MEMORANDUM

February 12, 2019

TO: MEMBERS, PORT COMMISSION
Hon. Kimberly Brandon, President
Hon. Willie Adams, Vice President
Hon. Gail Gilman
Hon. Victor Makras
Hon. Doreen Woo Ho

FROM: Elaine Forbes
Executive Director

SUBJECT: Informational update on the San Francisco Seawall Earthquake Safety and Disaster Prevention Program (Seawall Program)

DIRECTOR'S RECOMMENDATION: No action – Informational Only

EXECUTIVE SUMMARY

This is an informational update to the Port Commission on the progress of the San Francisco Seawall Earthquake Safety and Disaster Prevention Program (Seawall Program). The last Commission update was on July 10, 2018.

Highlights during this period include:

- The $425 million Embarcadero Seawall Earthquake Safety General Obligation Bond Measure passed on November 6, 2018 with 82.7% yes vote.
- The Port was awarded a $5M grant for the Seawall Program from the California Natural Resources Agency, included in the California 2018-19 Budget Act.
- The United States Army Corps of Engineers (USACE) and Port commenced the San Francisco Waterfront Storm Risk Management Study General Investigation (GI) on September 5, 2018, and successfully completed the first study milestone, Alternatives Milestone Meeting, on December 3, 2018.
- USACE and the Port came to a formal decision to suspend work on the USACE CAP 103 Study and devote resources to the larger USACE General Investigation.

THIS PRINT COVERS CALENDAR ITEM NO. 13A

- Field work for the geotechnical investigation was completed on time at the end of November and lab work is now under way.

- Seawall Community Meeting #2 was held in September at the Exploratorium with over 130 people in attendance.

- The Seismic Peer Review Panel met in July, September, and twice in November to review and comment on the geotechnical investigation and the approach and methodology for earthquake hazard assessment.

BACKGROUND

In 2015, under the leadership of Mayor Lee, the Port launched the Seawall Resiliency Project (later renamed the San Francisco Seawall Earthquake Safety and Disaster Prevention Program), a major City and Port effort to improve earthquake safety and performance of the Embarcadero Seawall, provide near-term flood protection improvements, and plan for additional long-term resilience.

Phase I will develop the overall Program and construct critical improvements to reduce the risk to life safety and sustain emergency response capacity following a major earthquake. Later phases will continue to reduce seismic and flood risk along the Embarcadero Seawall by both strengthening the Seawall and implementing adaptive measures to manage sea level rise. Phase 1 is currently budgeted at $500 million with completion targeted for the end of 2026.

The following is a brief summary of Port Commission information items and action items related to the Seawall Program since the last update on July 10, 2018.

- On August 13, 2018, the Port Commission authorized staff to enter into an Federal Cost Share Agreement with the United States Army Corps of Engineers San Francisco District for the San Francisco Waterfront Storm Risk Management Project (Resolution 18-46).

- On October 23, 2018, the Port Commission authorized staff to enter into a Grant Agreement with the California Natural Resources Agency to accept and expend up to $5,000,000 in grant funds to support the Seawall Program (Resolution No. 18-56).

STRATEGIC OBJECTIVE

This Seawall Earthquake Safety Program supports the goals of the Port's Strategic Plan as follows:

Engagement:
By regularly engaging in meaningful public participation and incorporate community feedback into Port initiatives, and by keeping the public informed of the financial responsibilities of the Port.

Livability:
By increasing the proportion of funds spent by the Port with LBE and micro-LBEs.

Resiliency:
By leading the City's efforts to address threats from earthquakes and flood risk through research and infrastructure improvements to the Seawall and Port property.

Sustainability:
By enhancing the quality of the Bay water and habitat with the improvements, by limiting construction impacts and waste, and by sustainable design and construction best management practices.

UPDATE ON PROGRESS & NEXT STEPS

PROGRAM MANAGEMENT

Program Overview: The Seawall Program is currently budgeted at $5 Billion with a 30 year implementation timeline. Phase 1 of the Seawall Program is budgeted at $500M with completion targeted for the end of 2026. This initial phase will develop the overall program and construct critical improvements to reduce risk to life safety and to improve emergency response capacity following a major earthquake or flood event. Later phases will continue to reduce seismic and flood risk along the entire Seawall by both strengthening and adapting the Seawall and co-dependent infrastructure.

- The Program framework has not changed during this period, however, the successful award and commencement of a USACE General Investigation may change the scope and scale of Phase 1 by bringing in the potential for federal investment earlier into the Program than previously anticipated. This is currently being evaluated.

- Secured Program funding for Phase 1 has increased by $430 million during this period, raising the secured funding amount to $446 million. Details are included in the Finance and Legislative update below.

Civic Edge Communications Consultant Contract: This is a contract for public relations, communications, media services, and related professional services for the Seawall Program.

- Contractor performance continues to be very good.
- There are no modifications or significant changes to report this quarter.

CH2M / Arcadis Planning, Engineering, and Environmental Support Consultant Contract: This is a contract for planning, engineering, and environmental services for the Seawall Program.

- Contractor performance continues to be good.
- Geotechnical work has been advanced from the Preliminary Design Phase into the Planning Phase.

Executive Steering Committee (ESC): The ESC meets quarterly to review progress of the Program and facilitate coordination among City Departments. Meetings were held in September and in December of 2018. The next meeting is planned for April 2019.

USACE CAP 103: The CAP 103 Project is a USACE led and Port sponsored effort to complete a feasibility study for a potential Federal project to improve flood protection along a portion of the Seawall from Pier 7 to Pier 22-1/2. Work on the CAP 103 Project was suspended this period due to the start of the larger USACE General Investigation. Work products will be used to inform the General Investigation.

USACE San Francisco Waterfront Storm Risk Management Study (Flood Study): Work commenced this period on the USACE General Investigation (GI). A GI has been a key strategy to bring federal funding for the Seawall Program and the Port is extremely appreciative to have been selected for a New Start in June of 2018. The Port Commission authorized staff to enter into the study agreement with USACE at its meeting on August 24, 2018. The agreement was executed on September 5, 2018, starting the three-year clock for the study process. USACE and the Port formed a Project Team, commenced the Flood Study, and successfully achieved the first major milestone (the Alternatives Milestone Meeting) on December 3rd, right on schedule. USACE will provide an overview of the Alternatives Milestone Presentation as part of this update, a copy is included as Attachment A. As an indication of the importance of the Flood Study to USACE, the Chief of Engineers, Lieutenant General (LTG) Todd Semonite, and the Assistant Secretary of the Army for Civil Works (ASA/CW), Mr. R.D. James, visited the Port and met with the study team and the Port's Executive Director.

PLANNING AND ENGINEERING

- *Existing Conditions Database and GIS*: CH2M/Arcadis continued to develop the Program database and GIS repository of existing and new data. Completion is expected in the spring of 2019.

- *Geotechnical Investigation*: CH2M/Arcadis and their sub-consultant, Fugro, completed field work for the geotechnical investigation on time at the end of November 2018. Over 100 locations were explored using a mix of techniques ranging from specialized sonic borings to simple and inexpensive CPT probes. The investigation techniques were refined using a pilot program, and final locations and mix of techniques were selected through consultation with the Seismic Peer Review Panel. Borings went as deep as 300 feet, through fill, bay mud, and into the underlying rock. Lab work is underway and preliminary results are expected in late

January. This work is extremely important for advancing the earthquake assessment, developing and estimating cost of alternatives, selecting the overall program, and advancing preliminary design of initial projects. This investment in subsurface information will also be useful for other Port and City efforts beyond the Seawall Program.

- *Bathymetric Survey and Laser Scanning*: Bathymetry is a term for a topographic survey of the Bay floor and this information is needed for both the detailed earthquake assessment and for adding wave components to the flood hazard assessment. Last quarter, the team completed field survey work for the entire Seawall area and began the process of interpreting data and developing survey maps. The maps are now complete and are being used by CH2M/Arcadis to advance analysis. The information is also being used by the Port Maritime Division for navigation and berthing.

- *Coordination with Owners/Operators of Co-dependent Infrastructure and Assets*: Good progress has been made to identify and characterize co-dependent infrastructure and assets in the Seawall zone of influence. The team is now advancing the methodology for assessing earthquake and flood damages and consequences of those assets and systems. We continue to receive good cooperation from agencies including SFPUC Wastewater Enterprise, SFPUC Water Enterprise, SFPUC Power Enterprise, SFMTA, SFPW, BART, PG&E, and AT&T, WETA and Golden Gate Ferry.

