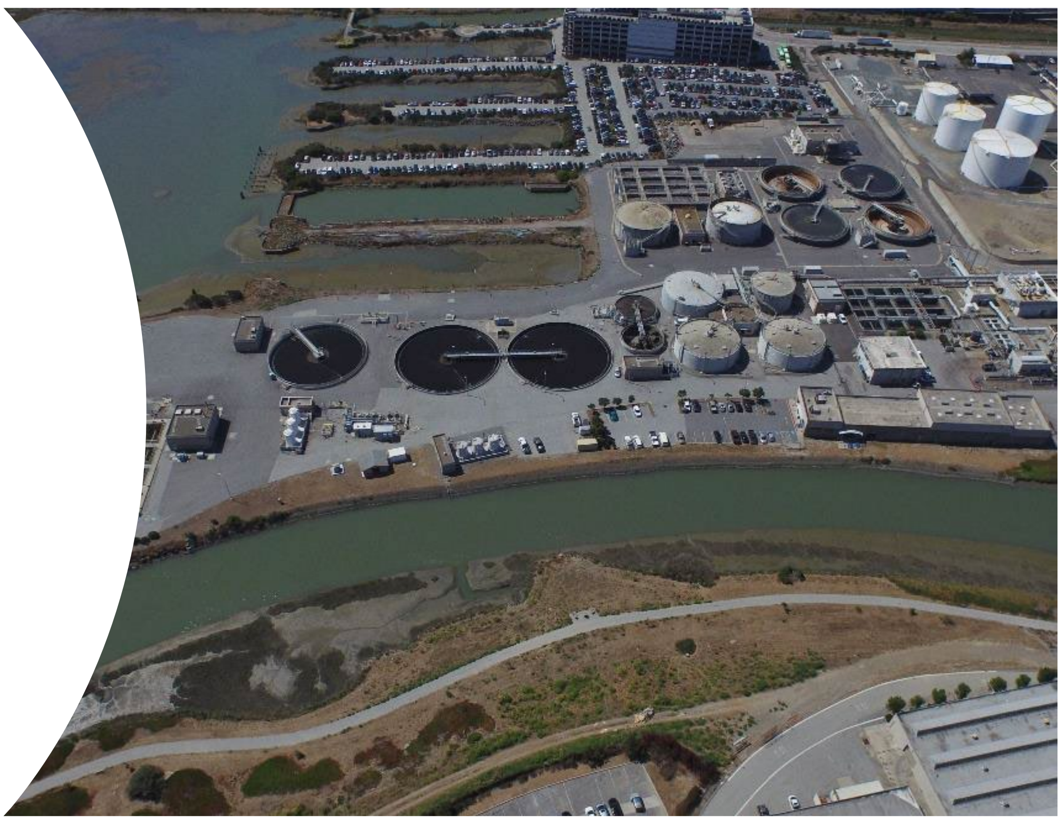
US Army Corps of Engineers®

Lower Colma Creek Continuing Authorities Program Section 103 Project

Final Detailed Project Report and Environmental Assessment



USACE San Francisco District

15 December 2023

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ACRONYMS

ABAG	Association of Bay Area Governments
AEP	Annual Exceedance Probability
APE	Area of Potential Effects
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
BMPs	Best Management Practices
B.P.	Before Present
CAP	Continuing Authorities Program
CAR	Coordination Act Report
CARB	California Air and Resource Board
CAAQS	California Ambient Air Quality Standards
CCC	California Central Coast
CEIWR-HEC	U.S. Army Corps of Engineers' Hydrologic Engineering Center
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CMP	Congestion Management Plan
CNDDB	California Natural Diversity Data Base
CNEL	Community Noise Exposure Level
CNPS	California Native Plant Society
CO	Carbon Monoxide
CO_{2eq}	Carbon Dioxide Equivalents
CSRM	Coastal Storm Risk Management
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
D&I	Design and Implementation
dBA	decibels
DPR/EA	Detailed Project Report / Environmental Assessment
DPS	Distinct Population Segment
EAD	Equivalent Annual Damages
EFH	Essential Fish Habitat
EO	Executive Order
EQ	Environmental Quality
ER	USACE Engineering Regulation
ESA	Endangered Species Act
FCSA	Feasibility Cost Sharing Agreement
FEMA	Federal Emergency Management Agency
FID	Federal Interest Determination

FMP	Fishery Management Plan
FTA	Federal Transit Administration
FWOPC	Future Without Project Condition
GHGs	Green House Gases
H&H	Hydrology and Hydraulics
HAPC	Habitat Aras of Particular Concern
HEC-FDA	Flood Damage Reduction Analysis
HTL	High Tide Line
HTRW	Hazardous, Toxic and Radioactive Waste
ICW	Inspection of Completed Works
LERRDD	lands, easements, rights-of-way, relocations, and disposal areas
LOS	Level of Service
LRSL	Local Relative Sea Level
LUST	Leaking Underground Storage Tank
MBTA	Migratory Bird Treaty Act
MCC	Motor Control Center
MGD	million gallons per day
MHHW	Mean Higher High Water
MLD	Most Likely Descendant
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NAVD	North American Vertical Datum
NBSU	North Bayside System Unit
NED	National Economic Development
NEPA	National Environmental Policy Act
NFS	Non-federal sponsor
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNBFs	Natural and Nature-Based Features
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OMRR&R	Operation, Maintenance, Repair, Replacement, And Rehabilitation
O_3	Ozone
O&M	Operation & Maintenance
OSE	Other Social Effects
P&S	Plans and Specifications
PA	Programmatic Agreement
PDT	Project Delivery Team
POOCCs	Problems, Opportunities, Objectives, and Planning Constraints and Considerations

PPA	Project Partnership Agreement
RCRA	Resource Conservation and Recovery Act
RED	Regional Economic Development
RLSC	Relative Sea Level Change
SC-GHG	Social Cost of Greenhouse Gas Emissions
SFBRWQCB	San Francisco Bay Regional Water Quality Control
SFIA/SFO	San Francisco International Airport
SFEI	San Francisco Estuary Institute
SHPO	State Historic Preservation Offices
SLC	Sea Level Change
SLR	Sea Level Rise
SSPD	South Pacific Division
SPN	San Francisco District
SSF	South San Francisco
WQCP	South San Francisco- San Bruno Water Quality Control Plant
SWRCB	State Water Resources Control Board
TMDLs	Total Maximum Daily Loads
TSP	Tentatively Selected Plan
RWQCB	Regional Water Quality Control Board
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
WSEL	Water Surface Elevation
WQC	Water Quality Certification
WQCP	Water Quality Control Plant
YBM	Young Bay Mud

EXECUTIVE SUMMARY

ES-1. INTRODUCTION

The U.S. Army Corps of Engineers and the City of South San Francisco (SSF), together with the SSF - San Bruno Water Quality Control Plant (the non-federal sponsor) are partnering on a coastal storm risk management project for the Water Quality Control Plant (WQCP) and one of its pump stations. The goal is to manage the risk that coastal flooding poses to this critical infrastructure, to maintain critical services, despite the increasing flood risk that is expected with sea level rise. Flood-induced plant failure could result in raw sewage backups into homes and streets, as well as emergency sewage releases into Lower Colma Creek and the San Francisco Bay. This project aims to reduce the risk of these damages and increase the community's resilience to coastal storm flood risk.

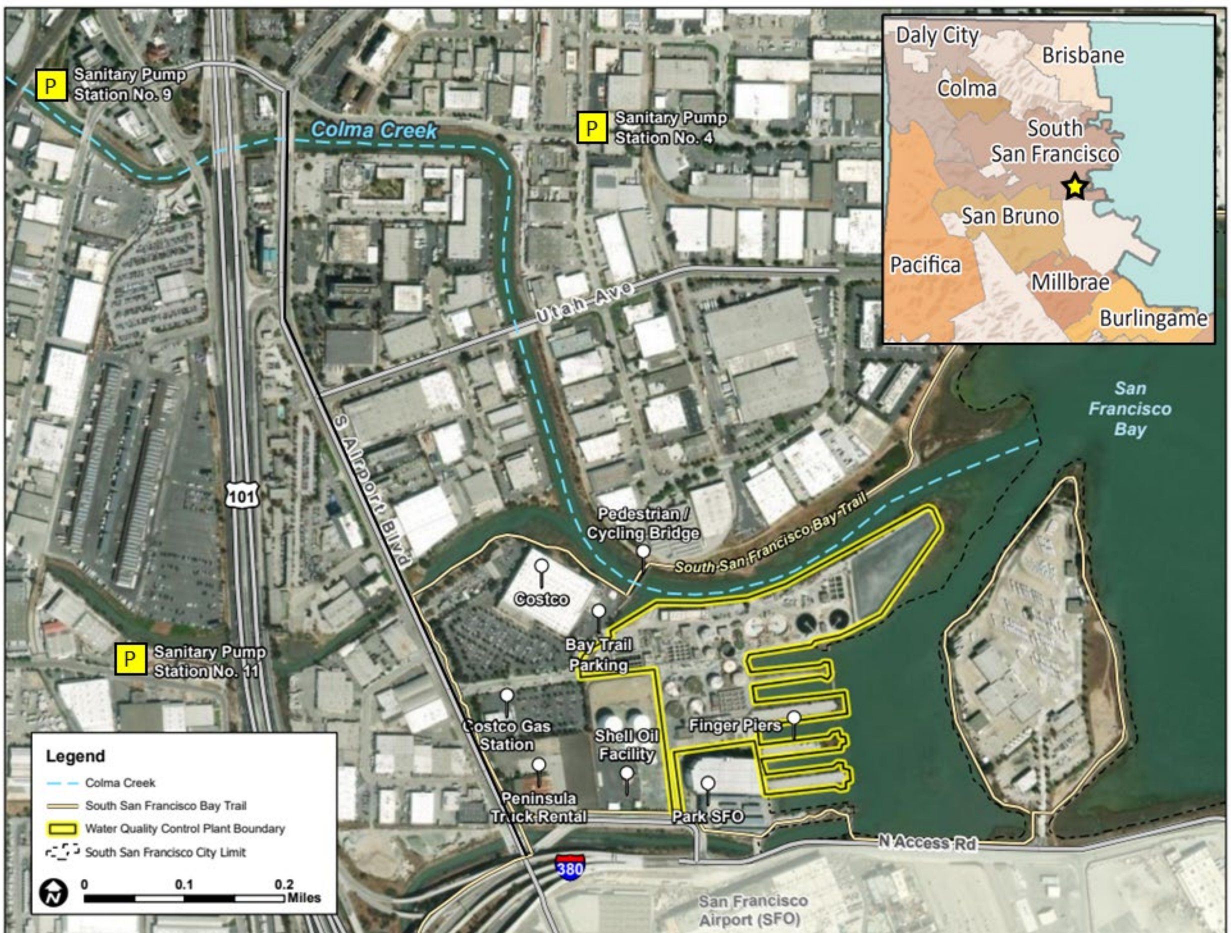

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Figure ES-1. The South San Francisco-San Bruno Water Quality Control Plant and three pump stations that pump directly to the plant are located just north of SFO, along Lower Colma Creek and the San Francisco Bay.

ES-2. PURPOSE AND NEED

The purpose of the Lower Colma Creek Continuing Authorities Program (CAP) 103 project is to reduce flood risk from coastal storms and sea level rise (coastal flooding) at a wastewater treatment plant in South San Francisco, California, including Pump Station 4 which pumps directly to the plant. The project is needed to protect residents, businesses, and the environment from the detrimental effects of unconfined raw sewage in the event of flood waters causing the wastewater treatment plant and/or pump stations to go offline. The scope of the project is the immediate vicinity of the South San Francisco/San Bruno Water Quality Control Plant (WQCP), which services an area with over 165,000 full time residents, plus the daily population of San Francisco International Airport (SFIA or SFO).

