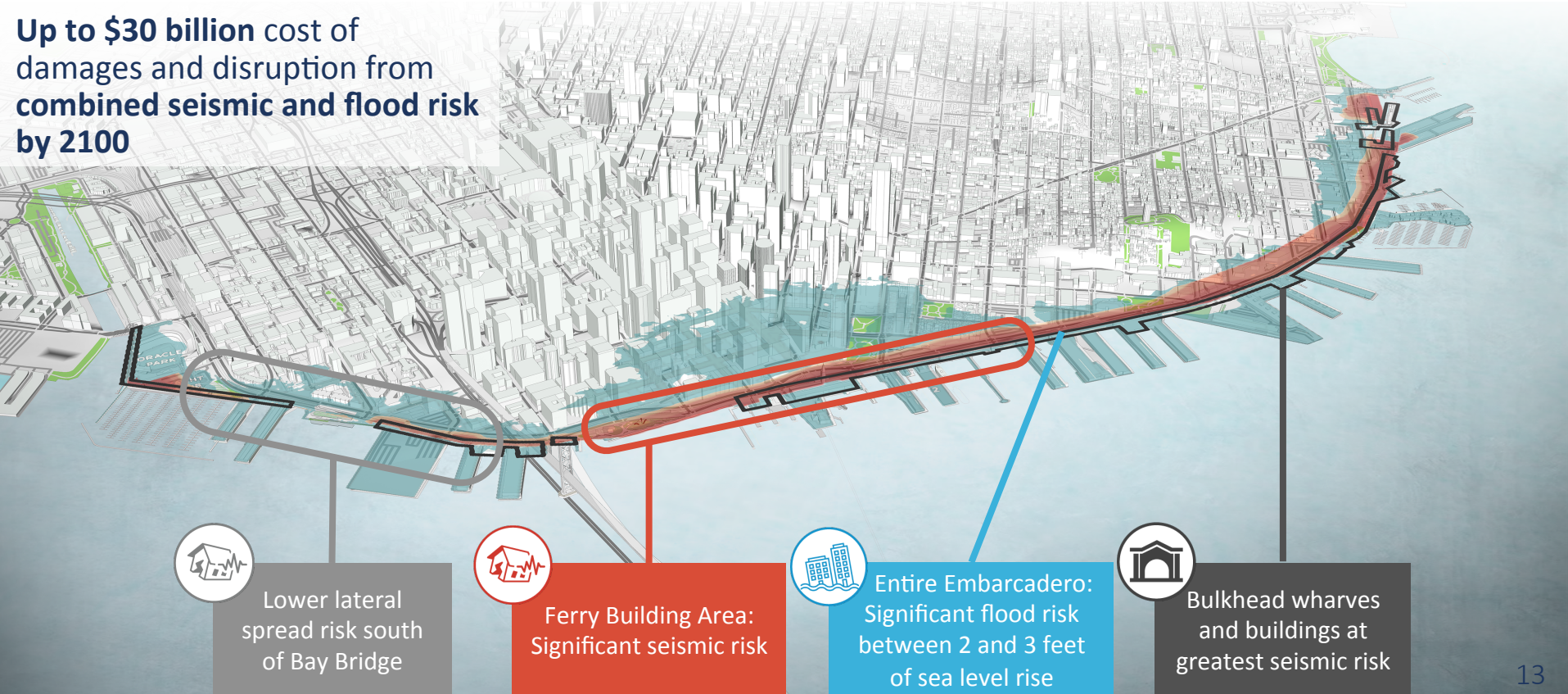


- Range of seismic hazards assessed within Embarcadero Seawall area
- Range of flood hazard scenarios assessed including impacts to critical City infrastructure
- Methodology: Bored holes and used lasers to uncover what is happening under the Bay and worked closely with agency partners to understand impacts to assets and services that the City and the region rely upon

HAZARDS AND CONSEQUENCES

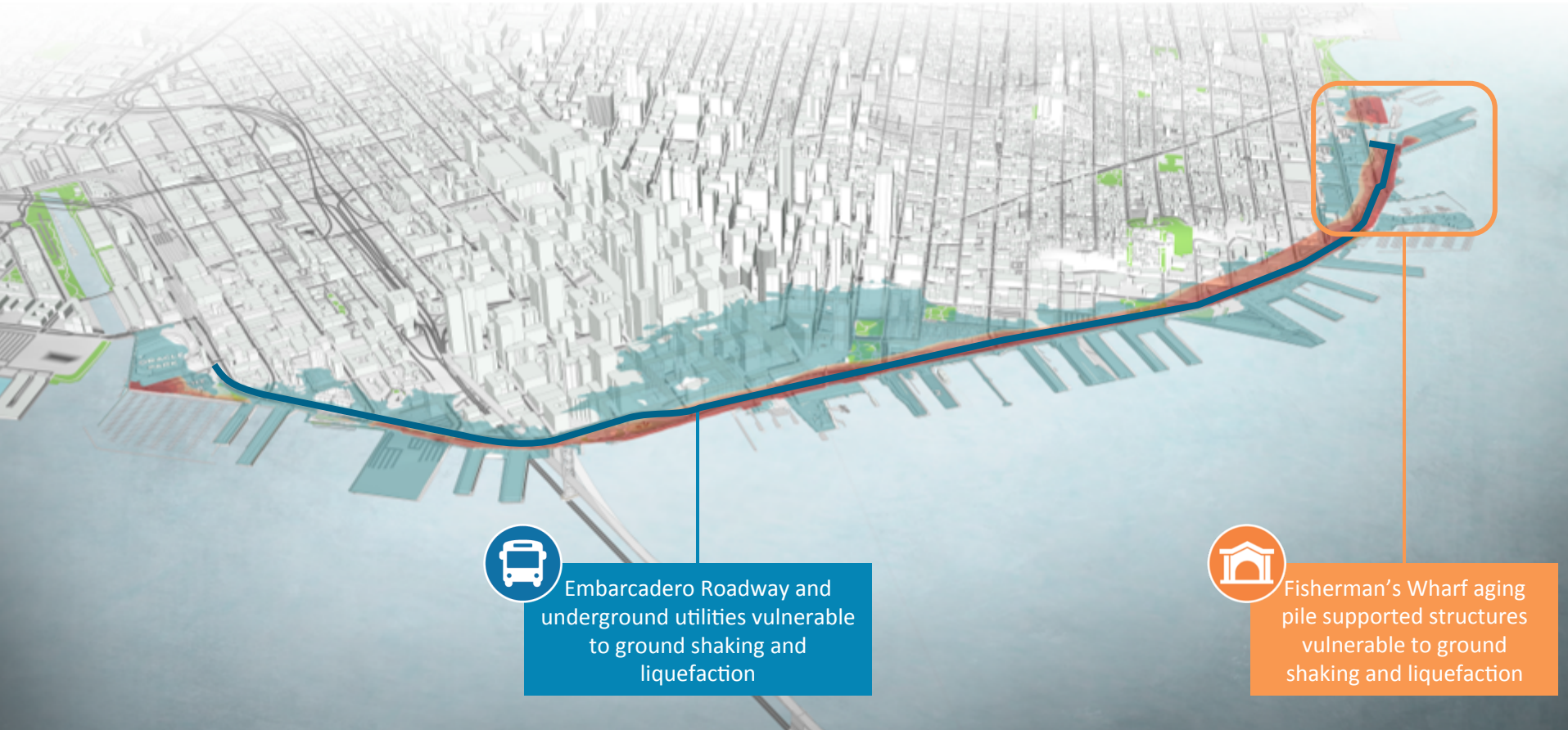
MHRA Key Findings

Up to \$30 billion cost of damages and disruption from combined seismic and flood risk by 2100