- *Multi-Hazard Risk Assessment (MHRA)*: The MHRA is the major effort to characterize earthquake and flood risks associated with the Seawall and measure the economic, societal, and environmental consequences of those risks. The MHRA includes advanced earthquake and flood risk assessments beyond the prior screening level studies and will measure consequences of estimated earthquake and flood damages in categories of importance for decision making. Work this period includes:
    - Advancing the overall methodology and toolkit including:
        - Refining the Strengthen, Adapt, and Envision framework for assisting with decision making as risks change over time;
        - Refining the risk metrics to be used in decision making;
        - Advancing development of a GIS based tool to help visualize risk metrics.
    - Advancing the earthquake assessment including:
        - Beginning the generation of site specific earthquake ground motions;
        - Refining the number and location of seawall sections to be used in detailed soil/structure analysis;
        - Advancing and refining the structural modeling techniques that will be used to create custom fragility curves of piers, wharves, and other unique Port structure types;
        - Meeting with the Seismic Peer Review Panel and modifying approaches based on peer review comments.

- Advancing the flood risk assessment including:
  - Meeting with USACE to determine acceptable techniques for modeling waves and wave damages;
  - Working with the City Sea Level Rise Committee on the approach to incorporate the recently updated CA state guidance for sea level rise.
- Economic Assessment
  - Advancing the methodology to assess direct, indirect, and induced damages from both earthquake and flood events;
  - Refining the inventory of structures and assets in the hazard zone including coordinating with the Citywide SLR effort and coordinating with USACE economics team leading the GI effort;
  - Updating the replacement cost of Port structures and buildings, particularly the historic pier and wharf structures.
- Land Use Planning and Regulatory Assessment
  - Advanced the overall assessment methodology;
  - Formed a Resource Agency Working Group (RAWG) consisting of agencies that will likely have permit and/or regulatory authority over projects and held the first regular meeting on October 3, 2018, to provide an overview and begin the dialog on agency concerns and considerations.
  - Continued to coordinate with the Port's Waterfront Land Use Plan Update.
- Urban Design Assessment
  - Advanced the overall assessment methodology;
  - Completed a public life survey and draft report.
- Disaster Response and Recovery Assessment
  - Completed the asset database;
  - Advanced the assessment methodology.
- Environmental Conditions and Opportunities Assessment
  - Advanced the overall assessment approach and methodology.

STAKEHOLDER AND COMMUNITY ENGAGEMENT

- *Seawall Community Meetings:* Port staff hosted Community Meeting #2 in September at the Exploratorium with over 130 people in attendance. Building on Community Meeting #1 in June, this meeting included presentations on the Seawall Program, the flood and seismic hazards, and the assets and services along the waterfront. After the presentations, attendees broke out into ten staffed tables and participated in an interactive mapping game where they were asked three questions: What do you love most about the waterfront? What assets are most important to the City? If disaster strikes, what is of most concern?

  Port staff hosted Community Meeting #3 on January 31st at SPUR. Building on Community Meeting #2, this meeting included an overview of prior meetings, introduction of the Port's work with USACE on the Flood Study of the Port's

waterfront, a presentation on draft goals for the Strengthen, Adapt and Envision phases of the Seawall Program and an exercise to elicit public feedback on those goals by having people apply the goals at tables where the focus was either Strengthening the Seawall to protect life safety and emergency response or Adapting to protect and preserve the existing waterfront or Envisioning a new waterfront that will be resilient to water levels beyond 2100. More than 90 people attended.

There are three more Embarcadero Seawall Community meetings that will be held in 2019 and will build upon input on the goals from the second meeting and begin to explore criteria and alternative development.

Additionally, Port staff will begin engagement in two other geographies – Islais Creek and Mission Creek – to support the USACE Flood Study. The first meeting focused on Islais Creek will be held in early March and will introduce the Flood Study and ask participants for their input on community priorities and concerns. The first meeting focused on Mission Creek will also happen later in March.

- *Community Presentation Roadshows:* Port staff continued to provide roadshow presentations at neighborhood and community group meetings across the city, bringing the total to over 100 presentations for the year, including 12 in-language presentations in Chinese, Spanish, and Filipino. Roadshow presentations will continue through 2019.

- *Seawall Walking Tours:* Port staff continued to host Seawall Walking Tours, bringing the annual total to ten public Seawall Walking Tours and one bike tour in partnership with the Bicycle Coalition. Many of the tours were “sold out.” The Tours include a Sea Level Rise visualization at Pier 14 where markers indicate various levels of Sea Level Rise through the end of the century. Seawall Walking Tours are planned in 2019.

- *Community Event Outreach*: The Seawall Program continued to be present at community events across the city, for a total of 65 events in 2018 where team members engaged over 13,000 people in conversation. All events includes multilingual outreach and printed material in English, Chinese, Vietnamese, Filipino, and Spanish. Community outreach included successful collaborations with the California Academy of Sciences, the Exploratorium, Sunday Streets, Neighborfest, and other strategic partnerships. Many of these successful collaborations will continue in 2019.

- *Online Engagement*: Port staff continued to provide Seawall-related social media on Facebook, Twitter, Instagram, and Snapchat, for a total of approximately 1 million online impressions in the year. The Program website (sfseawall.com) continues to host up-to-date Program information. Over the past year, the website has received over 27,000 views from more than 15,000 visitors. Port staff sent issue #9 of the

eNewsletter to a listserv of nearly 3,000 people. Seawall website updates, social media, and eNewsletters will continue in 2019.

- *Media Engagement*: There have been approximately 100 stories to date that include the Seawall. Port staff partnered with City partners to write and place three op-eds, including an op-ed for Labor Day written by Vice President of the Port Commission and President of ILWU Willie Adams and Executive Director of the San Francisco Labor Council Rudy Gonzalez. Targeted media outreach and press events will continue in 2019.

- *Innovative Outreach*: A key component of the overall Community Engagement Strategy continues to be engaging a multi-generational, cross-section of residents who are less likely to be engaged through traditional outreach and engagement channels. Strategies include social media, collaboration with mapping apps, maker's partnerships, art installations, and collaboration with science museums. Work this past quarter included:

    - "Makers" Partnerships: The Port collaborated with Black Hammer Brewing for a Seawall's Sea Puppy Beer and with Ritual Coffee Roaster on a Seawall Stroll espresso blend. These "makers" partnerships were featured in the Chronicle and other local outlets.

    - Twitter Chats: The Port coordinated two "chats" with major transportation agencies including BART, Muni, and Ferry providers as well as Port tenants including AT&T Park, the Exploratorium, and Fisherman's Wharf. Combined, the two chats had over 30K impressions on the Port's account alone.

    - Earthquake and Flood Simulation Video: Port staff managed the creation of a video that simulates the seismic and food risks to the waterfront. The video receive over 30,000 impressions in less than a month.

    - Messenger Videos: The Port staff created eight Seawall messenger videos with key leaders, including Port Director Elaine Forbes, Port Commission President Kimberly Brandon and Commissioner Doreen Woo Ho. Videos have been shared by the Mayor, key City Departments, San Francisco small businesses, and local press.

Unique, fun, and innovative Seawall outreach will continue in 2019.

<u>LEGISLATIVE AND FINANCE</u>

- *General Obligation Bond Measure:* This is the primary local funding strategy. On November 6, 2018, San Francisco voters overwhelmingly passed Local Measure A, the $425M Embarcadero Seawall Earthquake Safety Bond Measure. The final vote count was 82.7% yes, well above the 2/3 required to pass. Staff is targeting the first bond sale to be completed on or before June of 2019.

- *Infrastructure Finance District (IFD) Tax Increment:* Port IFD continues to be a promising local funding strategy for the Program. Port IFD can capture tax

increment from improved facilities within approved sub-project areas. The Teatro ZinZanni project will be the first local sub-project area dedicated to the Seawall. Timing and amount of potential funding is being currently being evaluated.

- *Community Facilities District (CFD):* The Seawall Finance Working Group met this period to refresh this previously recommended local funding concept and a decision was made to advance development of this strategy.

- *State Assembly Bill 2578, Infrastructure Financing Districts, City and County of San Francisco:* As previously reported, this bill would allow the Port to capture the State's share of tax increment for Seawall Improvements. AB 2578 was adopted unanimously by the California Assembly in May 2018; however, it was stopped on suspense in the Senate. Staff is planning to meet with the Seawall Finance Working Group and the Controller to evaluate options for State funding for the Seawall Program.