The water resource problem to be solved by the Lower Colma CAP project is inundation of the WQCP facilities during coastal storm flood events. There is an existing risk of coastal flooding and the frequency of coastal storm flood events is forecast to increase over time as a result of climate change. The WQCP is located at the confluence of Lower Colma Creek and the San Francisco Bay (Bay), a low-lying coastal area that is especially sensitive to sea level rise. Groundwater flooding is not currently a concern as the WQCP only requires minimal pumping to remove groundwater at a few locations during the peak winter months. Pumping capability is expected to keep up with potential groundwater rise over the next 100 years. Land subsidence is also not a concern. Santa Clara Valley Water (SCVW) conducted benchmark elevation surveys in 2019 which include surface elevation data from 138 benchmarks to evaluate the spatial variability of land subsidence. The survey results revealed that subsidence did not exceed 0.01 feet per year (SCVWD, 2019). A flood event could inundate subterranean control rooms from the surface, if flooding elevations reach the surface entry points to the control rooms. Flooding in the subterranean control rooms would damage equipment and could then reach electrical motor control centers via underground conduits, causing the WQCP and/or pump stations to shut down. Were this to occur, wastewater treatment services would cease, resulting in raw sewage backing up into homes, overflowing from manholes in streets, and being released untreated into the Bay. Impacts to the local community, buildings, property, and infrastructure, as well as the environment would be extensive. There have been no improvements to reduce coastal storm flood risk in the area surrounding the plant.

ES-3. PLAN FORMULATION

This study is being conducted under the CAP Section 103 Authority for coastal storm risk management (CSRM). The goal of this study is to manage the risk of coastal storm flooding at the WQCP and its pump stations throughout the 50-year period of performance, upon completion of the project. Therefore, the plan formulation prioritized meeting CSRM-related objectives, within the constraints identified.

Formulation and Comparison of Alternative Solution Sets

The No Action Alternative, also described as the Future Without Project Conditions, evaluated the impacts of forecast conditions in the absence of future work in the project area. Three action alternatives were formulated to assess the performance of different approaches to protecting the WQCP from flood waters. The three pump stations that pump directly to the WQCP were evaluated for coastal storm risk and Pump Station 4 was found to be vulnerable to coastal flooding. The other two—Pump Stations 9 and 11—had sufficient structural elevations to manage coastal flood risk. Since Pump Station 4 is connected via underground pipes to the WQCP, it was treated as one system which operates jointly and is hydraulically connected. All three action alternatives sought to maintain operability of the Pump Station 4 during a coastal flood event via a concrete ring wall with stop log gate to prevent flood waters from entering that building. In combining measures into alternatives, the team sought to establish a reasonable range of coastal storm risk management alternatives via a smaller floodwall alignment on only the lowest lying side of the WQCP (north side of the WQCP only), tying into high ground, and a second taller and more comprehensive alignment that included a floodwall along the southern side of the WQCP as well.

Nonstructural measures, such as floodproofing and raising critical infrastructure in place were also formulated into an alternative, with focus placed on life safety for the WQCP operators who would need elevated walkways and exits to move safety between facilities while operating the WQCP during a coastal flood event.

Three action alternatives were included in the focused array of alternatives. Two action alternatives were included in the final array for final comparison, plus a No Action alternative.

- **No Action Alternative—**the federal government would take no action to address coastal storm flood risk at the WQCP and pump stations. Coastal storm flood risk would increase over time.

- **Alternative 1—North Plant Floodwall Alternative** includes an I-wall (sheetpile) floodwall, approximately 3 to 4 feet above grade at WQCP at the north side of the WQCP adjacent to the right-bank of Lower Colma Creek (Floodwall 1A North, and 1B North). At Pump Station 4, a perimeter concrete T-wall (Ring Wall), approximately 2-4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that WQCP operators would know to ensure that the stop log gate is sealed. This alternative would reduce the damages to all 29 structures within the main WQCP and prevent approximately 19,000 structures from clean-up cost associated with sewage backup.

- **Alternative 2—North and South Plant Floodwalls Alternative (Recommended Plan / Agency Preferred Alternative)** includes an I-wall (sheetpile) floodwall, approximately 3 to 6.5 feet above grade at the north side of the WQCP adjacent to the right-bank of Creek (taller than what is proposed in Alternative 1) (Floodwall 1A North, and 1B North), as well as a second shorter approximately 2-4 foot-high floodwall south of WQCP adjacent to San Francisco Bay (Floodwall 2S). For Alternative 2, the overall line of defense elevation was raised to also address flooding from the south side of the WQCP that will occur during more extreme events. Correspondingly, the north wall height was raised for a consistent line of defense around the WQCP. At Pump Station 4, a perimeter concrete T-wall (Ring Wall), approximately 2-4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that WQCP operators would know when to seal the stop log gate. This alternative would protect all 29 structures within the main WQCP from flooding and prevent approximately 19,000 structures from clean-up cost associated with sewage backup.

Included in focused array of alternatives, but screened from final array as it was not cost effective compared to the other alternatives, nor economically justified with the costs well exceeding the benefits:

- **Alternative 3 – WQCP Floodproofing Alternative** would dry floodproof 23 structures at the main WQCP by installing watertight doors and windows and using membranes to waterproof structures. The subterranean interconnected electrical system is not practicable to flood proof and would need to be elevated. At Pump Station 4, a perimeter concrete T-wall (Ring Wall), approximately 2-4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that WQCP operators would know when to seal the stop log gate.

The non-federal sponsor did not request consideration of a Locally Preferred Plan.

Evaluation and Comparison of Alternative Plans

The three action alternatives were evaluated on anticipated performance if implemented and compared to the No Action Alternative. The alternative plans were assessed to ensure agreement with the previously described planning objectives, considerations, and constraints. Then, in accordance with the Principles, Requirements and Guidelines (2013), the analysis of the alternatives evaluated plan performance under the four criteria of completeness, effectiveness, efficiency, and acceptability.

Acceptability and Completeness

Acceptability refers to whether the plan is legally implementable. Completeness is the extent to which a given alternative provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. All the alternatives were determined to be acceptable and complete.

Effectiveness

All the alternatives were determined to be highly effective for reducing economic damages from flooding (objectives 3 and 4) and reducing damages to the environment from flooding and effluent releases into Lower Colma Creek and SF Bay (objective 5), based on the initial assessment.

For managing risk to human life and safety of WQCP workers (objective 1), there are concerns that Alternative 3 could pose safety hazards to WQCP operators who were going between buildings and operating the WQCP when up to 3.77 feet of floodwaters surround the buildings.

The team concluded that Alternative 3 was less safe to WQCP operators, than the structural alternatives where there is less risk of floodwaters entering the WQCP property and endangering operator safety. Therefore Alternative 3 ranked medium for meeting the objective to keep the WQCP operational during a coastal flood event and ranked well for Alternatives 1 and 2 on this metric.

Alternatives 1 and 2 ranked well for protecting human health and safety by preventing exposure to raw sewage due to WQCP shutdown (objective 2). Alternative 3 has the risk that raw sewage would still be released into Colma Creek and SF Bay should WQCP staff evacuate and treatment temporarily cease, so it ranked as medium for this objective. WQCP staff evacuating under Alternative 3 also makes this alternative medium in meeting the objective of reducing the economic, environmental, and social impacts that result from the loss of wastewater treatment services during a WQCP shutdown (objective 6).

Efficiency

Efficiency was analyzed in the context of cost effectiveness, in this case initially using rough costs and then again using net National Economic Development (NED) benefits. Alternative 2 has the highest net NED benefits and is the NED plan. It also has the highest benefit-to-cost ratio (BCR; 3.49). Alternative 1 has the second highest net NED benefits and BCR (2.38). Alternative 3 has substantial negative net benefits and a BCR below unity, meaning it is not economically justified based on NED benefits.

ES-4. RECOMMENDED PLAN

Alternative 2 is the NED Plan with the highest net NED benefits and was found to have a higher benefit to cost ratio (3.49) than Alternative 1. However, both alternatives were found to have positive benefit to cost ratios. Alternative 2 is also the comprehensive benefit plan that maximizes comprehensive benefits.

The Alternative 2 design includes a wall crest elevation approximately 13.5 to 15.5 ft NAVD88, which prevents flooding through the low spots on the north side from the Lower Colma Creek channel and through the low spots on the south side of the WQCP area. With Alternative 2 in place, the WQCP is still susceptible to overland flow from the west, but this flooding was found to enter the WQCP area only at extreme tide elevations greater than 13 ft NAVD88. This would allow WQCP operators to keep the WQCP operational and avoid emergency releases of raw sewage into Lower Colma Creek and San Francisco Bay due to WQCP shutdowns. It would also manage the risk of coastal flooding causing raw sewage to back up into homes and streets if pump stations were to fail or the WQCP were to not be able to accept pumped sewage. Alternative 2 reduces economic damages that could occur annually by $1,959,857 and has annual net benefits of $1.4 million and a benefit to cost ratio of 3.49. It improves resiliency to sea level rise for the project area region. The likely recommended plan also improves social justice by managing risk of impacts to human health and safety, as well as aesthetic impacts of raw sewage in socially disadvantaged communities. In addition, Alternative 2 will generate an estimated 121 cubic yards excavated material that will either be reused onsite or hauled off to an appropriate disposal facility (Appendix F).

The selected alternative performs with little risk over the project lifetime of 50 years, up to the highest modeled AEP event of 0.2%. There is a risk that unanticipated buried utilities will need to be relocated, which could increase the cost and duration of construction. The team has reviewed existing information and conducted a comprehensive review of as-built drawings, and aligned the proposed floodwall to reduce/mitigate this risk. There is a risk that outside factors, such as the price of materials, inflation, weather, and workforce availability could increase construction costs. The contingency for the cost estimate considered and included these risks, which should manage this risk to implementation.

ES-5. SIGNIFICANT RESOURCES/ENVIRONMENTAL CONSIDERATIONS

The team has coordinated with resource agencies throughout the study and no significant adverse effects were identified. The wetland delineation was used to avoid impacts to Waters of the U.S., therefore Alternative 2 will not directly impact wetlands or surface waters.

The proposed project site and its vicinity coincide with designated critical habitat for CCC steelhead and green sturgeon. As the project involves constructing floodwalls out of the water on existing banks with avoidance and minimization measures, the proposed project may affect, but is not likely to adversely affect CCC steelhead and green sturgeon and their critical habitat. Similarly, the proposed project may affect, but is not likely to adversely affect EFH managed as part of the Pacific Groundfish, Pacific Salmon, Pacific Coastal Pelagic Species, and West Coast Highly Migratory Species fishery management plans.

The floodwalls will manage coastal flood risk for the WQCP for the duration of the study's economic period of analysis and the project will have a long-term benefit of reducing flood hazard to the WQCP and reducing the frequency of untreated wastewater discharges to surrounding surface waters associated with a WQCP shut down.

USACE completed informal consultation with NMFS, and coordinated with BCDC to obtain concurrence with the Consistency Determination (CD). Coordination documentation for both can be found in Appendix B. USFWS provided a Fish and Wildlife Coordination Act Report (CAR) which concluded the project would protect critical water treatment infrastructure from coastal flooding and consequent release of untreated sewage that would otherwise damage sensitive environmental resources. USACE considered and incorporated the agency recommendations, as appropriate, and will continue to do so during the Design and Implementation (D&I) Phase of the project.

The team has consulted with the California State Historic Preservation Officer under Section 106 of the National Historic Preservation Act. Under Alternative 2, ground disturbance and excavation based on the footprint of the floodwalls would potentially impact site CA-SMA-45 depending on its confirmed location and depth within the footprint of the floodwall. Impacts to the site will be better understood after subsurface testing determines the absence or presence of CA-SMA-45 at certain depths of fill along the Lower Colma Creek banks.

USACE and SSF consulted with the area's affiliated Tribes, who did not bring up any concerns regarding unmitigable or significant impacts if an unanticipated cultural site is disturbed during construction. Subsurface testing is currently ongoing, but in the event that a cultural resource is identified, an agreement document pursuant to Section 106 will ensure mitigation measures, such as reburial of ancestral remains, will be followed and cumulative impacts are avoided, minimized, or mitigated.

ES-6. PLAN IMPLEMENTATION

The local sponsor supports the selected plan for the Lower Colma Creek CAP 103 project. The San Francisco District anticipates working with the South Pacific Division Office of Counsel to utilize a model PPA for the project design and implementation phase. PPA negotiations would follow the approval of the final detailed project report (i.e., the Final Report Approval milestone).

USACE proposes that implementation would begin shortly following approval of the detailed project report (DPR). This would signify implementation starts in FY24. Once the PPA has been executed (2023), the San Francisco District Engineering Division will prepare the final design for advertisement and construction (Spring 2024).

ES-7. VIEWS OF THE PUBLIC, AGENCIES, STAKEHOLDERS, AND TRIBES

The USEPA and NOAA Fisheries participated as NEPA cooperating agencies for this study. USEPA assisted with NEPA review and provided some input in a coordination meeting with the PDT. They have generally been supportive of the project.