OTHER EARTHQUAKE HAZARDS AND CONSEQUENCES

MHRA Key Findings



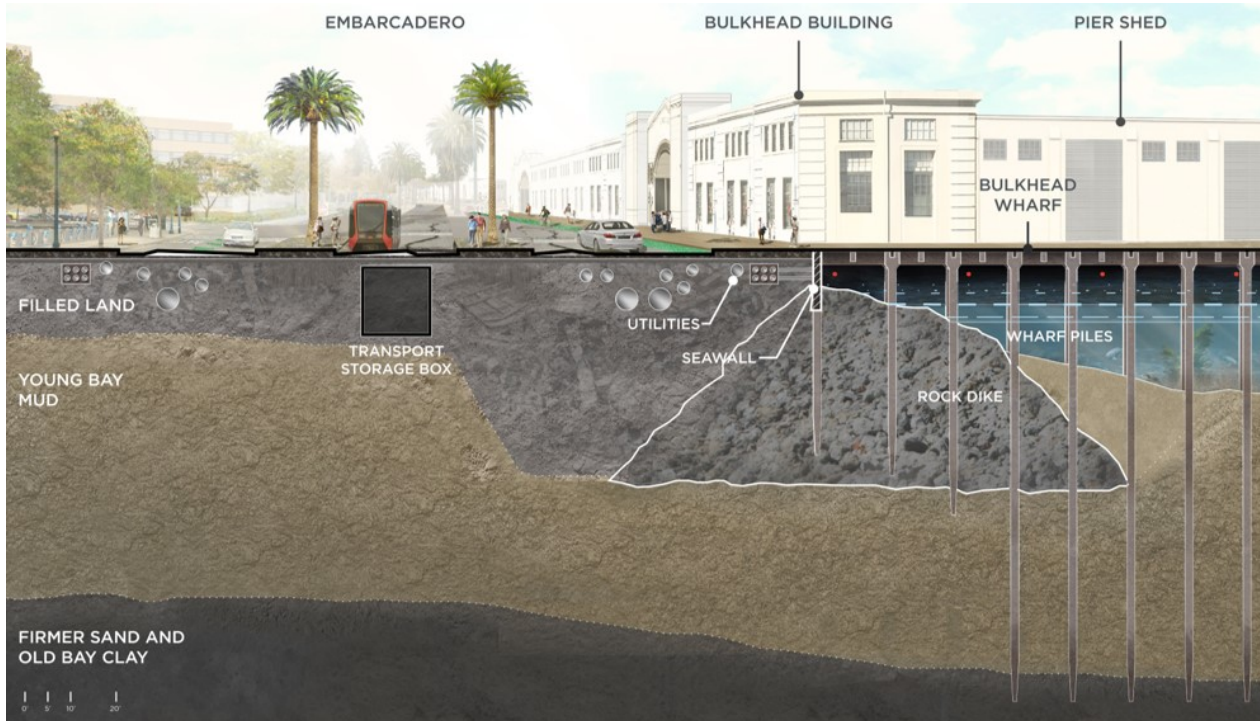
Embarcadero Roadway and underground utilities vulnerable to ground shaking and liquefaction



Fisherman's Wharf aging pile supported structures vulnerable to ground shaking and liquefaction

EXISTING SHORELINE

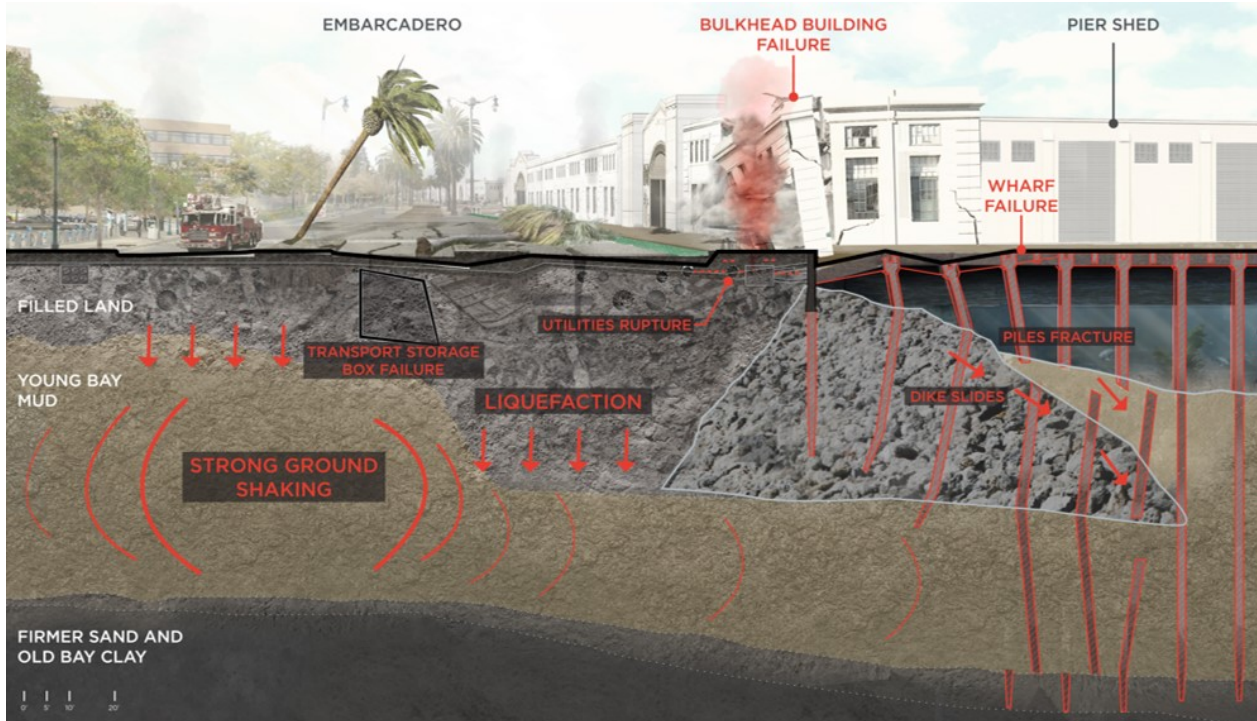
Critical Components of the Waterfront



- Seawall and Bulkhead Wharves are the city's flood protection and are highly vulnerable to seismic events