- *State Budget Request*: The Port requested $50M for the Seawall in the 2018 State Budget. The Governor responded with a $5 million appropriation through the CA Natural Resources Agency. The Port Commission authorized staff to enter into the grant agreement its meeting on October 23, 2018 (Resolution No. 18-56). Staff is currently analyzing the viability of a 2019 budget request.

- *State Cap & Trade*: Staff is developing a strategy to pursue programing of these funds specifically for adaptation projects.

- *USACE San Francisco Waterfront Storm Risk Management Study (Flood Study)*: The award of a New Start in June of 2018 was a big success for the Program. The Port has been pursuing a USACE GI since 2012 and it was the primary federal funding strategy recommended by the Finance Working Group. The award of a New Start in June represents a big success; however, this is only for the Study phase. Staff is currently working on strategies to include seismic benefits as part of any project, as well as strategies for the next steps, authorization of projects and appropriating funds for design and construction.

The next information update to the Port Commission on the Seawall Earthquake Safety Program is tentatively scheduled for April 10, 2019.

Prepared by: Steven Reel,
Seawall Program Manager

For: Elaine Forbes,
Executive Director

Attachment A: USACE Flood Study Alternatives Milestone Presentation

SAN FRANCISCO WATERFRONT

COASTAL STORM RISK MANAGEMENT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ANALYSIS

Alternatives Milestone Meeting
3 December 2018

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AGENDA

Opening Remarks (SPD/Vertical Team, SPN, POSF)

Presentation
-Meeting Purpose
-Study Authorization
-Non-Federal Sponsor
-Study Area and Purpose
-Problems, Objectives
-Opportunities, Constraints
-Future Without-Project Assumptions
-Plan Formulation
-Key Risks and Uncertainties
-Path to TSP

Discussion

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PURPOSE OF MEETING

Alternatives Milestone

To confirm that the Project Delivery Team has a clear and logical formulation and evaluation rationale that indicates the team is making risk-informed decisions, has developed an array of alternatives, and has defined the path forward to the Tentatively Selected Plan milestone.

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STUDY AUTHORIZATION

Original Study Authority: RHA 1950 § 110 and WRDA 1976 § 142 as amended by WRDA 1986 § 705

Water Resources Development Act of 1976, Section 142:
"*SEC. 142. The Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to investigate the flood and related problems to those lands lying below the plane of mean higher high water along the San Francisco Bay shoreline of San Mateo, Santa Clara, Alameda, Napa, Sonoma and Solano Counties to the confluence of the Sacramento and San Joaquin Rivers with a view toward determining the feasibility of and the Federal interest in providing protection against tidal and fluvial flooding. The investigation shall evaluate the effects of any proposed improvements on wildlife preservation, agriculture, municipal and urban interests in coordination with Federal, State, regional, and local agencies with particular reference to preservation of existing marshland in the San Francisco Bay region.*"

Water Resources Development Act of 1986, Section 705:
"*SEC. 705. SAN FRANCISCO BAY AREA FLOOD CONTROL STUDY.*
Section 142 of the Water Resources Development Act of 1976 (Public Law 94-587) is amended by inserting immediately after "Napa," the following: "San Francisco, Marin,".

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NON-FEDERAL SPONSOR

The Port of San Francisco is a public enterprise agency of the City and County of San Francisco, responsible for managing 7½ miles of waterfront property stretching from Aquatic Park in the north to Heron's Head Park in the south. This property is a complex mix of piers, structures, seawall, and open land, and is home to more than 500 tenants. Most of the piers' bulkhead buildings, seawall, and waterfront structures along the Embarcadero were built before World War II and many have historical distinction. The Port is obligated by the Burton Act to promote maritime commerce, navigation and fisheries, as well as to protect natural resources and develop recreational facilities for public use.

PORT OF SAN FRANCISCO

San Francisco Local Measure A authorizes the city to issue $425M in bonds to address the waterfront, BART and Muni, historic piers, and roads from earthquakes, flooding and rising seas. The measure passed with 82.7% yes votes. The Port of San Francisco is the lead city agency and the Corps' cost share partner for the San Francisco Waterfront Study. Bond proceeds will be used to support the non-Federal cost share and additional work not included in the study.

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STUDY HISTORY

Sept 5	FCSA Executed
Sept 18	Study Kickoff – PDT's First Weekly Risk-Informed Planning Workshop
Nov 6	City Agency Planning Workshop for the SF Waterfront Study
Nov 13	PDT Participation in Sea-Level Rise Consequences Workshop
Nov 27	Regulatory Agency Meeting
Dec 3	Alternatives Milestone Meeting

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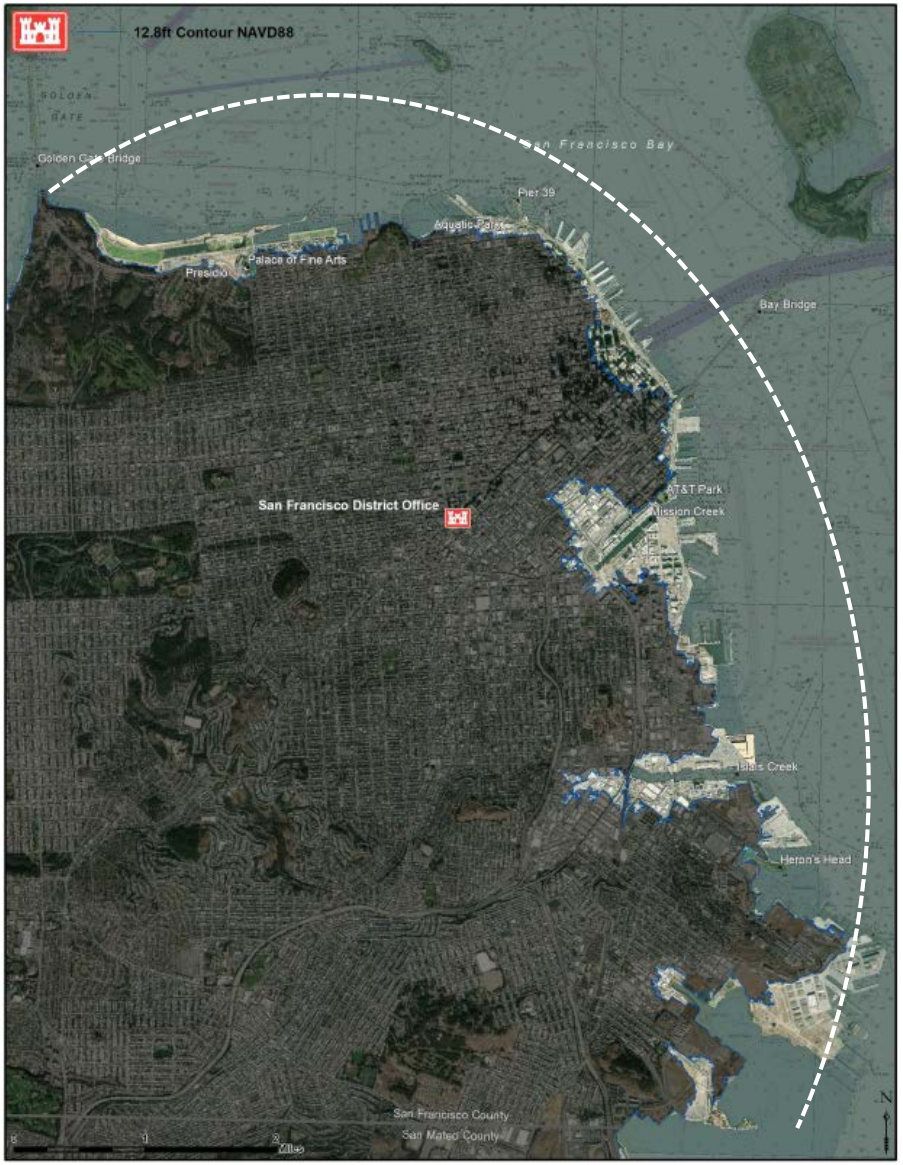
STATUS OF TASKS TO AMM

TASK	STATUS
AMM Read Ahead Submittal & DQC Certification	Complete
Risk Register, Decision Log, & Decision Management Plan	Complete
Establishment of initial (study) team	Complete
Invite NEPA Cooperating Agencies & Initiate informal NEPA Scoping	Complete
Negotiate SOW for USFWS CAR	Ongoing
Develop ESA species list	Complete
Formulation of arrays & Conduct 1 iteration of risk-informed planning process	Complete
Initiate coordination with CSRM PCX	Complete
Develop PMP	Started
Draft Review Plan	Complete
Preliminary Analysis of Federal Interest	Complete
Costs, Benefits, & Environmental Impacts of Focused Array	Complete
Projected scope, schedule, and budget for study	Started
Description of Problem	Complete
Study Authorization	Complete
FWOP including uncertainty	Complete
Study Objectives and Constraints	Complete
Environmental Compliance Status	Complete
Likelihood of Study completing within 3x3 criteria	Started
Memorandum For Record (MFR) for AMM	Complete after AMM

STUDY AREA AND PURPOSE



PURPOSE OF STUDY

Reduce the flood risk from coastal storms in the study area.