The USFWS was involved in the project through Endangered Species Act informal consultation and the process of writing the CAR, but did not participate as a formal NEPA cooperating agency for this study. USFWS attended coordination meetings, site visits, and provided input about the project's impacts to ESA listed species.

NOAA Fisheries participated as a NEPA cooperating agency for this study. NOAA Fisheries attended coordination meetings, site visits, and provided input about the project's impacts to ESA listed species and EFH.

ES-9. UNRESOLVED ISSUES/AREAS OF CONTROVERSY

There are no areas of controversy identified.

1.0 INTRODUCTION

The U.S. Army Corps of Engineers and the non-federal sponsor (the City of South San Francisco [SSF]), are partnering on a coastal storm damage reduction project for the South San Francisco–San Bruno Water Quality Control Plant (WQCP) and one of its pump stations. The goal is to manage the risk that coastal flooding poses to this critical infrastructure to maintain critical services, despite the increasing flood risk that is expected with sea level rise. Flood-induced WQCP failure could result in raw sewage backups into homes and streets, as well as emergency sewage releases into Lower Colma Creek and the San Francisco Bay. This project aims to reduce the risk of these damages and increase the WQCP's resilience to coastal storm flood risk.

This document is an integrated Continuing Authorities Program (CAP) Section 103 feasibility study and environmental assessment (EA) intended to be a decision document that complies with both U.S. Army Corps of Engineers (USACE) policy and the National Environmental Policy Act (NEPA). This document is a record of the study process and findings, including analysis of both structural and nonstructural measures, and opportunities to avoid, minimize, and mitigate for detrimental impacts that could result from the recommended project. Throughout the document, an asterisk denotes a section required by NEPA.

Pursuant to NEPA, 42 U.S.C. §§ 4321-4327, federal agencies are required to consider potential impacts to the human environment, including those to cultural resources, and propose appropriate mitigation measures when necessary for projects with federal involvement. NOAA Fisheries and U.S. EPA participated as NEPA cooperating agencies. The U.S. Fish and Wildlife Service was heavily involved in the project in accordance with the Fish and Wildlife Coordination Act and declined to participate as a formal NEPA cooperating agency. The project's California Environmental Quality Act (CEQA) document will be prepared by the non-federal sponsor under separate cover.

1.1 Study Purpose and Need*

The purpose of the Lower Colma Creek project is to reduce flood risk from coastal storms and sea level rise (coastal flooding) at a wastewater treatment plant in South San Francisco, California and the three pump stations that pump directly to the plant (Pump Stations 4, 9, and 11). The project is needed to protect residents, businesses, and the environment from the detrimental effects of unconfined raw sewage in the event of flood waters causing the wastewater treatment plant and/or pump stations to go offline.

The WQCP is located at the confluence of Lower Colma Creek and the San Francisco Bay (Bay), a low-lying coastal area that is especially sensitive to sea level rise.

The water resource problem to be solved by the Lower Colma CAP project is inundation of the WQCP facilities during coastal storm flood events. Though coastal flooding has not caused damages at the WQCP facilities to date, there is an existing risk of coastal flooding. Furthermore, the frequency of coastal storm flood events is forecast to increase over time because of climate change.

In addition to above-ground sources of flooding, the area is subject to rapid groundwater recharge that could cause the water table to rise to the surface (groundwater flooding). A flood event could inundate subterranean control rooms equipment, and electrical motor control centers via underground conduits, causing the WQCP and/or pump stations to shut down. Were this to occur, wastewater treatment services would cease, resulting in raw sewage backing up into homes, overflowing from manholes in streets, and being released untreated into the Bay. Impacts to the local community, buildings, property, and infrastructure, as well as the environment would be extensive. There have been no improvements to reduce coastal storm flood risk in the area surrounding the plant.

1.2 Location

The WQCP (study area) is located in the City of South San Francisco, California which is part of San Mateo County (Figure 1-1). South San Francisco is bordered by the cities of Brisbane to the north and San Bruno to the south. The project is within California's 14th Congressional District, which is represented by Congresswoman Jackie Speier.

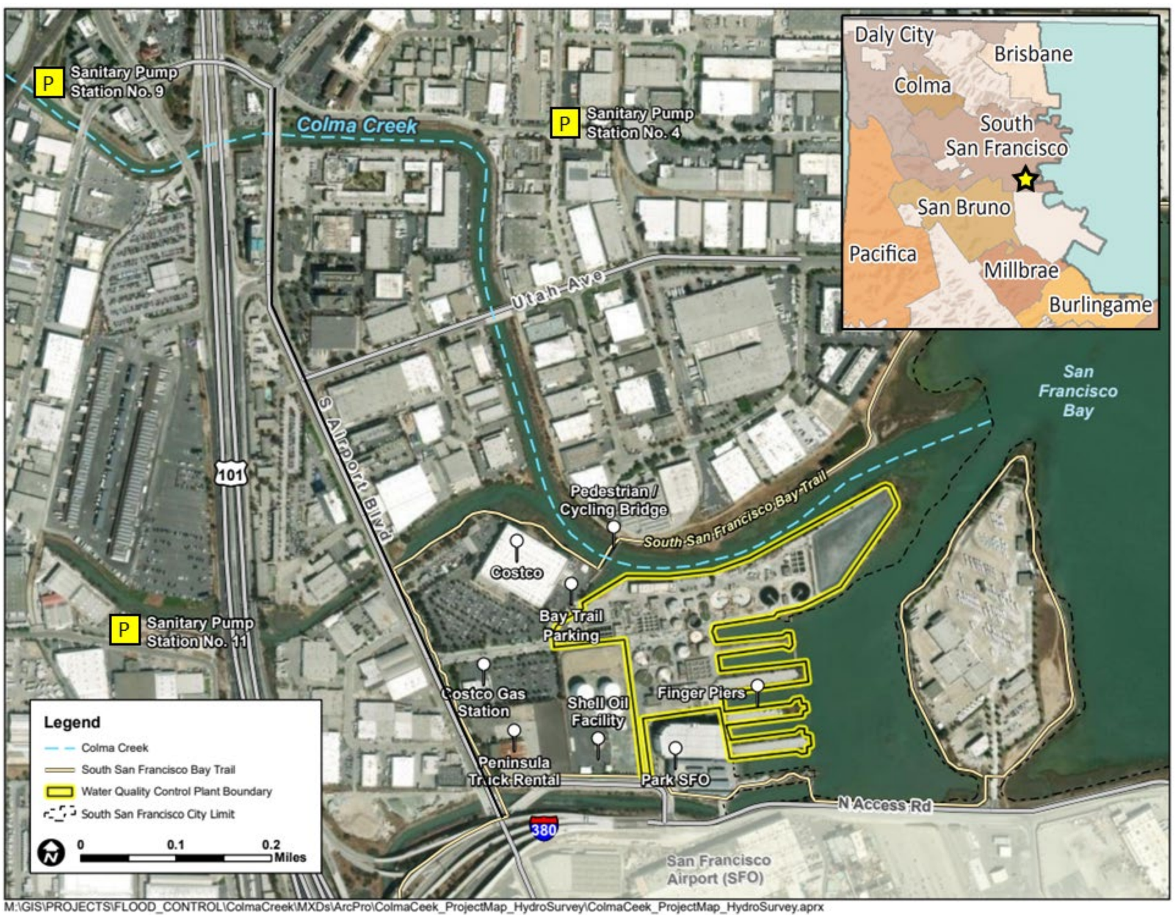

Figure 1-1. The South San Francisco-San Bruno Water Quality Control Plant and three pump stations that pump directly to the plant are located just north of SFO, along Lower Colma Creek and the San Francisco Bay.

The study area is located on land that is lived on by the Bay Area's Indigenous peoples, past and present. The Ohlone are the predominant Indigenous group of the Bay Area, including the Ramaytush of the San Francisco Peninsula, and the Muwekma Tribe throughout the region. Other Indigenous groups include the Graton Rancheria community (Coast Miwok and Southern Pomo), Kashaya, Patwin, and Mishewal Wappo in the North Bay, and the Bay Miwok in the East Bay.

Communities with environmental justice concerns make up a significant portion of the study area in San Bruno and SSF. Figure 1-2 shows the proximity of these communities relative to the WQCP and project location (gray highlight is area of note). In compliance with the Justice40 Initiative and USACE implementation guidance, the Council on Environmental Quality's Climate and Economic Justice Screening Tool was utilized to map the communities with environmental justice concerns within the South San Francisco area (indicated in gray on Figure 1-2). In addition, the study area also comprises affluent communities adjacent to the communities of concern, such as Burlingame, which would be affected by potential sewage as well.

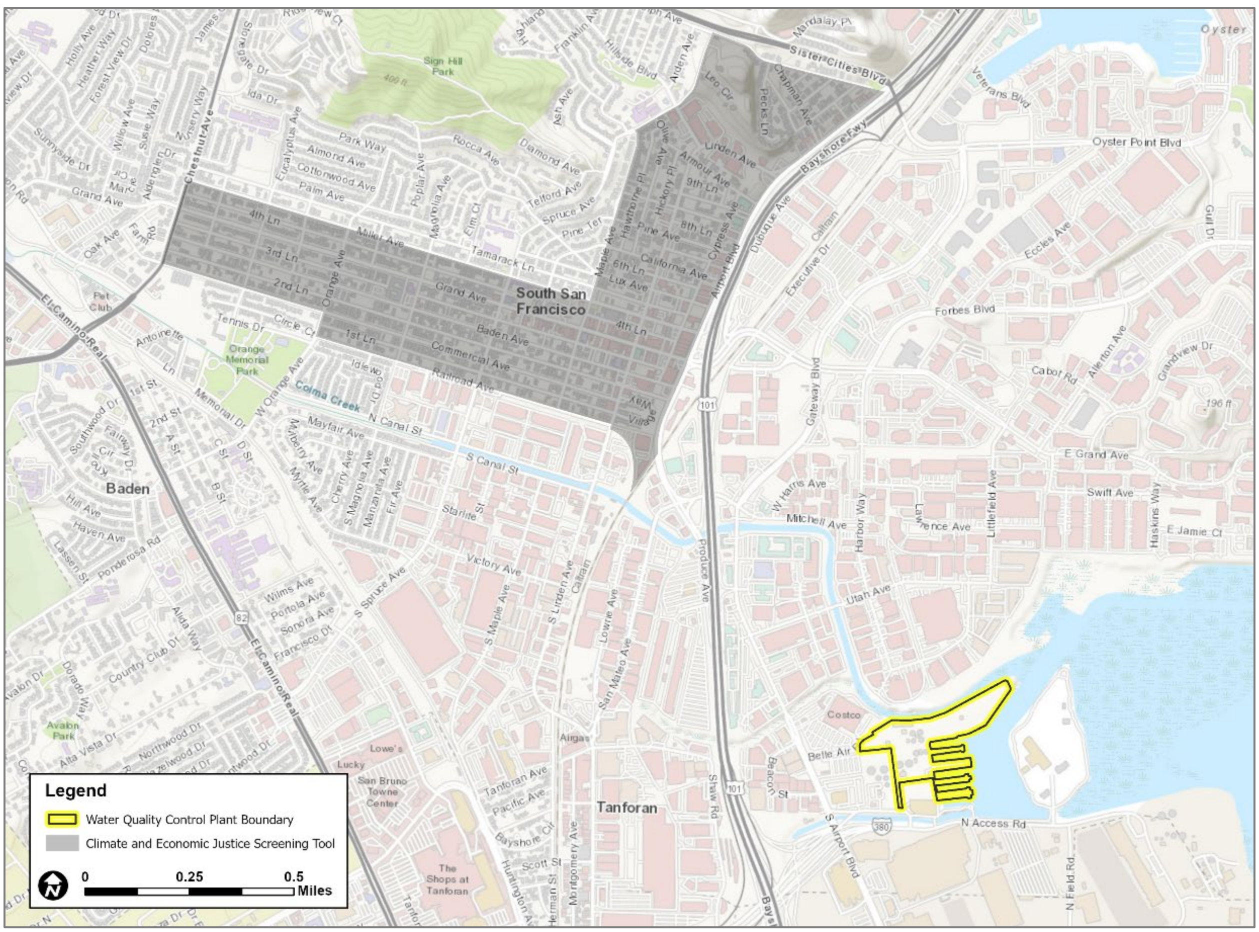

Figure 1-2. Communities with environmental justice concerns (shaded gray) within the vicinity of the WQCP (outlined in yellow). Climate and Economic Justice Screening Tool Data (https://screeningtool.geoplatform.gov/en)

The study area includes the immediate vicinity of the WQCP, which services an area with over 165,000 full time residents and spanning several municipalities, plus the daily population of San Francisco International Airport (SFIA or SFO) (Figure 1-3).