BULKHEAD WHARF EARTHQUAKE HAZARDS

MHRA Key Findings



Liquefaction induced lateral spreading at Port de Port-au-Prince



Lateral spreading cause by 1906 earthquake in San Francisco

BULKHEAD WHARF

WHARF TODAY AT CURRENT WATER LEVEL



WHARF TODAY WITH WATER LEVEL SURGE



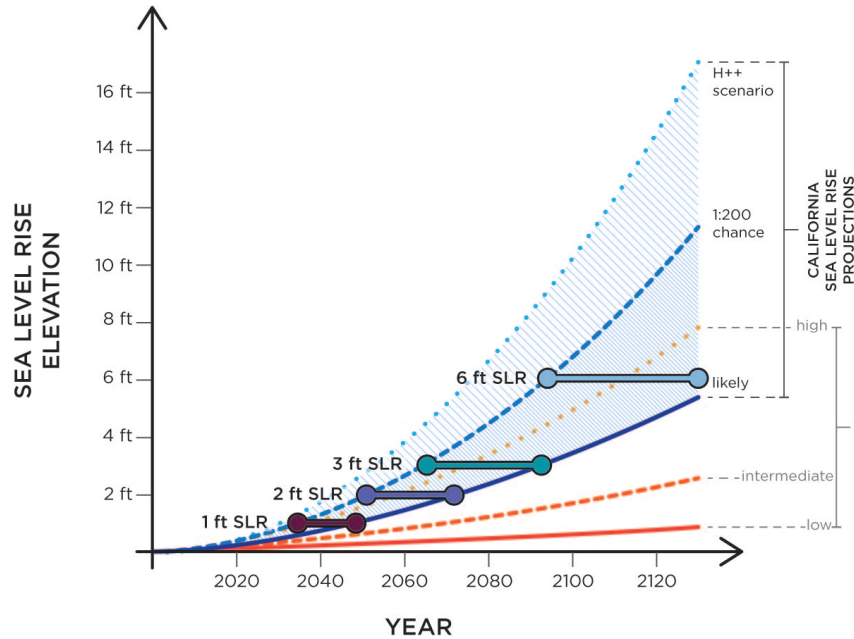
Wharf is a current protection measure – King Tide conditions today

LOCATIONS OF INTEREST



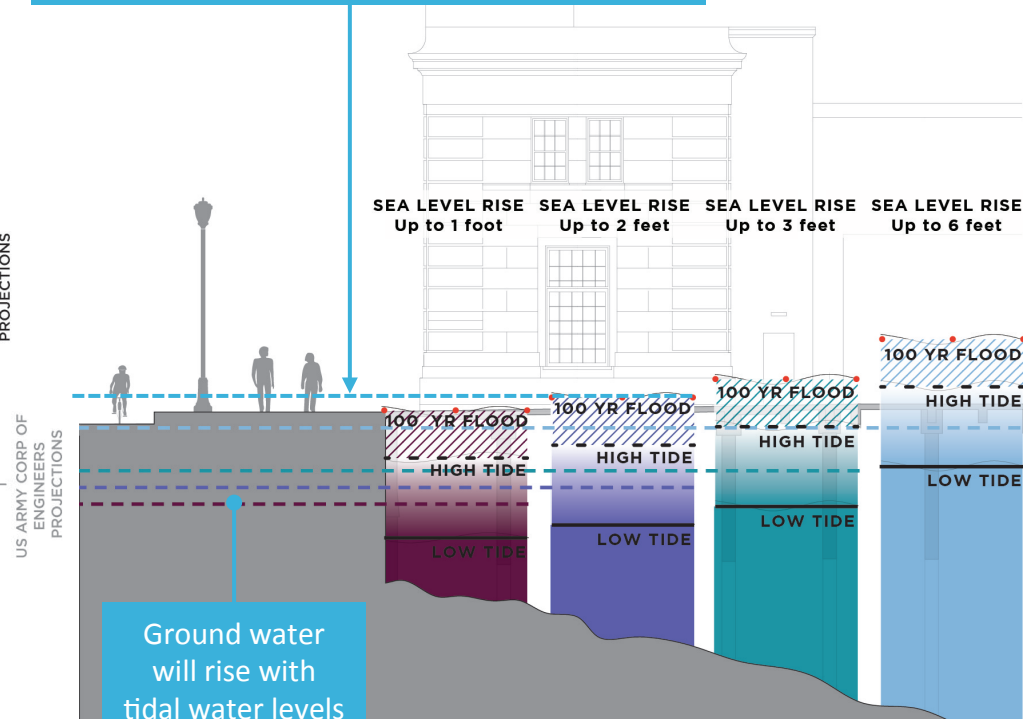
FLOOD HAZARDS

MHRA Key Findings



State of CA – Updated 2018; USACE – Updated 2013

Flood risk tipping point at 2' of sea level rise



Ground water will rise with tidal water levels due to SLR



HOW DOES THIS ADVANCE OUR UNDERSTANDING FROM 2016?

Significantly Advanced the Port's Understanding of the Risks and Consequences, Developed Important Tools, Strengthened Partnerships



Sitewide investigation and testing of soils informed variation in earthquake behavior along the waterfront including liquefaction of Embarcadero



Developed refined engineering models of Seawall to predict earthquake stability and lateral spreading, and to test improvement concepts



Estimated earthquake and flood damage and loss to Seawall dependent marine structures, buildings, and infrastructure



Determined economic, social, and environmental consequences of likely earthquake and flood damages



Collaborated with community, stakeholders, and partners during assessment, heard what is important to them and included in process

HOW DOES THIS ADVANCE THE PORT'S APPROACH TO PROP A PROJECTS?

Findings Point to Targeted Interventions in Phase 1 of Embarcadero Seawall Program



Earthquake instability of the Seawall is high between Rincon Park & Fisherman's Wharf, but moderate to low in South Beach. Pier 14 to Pier 9 is most challenging area to improve due to very thick Young Bay Mud and deep bedrock. Solutions here may be different and more expensive than areas to the north.



Bulkhead walls & wharves are high earthquake risk due to both seawall instability and ground shaking vulnerability; these are also shoreline and flood protection structures for the City, improvements need to consider mid and long-term sea level rise strategies and how investments can be adapted over time.



The Embarcadero is at risk from Seawall instability and liquefaction of the fill, improvements to both may eventually be needed to serve as a lifeline corridor.



