DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

CESPN-ET-P 21 November 2016

MEMORANDUM FOR South Pacific Division District Support Team, ATTN: CESPD-PDC (Mr. Paul Devitt)

SUBJECT: San Francisco Waterfront Continuing Authorities Program (CAP), Federal Interest Determination (FID) Milestone

1. References
   a. CESPD Memorandum, 27 May 2014, subject: U.S. Army Corps of Engineers Civil Works Program; CESPD Regional Guidance and Policy Framework for Execution of the Continuing Authorities Program (CAP)
   b. Memorandum for South Pacific Division, District Support Team, 5 August 2016, Subject: San Francisco Waterfront Section 103 CAP Coastal Storm Risk Management FID Report

2. A SMART Planning FID Milestone Conference for the San Francisco Waterfront Coastal Storm Risk Management CAP 103 FID was conducted on 17 November 2016 at the San Francisco District. Meeting participants included:
   a. South Pacific Division (SPD) – Josephine Axt, Kurt Keilman, Jason Norris, Kurt Keilman, Deanie Kennedy, Patrick Caden, Randy Merchant, Paul Devitt, Paul Zianno.
   b. San Francisco District (SPN) – Tom Kendall, Jim Howells, David Silvertooth, Patrick O'Brien, James Zoulas.
   c. Regional CAP Production Center (RCPC) – Mark Bierman, Jennifer Moody, Caleb Conn.

3. The FID Milestone marks SPD concurrence that study efforts are likely to lead to project implementation. During the FID Milestone conference, SPN provided an overview of the FID report findings and discussed SPD comments and SPN responses. During the Milestone conference, the following key concern was discussed and will be included in the Decision Log:
   a. Concern that a CAP project implemented in the identified study area would be a complete and separable project distinct from any potential GI project implemented in the greater area. SPN has confirmed to the extent practicable (with the limited scope and budget available for in-depth analysis in a FID Report) that the locations identified for study in the FID are "stand-alone" projects that would tie into adjacent high ground, and would prevent inundation (via flanking) of the low-lying areas of interest. SPN also acknowledged the requirement to include an in-depth assessment of residual risk in the

feasibility study specific to this issue.

4. The San Francisco Waterfront FID Milestone meeting concluded with both SPD Planning and SPN Planning agreeing that the requirements for the FID Milestone had been met and the team should move forward with the development and execution of a Feasibility Cost Sharing Agreement (FCSA) package to continue the feasibility study. In addition, the Regional CAP Production Center will lead the San Francisco Waterfront feasibility study technical effort, including FCSA package development, upon completion of the FID Milestone.

5. Point of contact for subject action is Mr. Caleb Conn, Project Planner, at (415) 503-6849, Caleb.B.Conn@usace.army.mil, and Ms. Katherine Reyes, Project Manager, at (415) 503-6847, Katherine.M.Reyes@usace.army.mil.

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4 Encls
1. Federal Interest Determination
2. NFS Letter of Support
3. DQC Review Certificate and Summary
4. SPD Policy Compliance Review Comments and SPN responses

THOMAS R. KENDALL, P.E.
Chief, Planning Branch
San Francisco District

18 November 2016
U.S. Army Corps of Engineers
San Francisco District

CONTINUING AUTHORITIES PROGRAM
DRAFT FEDERAL INTEREST DETERMINATION REPORT

San Francisco Waterfront, Continuing Authorities Program, Section 103
P2# 402624
Congressional Delegation: Senator Diane Feinstein, Senator Barbara Boxer, Representative Nancy Pelosi (California District 12)

Executive Summary

Extreme high tides and storms with frequent return intervals cause flooding along the San Francisco waterfront. The Embarcadero and Ferry Building are at risk of significant flooding from the 1%Annual Chance Exceedance (ACE) event under existing conditions. Flooding of this magnitude may result in the closure of the Embarcadero roadway and pedestrian promenade, as well as closure of the Ferry Building and temporary termination of ferry service at this location. The Embarcadero promenade and roadway are also at risk of significant flooding from the 2% ACE event under the existing condition. Sea level rise will severely exacerbate flooding. Initial assessments show that by 2030 flooding under the high sea level rise curve with the 1% ACE event may flood the Bay Area Rapid Transit (BART) and San Francisco Municipal Transportation Agency (MUNI) public transit systems, including potential inundation of underground public transportation tunnels serving the region. The Financial District is also subject to flooding under this scenario. This Federal Interest Determination Report (FID Report) finds that there is a high likelihood that a feasibility-level study will result in a favorable recommendation to implement a project along a separable ½ mile reach of the waterfront to address the flood problems in the study area, within the limits of the Continuing Authorities Program (CAP) Section 103. This FID Report also recommends that a General Investigations (GI) feasibility study is pursued to address flood problems along the entire San Francisco waterfront. The Port of San Francisco (Port) supports a study to evaluate coastal flood risk management for the San Francisco waterfront within the CAP study authority and also supports a GI study under Section 110 of River and Harbor Act of 1950, as amended, Section 142 of WRDA 1976, and a Resolution adopted by the Committee on Transportation and Infrastructure of the U.S. House of Representatives on July 24, 2002, for the South San Francisco Bay Shoreline Study, California (Docket 2697).

1. STUDY AUTHORITY

This study is being conducted under the authority of Section 103 of the River and Harbor Act of 1962 (Public Law 87-874), as amended. Section 103 of the River and Harbor Act authorizes the United States Army Corps of Engineers (USACE) to study, design, and construct small coastal storm risk management projects in partnership with non-Federal sponsors. The authority may be

used for protecting multiple public and private properties and facilities and single non-Federal public properties and facilities against damages caused by storm driven waves and currents. Projects must be formulated in accordance with current policies and procedures governing projects of the same type which are specifically authorized by Congress. Improvements under this authority are usually structural measures, including beachfill, groins, seawalls, revetment, breakwaters, and bulkheads. Non-structural measures, such as property acquisition may also be appropriate. The statutory Federal participation limit for Section 103 is $5 million, and includes feasibility, design, and construction.

> Section 103 - The Chief of Engineers of the United States Army, under the direction of the Secretary of the Army, is authorized and directed to cause investigations and studies to be made in cooperation with the appropriate agencies of the various States of the Atlantic, Pacific, and gulf coasts and on the Great Lakes, and of the States of Alaska and Hawaii, the Commonwealth of Puerto Rico, and the possessions of the United States, with a view to devising effective means of preventing erosion of the shores of coastal and lake waters by waves and currents; and any expenses incident and necessary thereto may be paid from funds appropriated for General Investigations, Civil Functions, Department of the Army: Provided, That the Department of the Army may release to the appropriate cooperating agencies information obtained by these investigations and studies prior to the formal transmission of reports to Congress.[1]

2. STUDY PURPOSE

The purpose of a FID Report is to evaluate the likelihood that a study will lead to a favorable recommendation to implement a project. The FID Report includes a description of the existing problem, identification of Federal interest and potential for solution(s) that would result in a policy-consistent project of a scope appropriate for the CAP, and identify of a willing and capable non-Federal sponsor (NFS)[2].

At the FID phase of the feasibility study, Federal Interest for a Section 103 CAP project is considered to have been met by having a potential for an alternative for the project area that meets CAP criteria, and a local Sponsor willing to cost share for the feasibility costs over $100,000. At this early stage in the feasibility process, determining whether there is a Federal Interest in implementing a coastal flood risk management project involves roughly and preliminarily quantifying the economic impact of coastal flooding in the study area, and comparing any reduction in flood damage associated with a potential project or projects with the expected range of project costs. Given the preliminary nature of this analysis, it is important to recognize that there is a high degree of uncertainty in the estimates of benefits and costs described in this report. Nonetheless, using existing data, professional judgment, and reasonable assumptions, it is possible to decide whether or

[1] River and Harbor Act of 1962 § 103, Pub. L. No. 87-874, as amended.
[2] USACE. (2007). *Engineering Regulation 1105-2-100 Planning Guidance Notebook, Appendix F, Amendment #2.*

not there is a high enough likelihood of finding Federal Interest when studied in greater detail to continue the study into the full feasibility phase.

3. LOCATION OF POTENTIAL PROJECT/CONGRESSIONAL DISTRICT

The study area is in San Francisco, California, 12th Congressional District of California, represented by Nancy Pelosi. The potential project area is located along the northeast side of San Francisco, within the Embarcadero area of the San Francisco waterfront, near the Bay Bridge (Figure 1). The San Francisco waterfront borders San Francisco Bay, which is the largest Pacific estuary in the Americas.

Figure 1. Section 103 Study Potential Project Area.

The *Sea Level Rise and Adaptation Study*[3] identified Areas of Concern (AOCs) corresponding with water entry points along the waterfront. While there are flood concerns along the entire 7.5 miles of the waterfront, studying the entire area is outside of the scope of the CAP authority. This FID Report focuses on two AOCs where economic flood damages could be severe: AOC02 and AOC03 (Figure 2 and Figure 3). AOC02 is a low point that is approximately 40 feet wide between two buildings near Pier 5. AOC03 includes a half mile low section of the seawall between the

[3] Port of San Francisco. (2012). *Sea Level Rise and Adaptation Study*.

Agricultural Building and Pier 22 ½. It may be possible to implement a separable project that is effective at managing flood risk in this smaller study area, with minimal risk that flooding elsewhere along the waterfront would outflank the constructed project. Additional studies are needed to fully evaluate the effectiveness of alternatives for these separable AOCs. A GI feasibility study is needed to study flood risk management along the entire waterfront.

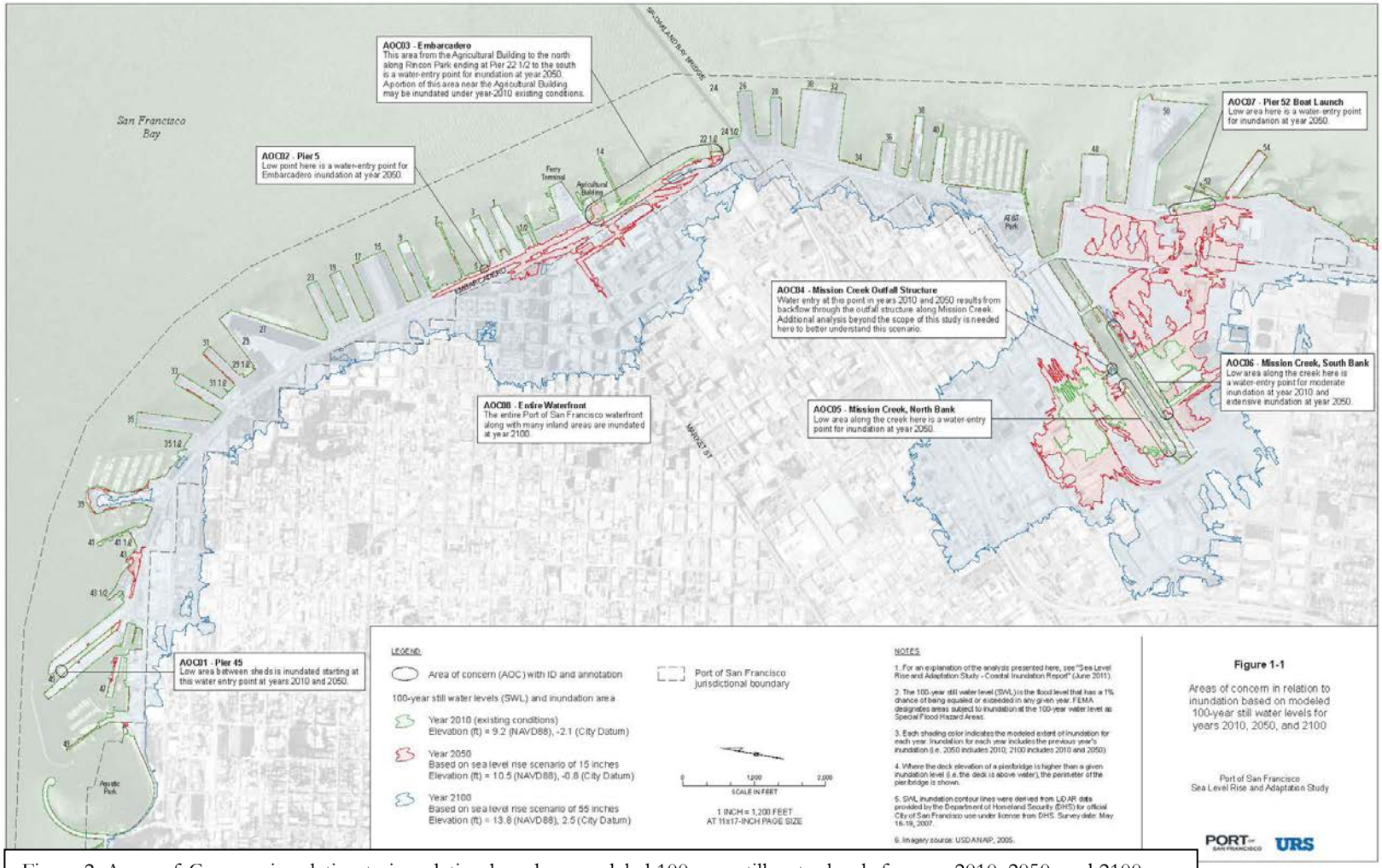

Figure 2. Areas of Concern in relation to inundation based on modeled 100-year still water levels for year 2010, 2050, and 2100. From the Port's Sea Level Rise and Adaptation Study (2012).