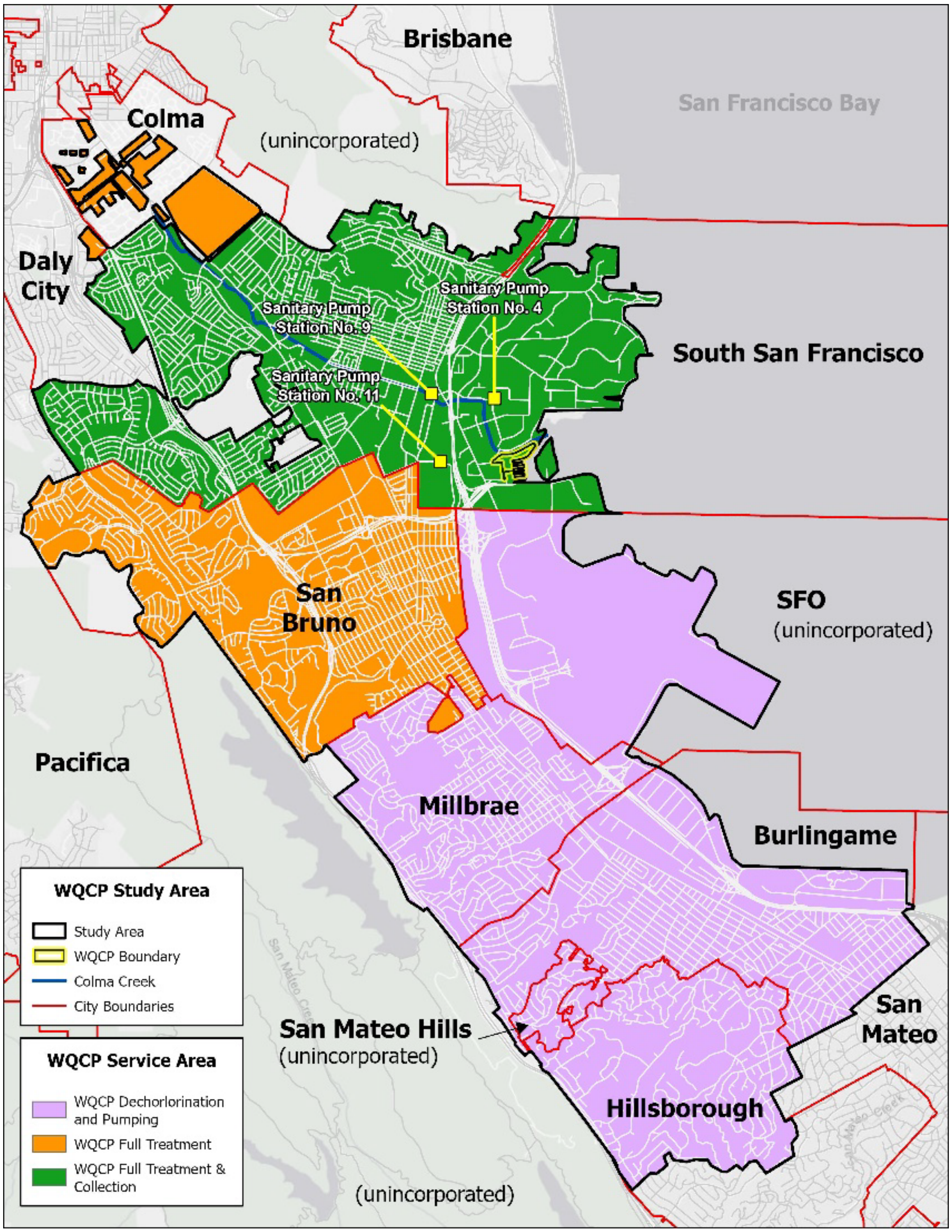

Figure 1-3. Study area.

Figure 1-3 shows the WQCP and the three pump stations which pump directly to the plant, namely Pump Stations 4, 9, and 11. The WQCP is located along Lower Colma Creek, at the confluence to the San Francisco Bay. The pink areas in Figure 1-3 have alternate wastewater treatment plants that they utilize but rely on the WQCP for pumping and dechlorination services. The remaining green areas in Figure 1-3 are fully reliant on the WQCP for collection and full treatment of wastewater, while the orange area relies on the WQCP for full treatment but has a separately operated collection system. This is discussed in more detail in Section 2.1.

The finger piers south of the main WQCP facilities (Figure 1-1) were formerly utilized for ship building and now serve as overflow parking to Park SFO, which rents space just south of the plant. Shell Oil, Peninsula Truck Rental, and Costco are neighbors of the plant to the west. The San Francisco Bay Trail runs along the opposite bank of Lower Colma Creek from the WQCP and crosses the creek via a bridge just northwest of the plant, circling up and around Costco, along South Airport Boulevard, and east along North Access Road before rejoining the Bay coastline south of the plant at the southern terminus of the current trail.

The study area includes all areas with potential impacts and benefits from an implementation of the project. For this study, the study area includes the WQCP, pump stations 4, 9, and 11, the entire service area of the WQCP pictured in Figure 1-3 and the aquatic environment in nearby Colma Creek and adjacent San Francisco Bay that could be impacted by emergency raw sewage releases associated with coastal flooding impacts to the WQCP.

1.3 Study Authority

This study is being conducted under the Section 103 Authority of the CAP, authorized under the River and Harbor Act of 1962 (P.L. 87-874), as amended. The CAP is a standing authority from Congress to study, formulate a recommended plan, and construct projects that are of limited complexity and are within the federal spending limits established for each section of the authority. In this case, the federal spending limit for Section 103 is $10 million from plan development to construction. CAP projects are intended to provide straightforward solutions to simple water resources problems through smaller-scale projects than those developed under a larger-scale feasibility study process. Projects implemented under the CAP Section 103 are formulated to protect public and private properties against damages caused by extreme water levels related to coastal storms[1]. Features of these projects may include structural measures (e.g., seawalls, groins, breakwaters) and/or nonstructural measures (e.g., floodproofing, elevation, and relocation of structures).

The federal interest determination to continue to the feasibility phase was confirmed on 27 August 2019. A feasibility cost sharing agreement was signed with the non-federal sponsor on 25 November 2020, which initiated the feasibility study phase of this project.

[1] Per Engineering Pamphlet (EP) 1105-2-58 on the Continuing Authorities Program, Specific Guidance for Section 103, paragraph 30 (March 2019)

1.4 Non-Federal Sponsor and Cost Sharing

The feasibility study is cost shared 50/50 between the USACE and the City of SSF, the non-federal cost sharing sponsor. Design and Implementation (D&I) of the project will be cost shared 65 percent federal and 35 percent non-federal.

1.5 Relevant Prior Studies and Reports

The following reports and studies were reviewed and included in the decision-making process.

1. The WQCP is one of the most critical infrastructure assets to the region and was identified as a Risk Class 3 Vulnerable Asset in the 2018 County of San Mateo Sea Level Rise Vulnerability Assessment (County of San Mateo, 2018). This analysis found the adaptive capacity of the plant to be low, with no other plant to treat the wastewater in this area, and both the primary and backup power sources vulnerable to flooding. It further concluded that a loss of power would cause the plant to shut down completely, resulting in saltwater intrusion as well as unsanitary discharges.
2. The Final Report (February 2020) on Sea Level Rise Vulnerability and Consequences Assessment by the City and County of San Francisco (City and County of San Francisco, 2020) assessed the vulnerability and consequences to wastewater treatment plants and pump stations in San Francisco, north of the study area.
3. San Bruno Creek/Lower Colma Creek Resiliency Study Final Report, prepared for SFO and the Coastal Conservancy, August 2015 (SFIA, 2015).

2.0 AFFECTED ENVIRONMENT - EXISTING CONDITIONS

This section summarizes the existing conditions of important resources in the study area.

2.1 Surface Water and Other Aquatic Resources

2.1.1 Surface Water

The study area is located on the current shoreline of San Francisco Bay at the confluence with Lower Colma Creek. Lower Colma Creek flows along the northern boundary of the WQCP, with San Francisco Bay along the east side of the WQCP. Lower Colma Creek in the study area is a tidal channel that has water in it year-round. Descriptions of wetlands and Waters of the U.S. are described later in this section and in Appendix B2.

Surface water is affected by climate change beyond sea level rise impacts. This can include sediment availability reduction, changes in freshwater flows, increase in nonnative species, and increased urbanization can affect surface water volumes and flows. Hazardous materials and contaminants could enter the surface water flow if overland flooding occurs as a result of sea level rise or coastal storms, especially if the pump stations and wastewater treatment plant are impacted. Surface water flooding could enter buildings and facilities, causing damage as well as impairing infrastructure and operations of emergency and medical services. If operations are impacted at the WQCP, sewage could backflow and enter surface water flooding in the streets. Lower Colma Creek currently has a TMDL listing for trash pollution.

2.1.2 Groundwater

Groundwater is a valuable resource and is present in alluvial groundwater basins. The study area is entirely within the Westside Groundwater Basin (Figure 2-1). Along the San Francisco Bay and Pacific Ocean shorelines as well as adjoining flatlands, historic high groundwater levels are shallow (0–10 feet below the surface) reflecting the neighboring open water (Appendix I). However, groundwater may fluctuate over time due to rains, tides, nearby construction, irrigation, and other man-made and natural influences. Based on geotechnical borings conducted in the past (Appendix I) groundwater near the northern portion of the site (along the creek) was encountered at depths of about 9–15 feet deep below ground surface and groundwater in the southern portion of the site was encountered deeper (about 30 feet below the ground) than the areas adjacent to the creek and the Bay.

Sea level rise is anticipated to increase the groundwater table and could have several impacts to groundwater resources in the County, especially in areas where municipal water supplies depend on groundwater (County of San Mateo, 2018). In the study area, sea level change poses a limited risk to municipal supply wells due to their deep screening depths, the presence of shallow confining layers, and the distances of supply wells from the Bay. Groundwater is also not the primary resource for the potable water supply in the County and the closest water supply well is approximately a mile from the WQCP on the west side of Highway 101. Groundwater flow in coastal aquifers could be affected by sea level rise, as an increase in water table elevation may result in basement flooding and compromised septic systems. It could also increase groundwater discharge to streams and result in local changes in the freshwater-saltwater interface (USGS, 2014). A recent study found that this area could be vulnerable to groundwater flooding assuming 1 m of SLR by 2100 to 2150 (Plane et al., 2019). However, the WQCP already has wells and infrastructure that pump to remove at most 20-50 gpm of groundwater for about 10 minutes per day in the peak winter months. The NFS stated it would not be difficult to increase their groundwater pumping to handle 1 m increase of groundwater flooding due to SLR over the next 100 years.

Land subsidence is not a concern. Santa Clara Valley Water (SCVW) conducted benchmark elevation surveys in 2019 which include surface elevation data from 138 benchmarks to evaluate the spatial variability of land subsidence. The survey results revealed that subsidence did not exceed 0.01 feet per year (SCVWD, 2019).