The Embarcadero Waterfront is very sensitive to flood thresholds, with major consequences by 2 feet of sea level rise, Folsom to Broadway is highest risk.



Seismic Measures Development

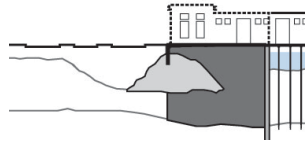
Introducing improvements or “measures”
for consideration along the Embarcadero

EMBARCADERO SEAWALL SEISMIC MEASURES

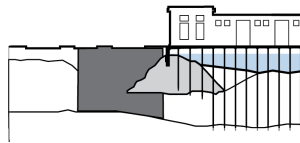
Draft seismic improvements under consideration by the Port

Seismic Measures

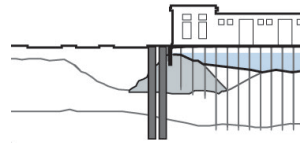
Shoreline
Stabilization



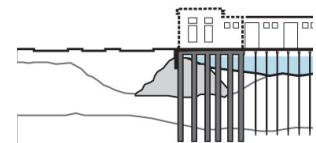
Nearshore
Buttress



Landside
Buttress

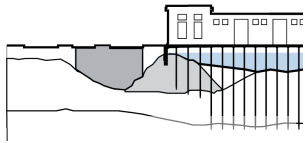


Drilled Shafts

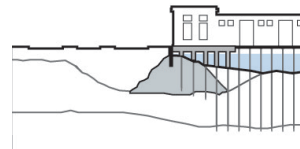


Super Bulkhead
Wharf

Targeted
Measures



Liquefaction
Mitigation



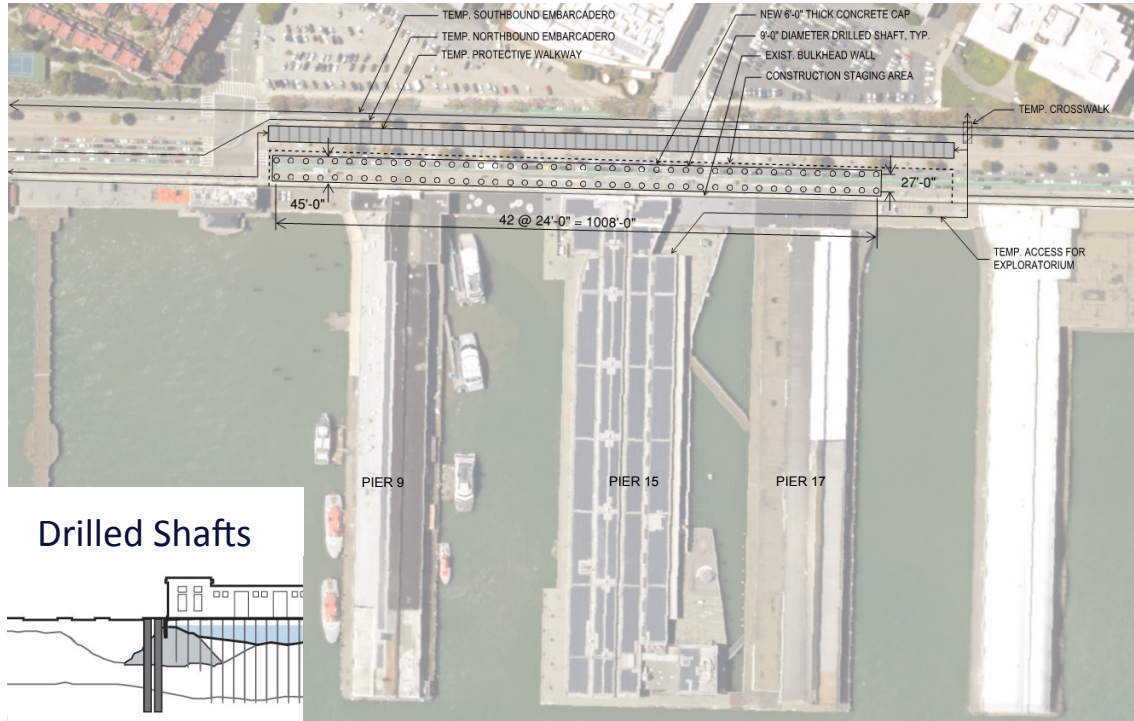
Bulkhead
Wharf Retrofits

For each seismic measure:

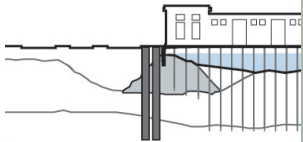
- Preliminary Engineering
- Cost Estimates
- Production Rates
- Construction Impacts
- Feasibility
- Adaptation for Sea Level Rise

SEAWALL SEISMIC MEASURES DEVELOPMENT

Example Measure Construction Process

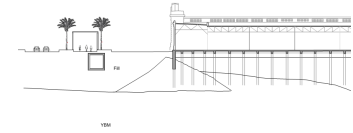


Drilled Shafts

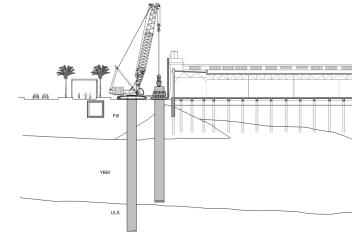


Construction Stages

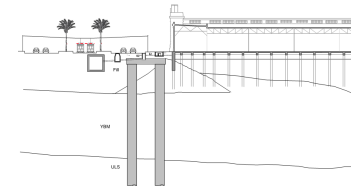
Remove / relocate utilities:



Close northbound lanes, reroute traffic, install concrete shafts:

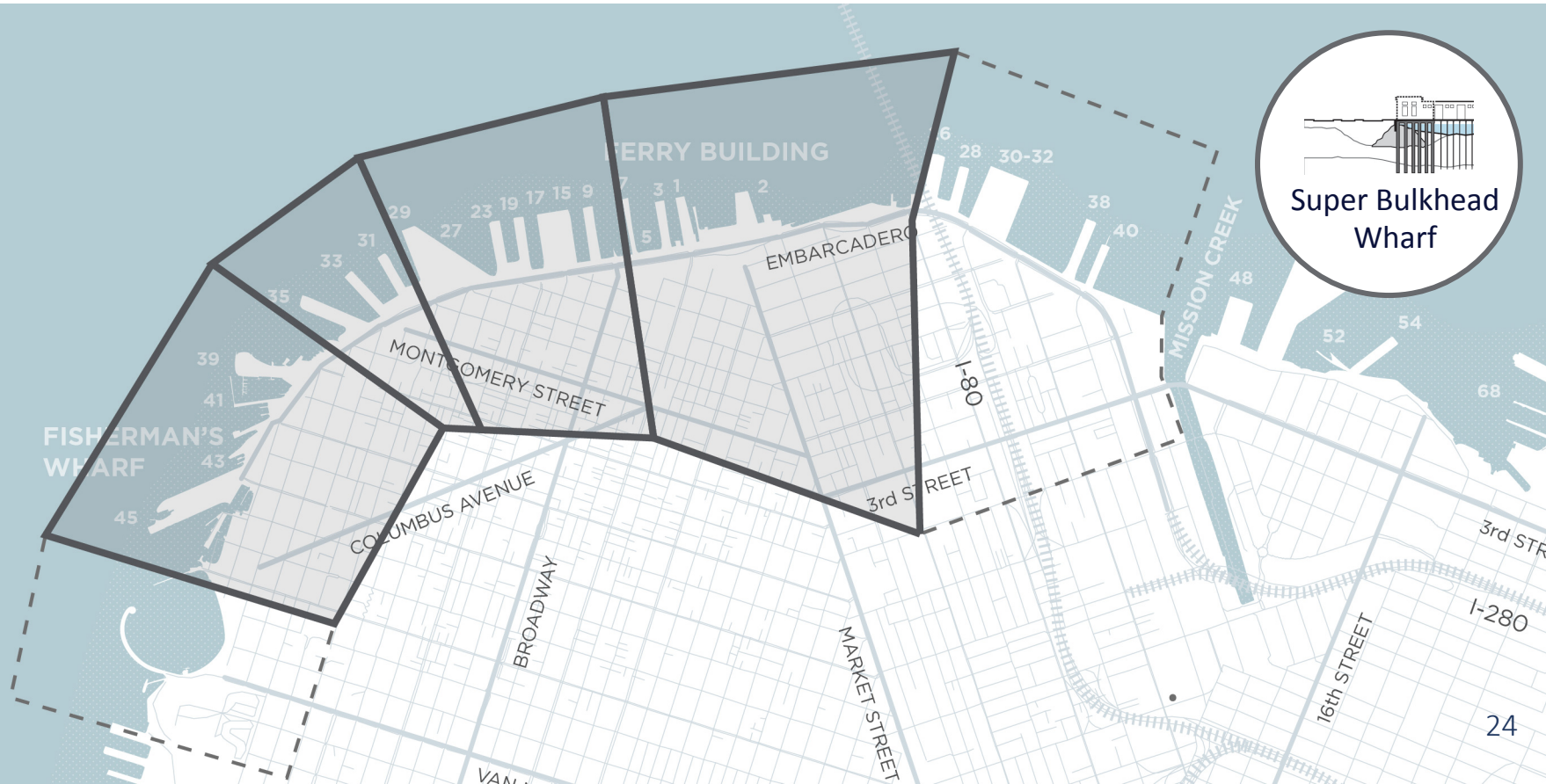


Place slab, restore Embarcadero:



SEISMIC MEASURES

Super Bulkhead Wharf – Applicable Subareas



An aerial photograph of San Francisco, showing the city's dense urban grid, the bay, and the Golden Gate Bridge in the distance. A dark blue semi-transparent box is overlaid on the left side of the image, containing white text.