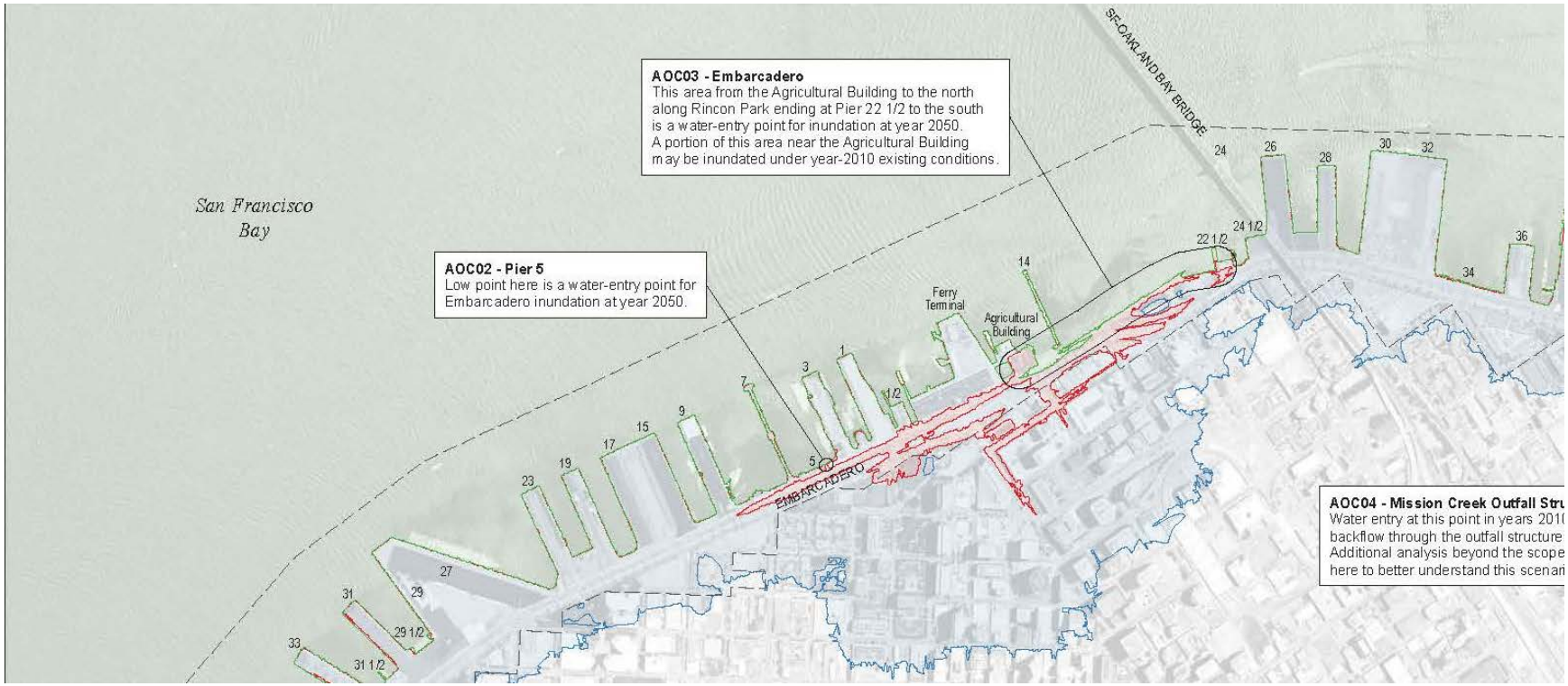

Figure 3. Close up view of Areas of Concern in relation to inundation based on modeled 100-year still water levels for year 2010, 2050, and 2100. From the Port's Sea Level Rise and Adaptation Study (2012).

4. NON-FEDERAL PARTNER AND PROCESS

The Port is the non-Federal sponsor for the study. The Port is responsible for the care and maintenance of 7.5 miles of San Francisco Bay Shoreline under the California Tideland Trust[4]. The Port supports a study to evaluate coastal flood risk management for the San Francisco waterfront within the CAP study authority and also supports a potential GI study under Section 110 of the River and Harbor Act of 1950, as amended.

USACE and the Port will execute a Project Management Plan (PMP) and a Feasibility Cost Sharing Agreement (FCSA) to complete a Detailed Project Report (DPR), which is the final product of a USACE feasibility study for CAP projects. Once the FCSA is executed, the Project Delivery Team (PDT) will initiate the feasibility study phase. In the feasibility phase, the PDT defines the study problems, opportunities, and related project objectives. To meet the planning objectives, the PDT formulates measures, which are combined to develop alternatives within the expressed study constraints. Alternatives are then screened, based on agreed upon screening criteria. Alternatives include a "no action" plan (future without-project condition) and various combinations of structural and non-structural measures. The final array of alternatives is evaluated for contributions to National Economic Development (NED). For all project purposes except ecosystem restoration, the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan, shall be selected. The final array of alternatives is also evaluated for contributions to Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE). The four planning criteria established by the Principles & Guidelines (P&G) are used to evaluate and compare alternatives: (1) Completeness, (2) Effectiveness, (3) Efficiency, and (4) Acceptability. After evaluating the array of alternatives, the PDT identifies the NED plan and any locally preferred plan, if warranted.

5. COST SHARING

The project FCSA will provide for 50/50 cost sharing of all feasibility phase costs in excess of $100,000 incurred after execution of the FCSA, except for the costs of the Independent Expert Peer Review[5] (IEPR) panel, if applicable. A Project Partnership Agreement (PPA) will be executed if the project proceeds to the Design and Implementation phase (i.e. detailed engineering design and construction phase) with costs shared 65% federal and 35% non-federal. The NFS would be responsible for the costs of lands, easements, relocations, rights-of-way, and disposal areas (LERRDs), which are creditable towards the 35% non-federal cost share. Section 103 also allows credit for certain in-kind contributions, including design coordination, materials, and construction. The non-Federal sponsor's required share could increase if the Federal costs of planning, design and implementation for the project exceed the statutory Federal per project participation limit for this authority and the non-Federal sponsor agrees to contribute funds for any costs that would normally

[4] Port of San Francisco. (2012). *Sea Level Rise and Adaptation Study.*

[2] IEPR may be required for decision documents under certain circumstances. IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. IEPR panels will consist of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of areas of expertise suitable for the review being conducted. IEPR is not expected to be necessary for this project.

be part of the Federal share but are over the per project limit. The statutory Federal participation limit for Section 103 is $5,000,000. The NFS is responsible for 100% of all costs and responsibilities related to the Operations, Maintenance, Repairs, Rehabilitation, and Replacements (OMRR&R) of the constructed project.

6. PROJECT STAKEHOLDERS AND SUPPORTERS

A project to address coastal flooding along the San Francisco waterfront will draw strong stakeholder interest. Since 1991 the waterfront has undergone a dramatic transformation, from a seldom visited area that primarily served light industrial and maritime businesses, to a vibrant array of mixed uses, including residential, commercial, and open spaces that brings millions of people to the waterfront each year[6]. Removal of the elevated Embarcadero Freeway in 1991, the Port's adoption of the *Waterfront Land Use Plan* in 1997, and changes to the City's Planning Code and Zoning Map in 1998, ushered in a new era for the San Francisco waterfront (Ibid). Twenty-four million people visited the waterfront in 2013 for employment, transportation, entertainment, recreation, and tourism (Ibid). As part of the public process for the development of the *Waterfront Land Use Plan*, the Port has held hundreds of advisory group meetings and planning workshops and continues to engage the public. It is anticipated that residents, commuters, businesses, and federal, state, and local government agencies will be interested and engaged in any planning process to modify the San Francisco waterfront to address coastal flooding.

7. PRIOR STUDIES AND REPORTS

USACE Studies:

- USACE. (2010). *Pier 36 Removal Project Letter Report*. Section 5051 of WRDA 2007.
- USACE. (2010). *Pier 70 Navigation Study Federal Interest Determination*. Section 107 of the River and Harbor Act of 1960, as amended.
- USACE. (In Progress). *Pier 70 Navigation Study Letter Report*. Section 107 of the River and Harbor Act of 1960, as amended.
- USACE. (2015). *Ocean Beach Regional Sediment Management Study Detailed Project Report*. Section 204 of WRDA 1992, as amended.

Non-USACE Studies:

- San Francisco Bay Conservation and Development Commission (BCDC). (1975-2012). *San Francisco Waterfront Special Area Plan*.
- Port of San Francisco. (1997). *Waterfront Land Use Plan*.
- Port of San Francisco. (2012). *Sea Level Rise and Adaptation Study*.
- Port of San Francisco. (2015). *Waterfront Land Use Plan Review, 1997- 2014*.
- City and County of San Francisco. (2016). *San Francisco Sea Level Rise Action Plan*.
- Port of San Francisco. (2016). *Presentation to the San Francisco Port Commission on the Preliminary Results of the Earthquake Vulnerability Study of the Northern Waterfront Seawall*.

[6] Port of San Francisco. (2015). *Port of San Francisco Waterfront Land Use Plan 1997 – 2014 Review*.

8. PLAN FORMULATION

8.1 EXISTING WATER PROJECT

The San Francisco seawall delineates the boundary between San Francisco's landside and San Francisco Bay. It provides coastal flood protection to the City's landside infrastructure, including the Embarcadero, the Financial District, local and regional light rail transit systems, and key utility infrastructure, including the City's combined sewer system[7]. The seawall, including the historic bulkhead wharfs and adjoining finger piers are part of the Embarcadero Historic District, was listed on the National Register of Historic Places in 2006[8].

The seawall was constructed from 1879 to 1916 by the California Board of State Harbor Commissioners, hundreds of feet bayward of the natural shoreline atop Young Bay Mud[9]. The seawall supports land built of fill material that is prone to liquefaction in an earthquake (Ibid). Figure 4 shows the location of the seawall in relation to the original natural shoreline. The natural shoreline is shown in blue and the seawall is shown in gold.

Figure 4. Angela Quintero / Los Angeles Times

The Port recently commissioned the *Earthquake Vulnerability Study of the Northern Waterfront Seawall* to address concerns about the performance of the seawall in an earthquake and to identify solutions to increase its resilience. Preliminary findings of the *Vulnerability Study* indicate that a moderate to large

[7] Port of San Francisco. (2016). Presentation to the San Francisco Port Commission on the Preliminary Results of the Earthquake Vulnerability Study of the Northern Waterfront Seawall.

[8] Port of San Francisco. (2015). *Port of San Francisco Waterfront Land Use Plan 1997 – 2014 Review.*

[9] Port of San Francisco. (2016). Presentation to the San Francisco Port Commission on the Preliminary Results of the Earthquake Vulnerability Study of the Northern Waterfront Seawall.

earthquake would likely cause most of the seawall to settle and move outward up to 1 foot due to a combination of weakness in the underlying Bay Mud and increased pressure from the liquefiable fill that it supports[10]. A major earthquake would cause up to 3 feet of lateral spreading of the seawall (Ibid). The study estimates the value of Port assets as risk from an earthquake due to lateral spreading of the seawall, but does not identify flood damages that would occur as a result of partial or total failure of the seawall in the event of an earthquake. The study estimates that $1.6B in Port assets are at risk from earthquake damage within the seawall zone of influence, and $2.1B of annual rents, business income, and wages. In addition, the northern waterfront contributes $11B annually to the tourism industry (Ibid).

Two major earthquakes have occurred in the San Francisco Bay Area in the last 110 years, however, neither is considered to have been a significant test of the seawall. In 1906 an estimated 7.8 magnitude earthquake struck on the San Andreas Fault, about 2 miles offshore from San Francisco. While the earthquake and fires destroyed much of the city, most of the seawall in the northern waterfront had not yet been constructed, so the event cannot be evaluated as a test of the seawall's resilience in a major earthquake (Ibid). The 1989 M6.9 Loma Prieta Earthquake was caused by a rupture of a segment of the San Andreas Fault located approximately 60 miles south of San Francisco. The earthquake caused severe damage in the Bay Area including portions of San Francisco built on fill. While a large earthquake, ground shaking intensity in San Francisco was moderate compared to shaking intensity near the epicenter. An earthquake of this magnitude or greater, with an epicenter within 10 miles of San Francisco would subject the City to much stronger ground shaking and likely cause major damage to the seawall (Ibid).

The United States Geological Survey 2014 Working Group on California Earthquake Probabilities concluded that there is a 72 percent probability of a strong earthquake (M≥6.7) occurring in the San Francisco Bay Region in a thirty year period between 2014 and 2043[11].

Following the release of the results of Vulnerability Study, Mayor Edwin M. Lee announced that the City will invest $8 million over the next two years to initiate efforts to fortify the seawall. The funding will allow the Port to advance technical feasibility studies, environmental review and public outreach, with the goal of identifying the most vulnerable sections of the seawall and prioritizing improvements to address both seismic and sea level rise concerns[12].

The aging and vulnerable seawall is the only existing structure that protects the waterfront from coastal flooding.

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[10] Port of San Francisco. (2016). Presentation to the San Francisco Port Commission on the Preliminary Results of the Earthquake Vulnerability Study of the Northern Waterfront Seawall.

[11] Port of San Francisco. (2016). Presentation to the San Francisco Port Commission on the Preliminary Results of the Earthquake Vulnerability Study of the Northern Waterfront Seawall; United States Geological Survey. (2014) Working Group on California Earthquake Probabilities.