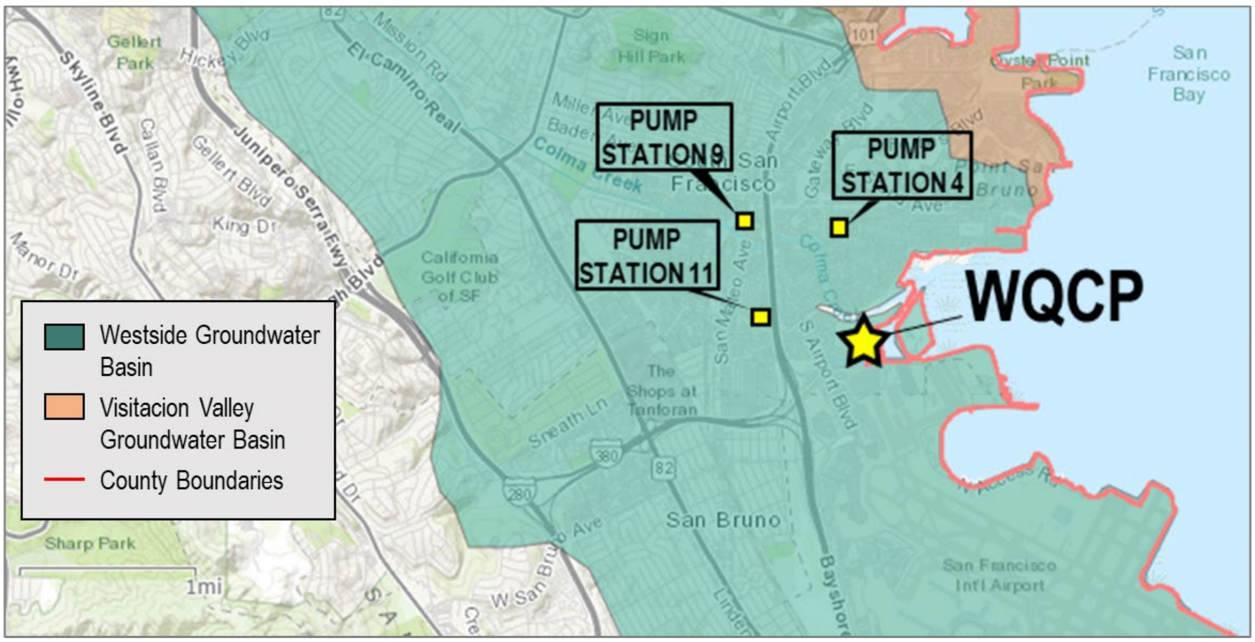

Figure 2-1. Groundwater basins in the vicinity of the Study Area.

2.1.3 Floodplains and Historic Flooding

Periodic flooding occurs in South San Francisco but is generally confined to certain areas along Lower Colma Creek north of the project site. The water levels in Lower Colma Creek are highly influenced by both tidal action and storm events. Mean Sea Level (MSL) is 3.22 ft (NAVD88) with a Mean Range of Tide (MN) of 6.37 ft NAVD88 (Port of Redwood City NOS Station 9414523). The project site is located within a 1 percent annual exceedance probability (AEP) floodplain, colloquially referred to as the 100-year floodplain, designated by the Federal Emergency Management Agency (FEMA, 2019). The FEMA maps reviewed in a recent flood study (Schaaf and Wheeler, 2012) indicate that the 1 percent AEP event occurring at high tide would raise water levels to 9.7 feet NAVD88 above mean sea level. The Maintenance Building at the WQCP lies at an elevation of approximately 12.82 feet NAVD88 (Carollo Engineers, 2010). While the water level is not regularly monitored in the stretch of the creek bordering the project site, near flooding conditions have been observed outside the Maintenance Building (Carollo

Engineers, 2010). As recently as 13 October 2009, the water level was measured to be 1.6 ft above the 1 percent AEP flood level (11.3 ft NAVD88 above mean sea level), which is approximately 1.5 feet below the Maintenance Building's foundation elevation. The WQCP is not substantially higher than potential flooding events (Figure 2-2).

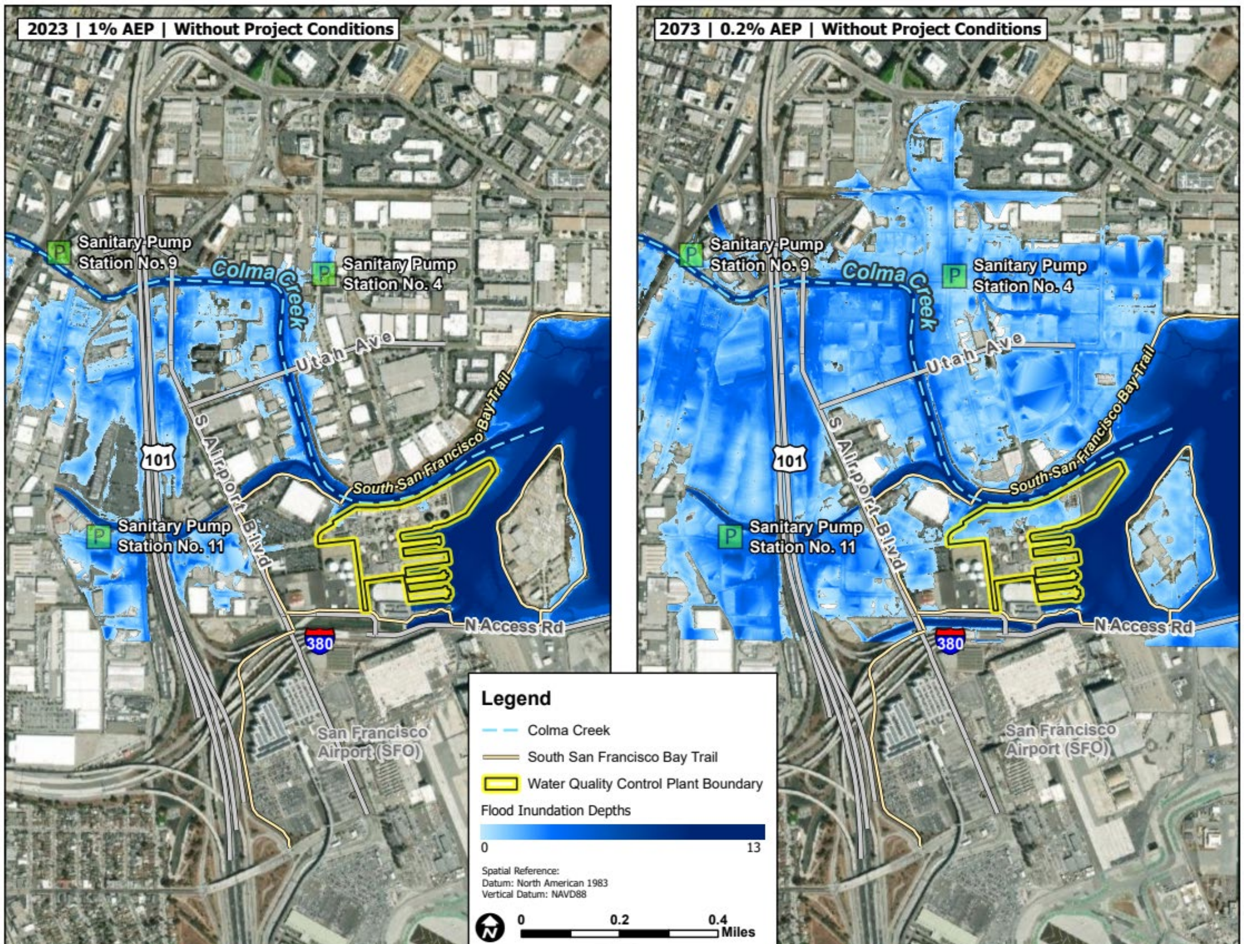

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Figure 2-2. Base year (2023) 1% AEP Flood Inundation (left) versus Future year (2073) 0.2% AEP Flood Inundation with Intermediate SLR (right) in existing (without project) conditions.

Pump stations 9 and 11 were determined to not be at risk of flooding due to their high structure elevations (Figure 2-3 and Figure 2-4). During the field survey conducted on 30 September 2021, the structure elevation of Pump Station 9 was found to be 13.58 ft NAVD88 and the structure elevation of Pump Station 11 was found to be 12.7 ft NAVD88. Both elevations are greater than the future year 2073, 0.2 percent AEP event with intermediate sea level rise, extreme tide elevation of 12.34 ft NAVD88. However, Pump Station 4 was surveyed to have a structure elevation of 10.91 ft NAVD88, leaving it vulnerable to an extreme tide elevation of 11.24 ft NAVD88 that occurs for a future year 2073, 1 percent AEP event with intermediate sea level rise (Figure 2-5). If sea levels rise on the high curve, then there may be coastal flood risk warranting further evaluation at Pump Stations 9 and 11 around 2070, if no regional CSRM solution is in place.

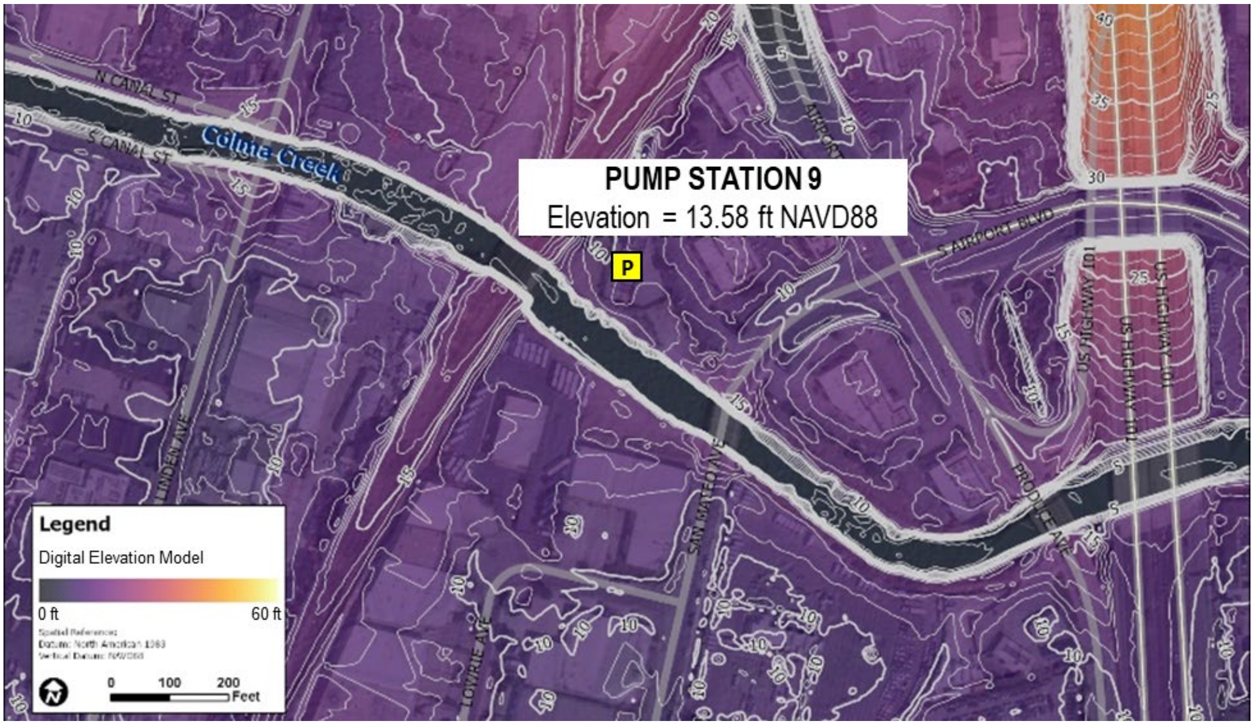

Figure 2-3. Elevation of Pump Station 9 (13.58 ft NAVD88) relative to the surrounding topography.

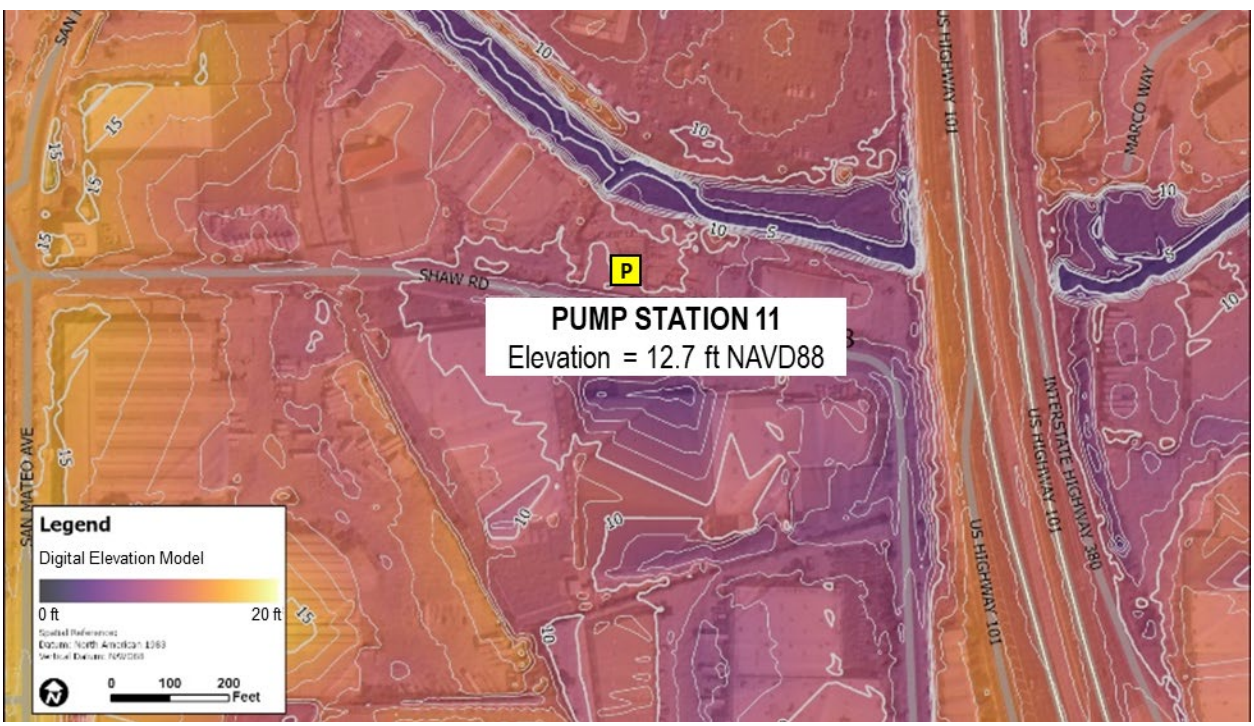

Figure 2-4. Elevation of Pump Station 11 (12.7 ft NAVD88) relative to the surrounding topography.