- 13 miles of waterfront property
- Extends from GG Bridge to City/County line
- Coastal flood risk varies – need for flood risk reduction more acute in some areas

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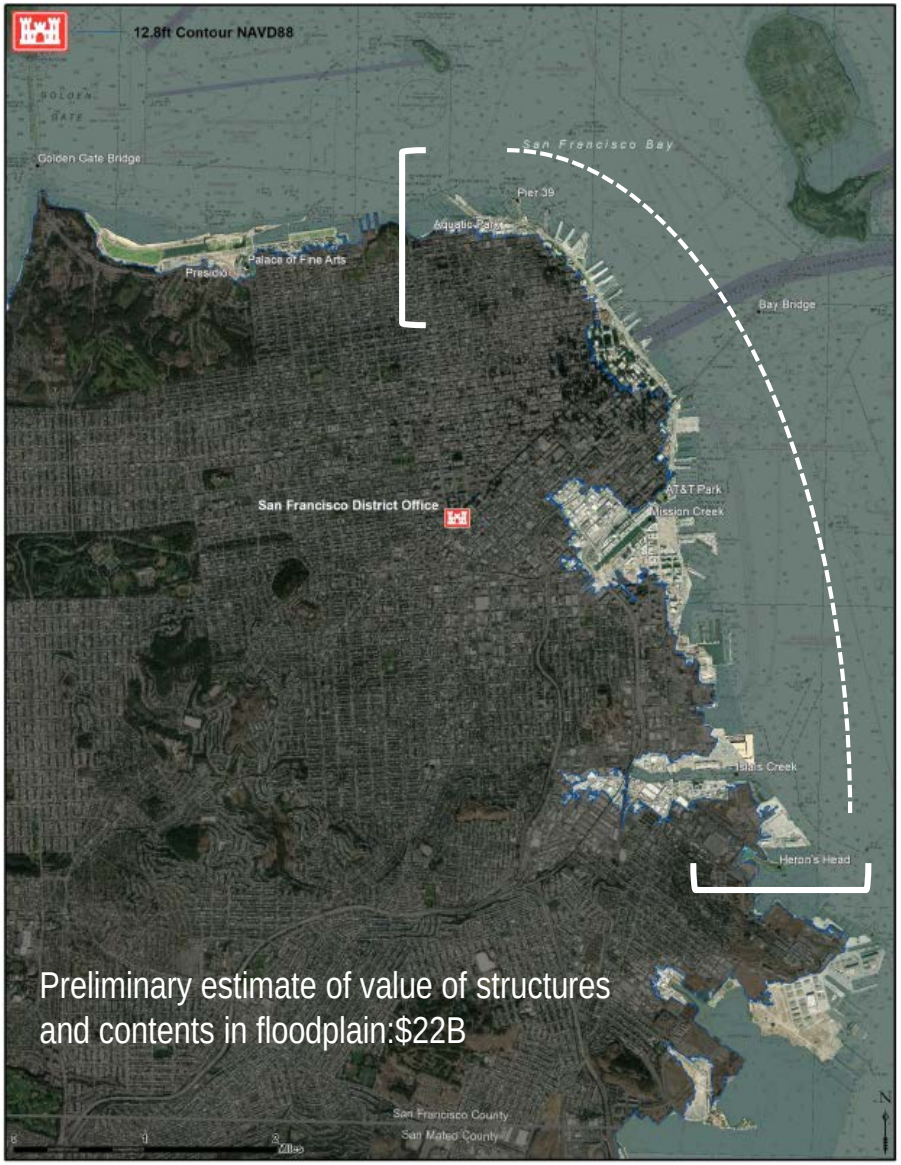
STUDY AREA AND PURPOSE



CURRENT PHASE OF STUDY AREA*

Approximately 7½ miles of waterfront between Aquatic Park (to the North) and Heron's Head Park (to the South)

-Geographic scoping based on preliminary assessment of coastal flood risk
-Hydrologically-independent area with greatest estimated coastal flood risk
-Tourism and financial heart of San Francisco
-Critical public infrastructure, including local and regional transit (above ground, below ground, and ferries) and wastewater treatment
-3 designated historic districts
-Dense residential, commercial, and industrial land use

*Other areas outside of study area should be a focus of future studies.

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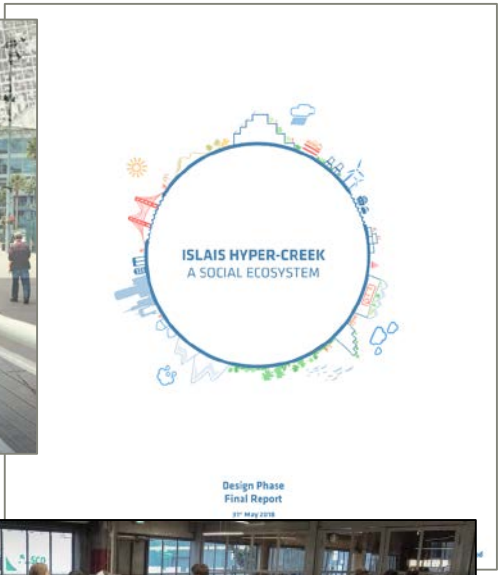
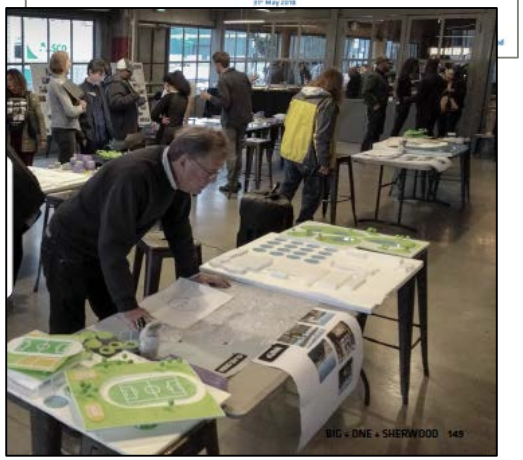
PLANNING WORK BY OTHERS





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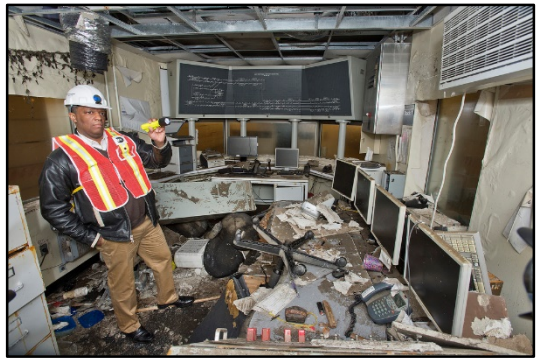
PROBLEMS AND OBJECTIVES

PROBLEMS

- Risk to Public Safety and Health
- Damage to Public and Private Infrastructure and Property
- Adverse Social and Economic Conditions
- Degradation of the Environment



OBJECTIVES

- Reduce the risk to public safety (including loss of life) and public health from Bay storms along the San Francisco waterfront.
- Reduce the risk to public and private infrastructure and property from Bay storms along the San Francisco waterfront.