Flood Measures Development

Introducing improvements or “measures”
for consideration along the Embarcadero



Waterfront Resilience Program

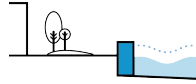
FLOOD MEASURES

Draft flood improvements under consideration by the Port

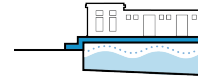
Physical



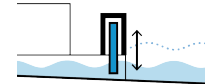
Levees



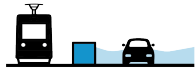
Seawalls



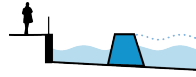
Raised Marine Structures



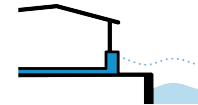
Tide Gates



Floodwalls



Breakwaters



Building Adaptations



Deployables

Ecological



Ecological Marine Structures



Ecological Features



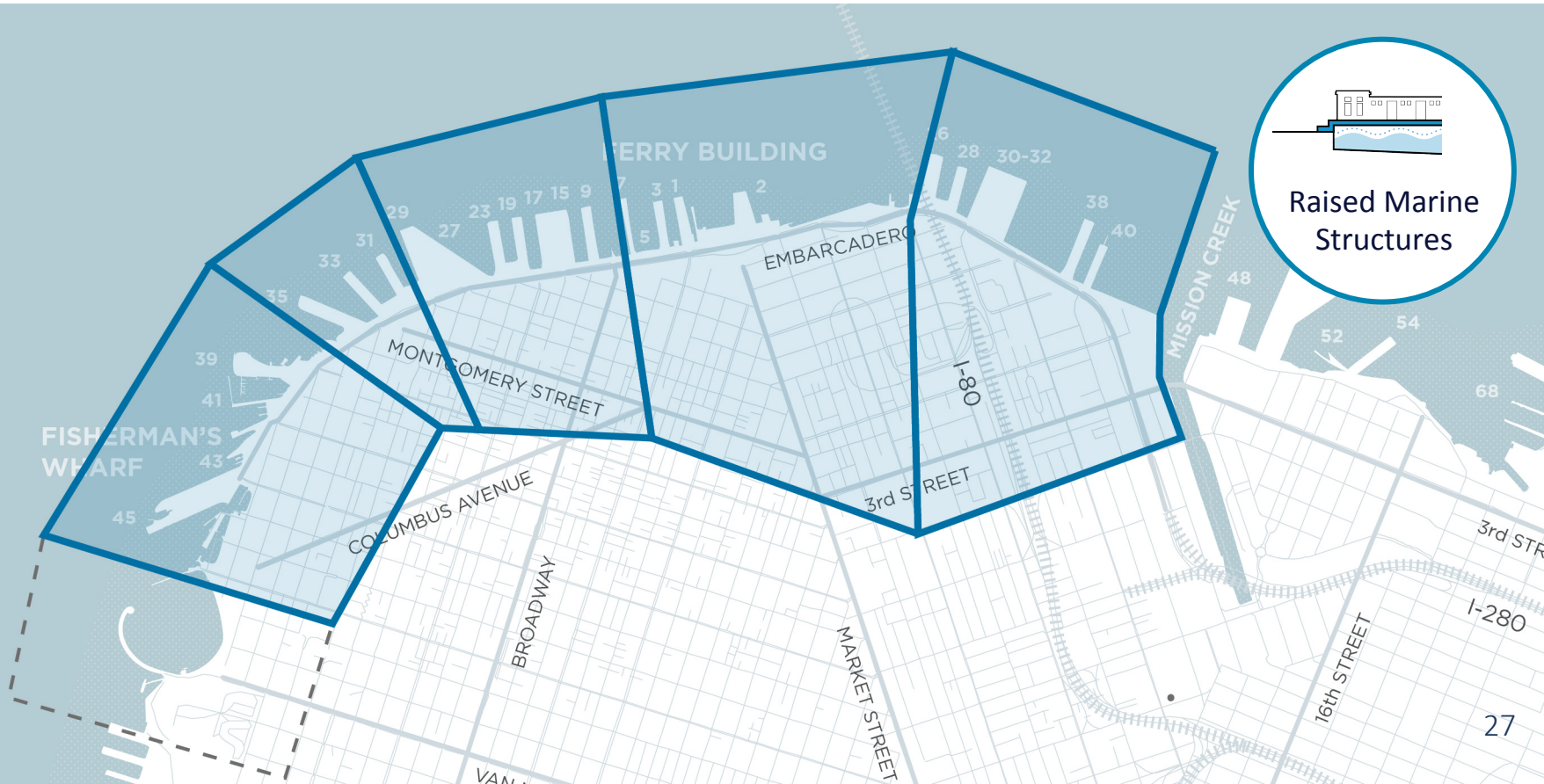
Aquatic Habitat



Ecological Shorelines

FLOOD MEASURES

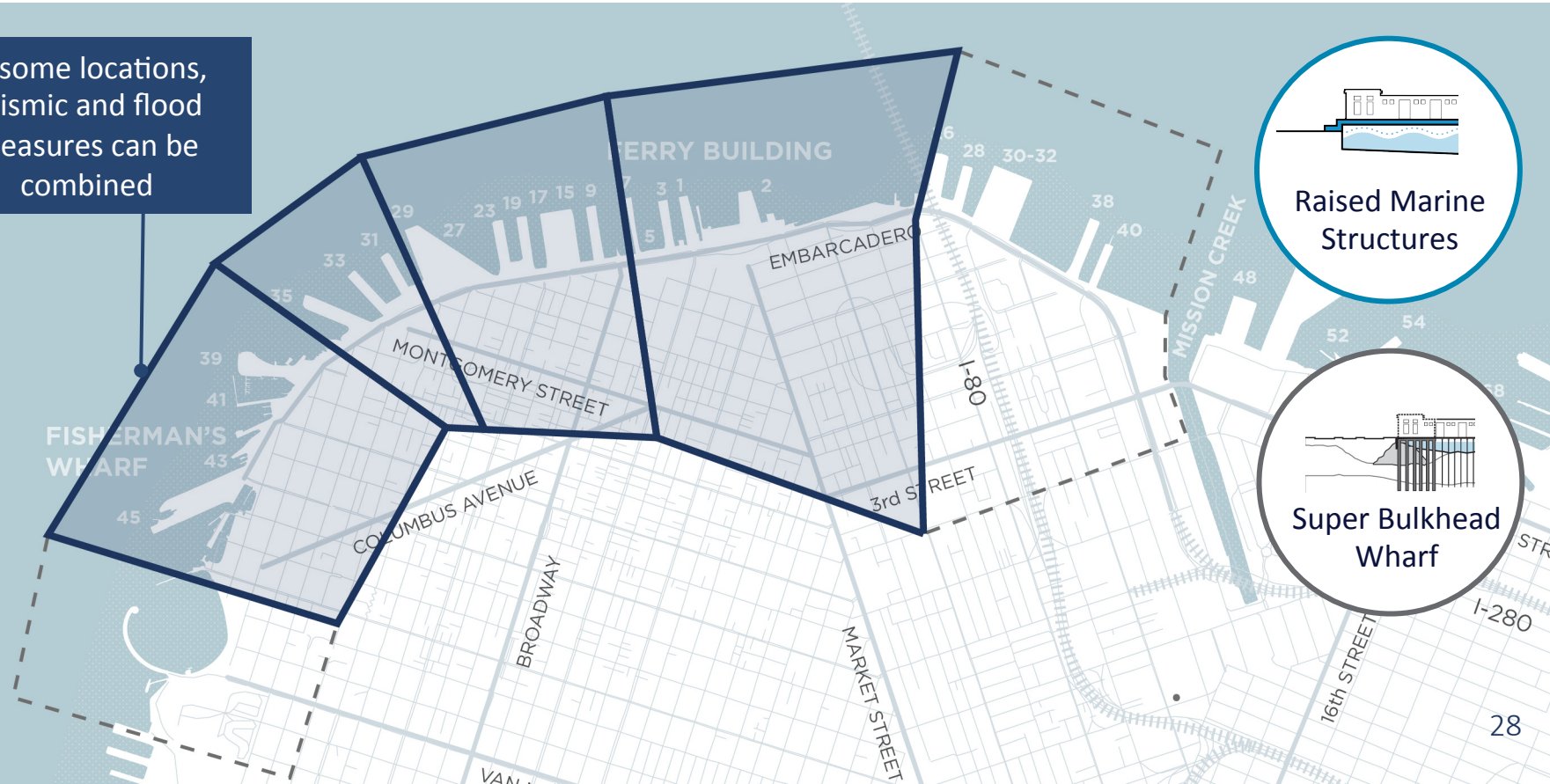
Raised Marine Structures – Applicable Subareas



SEISMIC & FLOOD MEASURES

Super Bulkhead Wharf and Raised Marine Structures – Applicable Subareas

In some locations, seismic and flood measures can be combined



An aerial photograph of the San Francisco waterfront, showing the city skyline with prominent buildings like the Transamerica Pyramid and the San Francisco Ferry Building. The water is dark, and a long pier extends into the bay. A large blue semi-transparent box is overlaid on the left side of the image, containing white text.

Long-Term Considerations

Envision planning helps inform Proposition A project selection and plan for the future

WHAT IS ENVISION?

Designed to understand and address the range of State of California sea level rise scenarios (Most Likely: 3.4 feet and 1:200: 7 feet)

Preserve existing form and function of the waterfront for as long as possible

Identify opportunities and constraints associated with adapting the current waterfront to the two selected sea level rise scenarios

Determine thresholds that will require major modifications to the waterfront

Provides a way to **engage stakeholders and decision-makers** regarding adaptation planning for the waterfront

Develop pro-active, desirable visions that provide resilience to sea level rise from 2080 to 2130 and beyond

Will inform Proposition A project selection by identifying *adaptation pathways* that begin with actions taken in the next 10 years that are building toward landscape scale approaches that address much higher water levels

ENVISION APPROACH

Technical studies

Flood measures applicable at 3.4' and 7' of SLR, soil conditions, seismic measures, MHRA, SLR modeling and elevation analysis

+

Public priorities

Stakeholder and decision-maker priorities, existing conditions and character, opportunities and constraints, themes