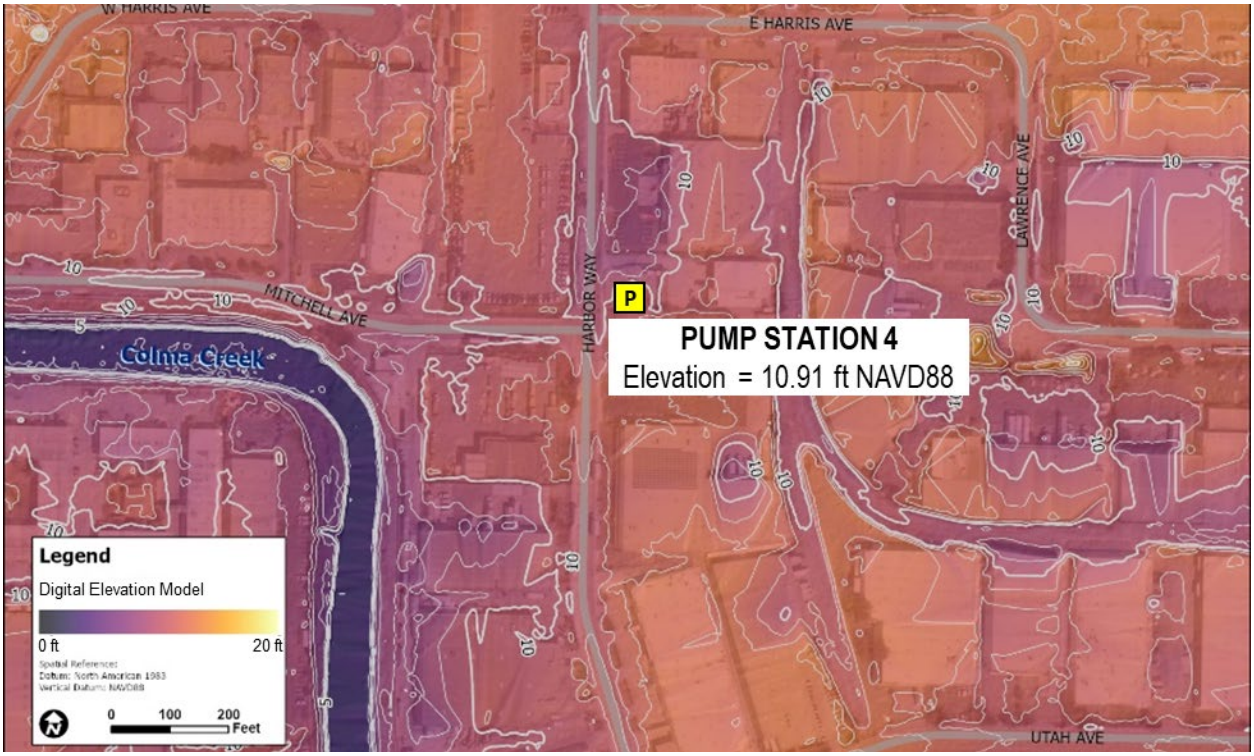

Figure 2-5. Elevation of Pump Station 4 (10.91 ft NAVD88) relative to the surrounding topography.

See Figure 3-16 for a comparison of the critical elevations of Pump Station 4 and the WQCP to 1 percent and 100 percent AEP events. Figure 3-3 shows where the low spots are along the perimeter of the WQCP area.

2.1.4 Wetlands and Waters of the U.S.

The WQCP is on the site of former marshes and Baylands. There was also an island that likely provided high and dry ground during the WQCP's construction. Many of these former wetlands have been filled in and had their configuration changed as development in the area progressed. The extent of these former Baylands relative to WQCP and three pump stations is shown in Figure 2-6.

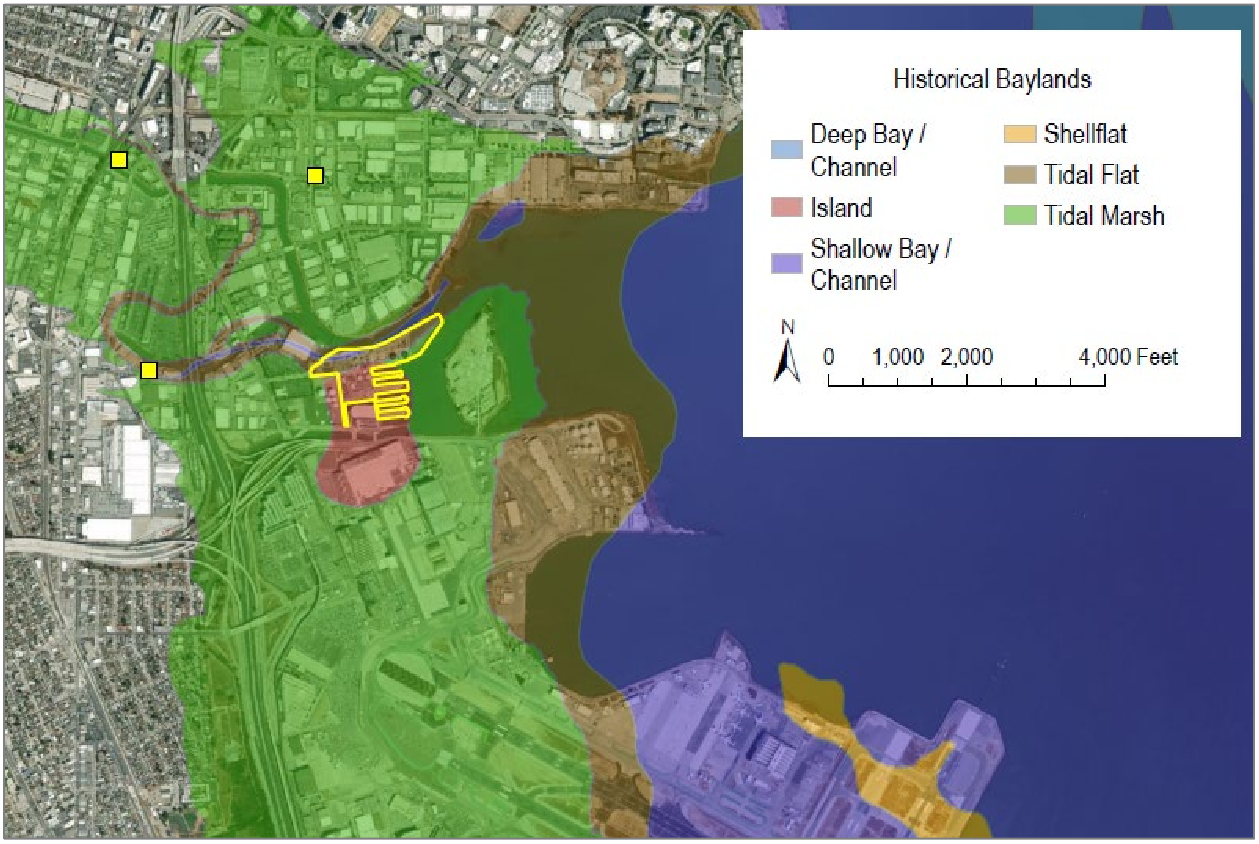

Figure 2-6. Historical Baylands in the vicinity of the study area (WQCP and three pump stations that pump directly to the plant shown for context [yellow]).

As the study area is located on the current shoreline of the Bay, there is a considerable amount of USACE jurisdictional wetlands and Waters of the U.S. nearby. A wetland delineation[2] was conducted for an approximate 100-acre study area (Appendix B2) to supplement a previously conducted wetland delineation (Horizon, 2015). In total, the wetland delineation identified approximately 14 acres of jurisdictional wetlands and non-wetland waters of the U.S. in the study area, which may be subject to regulation under Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act if impacted (Figure 2-7 and Appendix B2).

[2] While the recent Supreme Court ruling narrowed the definition of jurisdictional waters, using the prior definition in the absence of updated guidance is reasonable and would not affect the ultimate conclusion regarding impacts to jurisdictional waters.

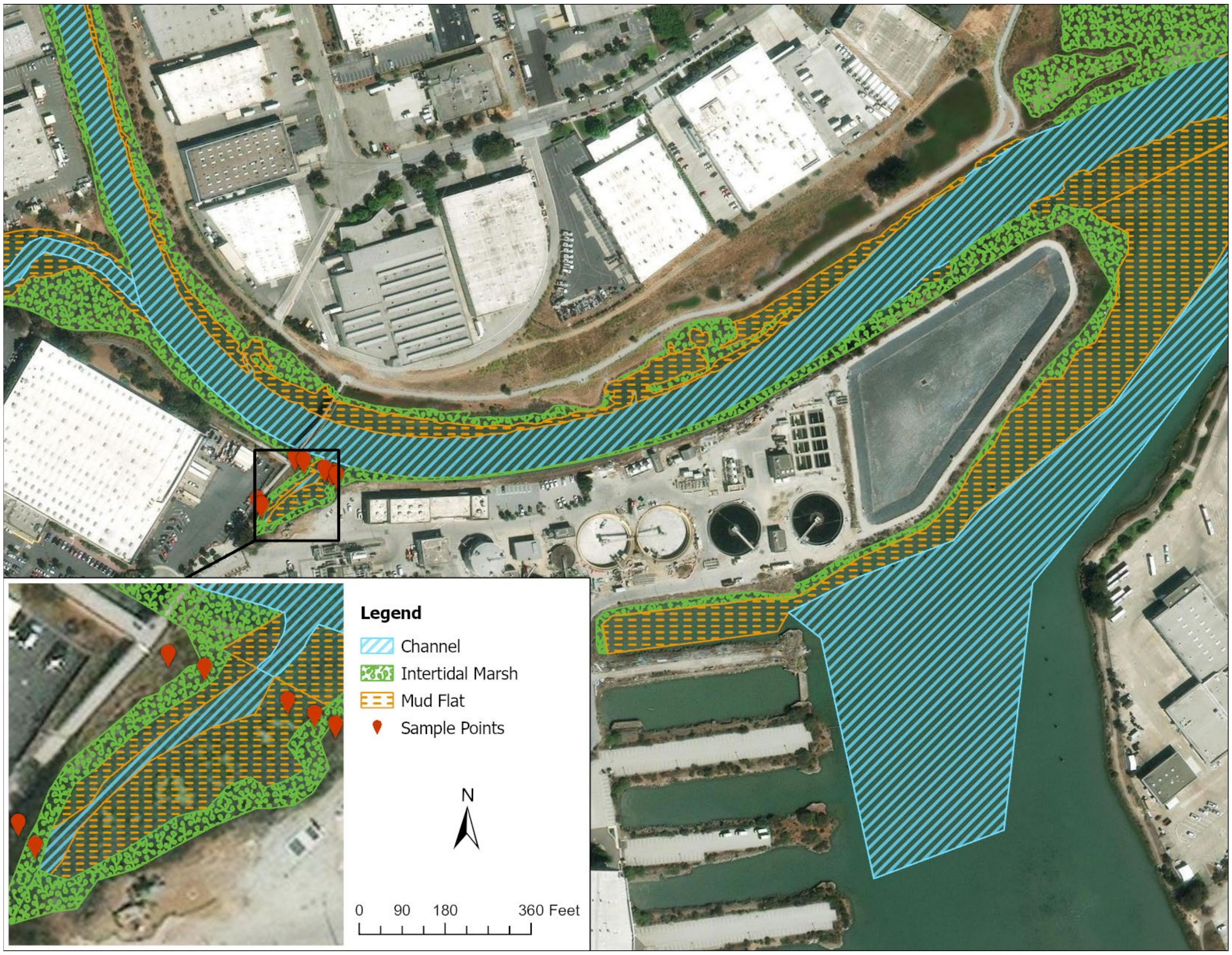

Figure 2-7. Wetlands and Waters of the U.S. in the vicinity of the study area.