[12] City and County of San Francisco. (2016). "Mayor Lee Invests In Seawall To Protect City." Office of the Mayor News Releases Homepage. Accessed 31 May 2016. URL: http://sfmayor.org/index.aspx?recordid=1141&page=846.

8.2 EXISTING CONDITION

On any given day an estimated 65,000 people visit and transit the San Francisco waterfront for employment, recreation, transportation, commerce, and tourism[13]. Currently, extreme high tides and storms with frequent return intervals flood areas of the waterfront. A "King Tide" in November 2015 demonstrated the vulnerability of the waterfront to coastal flooding. The USACE PDT conducted a site visit during the King Tide and documented their observations:

> Water levels during the time of the site visit were very high, with the National Oceanic and Atmospheric Administration (NOAA) San Francisco Tide Station[14] (9414290) recording a peak water level of 7.54 feet NAVD88 at 0942 am. The recorded water level was approximately 0.8 feet above the predicted tide, with much of this elevated condition potentially due to the effects of strong El Niño conditions. This water level is also 1.70 feet above Mean Higher High Water (MHHW), and a preliminary analysis of the extreme water levels at this tide station suggests that the return period for this water level is 2 years. Water surface conditions near the shoreline were relatively calm with wave heights in the 1 to 2 foot range. Weather conditions were breezy, with a light to moderate rain falling during the visit. The PDT team observed San Francisco Bay waters overtopping the walkway near the southeast side of the Agricultural building (Figures 5 and 6). While the Embarcadero roadway was not flooded, the team estimated that a 1 to 2 foot increase in water levels could flow through a gap in the curb separating the walkway from the roadway. [15]

[13] Port of San Francisco. (2015). *Port of San Francisco Waterfront Land Use Plan 1997 – 2014 Review.*

[14] National Oceanic and Atmospheric Administration. (2015). San Francisco, CA Station Homepage: http://tidesandcurrents.noaa.gov/stationhome.html?id=9414290. Data accessed on 24 November 2015.

[15] USACE. 2016. Memorandum for Record: San Francisco Waterfront Seawall Coastal Flood Risk Assessment for Federal Interest Determination (FID).

Figure 5. San Francisco Bay waters spilling onto the walkway immediately southeast of the Agricultural building (Photo by George Fong)

Figure 6. San Francisco Bay waters overtopping the seawall and spilling onto the adjacent walkway immediately southeast of the Agricultural building (Photo by James Zoulas)

8.3 Expected Future Without Project Conditions

A preliminary coastal flood risk assessment suggests that the Embarcadero and Ferry Building are at risk of flooding from the 1% ACE event, without additional sea level rise[16]. Flooding of this magnitude may result in closure of Embarcadero roadway and pedestrian promenade, as well as closure of the Ferry Building and termination of ferry service at this location. Closure of the Embarcadero roadway would require rerouting traffic causing major traffic delays, especially during commute hours, as the Embarcadero is an access point to Highway 80/Bay Bridge and Highway 101/Golden Gate Bridge. Alternative public transportation routes within the city may also have to be established to avoid the Embarcadero roadway. Alternatives to ferry service may have to be established in the event of closure of the ferry terminal. This may include establishing temporary bus service transiting the Bay Bridge and Golden Gate Bridge to access San Francisco. Additional analysis is needed to estimate economic damages associated with this magnitude of flooding.

[16] USACE. (2016). Memorandum for Record: San Francisco Waterfront Seawall Coastal Flood Risk Assessment for Federal Interest Determination (FID).

8.3.1 Sea Level Rise

SPN's preliminary coastal flood risk assessment evaluated three water levels, including the "King Tide[17]" from 24 November 2015, the 2% ACE) Total Water Level[18] (TWL) from the Port's *Sea Level Rise and Adaptation Study*, and the 1% ACE TWL from the same study. Three sea level change scenarios were evaluated, per ER-1100-2-8162[19]. The initial assessment considered three thresholds[20] of impacts to infrastructure (Figure 7):

a. First Threshold: Initial flooding of the Embarcadero at Mission Street when water levels approach 9.5 feet (NAVD88).

b. Second Threshold: Significant flooding of the Embarcadero and impacts to access to the Ferry Building at 10.0 feet (NAVD88).

c. Third Threshold: Major impacts to transportation system (BART and SF Muni tunnels) and Financial District at 11.0 feet (NAVD88).

[17] King tides or spring tides are the highest predicted or astronomical tides of the year, and occur twice a year. These predicted tide levels are generally used as a proxy water level for high frequency events or nuisance flooding. King tides, being predictable events, are often used to document impacts of nuisance flooding. The recorded King tide water level of 7.54 feet NAVD 88 on 24 November 2015 is roughly equivalent to a 1.8 year event based on statistical analysis of water levels at the NOAA tide gage, Station ID: 9414290 1901-2011. While the water level was most certainly influenced by regional El Niño conditions, the statistics are based on a long term average which includes many El Niño and non El Niño years. Water levels at this elevation for non-storm events (water levels without a non-tidal residual) currently occur one to two times per year and will increase in occurrence over time with sea level rise. Water levels associated with King Tides currently are at a 1.8 yr. Stillwater ACE, and will change to a more frequent occurrence interval over time.

[18] Total water level is the water level of the sea surface including wind waves; it is the sum of the still water level and wave runup. Still water level is the water level of the sea surface in the absence of wind waves. It is about equal to the midpoint of the waves in deep water. It can be thought of as the undisturbed water level also. It includes storm surge.

[19] USACE. (2013). *Engineering Regulation 1100-2-8162. Incorporating Sea Level Change In Civil Works Programs.*

[20] The thresholds refer to the water levels at which it can be anticipated that damage would occur to given infrastructure, as detailed in Appendix B.

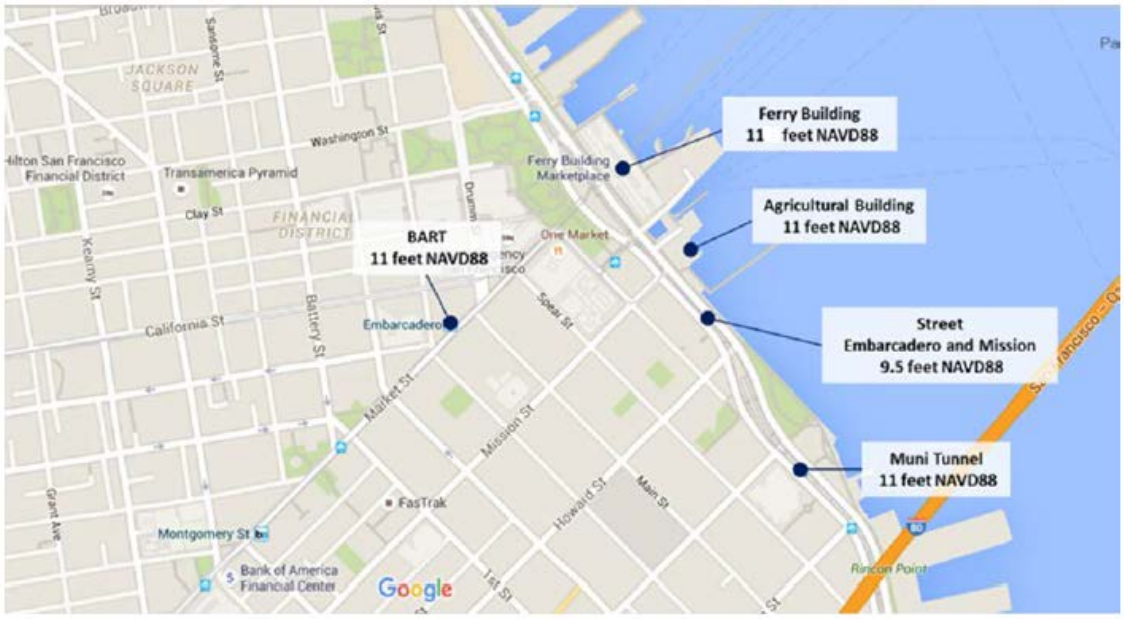


Figure 7. Map of critical infrastructure utilized to develop water level thresholds.

The preliminary assessment found that there could be severe flooding from the 1% ACE under the high sea level rise scenario as soon as 2030 and by 2055 under the intermediate sea level rise scenario. Flooding under the high sea level rise scenario from the 1% ACE may damage BART and MUNI and may inundate underground public transportation tunnels, including the Transbay Tube. Initial flooding of the San Francisco Financial District is also expected under this scenario. Flooding of this magnitude could result in significant direct and indirect economic damages that would trickle through the broader Bay Area economy. More information related to traffic flows, ferry usage, the value and level of exposure of BART and MUNI operations and other adjacent high rise buildings is needed to estimate economic damages.

8.3.2 Seismic Vulnerability and Coastal Flooding

Flooding may occur if the seawall is compromised in an earthquake. However, USACE policy does not provide for Federal participation in flood risk strictly associated with seismic hazards. Instead, project justification is based on the reduction of flood damages (net benefits) that will result from implementing a project to address coastal flooding, compared to the existing and future without project condition. USACE projects are required to meet seismic safety standards specific to the study area. It should also be noted that failure of the seawall and liquefaction in areas that are outside of the CAP study area could cause flooding in the study area after the project is constructed. This is true of any USACE project constructed in a seismic hazard zone.

8.4 Problems and Opportunities

Problems are undesirable conditions to be changed through the implementation of an alternative plan. Opportunities are positive conditions to be improved by an alternative plan.

Problem: Flooding along the San Francisco waterfront occurs during large storms and winter high tides[21] as a result of water overtopping the seawall at two water entry points along the Embarcadero (AOC02 and AOC03, Figure 2 and Figure 3). Significant damages are anticipated from the 1% and 2% ACE, assuming no change in sea level. Sea level rise will greatly exacerbate the flooding and economic damages. Based on the high sea level rise curve, by 2030 the 1% ACE has the potential to flood the Embarcadero, Ferry Building, Financial District, and MUNI and BART, including the Transbay Tube.

Opportunity: Manage flood risk associated with coastal storms along the San Francisco waterfront to protect infrastructure and property.

8.5 Federal and Project Objectives

The Federal objective, established by the U.S. Water Resources Council, is to contribute to National and Economic Development (NED) consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. The PDT will work with the non-Federal sponsor and project stakeholders to develop specific project objectives during the feasibility phase. The main objective at this stage of the study process is the following:

OBJECTIVE 1: Reduce the risk of coastal flooding associated with bay water overtopping the seawall at two low points along the San Francisco waterfront (AOC02 and AOC03, Figure 2) during the economic period of analysis and in consideration of adaptation for sea level rise.

8.6 Alternative Plans

8.6.1 Preliminary Measures

A measure is a feature or an activity that can be implemented at a specific geographic location to address one or more planning objectives. Below is a list of preliminary measures to address coastal flooding at the San Francisco waterfront:

- Raise existing floodwalls
- Construct new floodwalls
- Relocate structures and infrastructure out of the affected area

[21] The two areas that are the focus of this study include a low point extending approximately 40 feet between two buildings at the water's edge near Pier 5 (AOC02), and an area extending approximately 2,400 feet along the waterfront from the Agricultural Building to Pier 22½ (AOC03). AOC02 is a water entry point for flooding along the Embarcadero. AOC03 is a water entry point for flooding of the MUNI/BART tunnel on Embarcadero between Howard and Folsom.

8.6.2 Alternative Formulation Strategy

Measures are the building blocks that are grouped together to form alternative plans. The measures listed above were evaluated to determine which should be retained for use in the formulation of alternative plans. The PDT screened out relocation as a potential measure because it is cost prohibitive and it may be technically impossible given the limited space available for relocation.

The PDT's general formulation strategy is to build a robust and effective solution with a low visual impact, recognizing that the waterfront is a source of community identity and pride, as well as a world renowned tourist attraction.

8.6.3 Preliminary Alternatives

For the purposes of this FID Report, the PDT considered one structural alternative to demonstrate that there is a strong potential for a solution that will result in a policy consistent project of a scope appropriate for CAP 103 (Table 1). Additional alternatives will be developed during the feasibility phase of the study process.

Table 1. Preliminary Alternatives

Alternatives	**Formulation Strategy**	**Description (if available)**
No Action	No flood risk management project would be implemented.	This alternative will be further evaluated in the feasibility phase. USACE is required to consider the No Action alternative. The No Action alternative is synonymous with the future without-project condition. The No Action alternative provides the base against which all other alternatives are measured and ensures that any action taken is more in the public interest than doing nothing.
Alt 1	Maximize NED benefits	This alternative includes: 1. Construction of a 496-foot long solid wall following the edge of Pier 5. 2. Construction of a 603-foot-long solid wall along the edge of the piers, from Pier 14 to the Agricultural Building. 3. Construction of a raised 1,649-foot section of the existing wall from near Pier 14 to Pier 22 ½. *This alternative is from the 2012 *Sea Level Rise and Adaptation Study* and is scaled to address the 1% ACE 2050 based on a sea level rise rate of 10-17 inches (26-43 cm).

8.7 Feasibility Study Cost Estimate

The PDT is currently working to develop a feasibility cost estimate to support the PMP and the FCSA. Based on available information and expertise from USACE, the PDT estimates that the

feasibility study will cost a total of approximately $750,000. This includes study analysis and formulation as well as costs to develop this FID Report and future required review processes and procedures.