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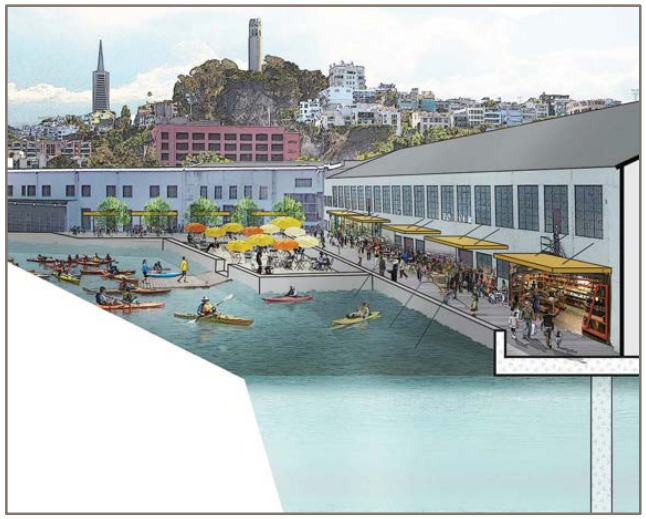
OPPORTUNITIES AND CONSTRAINTS

OPPORTUNITIES

- Improve public safety by changing traffic, bicycle, and pedestrian patterns along the Embarcadero
- Enhance recreation and tourism through improved visual and physical access to the Bay
- Improve the natural environment by using nature-based features in place of, or on top of, hard structures used for the storm risk management project



CONSTRAINTS

- Do not increase the risk of flooding from any source (bay, creek, or surface waters) outside or within the study area
- Do not increase the response time for emergency responders

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FUTURE WITHOUT-PROJECT ASSUMPTIONS

Floodplain with sub-areas by color

- During coastal storms, water will overtop the seawall and have significant economic, social, and environmental impacts
- The frequency and magnitude of damage will increase as sea-levels rise over time
- The Port and City will not have completed any of the necessary seismic improvements by the time the feasibility study is completed. Initial work will include pilot projects for evaluating ground improvement techniques. High degree of uncertainty on how much and where seismic improvements will be made in the future.

Due to the varied nature of the land use along the waterfront, the specific problems, opportunities, and constraints are highly variable along the waterfront. Also, the types of measures that can be implemented vary depending on where you are in the study area.

For this reason, 15 “sub-areas” were identified to aid the development of alternatives. The various colors in the figure at left represent these areas. More detail on later slides.

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FUTURE WITHOUT-PROJECT ASSUMPTIONS

SUB-AREA	FUTURE WITHOUT-PROJECT CONDITION
	What will happen if we do nothing in this area
AQUATIC PARK	Beach not usable. Loss of recreation. Potential impacts to maritime museum.
FISHERMAN'S WHARF	Significant tourism, recreational, and economic losses. Risk to the only commercial fish processing facilities on the waterfront. Infrastructure impacts include damages to ferry terminals, Northpoint wet weather treatment facility, and MTA bus facility/undergound fuel storage tanks.
NORTHEAST WATERFRONT	Significant tourism, recreational, economic, infrastructure, and historic losses. Impacts include damage to historic finger piers, cruise terminals, bar pilot boats and offices, and the Exploratorium. Infrastructure impacts would result from inundation of the Embarcadero transit system (road and rail), damage to four outfalls, and the Northpoint treatment plant.
FERRY BUILDING WATERFRONT	Major economic, recreation, tourism, and infrastructure losses due to inundation of Financial District and SF's transportation epicenter. Future without-project condition includes new ferry terminal (add to DEM), backflow pumps to address current overtopping of PUC transport storage boxes
SOUTH BEACH	Moderate to significant economic, recreation, and infrastructure impacts. AT&T ballpark, Embarcadero roadway, freeway access, and Muni lightrail assets all impacted. All Muni railcars access maintenance yard via rail in this sub-area. Caltrain terminus may be moved in the future, replaced with new development in study area.
MISSION CREEK	Moderate to significant infrastructure impacts with life safety implications. The feet of 3rd and 4th street bridges already corrode due to contact with water. Houseboat community at more immediate risk of adverse impacts.
MISSION ROCK	Significant transit impacts. Mission Rock development underway with elevated baseline; new mapping necessary.
MISSION BAY	Significant transit/transportation, economic, and life safety impacts. New ferry terminal and existing 3rd street corridor; potential for a new transbay tube to daylight in this area (very far in the future). There are plans for realignment of the shoreline in this sub-area with a new 5-acre park.
PIER 70	Some historic and recreation impacts. Pier 70/Forest city development site (being raised), with park. Future of shipyard uncertain. Areas on each side are planning to adapt to sea-level rise.
OLD POWER PLANT	Some potential infrastructure impacts; low risk. Essentially high ground. Cleaning up area currently (contamination)
PIER 80	Significant infrastructure impacts. WWTP, MTA, and Port cargo facilities all at risk. Pier 80 is a low, sheet-pile filled land structure with active cargo operations.
ISLAIS CREEK	Some infrastructure impacts. Important to maintain bridges and N-S access. Question: possible to deauthorize federal channel as part of the project?
BACKLAND	Economic and infrastructure impacts. Current Use: City recycling, maritime operations, bay sand mining operations, aggregate import.
PIER 94/96	Infrastructure and economic impacts; life safety implications. Current navigation facilities include deepwater berthing. The area is highly susceptible to earthquake damage. City's recycling facility. Already experiences some flooding.
HERON'S HEAD	Low recreational impacts and moderate environmental impacts. Parkland with natural shoreline. Potential industrial redevelopment. Potential loss of land due to SLR (loss of habitat, etc.)

Over the course of several workshops, and with input from stakeholder agencies, an assessment was completed for each of the 15 sub-areas.

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PLAN FORMULATION

1st Iteration of Risk-Informed Planning

- Weekly 3-hr PDT planning workshops
  - Scoped Geographic Study Area
  - Developed POOCs
  - Defined 15 “sub areas” and future without project conditions for each
  - Delineated Lines of Defense and described applicable measures
  - Identified preliminary array of alternatives

2nd Iteration of Risk-Informed Planning

- San Francisco stakeholder agency workshop (PUC, MTA, etc.)
- Executive Steering Committee meeting (SF City agencies)
- Sea-level rise consequences workshop (hosted by City of SF)
- Regulatory agency workshop (BCDC, Water Board, etc.)
- PDT used external stakeholder input and screening criteria to identify focused array of alternatives

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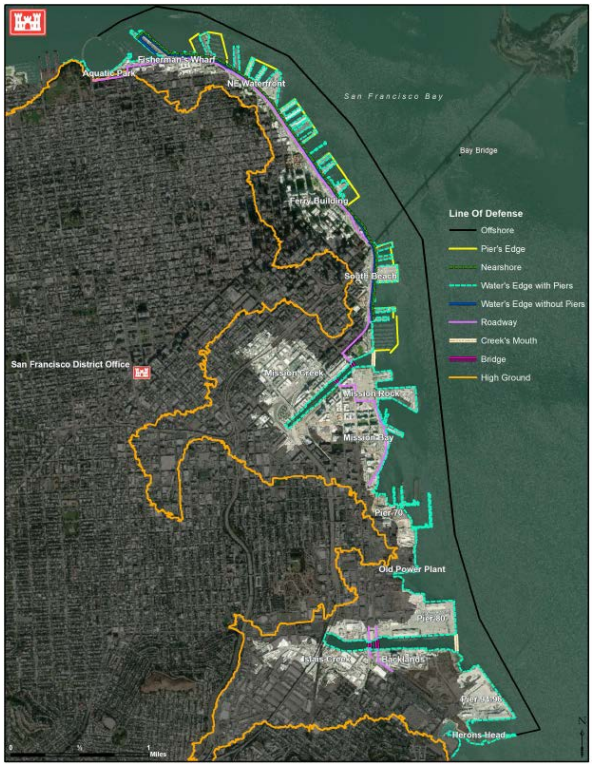
PLAN FORMULATION

Plan Formulation Strategy: Lines of Defense

A line of defense (LoD) is an alignment along a portion of, or, the entire Study Area, that separates the floodwaters from the Bay onto one side of the line from the people, property, and infrastructure to be protected from the floodwaters on the other side of the line. To form a complete alternative plan, the LoD either has to cover the entire length of the Study Area, or two or more LoDs must be combined to cover the entire length of the Study Area.

- Offshore
- Pier End
- Nearshore
- Water's Edge with Piers
- Water's Edge without Piers
- Roadway
- Creek's Mouth
- 3rd Street Bridge
- 4th/Illinois Street Bridges
- Creek's End
- High Ground



Larger image shown on slide 17

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LINES OF DEFENSE

The costs, benefits, opportunities, and residual risk vary by line of defense. The figure at left shows the major lines of defense identified to date through the risk-informed planning process.