2.1.5 Wastewater Facility

The WQCP is located on the shoreline of the Bay, just north of SFO and south of Lower Colma Creek. The WQCP lies on a peninsula with protected inlets of the Bay to the east and south. The plant site consists entirely of previously developed or landscaped areas with mostly industrial land use in the vicinity such as petroleum storage, warehousing, shipping, and light manufacturing (BCDC, 1998).

The current average dry weather flow through the plant is 7 million gallons per day (MGD) with peak wet weather flows of over 60 MGD. The permitted average dry weather flow capacity is 13 MGD (Carollo Engineers, 2011). Wastewater treatment processes at the plant include screening and grit removal, primary clarification, secondary treatment by an activated sludge process, secondary clarification, disinfection, and dechlorination. Much of the treatment infrastructure components and their associated utilities (high voltage power cables, etc.) are located underground and are therefore vulnerable to surface water flooding. These include expensive electronic control systems and other components essential to the plant's operation. The biosolids that the plant generates are concentrated using dissolved air flotation thickeners, anaerobically digested, and dewatered with belt filter presses. Biosolids are hauled from the plant and used as alternative daily cover at the Potrero Hills Landfill in Suisun City, California.

The Cities of South San Francisco and San Bruno are members of the North Bayside System Unit (NBSU), a joint powers authority that also includes the Cities of Burlingame and Millbrae and SFO. Treated, disinfected wastewater from the plant enters the NBSU force main and combines with treated, disinfected wastewater from other NBSU members.

In addition to processing wastewater from the cities of South San Francisco and San Bruno, and the Town of Colma, the plant provides dechlorination treatment of the chlorinated effluent from the cities of Burlingame and Millbrae and SFO prior to discharging the treated wastewater into Lower San Francisco Bay. The wastewater discharge is regulated by the National Pollutant Discharge Elimination System (NPDES) permit No. CAS0038130, Order No. R2-2008-0094 issued to the Cities of South San Francisco and San Bruno by the SFBRWQCB.

When the WQCP's effluent flow exceeds 35 MGD, the system pumps fully treated effluent to a 7 million gallon effluent storage pond. During extreme wet weather events, the onsite effluent storage pond can exceed capacity and an emergency discharge can occur through the nearshore outfall with adequate notice to the RWQCB. Also, if significant WQCP systems were to fail or the NBSU force main were to be damaged, disinfected effluent could be dechlorinated and discharged to the nearshore outfall. The outfall discharges to Lower Colma Creek adjacent to the WQCP.

The use of the nearshore discharge has occurred only four times since 2005 when the WQCP built its 7 million gallon holding storage pond to help prevent this and store more water coming into the plant (Table 2-1). This outfall was most recently used in October and again in December 2021. In both cases, use of the nearshore discharge was necessary to protect staff, plant infrastructure and prevent sanitary sewer overflows in the collections systems. Failure to control the release of treated wastewater during this high flow period and route it to Lower Colma Creek would have flooded the 480-volt electrical substation area at the NBSU Effluent Pump Station. Flooding in this area would create a dangerous electrical hazard to plant staff and damage vital pumping facilities. There were no feasible alternatives to this bypass due to the storm's severity. Emergency discharges of blended effluent are expected to become more frequent given future climate change projections for SLR and resulting increased coastal storm intensity.

Table 2-1. Summary of emergency discharge events requiring the use of the WQCP nearshore outfall at Lower Colma Creek.

Date	Total Influent Flow (MG)	Peak Influent Flow (MGD)	Total Approximate Effluent Volume (M gallons)	24-hr Cumulative Rainfall (inches)*
Jan. 25, 2008	30	57	3.78	3.31
Dec. 11, 2014	36.04	58.16	4.92	3.81
Oct. 24, 2021	42.51	58.34	5.34	4.92
Dec. 13, 2021	33.79	52.79	0.14	2.90

** National Oceanic and Atmospheric Administration (NOAA) and National Weather Service (NWS) data at the SFO weather station for the storm event.*

2.2 Climate Change and Greenhouse Gas Emissions

On January 9, 2023, the CEQ released National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (GHG Guidance) (CEQ 2023). This guidance provides details for how federal agencies can incorporate GHG and climate change considerations into the NEPA process, including assessing and reducing impacts from GHG emissions or incorporating climate resiliency considerations into alternatives. Although the GHG Guidance is considered "interim," it is effective immediately, while CEQ seeks public comment on the guidance. As discussed in this guidance, when conducting climate change analyses in NEPA reviews, agencies are recommended to consider the potential effects of a proposed action on climate change, including by assessing both direct and indirect GHG emissions and reductions from the proposed action, quantifying the baseline (no-action) emissions, and the effects of climate change on a proposed action and its environmental impacts. The GHG guidance further recommends that GHG emissions should be quantified for the gross and net emissions for each chemical compound (i.e., methane, nitrous oxide, etc.) and summarized as carbon dioxide equivalent (CO2e) and social cost of greenhouse gases.

Despite CEQ guidance for federal agencies, there are still no established federal thresholds for greenhouse gas emissions to evaluate impacts that could cause significant effects through climate change. Therefore, the evaluation of project related effects to climate change and establishment of thresholds of significance are within the discretion of the lead NEPA agency. In order to determine significance for this action, a qualitative assessment which is contextualized by state and local climate action plans and greenhouse gas reduction goals will be used. BAAQMD CEQA Guidelines includes GHG thresholds of significance with a threshold of 1,100 metric tons per year for development projects under their jurisdiction, with no threshold established for construction related emissions (BAAQMD 2022). The proposed thresholds for land use projects are designed to address operational GHG emissions which represent the vast majority of project GHG emissions (BAAQMD 2022). For these reasons, while relevant as a general point of comparison, these thresholds are not applicable to this project.

2.2.1 Climate Change and GHG Reduction Goals

In order to better provide context for anticipated project emissions, climate change and GHG reduction goals from federal, state, and local governments can be used to qualitatively compare how emissions from project alternatives can either help or prevent climate and GHG reduction goals from being reached. To this end, several climate and GHG reduction goals have been identified and summarized below.

FEDERAL CLIMATE CHANGE AND GHG REDUCTION GOALS

The federal government uses four main documents to communicate the "…vision for [federal] climate strategy and emissions pathways," including the *U.S. National Climate Strategy, Long-Term Strategy of the United States to Reach Net-Zero Emissions by 2050, The U.S. National Communication and Biennial Report, and the U.S. Adaptation Communication*. For consideration in how project GHG emissions could conflict or facilitate the overall federal vision, The Long-Term Strategy to reach net-zero emissions (i.e., carbon neutrality) by 2050 is pertinent for our discussion. This Long-Term Strategy depends on reducing GHG emissions as well as removing (sequestering) CO2 emissions from the atmosphere across a wide range of sectors from land use to transportation, energy production and technology, providing a holistic approach to achieving net-zero emissions, which is often necessary. Evaluation for how project emissions may conflict or facilitate the Federal Government's Long-Term Strategy will be given in the results of the GHG analysis in Section 4.2.4.

CALIFORNIA CLIMATE CHANGE AND GHG REDUCTION GOALS

The State of California has an intricate framework of policy, regulations, and laws which are driving the state toward its ultimate goal of net-zero GHG emissions (i.e., carbon neutrality) by the year 2045 (SOC 2018). California State's climate goals are outlined in Executive Order B-55-18 and are more aggressive than the federal goal to reach net-zero (i.e., carbon neutrality) by 2050, per the Long-Term Strategy, and it provides even more complexity over various sectors in order to holistically achieve net-zero GHG emissions. Evaluation for how project emissions may conflict with or facilitate California's 2045 carbon neutral goal will be given in the results of the GHG analysis in Section 4.2.4.

LOCAL CLIMATE CHANGE AND GHG REDUCTION GOALS

The Local climate change goals from the City of San Francisco (City) are included in the City's Climate Action Plan and include the methods and strategies for achieving net-zero carbon emissions (i.e., carbon neutral) by the year 2040 (COS 2021). The City's goal for carbon neutral emissions is even more ambitious than California State's goal of 2045, and the Federal Government's goal of 2050. Evaluation for how project emissions may conflict with or facilitate the City's 2040 carbon neutral goal will be given in the results of the GHG analysis in Section 4.2.4.

2.2.2 Baseline Conditions for Climate Change and GHG Emissions

The current climate for South San Francisco is classified as warm and temperate, with an average temperature of 56.4 degrees Fahrenheit (F) and 22.9 inches of annual average rainfall. The winters are rainier than the summers and the least amount of rainfall occurs in July, while the greatest amount of precipitation occurs in February, with an average of 4.6 inches. Temperatures are highest on average in September, at around 62.7 degrees F, with the lowest average temperatures in the year occurring in January when it is around 49.2 degrees F (Climate-data.org, 2022). However, this current climate is expected to change due to global warming.

"Global warming" and "climate change" are terms commonly used to describe the increase in the average temperature of the earth's near-surface air and oceans since the mid–20th century. Natural processes and human actions have been identified as affecting the climate. The Intergovernmental Panel on Climate Change (IPCC) has concluded that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward.

However, increasing GHG concentrations in the atmosphere resulting from human activity since the 19^{th} century, such as fossil fuel combustion, deforestation, and other activities, are believed to be a major factor in climate change. GHGs in the atmosphere trap heat by impeding the exit of solar derived radiation that is otherwise reflected or re-radiated back into space—a phenomenon referred to as the "greenhouse effect." Some GHGs occur naturally and are necessary for keeping the earth's surface habitable, such as water vapor. However, increases in the concentrations of other greenhouse gases in the atmosphere during the last 100 years such as methane and nitrous oxide have trapped additional solar radiation, intensifying the natural greenhouse effect and resulting in an increase in global average temperature which has increased at an average rate of 0.17 F per decade since 1901 (EPA, 2022).

Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are the principal GHGs emitted which contribute to global warming. When concentrations of these gases exceed historical concentrations in the atmosphere, the greenhouse effect is intensified. CO_2, methane, and nitrous oxide occur naturally and are also generated by human activity. Emissions of CO_2 are largely byproducts of fossil fuel combustion, while methane results from off-gassing, natural gas leaks from pipelines and industrial processes, and incomplete combustion associated with agricultural practices, landfills, energy providers, and other industrial facilities. Nitrous oxide emissions are also largely attributable to agricultural practices and soil management. CO_2 sinks (i.e., absorb more carbon from the atmosphere than they release) include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution, and are two of the largest reservoirs of CO_2 sequestration. Other human-generated GHGs include fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, which have much higher potential for heat absorption than CO_2 and are byproducts of certain industrial processes.

CO_2 is the reference gas for climate change, as it is the GHG emitted in the highest volume. The effect of each GHG on global warming is the product of the mass of their emissions and their global warming potential (GWP). The GWP of a gas indicates how much the gas is predicted to contribute to global warming relative to the amount of warming that would be predicted to be caused by the same mass of CO_2. For example, methane and nitrous oxide are substantially more potent GHGs than CO_2, with GWPs of 25 and 298 times that of CO_2 respectively, which has a GWP of 1. In order to quantify these emissions as one quantity, they were converted to carbon dioxide equivalent units (CO_2e) using their global warming potential and then added together to get the total. Using the equation below and the global warming potential of each greenhouse gas per the Code of Federal Regulations Title 40, Subpart A of Part 98 the total CO_2e from each project alternative were calculated. Please see Section 4.2.4 for the results of this calculation.

$$CO_2eq = xCO_2 + yN_2O + zCh_4$$

Where:

x = 100 year global warming potential of carbon dioxide = 1
y = 100 year global warming potential of nitrous oxide = 298
z = 100 year global warming potential of methane = 25

Baseline Effects of Global Climate Change

Among the potential global warming impacts in California are loss of snowpack, sea level rise, more extreme-heat days per year, an increase in the number of days with high ground-level ozone, larger forest fires, and increased drought in some parts of the state. Secondary effects are likely to include the displacement of thousands of coastal businesses and residences (as a result of sea level rise), impacts on agriculture, changes in disease vectors, and changes in habitat and biodiversity. As the CARB 2008 Scoping Plan noted, when enacting Assembly Bill 32, the Global Warming Solutions Act, the California Legislature found that global warming would cause detrimental effects to some of the state's largest industries—agriculture, winemaking, tourism, skiing, commercial and recreational fishing, and forestry—and to the adequacy of electrical power generation (CARB 2008).