8.7.1 Project Implementation (Construction) Cost Estimate

Project implementation costs have been estimated to total approximately $3 million. This is within the Section 103 limit of $5 million for the federal cost share of the total project costs. This cost estimate is based on the construction cost estimate from the Port's *Sea Level Rise and Adaptation Study*. The Port is aware of the requirements to provide all LERRDs and real estate interests for this project.

8.8 BENEFITS

For flood risk management feasibility studies, the key to understanding federal interest in a project is to estimate with a reasonable degree of confidence the future expected annual damage (EAD) from flooding in the study area under both the without and with-project conditions. At this preliminary phase of the investigation, the estimate must be made by combining existing information with a set of reasonable assumptions based on sound professional judgment.

The EAD estimated as part of this FID Report does not account for the full range of economic effects that could be expected following a flood event in the study area. Damages were modeled only to the Ferry Building, Embarcadero roadway and Embarcadero BART station because of limited time, resources, and data availability. Further, the full range of the potential economic damages to the above assets were not modeled. For instance, BART damages reflect the opportunity cost of lost or delayed trips but do not account for the potential direct repair and replacement costs to BART facilities following a flood. Even when narrowing the evaluation of damages to the extent described in the following paragraphs, the conservatively low estimated EAD would support a benefit-cost ratio (BCR) of greater than or close to 1.0 for project costs ranging from $3 million to $10 million. The EAD would only increase and reflect a larger BCR if one was to include further analysis on other significant assets in the study area such as the Agriculture Building, Downtown Ferry Terminal, MUNI light rail, high-rise buildings in the Financial District and other utility infrastructure like the City's combined sewer system. It is assumed that damages to these additional assets, as well as a more comprehensive assessment of damages to the assets evaluated below would occur post-FID Report.

Coastal and Hydraulic Engineers analyzed present and future coastal flood risk for the 50%, 2%, and 1% Annual Chance of Exceedance (ACE) events associated with low, intermediate and high rates of sea-level rise. The intermediate sea-level rise scenario, which is associated with adverse economic impacts from the 1% ACE event for each of the assets in Table 2, was used to inform the EAD[22].

[22] Flood risk was also evaluated for the Ferry promenade and terminal and the Financial District. This information has not been included in Table 1 since these assets were not included as part of the EAD.

Table 2. Coastal Flood Thresholds to Key Assets in the FID Study Area

Asset	Damages	ACE Event	SLR Low	SLR Intermediate	SLR High
Embarcadero Roadway (9.5ft NAVD88)	Travel delays	50 % ACE	After 2100	2100	2055
		2 % ACE	2015	2015	2015
		1% ACE	2015	2015	2015
Embarcadero BART Station (11ft NAVD88)	Travel delays	50 % ACE	After 2100	After 2100	2080
		2 % ACE	After 2100	2080	2050
		1% ACE	2080	2050	2030
Ferry Building (11ft NAVD88)	Direct damage to structures and contents	50 % ACE	After 2100	After 2100	2080
		2 % ACE	After 2100	2080	2050
		1% ACE	2080	2050	2030

The key information used and the various sources are listed in Table 3. The methodology and results of the economic flood risk analysis are described in the paragraphs that follow.

Table 3. Data and Information Used to Estimate EAD

Information	Source
Flood Zone Designations	Modeling and USACE professional judgment
Depth of Flooding	Professional judgment by USACE
Depth Damage to Structures and Contents	USACE EGM 04-01
Structure Replacement Value	Non-federal sponsor
Average Daily Trips by Vehicles Through Study Area	San Francisco Metro Transportation Authority
Methodology for Valuing Traffic Delay and Detour	Institute for Water Resources Report 91-R-12

Inundation Damage

Flood damage to structures and contents was limited to the first floor of the Ferry Building, which hosts over 40,000 square feet of eateries and other small retail vendors. Given the lack of available data, for this preliminary analysis it was assumed that flood depth at the Ferry Building would reach 0.5 foot under the 1% ACE event with intermediate sea-level rise by the year 2050. For the 0.2% ACE event with intermediate sea-level rise it was assumed that flood depth would increase from 0.5 foot to 1.0 foot by the year 2050. According to the USACE depth-damage relationships (IWR-92-R-3), at a flooding depth of 0.5 foot and 1.0 foot, the percent damage to a steel frame structure like the Ferry Building is assumed to be 18%. The percent damage to the contents for eating and recreation facilities, measured as 40 percent of structure value, is assumed to be 18% and 24% for a 0.5 foot and 1.0 foot of flooding, respectively. A replacement value of $250 per square foot was estimated by the non-federal sponsor.

As Table 4 illustrates, the total damage is estimated to be $1.1 million for the 1% ACE event and $1.2 million 0.2% ACE event under the scenario of an intermediate rate of sea-level rise. Because

these damages are not expected until 2050, the results have been discounted accordingly using the FY 2016 discount rate of 3.125% with a base year of 2020 and a 50-year period of analysis.

Table 4. Event-Based Damages to the Ferry Building: Intermediate Sea-Level Rise Scenario in 2050

Event ACE -----»	**0.20%**	**1%**	**2%**	**4%**	**10%**	**20%**
Square Feet of Structures	43,187	43,187	0	0	0	0
Replacement Value (Per Square Foot)	$250	$250	0	0	0	0
Total Replacement Cost	$10,796,750	$10,796,750	0	0	0	0
Average Depth of Flooding (Feet)	1.0	0.5	0	0	0	0
Percent Damage to Structures	18%	18%	0	0	0	0
Percent Damage to Contents	24%	18%	0	0	0	0
Content to Structure Value Ratio	40%	40%	0	0	0	0
Total Structure Damage	$1,975,805	$1,975,805	0	0	0	0
Total Content Damage	$1,032,169	$768,729	0	0	0	0
Total Damage (All)	$3,007,975	$2,744,534	0	0	0	0
Total Damage NPV 2050	**$1,194,965**	**$1,090,309**	**0**	**0**	**0**	**0**

Traffic Delay and Detour Impacts

In the event of flooding roadways and transportations systems can be impaired. The USACE guidance (IWR Report 91-R-12 "*Value of Time Saved for Use in Corps Planning Studies*"), provides a methodology for measuring the value of time lost time to travel delays. Using estimates of the number of trips affected, the duration of the delay and the annual wage of the traveler (the methodology recommends using family income) the opportunity cost of travel delays can be calculated.

Embarcadero Roadway

Flooding to the Embarcadero roadway in the study area could result in traffic delays to the 30,000 daily trips going in both directions. This current day estimate was derived from peak hour traffic counts provided by the San Francisco Metropolitan Transportation Authority and adjusted to average daily counts with data from the California Department of Transportation. Because the EAD is modeled for the year 2050, current trip counts were adjusted upward proportional to the projected increase in population in the 9 Bay Area Counties between 2015 and 2050 with data from the California Department of Finance. This approximate 22% increase in trips by 2050 is equal to ~36,500 daily trips.

A one day closure to the Embarcadero roadway in the study area is assumed to result in a 15 minute traffic delay, and an additional one-third of a mile of travel for each vehicle traveling along this stretch of road. Using the USACE methodology (IWR Report 91-R-12), the value of a one day closure shown in Table 5 is $133,176 for the 2% ACE, 1% ACE and 0.2% ACE events. This value represents a weighted average of delays based on weekday and weekend probabilities and is

discounted for the year 2050 using the FY 2016 discount rate of 3.125% with a base year of 2020 and a 50-year period of analysis.

Table 5. Embarcadero Roadway Travel Delays: Intermediate Sea-Level Rise Scenario in 2050

Event ACE -----»	0.20%	1%	2%	4%	10%	20%
Travel Delay Weekday	$346,098	$346,098	$346,098	0	0	0
Travel Delay Weekend	$283,637	$283,637	$283,637	0	0	0
Weighted Travel Delay	$328,252	$328,252	$328,252	0	0	0
Extra Mileage Costs	$6,980	$6,980	$6,980	0	0	0
Total Damage NPV 2050	**$133,176**	**$133,176**	**$133,176**	**0**	**0**	**0**

Embarcadero Bart Station

Flooding in the Embarcadero BART station could result in service disruptions to all trains coming and going from the East Bay to San Francisco, and vice versa. There are a few anecdotes that illustrate the potential consequences of service disruptions to this Transbay chokepoint. For instance, BART workers went on strike for over 4 weekdays in 2013, resulting in over 400,000 daily BART riders looking for alternative forms of transportation. Loss of service resulted in longer commutes and a decline in worker productivity estimated at $73 million per day by the Bay Area Economic Institute. This value was estimated in a similar manner to the USACE methodology (IWR Report 91-R-12) that was applied to travel delays at the Embarcadero roadway above. The Bay Area Economic Institute assumed a 2 hour travel delay to 200,000 BART commuters who used alternative transportation mediums like bus service or a private automobile to get to their desired location. This number of riders is equivalent to half of a weekday average BART ridership. Similarly, half of the weekday BART ridership are Transbay commuters, meaning they either exit or travel through the Embarcadero BART station and would similarly be impacted by its closure.

Table 6 below shows that the value of a one day closure of the Embarcadero BART station is preliminarily estimated at ~$24 million for the 1% ACE event and 0.2% ACE event. This value represents a weighted average of delays based on weekday and weekend probabilities and is discounted for the year 2050 using the FY 2016 discount rate of 3.125% with a base year of 2020 and a 50-year period of analysis. The weekday travel delay adopts the Bay Area Economic Institute value of $73 million and increases it proportional to current BART ridership levels. The weekend delay adopted similar assumptions to the weekday scenario where half of the average ridership would experience a two hour delay. Additionally, the damages include the cost to introduce a bus service between downtown Oakland and downtown San Francisco. This cost was derived from a similar bus bridge that was instituted to allow for scheduled BART maintenance in the Transbay Tube over two weekends in 2015.

Table 6. BART Travel Delays: Intermediate Sea-Level Rise Scenario in 2050

Event ACE -----»	0.20%	1%	2%	4%	10%	20%
Travel Delay Weekday	$77,390,297	$77,390,297	0	0	0	0
Travel Delay Weekend	$16,419,046	$16,419,046	0	0	0	0
Weighted Travel Delay	$59,969,940	$59,969,940	0	0	0	0
Bus Services Weekday	$750,000	$750,000	0	0	0	0
Bus Services Weekend	$375,000	$375,000	0	0	0	0
Weighted Bus Services	$642,857	$642,857	0	0	0	0
Total Damage NPV 2050	**$24,079,390**	**$24,079,390**	**0**	**0**	**0**	**0**

Expected Annual Damage

The sum of the event-based damage associated with structure and traffic impacts were entered into a spreadsheet model that integrates the values across a range of ACE events. The result of this integration is a value that is termed the "expected annual damage" or EAD. EAD can be thought of as the amortized value of the total expected flood damage in the area over a long period of time. EAD is calculated in order to better understand the expected benefits of a flood risk management project, and to be able to compare the benefits to the amortized cost of the project. The EAD as shown in Figure 8 is $333,022.

Figure 8. Expected Annual Damages, Intermediate Sea-Level Rise Scenario

ACE	Interval	Event Damage	Average	Weighted Damage	Cumulative EAD
0.002		$25,407,531			$330,021.88
	0.008		$25,355,203	$202,841.62	
0.01		$25,302,875			$127,180.26
	0.010		$12,718,026	$127,180.26	
0.02		$133,176			$0.00
	0.020	0	$0	$0.00	
0.04		$0			$0.00
	0.0600		$0	$0.00	
0.1		$0			$0.00
	0.100		$0	$0.00	
0.2		$0			$0.00
	0.3		$0	$0.00	
0.5		$0			

The benefit-cost ratio (BCR) for a project can be calculated by comparing the average annual project cost to the expected annual benefits. The BCR was calculated for the estimated $3 million project cost as well as for a higher project cost of $5 million. Both of these project costs when annualized and compared to the expected annual benefits result in a BCR greater than 1.0. These values assume a 50 year period of analysis, 2020 base year, and FY 2016 3.125% discount rate. The expected annual

benefits shown in Figure 8 above assume that the project effectively eliminates the flood risk across all analyzed events. It is important to note that the expected annual benefits would be less if a project is built that eliminates damages from all events up to the 1% ACE event, but not full protection from the 0.2% ACE event. It follows that reduced benefits would result in a lower BCR. Alternatively, further analysis of additional assets, and a more comprehensive evaluation of primary and secondary impacts, would likely result in a both a higher EAD and BCR that could in turn justify a larger project cost.

Table 7. Project Payback

Project Cost	Average Annual Costs	Expected Annual Benefits	Expected Annual Net Benefits	Benefit-Cost Ratio
$3 million	$119,379	$330,022	$210,643	2.76
$5 million	$198,365	$330,022	$131,657	1.66

8.9 Status of Environmental Compliance

The National Environmental Policy Act (NEPA) review process will be completed during the feasibility phase, pursuant to requirements in ER-200-2-2[23]. The project must be compliant with all applicable laws and regulatory requirements. An environmental assessment (EA) in accordance with NEPA will be prepared to evaluate probable impacts of the project on the existing environment. Factors addressed by the evaluation include, but are not limited to, public safety, water quality, air quality, wetlands, threatened and endangered species, noise, economics, fish, and wildlife. This process includes demonstrating compliance with all applicable laws and regulations to include the Endangered Species Act (ESA), Clean Water Act (CWA), National Historic Preservation Act (NHPA), Fish and Wildlife Coordination Act (FWCA), Noise Control Act (NCA), Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA), Marine Mammal Protection Act (MMPA), Coastal Zone Management Act (CZMA), Clean Water Act (CWA), Clean Air Act (CAA), Executive Order 11988 on Floodplain Management, and Executive Order 11990 on the Protection of Wetlands. At this time, it appears USACE's obligations under NEPA can be adequately addressed in an EA and will result in a Finding of No Significant Impact (FONSI). It is expected that any impacts other than temporary impacts resulting from construction activities.