3 concepts
for the waterfront

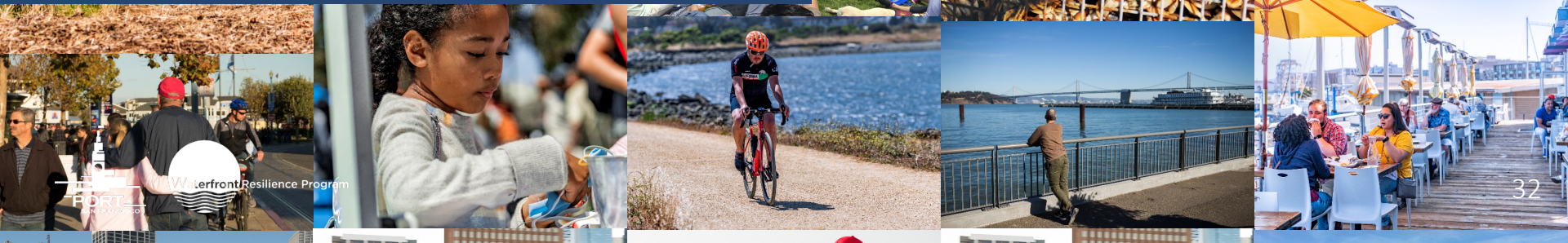
Envision takeaways:

- Findings to support Prop A projects selection
- Findings to support USACE Tentatively Selected Plan



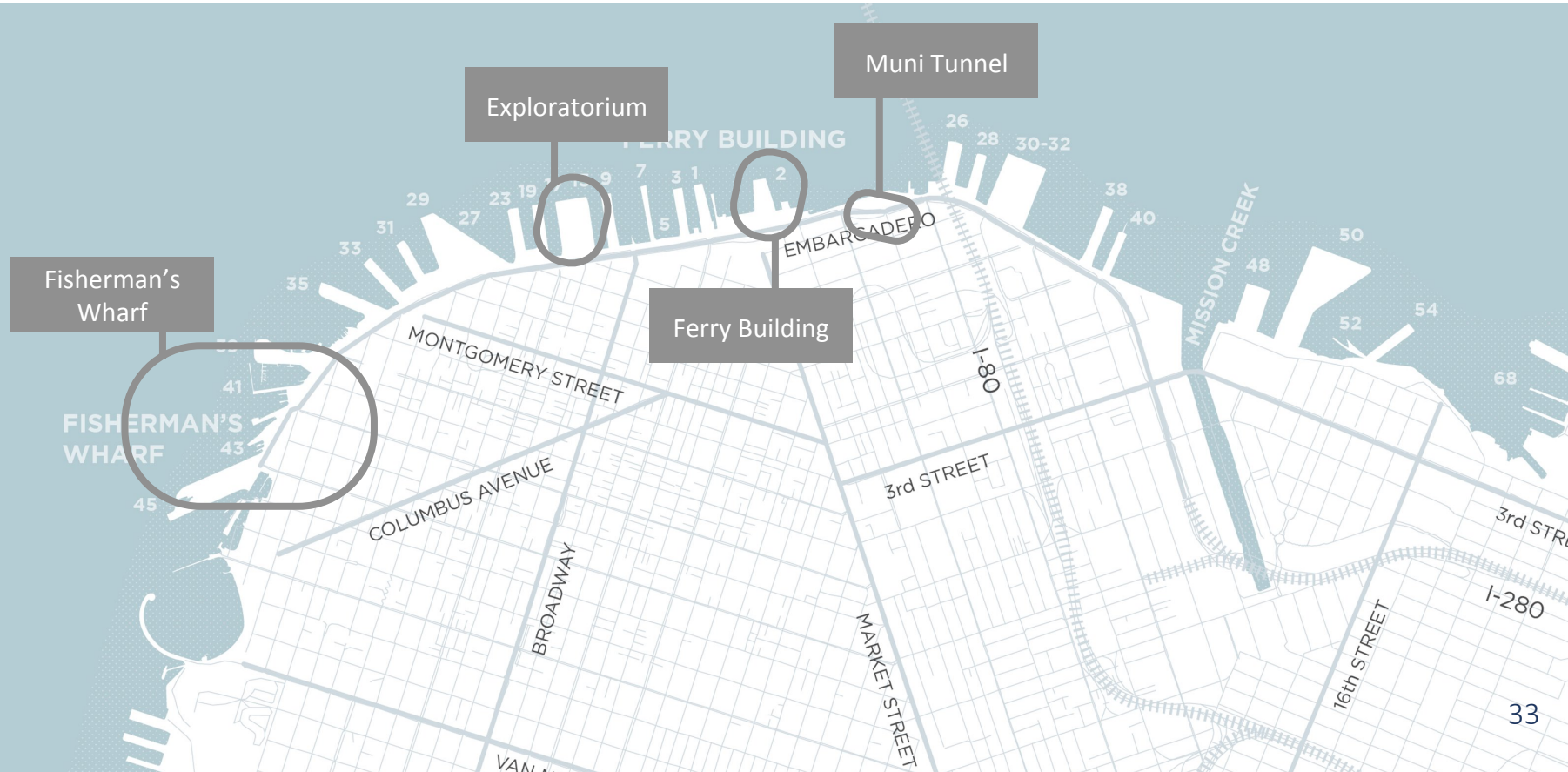
What have we heard?

Key feedback from community and stakeholder engagement



WHAT WE HEARD

Key Community Feedback on the Embarcadero Waterfront





LBE Participation

Workforce Development and LBE Support
Services for Future Contracting Opportunities

WATERFRONT RESILIENCE PROGRAM CONTRACTS OVERVIEW

The Port Resilience team remains committed to supporting LBEs and small businesses

1

CH2M has had 27.2% LBE participation since September 2019, increasing total LBE participation to 17.1%, with a goal of 22.9%