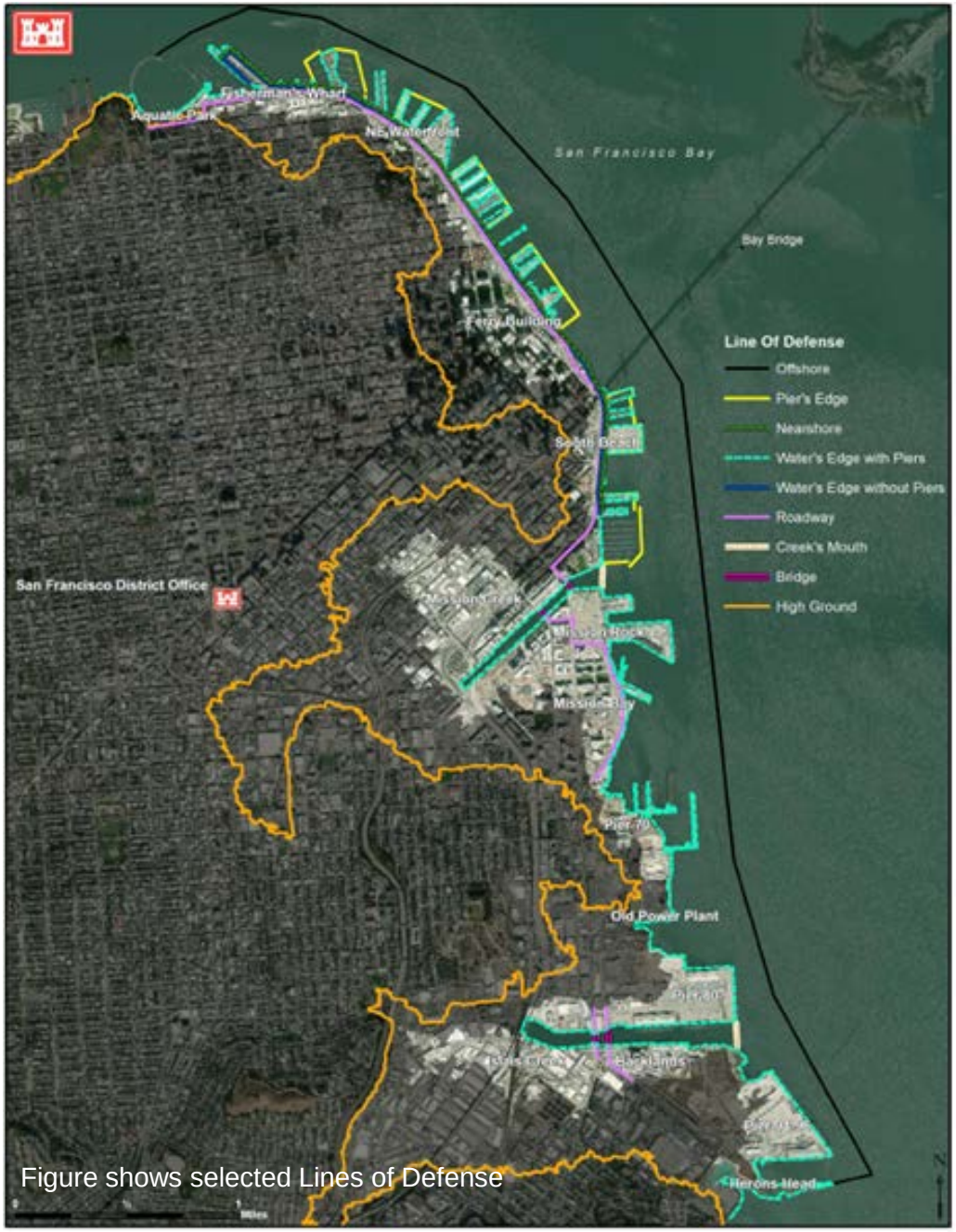

Figure shows selected Lines of Defense

Close up view of Ferry Building area Lines of Defense shown on slide 18

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More focused view of some of the major lines of defense identified. The Financial District and the Ferry Building are in the center of the image.

This area includes multiple entry points for coastal flood water into the regional underground transit system, including the muni portal pictured below.

Looking north along the Embarcadero at the muni portal.

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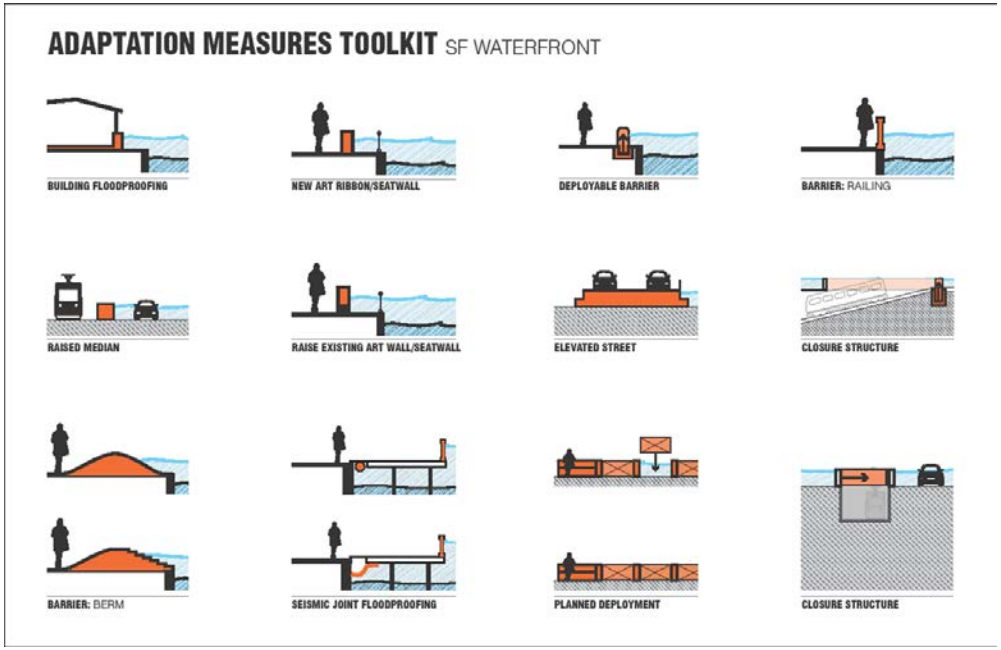
PLAN FORMULATION

MEASURES

Highly varied land use along waterfront means it is possible to use each of these measures at least once as part of a complete alternative.

- Breakwater
- Tide Gates
- Seawall
- Bulkhead Seawall
- Levee
- Levee (raised pedestrian path)
- Embankment/Levee
- Horizontal Levee
- Raised Road (levee)
- Barrier Railing (floodwalls)
- Deployable Floodwall
- Wetlands
- Floodproofing
- Managed Retreat



One of the graphics produced to aid formulation

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PLAN FORMULATION

LINE OF DEFENSE	APPLICABLE MEASURES
Offshore	Breakwaters Storm surge barriers Tide gates
Pier End	Seawalls Breakwaters Tide gates
Nearshore	Seawalls Floodproofing
Water's Edge with Piers	Seawalls Floodwalls (permanent and deployable) Barrier railings Levees Horizontal levees Raised path Bulkheads Living shorelines Wetlands Beach nourishment
Water's Edge without Piers	Floodwalls Levees Raised path Bulkheads Living shorelines Beach nourishment Floodproofing
Roadway	Embankments-raised roads Floodwalls Setback levees Floodproofing