8.10 Significance of Resources

The project area includes significant biological and human resources, including aquatic habitat in San Francisco Bay. The EA and applicable environmental compliance documents will address the significant resources in sufficient detail to comply with the respective environmental laws and regulations. Appendix A provides an overview of the specific resources, environmental compliance required for each resource, the regulating agency, and any foreseeable issues. As noted in the table, there may be potential concerns when evaluating resources under the NHPA, CZMA, and CAA.

[23] USACE. (1988). *Engineering Regulation 200-2-2. Environmental Quality Procedures for Implementing NEPA.*

While state and local environmental compliance requirements are not listed in the table, there may also be impacts on state-listed longfin smelt, which the local sponsor will need to address.

8.11 Operations, Maintenance, Repairs, Rehabilitation, and Replacements

The Port is willing and able to assume all OMRR&R requirements of features constructed for a Section 103 CAP project.

9. FEDERAL INTEREST

This FID Report has concluded that there is Federal interest in continuing with a feasibility study under the CAP Section 103 authority, to further evaluate solutions to address coastal flood risk at the San Francisco waterfront:

- The Port has submitted a Letter of Intent to the SPN seeking its assistance under CAP Section 103 to address coastal flooding along the San Francisco waterfront. Per Engineering Circular 1105-2-100 Appendix F[24], the Port has the full authority and capability to perform the terms of its agreement and to pay damages, if necessary, in the event of failure to perform. The Port is also able to participate during design and implementation of the project and to make the long-term commitment and capability to finance and perform any necessary OMRR&R activities.
- There is a strong potential to implement a policy-consistent project of a scope appropriate for the CAP Section 103.
- Real Estate costs are not expected to exceed 25% of total project costs.
- Federal costs do not exceed $5 million.

10. PRELIMINARY FINANCIAL ANALYSIS

The Port is willing and able to partner in the 50/50 cost-share of the feasibility study and fully understands the responsibilities required of a NFS.

11. SUMMARY OF FEASIBILITY STUDY ASSUMPTIONS

- The feasibility phase will formulate for a project that does not depend on the implementation of a separate project.
- This FID Report assumes that real estate lands will be available for the implementation of a coastal flood project.

12. FEASIBILITY PHASE MILESTONES

- Federal Interest Determination 1QFY2017
- Tentatively Selected Plan 1QFY2018

[24] USACE. (2007). *Engineering Regulation 1105-2-100 Planning Guidance Notebook, Appendix F, Amendment #2.*

13. FINDINGS AND CONCLUSIONS

This FID Report recommends that feasibility-level studies be conducted to evaluate alternative plans for project implementation. This FID Report includes a description of the existing problem; demonstration of a federal interest; a willing and capable NFS; and a strong potential for a solution that will result in a policy-consistent project of a scope appropriate for the CAP, Section 103 authority. In accordance with CESPD Memorandum, 27 May 2014, subject: U.S. Army Corps of Engineers Civil Works Program; CESPD Regional Guidance and Policy Framework for Execution of the Continuing Authorities Program (CAP), the undersigned hereby approves this FID Report.

MCCORMICK.KEVIN.MICHAEL.1171685679

Digitally signed by MCCORMICK.KEVIN.MICHAEL.1171685679
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MCCORMICK.KEVIN.MICHAEL.1171685679
Date: 2016.11.21 14:38:06 -08'00'

JOHN C. MORROW
LTC, EN
Commanding

Appendix A. Federal Environmental Compliance for the CAP Section 103 San Francisco Waterfront Study				
Environmental Law or Regulation	**Regulating Agency**	**Environmental Compliance Documentation**	**Resources in the Project Area**	**Potential Concerns**
NEPA	Not applicable for EA	Division Commander signs FONSI	Human resources, including biological resources.	Historical resources—the entire seawall is listed on the National Register for historic resources. Air quality—the Bay Area Air Quality Management District is considered 'non-attainment' for all air pollutants. Environmental compliance—all applicable federal environmental permits and compliance documentation must be obtained prior to signing the FONSI.
Federal ESA	United States Fish and Wildlife Service and National Marine Fishery Service	Biological Opinions issued	Listed fish and critical habitat are present in the action area, including: green sturgeon and its critical habitat; five species of salmonids and critical habitat; and listed birds that may forage or	None.

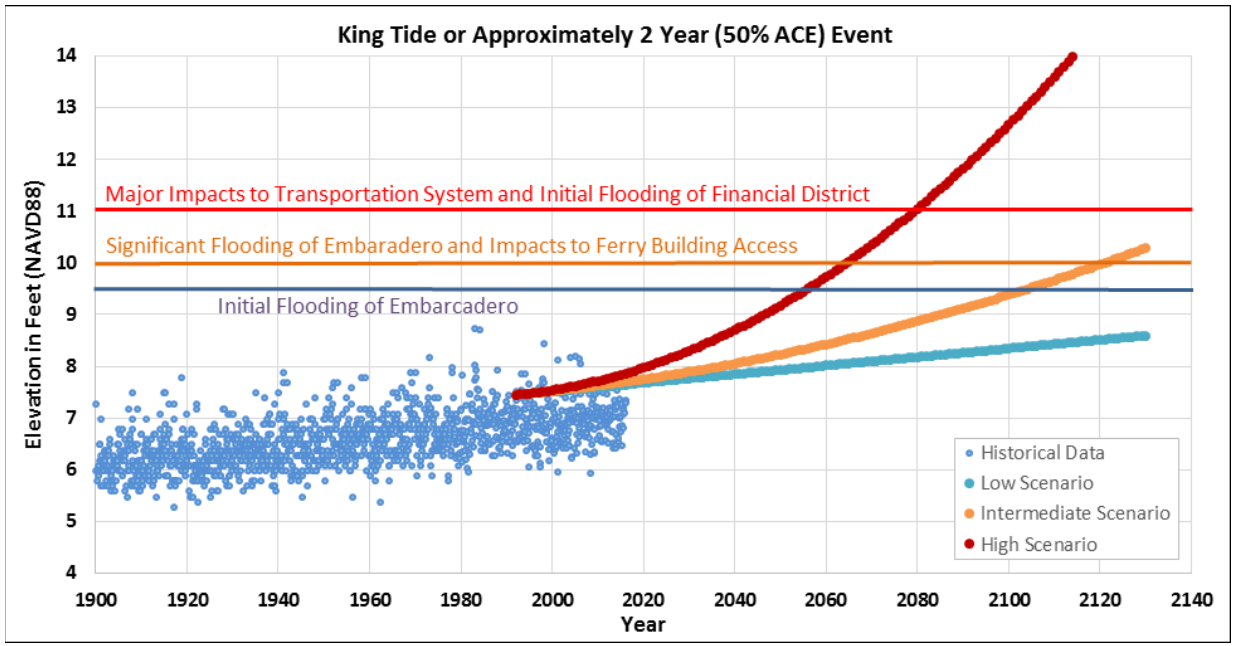
Appendix A. Federal Environmental Compliance for the CAP Section 103 San Francisco Waterfront Study				
Environmental Law or Regulation	**Regulating Agency**	**Environmental Compliance Documentation**	**Resources in the Project Area**	**Potential Concerns**
			roost in the project area.	
CWA Section 404	USACE	404(b)(1) compliance demonstration	Should the project result in potential discharge into waters of the United States (e.g., San Francisco Bay), the EA must demonstrate CWA 404(b)(1) compliance and apply for a section 401 Water Quality Certification.	None.
CWA Section 401	San Francisco Regional Water Quality Control Board	Water Quality Certification issued	Protection of beneficial uses of water as described in the San Francisco Bay Basin Plan.	None.
CZMA	San Francisco Bay Conservation and Development Commission (BCDC)	Consistency Determination issued	All Bay waters, including the project area, are subject to BCDC jurisdiction.	BCDC's policy is to restrict fill of Bay Waters. The agency is likely to consider seawall structures as fill and may require mitigation. Often, mitigation can be removing creosote pilings from the Bay.

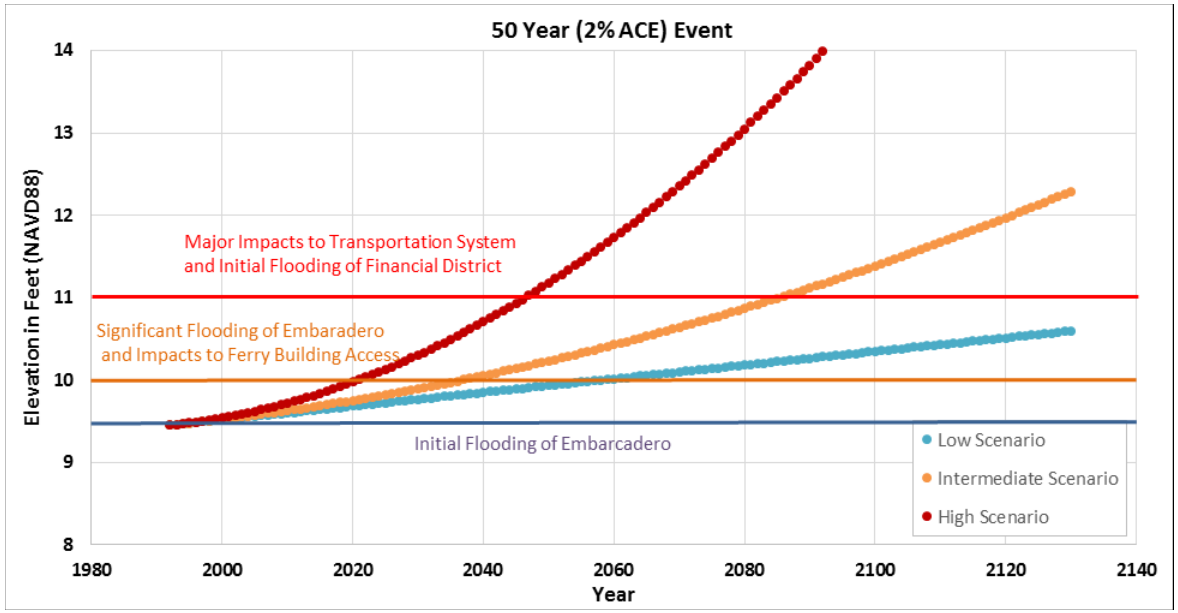
Appendix A. Federal Environmental Compliance for the CAP Section 103 San Francisco Waterfront Study				
Environmental Law or Regulation	**Regulating Agency**	**Environmental Compliance Documentation**	**Resources in the Project Area**	**Potential Concerns**
MSFCMA	National Marine Fisheries Service	Essential Fish Habitat (EFH) Conservation Recommendations	Pacific Salmonid, Pacific Groundfish, and Coastal Pelagic EFH present in the project area.	None.
NHPA Section 106	State Historic Preservation Officer (SHPO)	Section 106 SHPO coordination	The entire seawall is listed on the National Register as historic. Possible other historic resources.	Since the seawall is considered a significant historic resource, there may be limitations on the construction and rehabilitation efforts.
CAA	Bay Area Air Quality Management District	Comply with National Ambient Air Quality Standards	Air quality – evaluate construction emissions to determine conformity with the State Implementation Plan (SIP).	The Bay Area Air Quality Management District is considered in 'non-attainment' for all air pollutants. To ensure that construction of the project does not exceed the SIP thresholds or General Conformity de minimis thresholds, there may be mitigation placed on the project that affects construction equipment, timing and/or schedule.
NCA	Environmental Protection Agency	Ensure compliance with federal noise emission standards	The project is located in a commercial, industrial and recreation area	None.

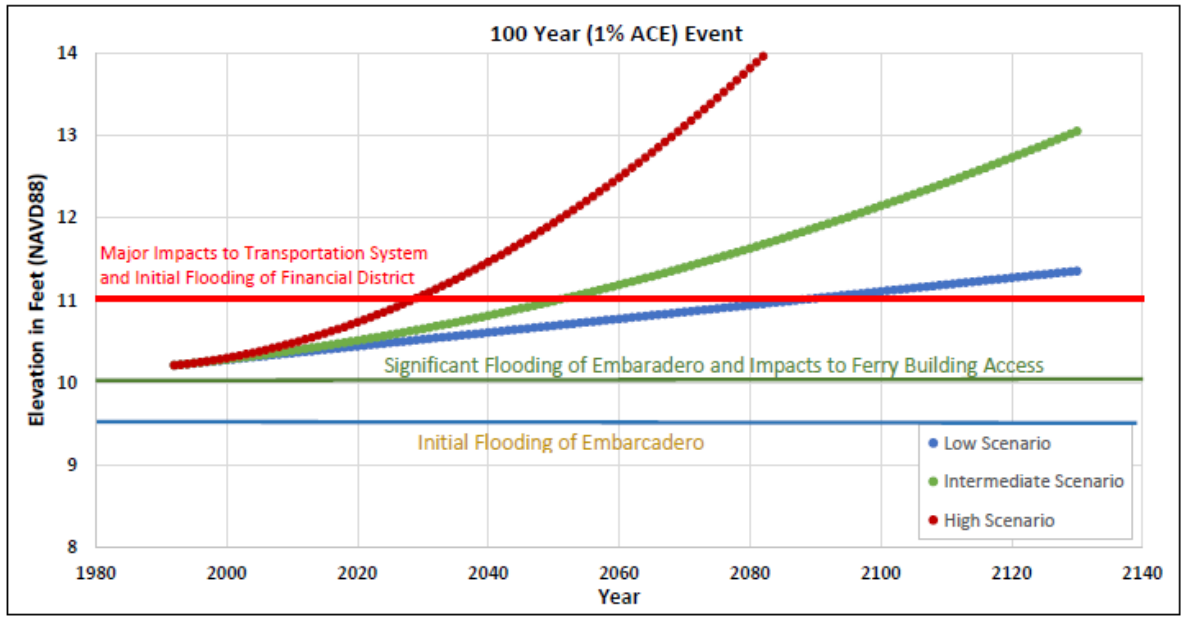
Appendix A. Federal Environmental Compliance for the CAP Section 103 San Francisco Waterfront Study				
Environmental Law or Regulation	**Regulating Agency**	**Environmental Compliance Documentation**	**Resources in the Project Area**	**Potential Concerns**
		in the NEPA document	where noise levels are generally high.	
Executive Order 11988 on Floodplain Management	Not applicable	Ensure compliance in NEPA document	Determine if the project is located within a floodplain and ensure project considers floodplain management.	None.
Executive Order 11990 on the Protection of Wetlands	Not applicable	Show compliance in NEPA document.	Wetlands are likely not present in the project area.	None.