2

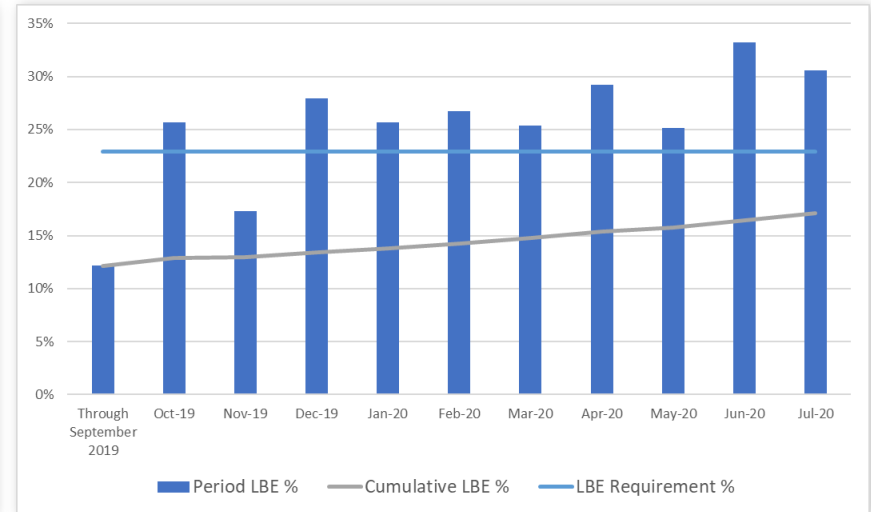
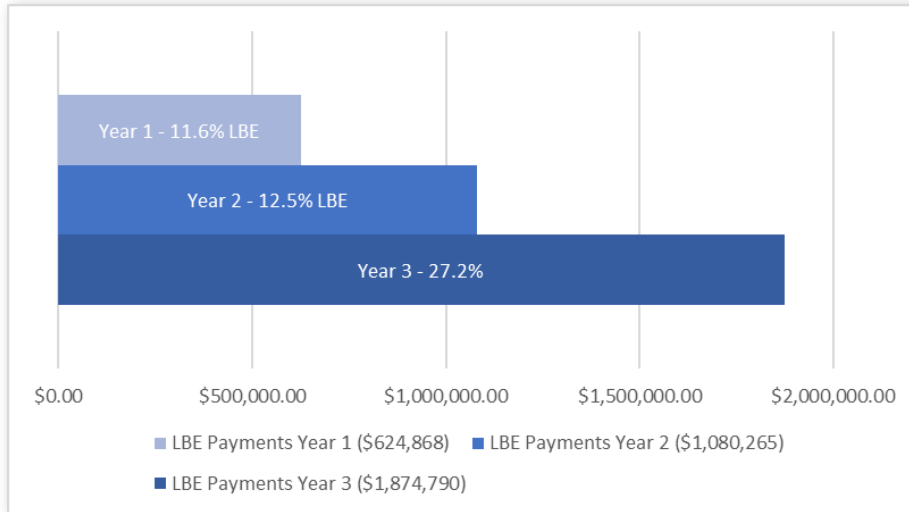
The WRP team has initiated a **Workforce Development and LBE Support Services task** to enhance economic opportunities in future WRP contracting opportunities

3

Civic Edge Consulting contract is at 35.4% LBE participation as of July 2020, with a goal of 36%

CH2M CONTRACT LBE PARTICIPATION UPDATE

LBE participation has improved since the CH2M contract amendment was signed



LBE Payments more than doubled in the last 12 months

Years 1+2: \$1.7M

Year 3: \$1.9M

WORKFORCE DEVELOPMENT AND LBE SUPPORT SERVICES

\$1.2 million scope of work included in the CH2M contract amendment

1

Effort will support workforce development programs and LBE outreach so that underserved San Francisco residents and businesses are well-positioned for future economic opportunities in the Waterfront Resilience Program, including Proposition A projects

2

Added subconsultants to the CH2M contract to support this work:

- Davis & Associates Communications, Inc.
- The Allen Group
- RDJ Enterprises LLC

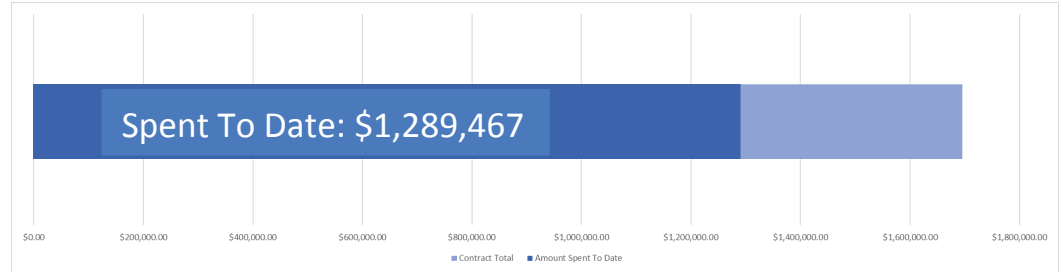
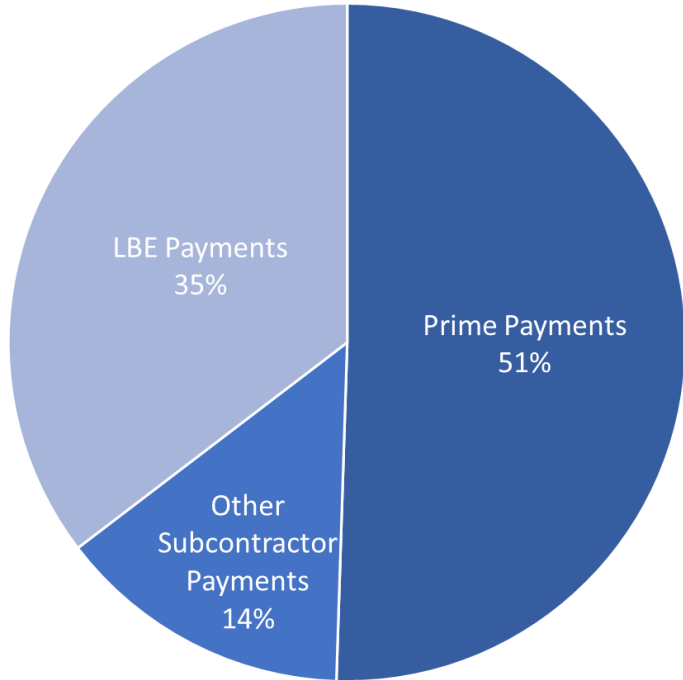
3

Scope of work includes:

- 1) Baseline Assessment of existing conditions and developing the overall workforce and LBE strategy (Sept 2020 – Feb 2021)
- 2) Program Development to integrate strategies with the proposed design & construction projects (Mar – Oct 2021)
- 3) Workforce and LBE Program Implementation (Nov 2021 – Program completion (TBD))

CIVIC EDGE CONSULTING CONTRACT LBE PARTICIPATION UPDATE

LBE participation is nearly at contracted goal of 36% with 24% of contract remaining



Total To Date

76% Spent to Date



Next Steps

What's Next for the Embarcadero Seawall Program



ALTERNATIVES DEVELOPMENT

Embarcadero Seawall Program Proposition A Project Selection



UPCOMING WRP PORT COMMISSION PRESENTATIONS

Planned WRP Presentations for Consideration and Decision Making



- **October:** USACE Focused Array
- **Fall:** Draft Alternatives, Envision Concepts and Decision-Making Framework
- **January 2021:** Recommendations for Proposition A Projects
- **March 2021:** Port Commission Endorsement of Proposition A Projects
- **Spring 2021:** Adapt Plan
- **Summer 2021:** USACE Final Array

A photograph of two children riding bicycles on a dirt path. The child in the foreground is wearing a red and white jersey and a yellow helmet. The child in the background is wearing a dark jersey with the number 30 and a dark helmet. They are riding away from the camera towards the ocean under a clear blue sky. A large dark blue semi-transparent box is overlaid on the left side of the image, containing text.

Thank You!

Brad Benson, Lindy Lowe, Steven Reel
Port of San Francisco
sfport.com