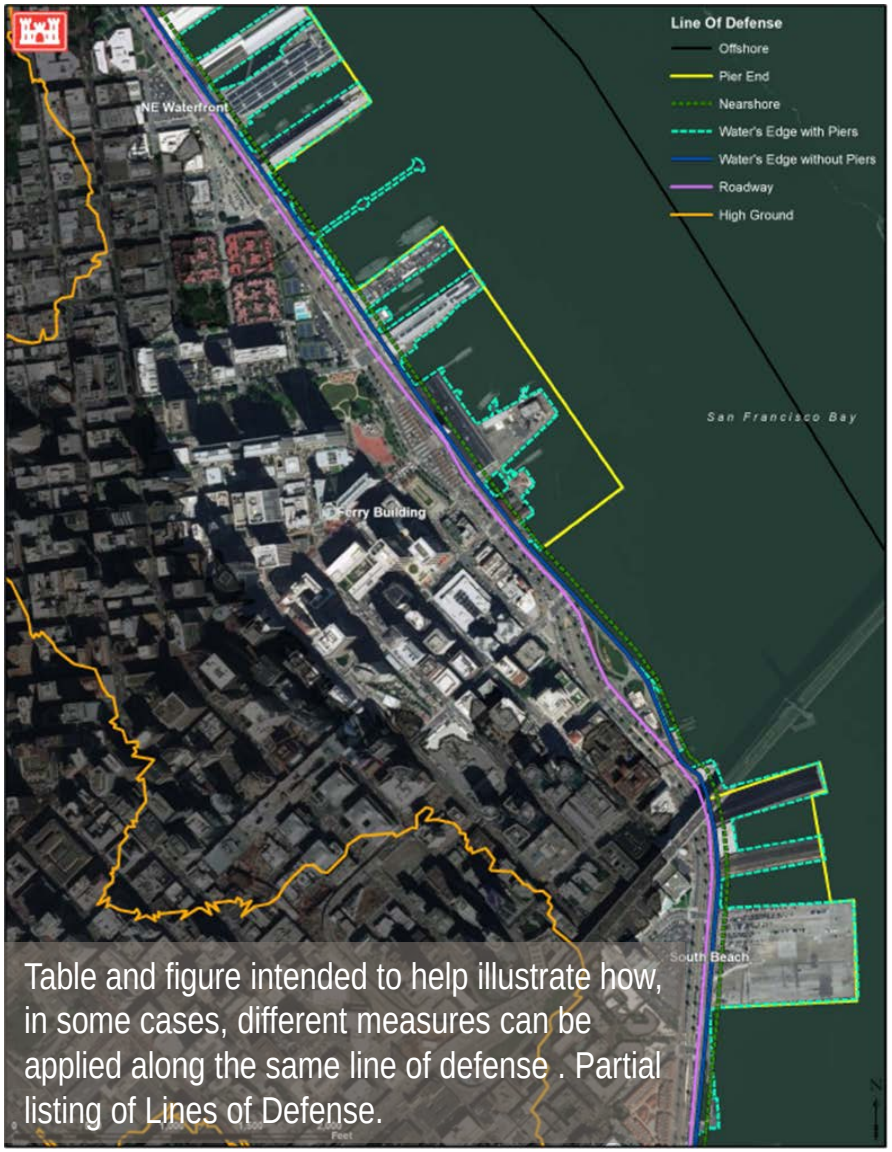


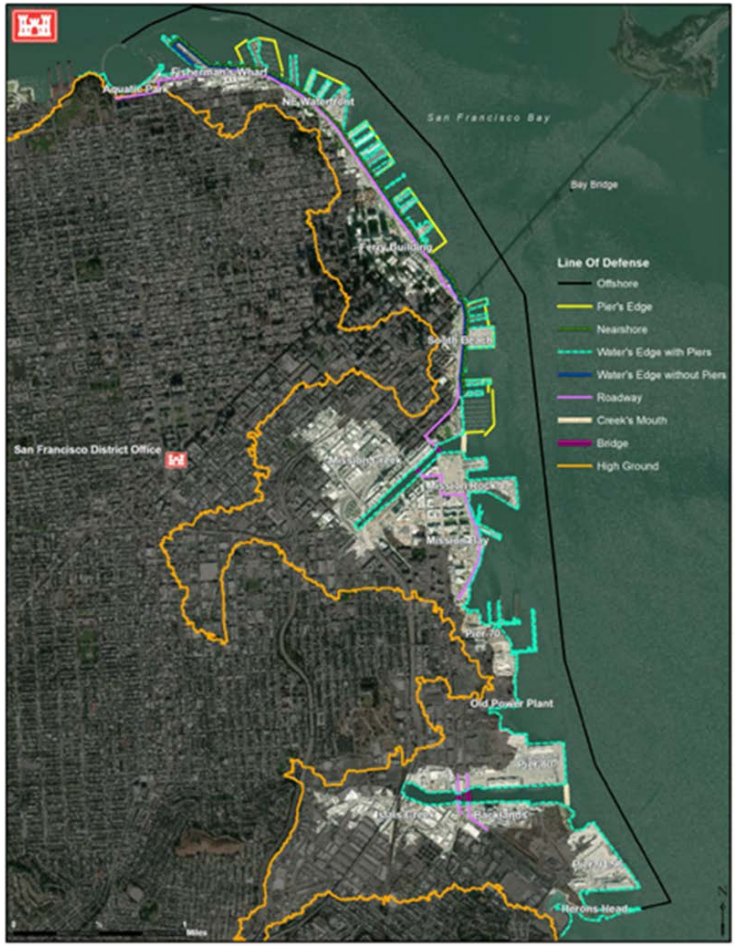
Table and figure intended to help illustrate how, in some cases, different measures can be applied along the same line of defense . Partial listing of Lines of Defense.

ALTERNATIVES

11 alternatives were originally formulated. These alternatives are combinations of different lines of defense that considered the varied opportunities and constraints along the segments of the waterfront.

- Barrier at Golden Gate Bridge
- Offshore Wave Attenuator
- Offshore Seawall - Entire Study Area
- Offshore Seawall until Islais Creek
- Balanced Alternative
- Heritage Plan
- New Seawall
- Depend on the Piers
- Shoreline Defense
- Living with Water
- Full Managed Retreat

Slide 22 describes the alternatives in more detail.



Primary lines of defense

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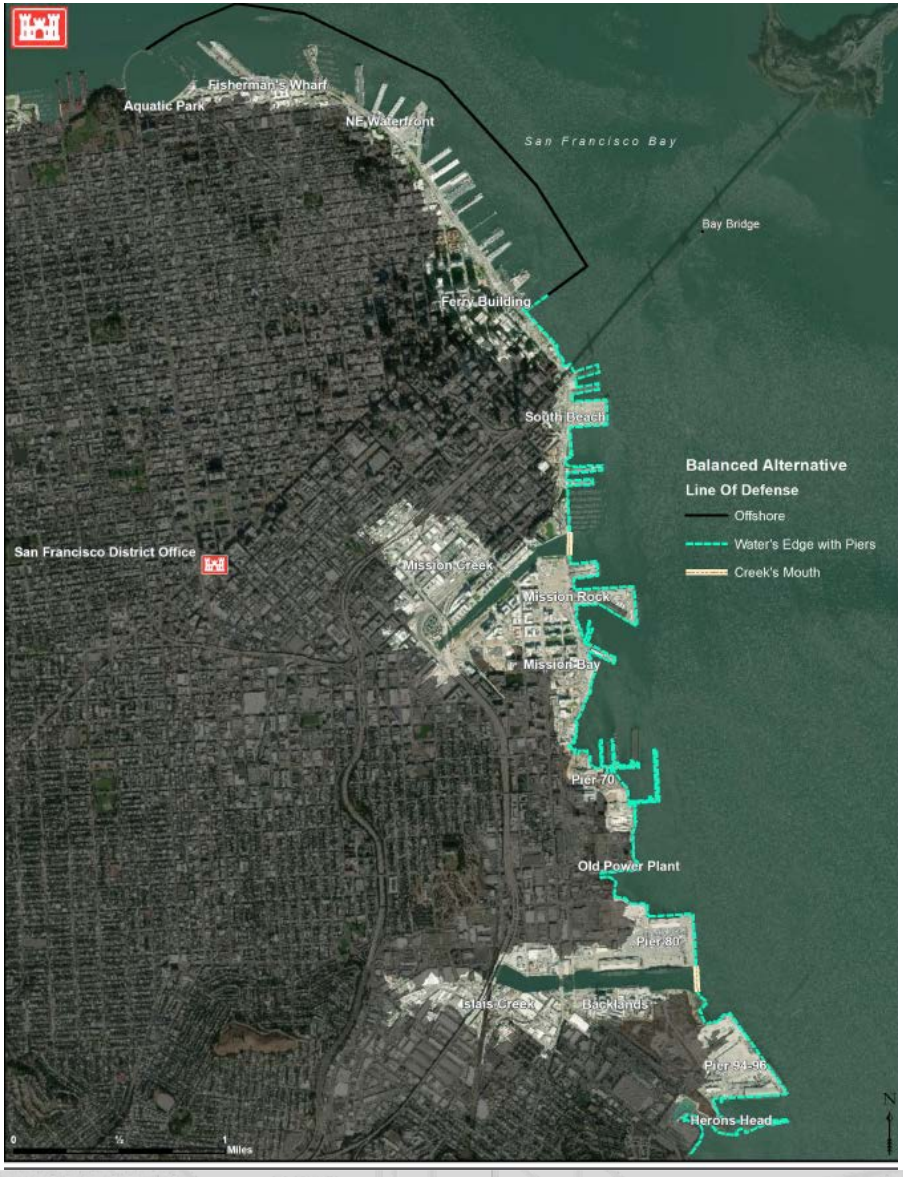
ALTERNATIVE	DESCRIPTION
Barrier at Golden Gate Bridge	Deployable barrier or permanent gate with locks at or near the golden gate bridge.
Offshore Wave Attenuator	Offshore wave attenuator from Aquatic Park to Pier 80 where the project moves to a water's edge with piers alignment until the mouth of Islais Creek. There is a barrier at the mouth of Islais Creek with the alignment resuming at the water's edge (with piers) from Pier 94/96 to Heron's Head Park.
Offshore Seawall - Entire Study Area	Offshore seawall with gates to support the movement of marine traffic from Aquatic Park to Heron's Head Park.
Offshore Seawall Until Islais Creek	Offshore seawall with gates to support the movement of marine traffic from Aquatic Park to Pier 50 where the project moves to a water's edge with piers alignment until the mouth of Islais Creek. There is a barrier at the mouth of Islais Creek with the alignment resuming at the water's edge (with piers) from Pier 94/96 to Heron's Head Park.
Balanced Alternative	Offshore solution extending from Aquatic Park to Pier 14 where the project moves to a water's edge with piers alignment (including barriers at the mouths of Mission Creek and Islais Creek) until Heron's Head Park.
Heritage Plan	Pier end alignment with a project connecting Aquatic Park to Pier 45. Project continues along pier ends to Pier 14 where the alignment moves to water's edge with piers. The project resumes its pier end alignment at Pier 24, continuing to Pier 50 where it becomes a water's edge with piers alignment until Heron's Head Park. There are barriers with gates at both creek mouths.
New Seawall	Water's edge with piers alignment from Aquatic Park to Pier 45, where it becomes a new nearshore seawall extending south to Pier 50. The northern-waterfront alignment briefly becomes water's edge with piers to accommodate the Ferry Building. South of Pier 50, the alignment is water's edge with piers to the end of the project at Heron's Head Park. There are barriers at both creek mouths.
Depend on the Piers	Water's edge with piers alignment from Aquatic Park to Pier 50 where the alignment becomes water's edge without piers until Heron's Head Park. Barriers at both creek mouths.
Shoreline Defense	Beach nourishment at Aquatic Park with a water's edge without piers alignment throughout the remaining project area. Barriers at both creek mouths. Potential flood proofing of select pier structures and construction of new select piers.
Living with Water	Alignment along first inland roadway from Aquatic Park to 19th St where the project takes advantage of high ground until 23rd St, at which point it resumes along the roadway (23rd to Cargo Way; Illinois St from Cargo Way to Jennings; Jennings St until Evans St where the project ends). Includes closures for BART and Muni tunnels.
Full Managed Retreat	Relocate all assets in the study area to high ground.