Appendix B.

The thresholds refer to the water levels at which it can be anticipated that damage would occur to given infrastructure, and do not represent a single sea level change scenario. For example, the below figure indicates that a "King Tide" water level under the "High" scenario would approach the initial flooding of the Embarcadero threshold (9.5 feet NAVD88) a couple years before 2060.




50 Year (2% ACE) Event
Elevation in Feet (NAVD88)
14
13
12
11
10
9
8
1980
2000
2020
2040
2060
2080
2100
2120
2140
Year
Major Impacts to Transportation System
and Initial Flooding of Financial District
Significant Flooding of Embaradero
and Impacts to Ferry Building Access
Initial Flooding of Embarcadero
Low Scenario
Intermediate Scenario
High Scenario


100 Year (1% ACE) Event
Elevation in Feet (NAVD88)
14
13
12
11
10
9
8
1980
2000
2020
2040
2060
2080
2100
2120
2140
Year
Major Impacts to Transportation System
and Initial Flooding of Financial District
Significant Flooding of Embaradero and Impacts to Ferry Building Access
Initial Flooding of Embarcadero
Low Scenario
Intermediate Scenario
High Scenario

From:	Reel, Steven (PRT)
To:	O"Halloran, Jaime L SPN; Reyes, Katherine M SPN; Howells, James A SPN; Kendall, Thomas R SPN; Zoulas, James SPN; Mcgregor, Aaron R SPN; Fong, George G SPN
Cc:	Kim, Eunejune (PRT); Dunham, Daley (PRT); Forbes, Elaine (PRT); Wallace, Meghan (PRT); Benson, Brad (PRT); Prasad, Uday (PRT); Rhett, Byron (PRT); Bach, Carol (PRT); Oshima, Diane (PRT)
Subject:	[EXTERNAL] RE: SF Waterfront Draft Federal Interest Determination for Review
Date:	Friday, June 10, 2016 6:34:41 PM
Attachments:	CAP 103 SF Waterfront DRAFT FID 6.2.2016(PortComments).docx

Hi Jamie,

Attached are the Port's comments in track changes. Comments are minor, the draft report is very high quality, comprehensive, and succinct. The Port is excited to continue a successful partnership with the USACE San Francisco District. We are looking forward to executing the PMP and FCSA, and getting to work tackling this very important project for the Port and City. Have a great weekend and please let me know if you need any clarification on our comments.

Regards,
- Steve

Steven Reel, PE, LEED AP
Project Manager, Engineering Division
Port of San Francisco
415.274.0574 direct
steven.reel@sfport.com

-----Original Message-----
From: O'Halloran, Jaime L SPN [mailto:Jaime.L.O'Halloran@usace.army.mil]
Sent: Thursday, June 02, 2016 11:17 AM
To: Reyes, Katherine M SPN; Howells, James A SPN; Kendall, Thomas R SPN; Zoulas, James SPN; Mcgregor, Aaron R SPN; Fong, George G SPN; Reel, Steven (PRT)
Subject: SF Waterfront Draft Federal Interest Determination for Review

Team,

Please review the attached Draft Federal Interest Determination for the SF Waterfront, CAP Section 103 Study.

Please send me your comments and edits using Track Changes by COB 9 June 2016.

Thank you.

Jaime O'Halloran
Project Planner
United States Army Corps of Engineers
San Francisco District
(415) 503-6738

DISTRICT QUALITY CONTROL REVIEW CERTIFICATION

Project Title: San Francisco Waterfront Federal Interest Determination Report
Phase or Type of Project: Continuing Authorities Program Section 103
Certification Date: 5 August 2016

Notice is hereby given that a District Quality Control Review (DQCR), appropriate to the level of risk and complexity inherent in the project, has been conducted in accordance with the current Programmatic Review Plan. During the DQCR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level obtained; and reasonableness of the result, including whether the product meets the customer's needs consistent with law and existing Corps policy. The District Quality Control Review was accomplished by an independent team. All comments resulting from DQCR have been resolved. The comments and resolution are attached.

Mark D. Bierman
SPD CPC Program Manager

Katherine M. Reyes 8/4/16
Katherine M. Reyes
Project Manager

CERTIFICATION OF DISTRICT QUALITY CONTROL REVIEW

All concerns resulting from District Quality Control Review of the project have been fully resolved.

FOR James L. Howells 8/4/2016
Thomas R. Kendall
Planning Chief, San Francisco District

DISTRICT QUALITY CONTROL REVIEW

COMMENT SUMMARY

Project Title: San Francisco Waterfront Federal Interest Determination Report
Phase or Type of Project: Continuing Authorities Program (CAP) Section 103
Certification Date: 5 August 2016

San Francisco District Reviewers

Patrick O'Brien: Civil Engineer, Water Resources Section

James Howells: Chief, Plan Formulation Section

Mark Bierman: CAP Program Manager

Thomas Kendall: Chief, Planning Branch

Critical Review Comments:

1. I don't think enough was done to demonstrate federal interest. I think the report needs to paint a clearer picture of what could happen under what scenarios, and at least make some attempt to bring EAD into the discussion. For example, if the likelihood of Bart flooding is 1%, and the damages would be between $10M and $1B, then we can say something about what that means in terms of EAD in comparison to the cost of the project. Also, I think more should be done to describe the timing of the benefits - that our project could reduce flood risk for between XX and XX years before it is outflanked by flooding from other locations.

Response: Concur. Additional discussion about EAD and federal interest was added to the FID Report.

Back check: Concur.

2. The report needs to be more explicit about how the seismic issue matters or doesn't matter. There is a lot about earthquake risk, but the context is not clear to me. Seems to me like an earthquake that damaged the seawall or lowered the elevation of the fill/bulkhead would negate any of the benefits of our project. Is this correct? If so, we should be explicit about this risk. A big earthquake could make it all for naught.

Response: Concur. The seismic vulnerability discussion was included in the report to demonstrate the condition of the existing seawall. There is also potential for the waterfront to flood in the event that the seawall fails in an earthquake under the existing and future without project. The damages that could result from this have not been quantified, but billions of dollars in assets are at risk due to lateral spreading of the seawall and liquefaction of the land it supports along the waterfront. While the Corps may not quantify flood damages that would occur as a result of an earthquake, it seems this is at least important to describe qualitatively, as the flood damages are potentially significant. The FID Report also describes the probability that a damaging earthquake will occur and the type of damage to the seawall that would be expected. So far, the City of San Francisco has not evaluated flood damages in relation to

failure of the seawall. In previous studies of the SF Bay Delta the State's work on seismic vulnerability was used by the Corps to prioritize levee repair. This type of analysis may be applicable to SF Waterfront. A sentence was also added to the FID Report to indicate that a seismic event could negate the benefits claimed for the without project condition.

Back check: Concur.

3. Is it a stretch to say that flooding along the waterfront is a "life safety risk" to pedestrians? Why? Is the water deep? Might someone get swept out to the bay? I think we have to reserve use of that term for when it really applies.

Response: Concur. There is the potential for someone to get swept out into the Bay with water coming over the seawall during high tide and frequent ACE events (5 year storm). However, we did take out the reference to life safety since there is no evidence, to date, that demonstrates the life safety issue (i.e. no one has had to be rescued).

Back check: Concur.

4. I think the report should state what is mean by Federal Interest - could be added to Section 2: At the Federal Interest Determination (FID) phase of the feasibility study, Federal Interest for a Section 103 CAP project is considered to have been met by having a potential for an alternative for the project area that meets CAP criteria, and a local Sponsor willing to cost share for the feasibility costs over $100,000. At this early stage in the feasibility process, determining whether there is a Federal Interest in implementing a coastal flood risk management project involves roughly and preliminarily quantifying the economic impact of coastal flooding in the study area, and comparing any reduction in flood damage associated with a potential project or projects with the expected range of project costs. Given the preliminary nature of this analysis, it is important to recognize that there is a high degree of uncertainty in the estimates of benefits and costs described in this report. Nonetheless, using existing data, professional judgment, and reasonable assumptions, it is possible to decide whether or not there is a high enough likelihood of finding Federal Interest when studied in greater detail to continue the study into the full feasibility phase.

Response: Concur. Added the above statement.

Back check: Concur.

5. Page 14: Is manage flood risk an opportunity? I thought Opportunity referred to the improvement of a positive condition. I am not sure flood risk management fits the definition. This is always a weird one for me.

Response: There are two schools of thought on opportunities in the Plan Form world. Most recently, I was told by a FRM ATR lead that opportunities should mirror the problems, rather than being independent. That's what I tried to do here. If it doesn't work we can take it out.

Back check: Concur.

6. Page 16: the study should not cost $1.5M. Very few CAP studies in the nation cost that much. The average for 103s in the country is less than $500k. I think the study cost should be cut in half unless there is some compelling reason why it should be above $1M.

Response: Concur. We cut it in half. The idea was that there could be complex coastal modeling and the cost of the study would go up due to that.

Back check: Concur.

7. Verify the GI authority.

Response: Concur. Did additional research and verified.

Back check: Concur.

8. I'd recommend not referring to the old NRC Curves I and III - I know that's the origin of what's become the USACE curves; but there's so much that's gone into the ultimate refinement of those curves. We refer to the SLC curves as low, intermediate and high. Intermediate and high are based on NRC I and III but not exactly the same. Unfortunately, this is still done far too often in reports and we have to correct.

Response: Concur. Took out reference to NRC curves.

Back check: Concur.

CAP 103 SF Waterfront FID
SPD Policy Compliance Review Comments and SPN Responses

1. Randall Merchant: Paul I am looking through and I need more time. I will tell you what my primary concern is. Basically, is this a proper project for a CAP? I don't know if it is a legal concern, but could be. Primarily, you are identifying a larger area, the entire Bayfront in San Francisco that is at risk yet you are "segmenting" a portion of it to get through authority issues by going CAP? Is the project really beneficial, given the problems in the entire area? Anyway, may not be legal, but it does raise a flag to me that I am going to review further. I would say that I will try to get more specific comments next week.

   To follow on with my earlier comments, and after reviewing the FID report, I still have a concern with the concept of "completeness" as the term is found in the authorizing legislation for section 103 (33 USC 426g(a)(3) "a project under this section shall be complete. From a layman's perspective, when I read that the entire waterfront along San Francisco Bay is at risk from the same factors affecting the two proposed study areas, does the FID Report do enough to explain and justify why further study can lead to a "complete" project, to protect against flood risks, specific to this area? I do note that "flanking" was a term used in the report, but (and I may have missed it) I didn't see much other discussion of this. When you have a problem on a larger area, is there value in spending federal funds here?

   Additional Comment/Clarification from Leslie Philips:

   Randall,

   Not sure this is helpful BUT...we are (and have been) proposing the Waterfront Study as a new start feasibility study in FY 17 and FY 18. Attached is the justification sheet.

   Below is an excerpt from the J-sheet that discusses the piece that we are doing under CAP and its relationship to the proposed GI study. I think this background may help you.

   The Corps is working on a Continuing Authorities Program (CAP) Section 103 Federal Interest Determination (FID). The draft FID was completed in May 2016 identifying federal interest in continuing with a Detailed Project Report to evaluate coastal flood risk management alternatives for a separable portion of the San Francisco waterfront, within the CAP limits. Because the opportunity exists with the CAP 103, we are looking to begin addressing the highest priority areas first with this authority. The Sea Level Rise and Adaptation Study (2012), by the Port of San Francisco, identified Areas of Concern corresponding with water entry points along the waterfront. The Section 103 FID focuses on two water entry points on the northeast side of the San Francisco waterfront. Overall it's a little over a 1/2 mile section of the seven mile waterfront. The City and County of San Francisco elected to participate in FEMA's National Flood Insurance Program back in 2008, when San Francisco adopted a floodplain management ordinance. The ordinance was amended in 2010; the amended ordinance incorporates standards for new construction in area's delineated in the interim floodplain map. The City has also established a Sea Level Rise Coordinating Committee and a Sea Level Rise Action Plan, a screening level engineering study of the northern waterfront seawall, waterfront plan update, and other Port capital and development projects.