ALTERNATIVES



Example: Balanced Alternative

Offshore solution extending from Aquatic Park to Pier 14 where the project moves to a water's edge with piers alignment (including barriers at the mouths of Mission Creek and Islais Creek) until Heron's Head Park.

Preserves the historic core in the North while not depending on the integrity of the piers for flood risk reduction.

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ALTERNATIVES

ALTERNATIVE	RETAINED?	NOTES
Barrier at Golden Gate Bridge	No	Unacceptable environmental and navigation impacts.
Offshore Wave Attenuator	No	Not effective long term
Offshore Seawall - Entire Study Area	No	Not effective long term
Offshore Seawall until Islais Creek	Yes	
Balanced Alternative	Yes	
Heritage Plan	Yes	
New Seawall	Yes	
Depend on the Piers	Yes	
Shoreline Defense	Yes	
Living with Water	Yes	
Full Managed Retreat	No	Not efficient or acceptable. Managed retreat will be maintained as a measure for other alternatives.

Screening of Alternatives was based on risk-informed assessment of performance relative to these criteria:

- Effectiveness
- Efficiency
- Acceptability

For both evaluation against FWOP and comparison of plans against each other.

The next iteration of screening and evaluation will also include the criteria of resilience.

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ALTERNATIVES

At this very early stage, there is a high degree of uncertainty in project costs and benefits. More detailed feasibility work over the next year (including without-project flood damage analysis, seismic conditions assessment, etc.) will significantly reduce this uncertainty. The present value of project costs and benefits are expected to exceed $1B.

ALTERNATIVE	THEME	RELATIVE COST*	RELATIVE BENEFITS*	RELATIVE ENV. IMPACTS
Offshore Seawall until Islais Creek	Preserves maritime environment, existing over-water structures and waterfront uses; low disruption plan.	High	Middle	High
Balanced Alternative	Preserves the historic core in the North with a "return to the Bay" in the south.	High	Middle	High
Heritage Plan	Maximum historic preservation with opportunities for pier restoration. Pier-centric plan.	High	Middle	Middle
New Seawall	New seawall; multi-hazard risk management. Includes assumption of incidental seismic benefits.	Middle	High	Middle
Depend on the Piers	Piers provide flood risk management, which is a medium-term solution.	Middle	Middle	Middle
Shoreline Defense	This is a no pier solution that defends the shoreline.	Low	Low	Low
Living with Water	Embracing the water.	Low	Low	Low

*Relative ranking of costs and benefits are preliminary. More information on the expected costs and benefits of the focused array will be developed in the next phase of study. Ranking are relative within each column (costs relative to other costs, for example).

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ENVIRONMENTAL COMPLIANCE TO DATE

Action	Date
Letters inviting resource agencies to cooperate under NEPA	9 Nov 2018
Initial interagency kickoff meeting Attending agencies: - BCDC - CDFW - NMFS - USEPA - USFWS - San Francisco Bay RWQCB Agencies invited, but unable to attend: - SHPO - FEMA - Tribes - BAAQMD - SLC	27 Nov 2018
ESA species list (requires official list < 90 days old for consultation)	10 Oct 2018
NHPA / SHPO coordination	7 Nov 2018
NHPA / Tribal initiate tribal coordination	7 Nov 2018
Fish Wildlife Coordination Act scope / MIPR (coordination ongoing)	Post - AMM
Formally initiate NEPA scoping activities (post Notice of Intent)	Post - AMM

KEY RISKS & UNCERTAINTIES - TSP

- Public outreach and stakeholder engagement

  -Due to its location, potential size, short and long-term impacts, and the number of people, agencies, and businesses affected, determining the Tentatively Selected Plan will require an unusually high level of public engagement and communication.

- Costs associated with high seismicity and fill

  -Sufficiently understanding the seismic risk to inform the cost of alternatives that require seismic improvements

- Regulatory and environmental compliance, particularly in relation to the in-water alternatives

PATH TO TSP – KEY TASKS

Public and Agency Engagement

- Create public engagement and communication plan (GCC support)
- Participate in public meetings lead by POSF
- Coordinate with resource agencies at regularly-scheduled meetings

Engineering and Real Estate

- Estimate water levels including contribution from waves for 3 SLR scenarios (USACE) and CA OPC required scenario (FUNWAVE modeling)
- Assess seismic conditions
- Refine alternatives with specific measures (PDT)
- Quantities and cost estimates for focused array of alternatives
- Draft Real Estate Plan

Economics

- Complete detailed structure inventory; HEC-FDA modeling of 3 SLR scenarios
- Estimate without and with-project flood damage to critical assets, including BART and Muni
- Initiate consideration of potential incidental seismic benefits from project construction

Environmental

- Fish and Wildlife Coordination Act scoping
- Continue informal regularly-scheduled coordination meetings
- Formally initiate NEPA scoping

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PATH TO TSP – BUDGET AND SCHEDULE

FSCA to AMM (actual)

- **Schedule**: September 5 to December 3 (89 Days)
- **Budget**: $184k spent, not including WIK by the sponsor

AMM to TSP (estimated)

- **Schedule**: December 4, 2018 to August 2020 (21 months) (preliminary)
  -Public Involvement: Public input and acceptance is critical to plan formulation and selection. First in a series of planned public meetings to be held in January. Total of 9 meetings planned (3 locations x 3 meetings each location) over the next year.
  -Seismic Conditions: Seismic studies necessary to reduce cost uncertainty of the alternatives that are built on or tie into land. Potential consideration of incidental seismic benefits will require significant technical work and coordination. Critical for NED identification and plan selection.
  -Detailed schedule under development

- **Budget**: Currently under development.

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PATH TO TSP

It is the District's and NFS's assessment that we will need to request an exemption to 3x3x3 based on both schedule and budget.

> A detailed accounting of the basis for our future request is being developed and will be shared when complete. Currently we are targeting to have a detailed scope, schedule, and budget within 8 weeks.

We look forward to receiving guidance from the vertical team, and look forward to working together on this challenging and very meaningful project.

DISCUSSION

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