SPN Response:

SPN has confirmed to the extent practicable with the limited scope and budget for an FID Report that a project implemented in the identified study area would be a complete and separable project. The study area includes two particularly low spots along the waterfront where water surface elevations of 9.2 (AOC03) and 10.5 feet (AOC02) (NAVD88), respectively, would result in significant flooding of adjacent low-lying areas. The existing adjacent seawalls along the rest of the waterfront in the study area is high enough to prevent inundation (via flanking) of the low-lying areas of interest from a water surface elevation of 10.5 feet (NAVD88). Raising the two respective low spots to tie in with higher elevations of the adjacent seawalls will provide independent economic benefits and utility (i.e., is a standalone project that is not dependent on implementation of the proposed GI study/project and maybe complementary as well). As a point of reference, the estimated 2% (50-yr) and 1% (100-yr) total water level elevations are 9.6 feet and 10.4 feet (NAVD88), respectively. Further, implementation of the CAP 103 SF Waterfront Project will in all likelihood expedite realization of economic benefits for the two critical areas as the GI is of a much larger scope and complexity, which will require project authorization via WRDA.

Please refer Figure 2 in the FID (also shown below), which clearly shows that flood waters originating from Pier 45 and Mission Creek would not flank around the proposed improvements at the two low spots.

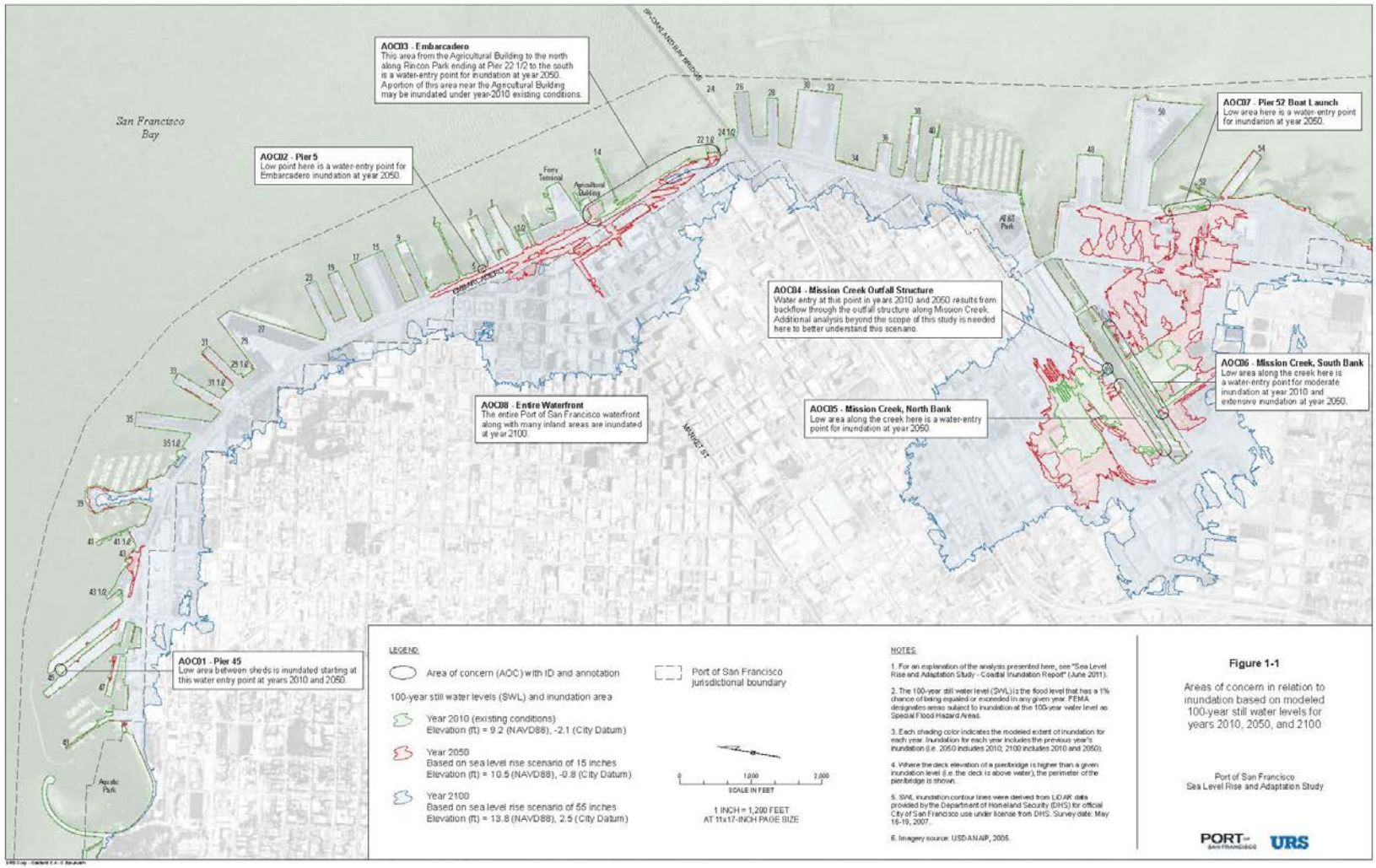


Figure 1-1

Areas of concern in relation to inundation based on modeled 100-year still water levels for years 2010, 2050, and 2100

Port of San Francisco
Sea Level Rise and Adaptation Study

PORT OF SAN FRANCISCO URS

2. Kurt Keilman:

   Then what is the defined purpose of this CAP, if we are going to take on a more comprehensive study in FY 17?

   If it is a piece meal formulation I question gaining any study efficiencies when the residual risk for areas outside the CAP need to be assessed. The CAP alternatives need to be completely independent from the rest of the system to be viable as a "stand alone" or all hydraulic impacts need to be mitigated or avoided as part of the CAP.

SPN Response: Please refer to response to comment 1.

3. Thomas Taam: Page 17. Para 8.7 - 2nd Sentence states that the feasibility study will cost a total of approximately $750,000 million. Need to revise.

SPN Response: Sentence will be revised to remove “million.”

4. Jason Norris:

A) Concern: Section 2, Study Purpose. First paragraph states that FID is to determine a project of scope appropriate for CAP but this appears to be a concern for 7.5-miles of waterfront (Page 3, Section 3, Paragraph 2). Concern is that this is attempt to piecemeal what should be a GI study. Section 103 of RHA1962 states “the total amount allotted shall be sufficient to complete the Federal participation in the project”. If the entire waterfront is the issue, then doing a small reach under CAP would not appear to comply with the intent or spirit of the law. Even worse, if a project is completed under Section 103, it could be interpreted as solving the problem (commensurate with the requirements of RHA1962) when that would not be the case.

Basis: Section 103 of the River and Harbors Act of 1962

Significance: Potentially high, could force Section 103 to terminate in lieu of planned GI study, or convert Section 103 to GI study.

Probable Action to Resolve: Obtain concurrence from SPN and SPD Offices of Counsel that this is an appropriate use of the Section 103 authority and would not jeopardize future efforts to address waterfront flooding.

SPN Response: Please refer to response to comment 1.

B)

Concern: Section 8.1, agent that constructed the existing seawall. If the existing seawall was constructed (in part or whole) by the Corps, CAP would not be applicable since CAP cannot be used to replace any portion of a Corps constructed project. ER 1105-2-100 restricts using CAP to replace any portion of a Congressionally-authorized project and RHA1962 states that a completed Section 103 project should be sufficient to complete Federal participation.

Basis: ER 1105-2-100, App F, F-4 and Section 103 of RHA1962.

Significance: High. Speaks to ability to use 103 authority to construct a project. Could prevent Corps participation in whole or in part.

Probable Action to Resolve: Please supplement discussion of seawall construction to include any Corps involvement.

SPN Response: A sentence will be added to clarify that USACE did not construct the existing seawall.

C)

Concern: Section 8.3.1 Sea Level Rise. If the drivers of inundation are based on the "King Tide", what is the return period of this water level given its tie to El Nino? When does this return period become of such frequency (given SLR) that it will cause damages on a regular basis? Is this likely to significantly affect benefit accrual?

Basis: ER 1105-2-100, Chapter II, Paragraph 2-3, Section b.

Significance: Moderate, may affect net annual benefits.

Probable Action to Resolve: Describe basis for using King Tide rather than normally occurring water level such as MLLW, etc. and describe anticipated return intervals for King Tide including when it becomes significant enough to cause damages.

SPN Response: It is recommended to add the following (or similar) clarifying language to the FID Report text or as a footnote:

"King tides or spring tides are the highest predicted or astronomical tides of the year, and occur twice a year. These predicted tide levels are generally used as a proxy water level for high frequency events or nuisance flooding. King tides, being predictable events, are often used to document impacts of nuisance flooding. The recorded King tide water level of 7.54 feet NAVD 88 on 24 November 2015 is roughly equivalent to a 1.8 year event based on statistical analysis of water levels at the NOAA tide gage, Station ID: 9414290 1901-2011 (see below reference). While the water level was most certainly influenced by regional El Niño conditions, the statistics are based on a long term average which includes many El Niño and non El Niño years. Impacts are occurring at this water level as described in this document (Figures 5 and 6).

Water levels at this elevation for non-storm events (water levels without a non-tidal residual) currently occur one to two times per year and will increase in occurrence over time with sea level rise. Water levels associated with storms currently are at a 1.8 yr. Stillwater ACE, and will change to a more frequent occurrence interval over time."

Reference:

USACE, 2015. Appendix D1 (to the Final South San Francisco Bay Shoreline Study Feasibility Study and Environmental Impact Statement): Coastal Engineering and Riverine Hydraulics Summary, 3 June 2015

In addition, the text in Section 8.2 should be changed to reflect an approximate return period of 2 years (instead of 2 to 5 years).

D)

Concern: Section 8.8 Benefits. If flooding is occurring due to storm conditions at the 1% ACE level, how likely is it that ferry service would be running anyhow? Does road traffic and retail activity along the waterfront still occur during storms of that magnitude? Benefits should be calculated based on the traffic that would be expected to occur during storm conditions in both the without and with-project conditions rather than that which would occur under non-storm conditions.

Basis: ER 1105-2-100, Appendix D, Paragraph D-2, Section c.

Significance: Moderate, may affect net annual benefits.

Probable Action to Resolve: Please confirm that benefits from reduced disruptions to auto and ferry traffic and retail operations is based on storm conditions in both the without and with-project conditions rather than on a "Sunny Day" in the without-project condition and under storm conditions in the with-project condition.

SPN Response: A preliminary economic benefit analysis was performed commensurate with the limited scope and budget of a CAP 103 FID and indicates economic justification for a viable project and provides a basis to execute a FCSA and continue with feasibility-level studies, consistent with the scope and complexity of CAP. Public transit systems such as BART and Ferries as well other modes vehicular transportation (e.g., private vehicles, taxi services, etc.) operate during storm events. In addition, other potential economic benefit categories were not included in the preliminary economic analysis (e.g., Muni Metro Subway, Muni Light Rail/Trolleys, Muni Buses, Commercial and Industrial Infrastructure, etc.) due the FID's limited scope and budget. The preliminary economic analysis will be updated with a more rigorous and comprehensive level of effort, consistent with scope of CAP, for the MDM/TSP pending FID approval and execution of a FCSA.

E)

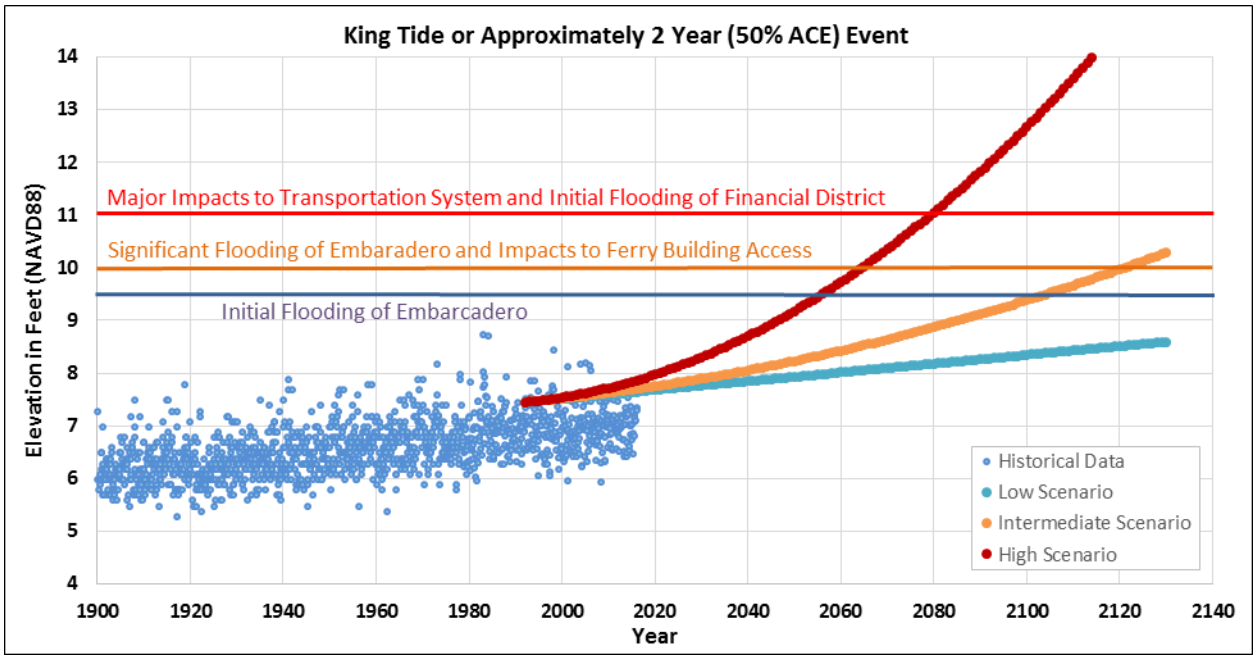
Concern: Section 8.3.1 Sea Level Rise. Section 8.3.1 says that SLR conditions were evaluated per ER 1100-2-8162. It is unclear whether the three damage thresholds correspond to the low/intermediate/high scenarios from those calculations or if they are thresholds for damages.

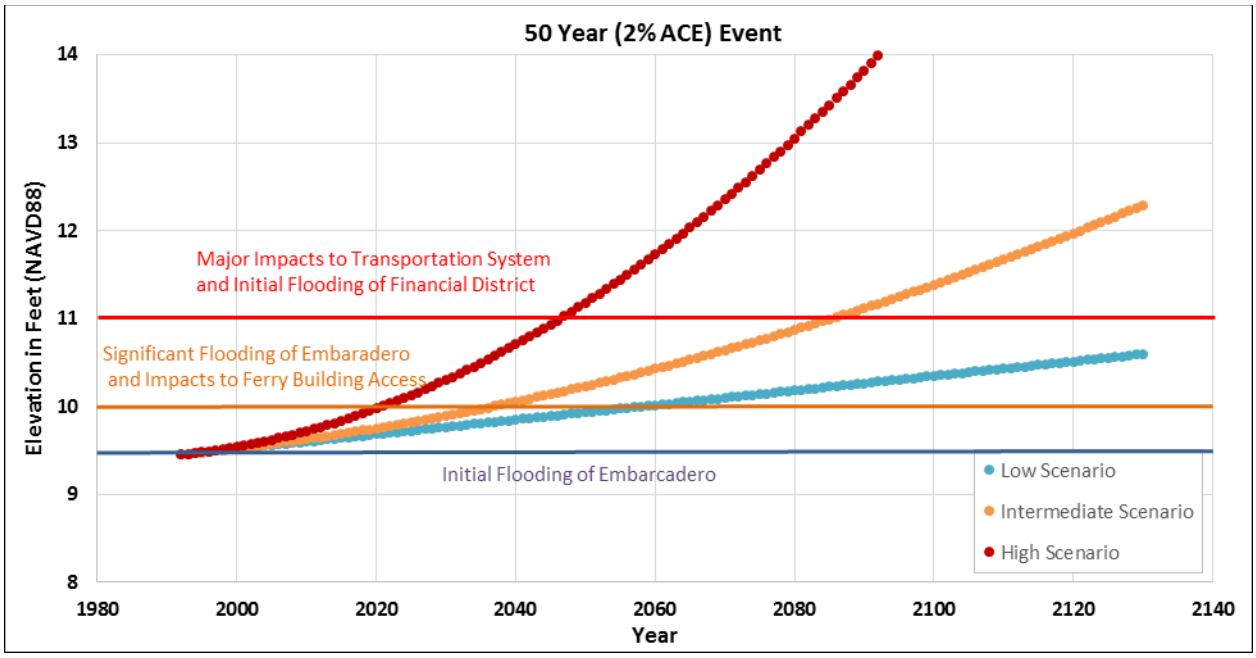
Basis: ER 1100-2-8162

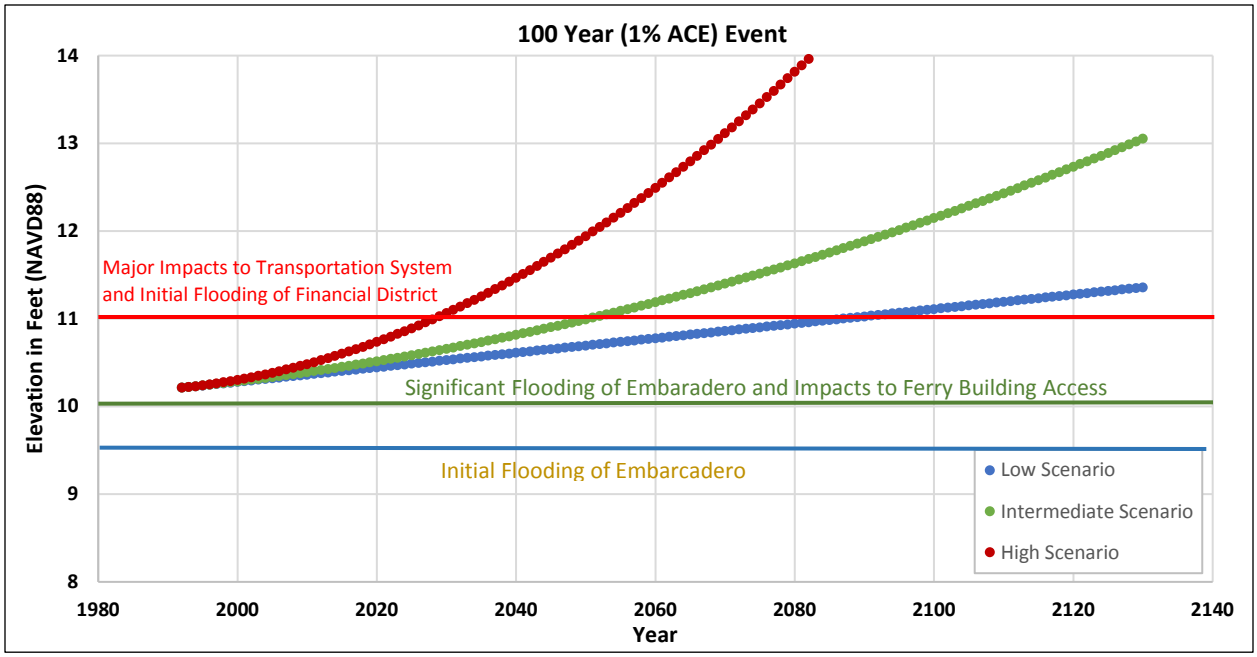
Significance: Low, likely a clarification issue.

Probable Action to Resolve: Please confirm that damage thresholds reference the low/intermediate/high scenarios as calculated per ER 1100-2-8162.

SPN Response: The thresholds refer to the water levels at which it can be anticipated that damage would occur to given infrastructure, and do not represent a single sea level change scenario. For example, the below figure indicates that a "King Tide" water level under the "High" scenario would approach the initial flooding of the Embarcadero threshold (9.5 feet NAVD88) a couple years before 2060. Water Resources suggests adding the below figures to the FID Report for clarity.


King Tide or Approximately 2 Year (50% ACE) Event
Elevation in Feet (NAVD88)
Year
Major Impacts to Transportation System and Initial Flooding of Financial District
Significant Flooding of Embaradero and Impacts to Ferry Building Access
Initial Flooding of Embarcadero
Historical Data
Low Scenario
Intermediate Scenario
High Scenario


50 Year (2% ACE) Event
Elevation in Feet (NAVD88)
Year
Major Impacts to Transportation System
and Initial Flooding of Financial District
Significant Flooding of Embaradero
and Impacts to Ferry Building Access
Initial Flooding of Embarcadero
Low Scenario
Intermediate Scenario
High Scenario



F)

Concern: Section 3. Location of Potential Project/Congressional District. Separable Elements (Reaches). Study area is divided into two reaches (AOC02 and AOC03) but benefits and costs are only reported for the whole project. It is possible that one reach may be justified but the other may not be.

Basis: ER 1105-2-100, Appendix E, Paragraph E-3, Section c., sub-Section (2)

Significance: Potentially high. Could speak to justification of one of the two reaches.

Probable Action to Resolve: Please clarify cost and benefits expected to accrue to each reach. It is understandable that there may some uncertainty surrounding this due to the preliminary nature of the FID.

SPN Response: Please refer to response to comment 4D.

G) Preliminary Costs

Concern: Do cost estimates include LERRDs and any mitigation that is anticipated to be required due to modification of an historic structure/district? If significant, could change net annual benefits and costs to NFS.

Basis: ER 1105-2-100, App D, Paragraph D-3, Section e., sub-Section (9) and ER 1105-2-100, App C, Paragraph C-4, Section g.

Significance: Likely low, unlikely to affect project justification.

Probable Action to Resolve: Please include a brief discussion or anticipated LERRDs/historic mitigation costs. It is understandable that there may some uncertainty surrounding this due to the preliminary nature of the FID.

SPN Response: Preliminary project costs estimates were prepared commensurate with the scope and budget of a FID. While the current preliminary project cost estimates do not include LERRDs nor mitigation for historical preservation, those type of project costs may be minimal as the Port of San Francisco may already own the required LERRDs given the existing seawall and that the project is focused on seawall improvements and not on modifications of more historically sensitive building architecture. A recent USACE/Port of San Francisco Pier 36 Removal and Bulkhead Stabilization (Brannan Street Wharf) project did not incur any LERRDS or mitigation for historical preservation. Also, please refer to responses to comments 1 and 4D.

H)

Concern: Net Annual Benefits. Per policy, recommendations are based on net annual benefits, not benefit-to-cost ratio.

Basis: ER 1105-2-100, Appendix E, Paragraph E-3, Section b., sub-Section (1)

Significance: Low.

Probable Action to Resolve: Please report Net Annual Benefits in Table 7.

SPN Response: Table 7 will be amended to show net annual benefits.

Editorial Comments (optional):

a) Page 1, Study Authority, USACE acronym used for first time, please spell out.

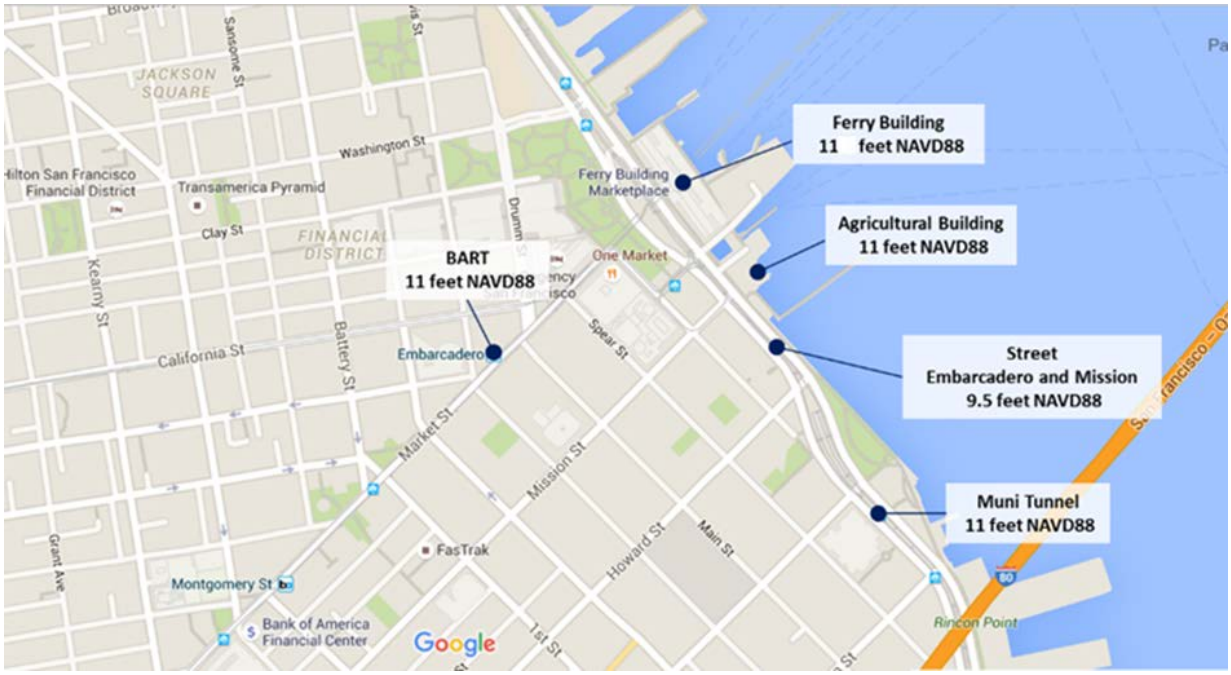
SPN Response: Correction will be made.

b) Recommend putting Figures 2 & 3 on 11x17s for legibility purposes.

SPN Response: Figures 2 and 3 will be put on 11x17s.

c) Inconsistency between Figure 7 and language. Figure 7 states that the Ferry building is at 11.5 feet NAVD88. If this is true, it may affect benefit calculations. Please clarify height, make consistent throughout report, and confirm that benefits from Ferry Building inundation are not affected.

SPN Response: There was a typographical error with the elevation of the base of the Ferry Building, which was incorrectly labeled as 11.5 feet NAVD88 in Figure 7. The correct elevation should be 11.0 feet NAVD88. Please insert the below version of Figure 7 into the final FID Report.



Sorry, after I left yesterday, I realized I had an error in one of my comments. On my comment #3, I would like to revise the Probable Action to Resolve to the following: "Probable Action to Resolve: Describe basis for using King Tide rather than normally occurring water level such as the .01 ACE event absent El Nino. and describe anticipated return intervals for King Tide including when it becomes significant enough to cause damages." It's obvious that MLLW would not be used for this purpose. Sorry about that, had a lot of thoughts going and missed changing that one.

SPN Response: Please refer to previous response to comment 3.