Climate change is expected to affect diverse types of ecosystems. As temperatures and precipitation levels change, seasonal shifts in vegetation will occur; this could affect the distribution of associated flora and fauna species. The IPCC states that "a large fraction of both terrestrial and freshwater species faces increased extinction risk under projected climate change during and beyond the 21st century, especially as climate change interacts with other stressors, such as habitat modifications, over exploitation, and invasive species" (IPCC 2014a). Forest die-back poses risks to carbon storage, biodiversity, wood production, water quality, and economic activity. Wildfires, an important control mechanism in many ecosystems, are becoming more severe and more frequent, making it difficult for native plant species to repeatedly re-germinate. Continued emissions of GHGs will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive, and irreversible impacts for people and ecosystems (IPCC, 2014b).

Warming of the atmosphere would be expected to increase smog and particulate pollution, which could adversely affect individuals with heart and respiratory problems, such as asthma. Extreme heat events would also be expected to occur with more frequency and could adversely affect the elderly, children, and people experiencing homelessness. Finally, the water supply impacts and seasonal temperature variations expected as a result of climate change could affect the viability of existing agricultural operations, making the food supply more vulnerable (U.S. Global Climate Change Research Program, 2016). Climate change will also likely increase the risk of vector-borne infectious diseases, particularly those found in tropical areas and spread by insects such as malaria, dengue fever, and encephalitis; these health effects would largely affect tropical areas in other parts of the world, but effects would also be felt in California.

U.S. Greenhouse Gas Emissions

In 2020, the United States emitted about 5,222 $MMTCO_2e$. Emissions decreased by 11 percent from 2019 to 2020 (after accounting for sequestration from the land sector). The primary driver for the decrease was an 11 percent decrease in CO_2 emissions from fossil fuel combustion. This decrease was primarily attributable to a 13 percent decrease in transportation emissions driven by decreased demand as a result of the ongoing COVID-19 pandemic. Emissions from the electric power sector also decreased 10 percent, reflecting both a slight decrease in demand from the COVID-19 pandemic and a continued shift from coal to less carbon intensive natural gas and renewables.

Of the major sectors nationwide, transportation accounts for the highest volume of GHG emissions at approximately 27 percent of the total, followed by electricity, industry, commercial and residential, and agriculture contributing 25 percent, 24 percent, 13 percent and 11 percent of the total, respectively (USEPA, 2022a).

2.2.3 Social Cost of Greenhouse Gas Emissions

Per the January 9, 2023 CEQ-issued "NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change", the calculation of social cost of greenhouse gas (SC-GHG) is recommended to be included in NEPA studies in order to disclose the potential future costs to society stemming from the carbon emitted by the project. Per this guidance, SC-GHG is not required for use in a cost-benefit analysis and was not used in the economics analysis for computing a cost-benefit ratio though is included in order to further contextualize the anticipated emissions from each project alternative and provide an additional metric for alternatives comparison (CEQ, 2023). The SC-GHG was calculated for each project alternative by summing the individual emissions from the major greenhouse gas pollutants CO, CO_2, CH_4, and N_2O, and then multiplying by the social cost of each pollutant for the year in which they were generated using the tables from the Interagency Working Group on Social Cost of Greenhouse Gases (IWGSC) report as established by Executive Order 13990 to provide interim updated social costs values. Since the IWGSC report only includes tables of social costs up to the year 2050, all social costs calculated for years 2050-2080 used the 2050 value with a 3% discount rate (IWG, 2021). Discount rates are a limit for how much of a resource, in this case additions of GHG emissions to the atmosphere, can be used each year in order to ensure future generations still have some of the resource to use. Discount rates applied to social costs of GHG emissions can be understood by thinking of how using up atmospheric capacity for GHG emissions now would necessitate changes for future generations. A high discount rate is associated with using more of the resource each year and lower social costs in the near-term and leverages higher emissions reductions for future generations whereas a lower discount rate would use less of the resource each year and have higher social costs in the near-term and leverage less emissions reductions on future generations. The below equation was used to calculate social costs:

$$SC - GHG \ = \ CO_2 * SC - CO_2 + CH_4 * SC - CH_4 + N_2O * SC - N_2O$$

Where:

$SC - GHG = the\ social\ cost\ of\ greenhouse\ gas\ emissions\ in\ dollars$
$CO_2 = total\ carbon\ dioxide\ emissions\ in\ metric\ tons$
$CH_4 = total\ methane\ emissions\ in\ metric\ tons$
$N_2O = total\ nitrous\ oxide\ emissions\ in\ metric\ tons$
$SC - CO_2 = social\ cost\ of\ carbon\ dioxide\ (also\ used\ for\ carbon\ monoxide)$
$SC - CH_4 = social\ cost\ methane$
$SC - N_2O = social\ cost\ of\ nitrous\ oxide$

2.3 Soils and Geology

The site is located in a seismically active region of California that is part of the Coast Ranges geomorphic province. This region is characterized by northwest trending valleys and mountain ranges running subparallel to the San Andreas Fault Zone. The closest active fault to the project site is the San Andreas Fault which is located approximately seven miles to the southwest (CGS, 2015). According to the U.S. Geological Survey (USGS) Working Group, the San Andreas Fault and other regional active faults, including the Hayward and Calaveras faults, pose the greatest threat of significant damage in the Bay Area (USGS, 2003). The three faults exhibit strike-slip orientation and have experienced movement within the last 150 years.

Recent studies by the USGS (2008) indicate that there is a 63 percent likelihood of a Richter magnitude 6.7 or higher earthquake occurring in the Bay Area in the next 30 years. The study site could experience a range of ground shaking effects during an earthquake on one of the aforementioned Bay Area faults. Depending on a variety of factors such as distance to the epicenter, magnitude of the event, and behavior of underlying materials, ground shaking could be significant. Seismic shaking of this intensity can also trigger ground failures caused by liquefaction, potentially resulting in foundation damage, disruption of utility service and roadway damage. Considering the close proximity to the Bay margin, the site is underlain by artificial fill, Bay Mud deposits (generally characterized as soft compressible clays with localized sand lenses), and bedrock. Liquefaction potential is generally highest in loose saturated sediments in the upper 50 feet. Based on the preliminary geotechnical report, groundwater is encountered at depths ranging from nine to 29 feet below ground surface (Appendix I). Liquefaction is defined as a loss of strength of saturated cohesionless soil caused by seismic shaking. Soil types most susceptible to liquefaction are loose, saturated silt to fine clean sands. The United States Geological Survey (USGS) has mapped the site area as having quintenary unit artificial fill estuarine mud with a very high potential for seismically induced liquefaction. In general, it is anticipated that liquefaction may occur at some locations. Bay Mud sediments (shells, etc.) and some of the loose and medium dense coarse grain fill and alluvium may liquefy during a large seismic event. A preliminary liquefaction analysis indicates that the site may experience 2 to 6 inches of liquefaction-induced settlement.

The subsurface soil conditions at the project site generally consist of existing fill overlying the soft silty clay known as Young Bay Mud (YBM), which in turn, overlie alluvium deposits. Fill soil encountered in the existing exploratory borings extended to depths ranging approximately from 5 feet to 11 feet. The fill soil generally consists of medium stiff to very stiff lean clay, with a heterogenous mix of dense gravelly sands with varying amounts of silts and clays. The thickness of the YBM underlying the fill soil varies from one area to another, generally, it increases from the inland (Southern) portion of the project site to the Bay and along the Riverbank. Alluvial deposits were encountered beneath the YBM and generally extended to the bedrock depth explored. These deposits generally consist of over-consolidated medium stiff to very stiff lean and fat clay to sandy lean clay with some relatively thin, isolated layers of loose to dense silty sand and clayey sand.

2.4 Biological Resources

2.4.1 Aquatic Resources

Lower Colma Creek in the study area is a tidal channel that has water in it year-round. It has hardened banks that consist of either concrete floodwall or articulated concrete mat revetment, narrow floodplain benches with marsh vegetation and mudflats that are exposed at low tide. Leidy (2007) identifies five fish species that live in Lower Colma Creek, two of which are native (threespine stickleback and staghorn sculpin) and three of which are nonnative (rainwater killifish, western mosquitofish, and yellowfin goby). Insufficient information exists to assess the historical distribution of salmonids in the Lower Colma Creek watershed. The watershed currently does not contain suitable habitat to support salmonids (Leidy et al., 2005). The National Marine Fisheries Service (NMFS) multispecies salmonid recovery plan does not identify Lower Colma Creek as suitable or critical habitat for steelhead, Coho, or Chinook salmon (*Oncorhynchus* spp.). While Lower Colma Creek itself is not designated critical habitat, the waters of the Bay are considered critical habitat for steelhead (Federal Register No. 52488) up to the extent of extreme high tide and critical habitat for green sturgeon (*Acipenser medirostris*) up to the extent of mean higher high water (Federal Register No. 52300). The tidal portion of Lower Colma Creek falls within these limits. Lower Colma Creek has aquatic habitat for benthic invertebrates typical of tidal channels in the Bay Area.

2.4.2 Terrestrial Resources

The project area consists entirely of previously developed or landscaped areas within the existing WQCP and is adjacent to tidal portions of Lower Colma Creek, the San Bruno Slough, the San Bruno Canal and the Bay shoreline. The project site is located in the City of South San Francisco (City) on a peninsula, south of Lower Colma Creek, with protected inlets of the Bay to the east and south. The surrounding land uses are generally industrial in nature, including petroleum storage, warehousing, shipping, and light manufacturing. The proposed project components are not directly located in areas supporting special-status plants or wildlife or their habitat.

2.4.3 Migratory Birds

The San Francisco Bay area is located within the Pacific Flyway. Several migratory birds may be present foraging and/or roosting within or adjacent to the study area in mudflats, marshes, open water, and trees. Characteristic bird species of this area include Canadian geese (*Branta canadensis*), Ross's goose (*Chen rossii*), gulls (*Larus sp.*), terns (*Sterna sp.*), western grebes (*Aechmophorus occidentalis*), sanderlings (*Calidris alba*), and whimbrels (*Numenius phaeopus*), wintering shorebirds (western sand pipers, least sand pipers, willets, long-billed curlews, etc.), avocets, black-necked stilts, migratory passerines, and other species.

Several species of gulls were observed foraging in and around the project site, particularly near the secondary clarifiers; and Canadian geese were observed foraging and nesting in and around the effluent storage basin during a USACE site visit on 18 April 2022.

2.5 Special Status Species

To help determine ESA listed species potentially present on the site, an IPaC Species Search was conducted in November 2021 to determine USFWS-managed species potentially present in the project area (Appendix B8). A Biological Assessment (BA) and Essential Fish Habitat Assessment (EFHA) was prepared to evaluate the potential effects of the proposed action on threatened and endangered species (Appendix B3) that may be present in or adjacent to the study area.

NOAA-NMFS participated in the project as formal cooperating agencies (Appendix B7). USFWS did not engage in formal consultation, but were involved throughout the project including coordination calls and conducting a site visit with USACE staff. During coordination and their review of the project, neither agency identified additional species requiring analysis in this BA or in the Fish and Wildlife Coordination Act Report (Appendix B6).

2.5.1 Threatened and Endangered Species

This section summarizes the information provided in the BA, along with an analysis of whether the respective species is likely to be in the study area is provided below.

California Ridgway's Rail (*Rallus longirostris obsoletus*)

The federal and state listed California Ridgway's rail lives in coastal salt and brackish marshes and tidal sloughs. Year-round residents, Ridgway's rails stay mainly in the upper to lower zones of coastal marshes that are dominated by pickleweed and cordgrass. They feed in the lower marsh zone where tidal sloughs and channels provide important foraging habitat and cover from predators. A small population of the California Ridgway's rail (*Rallus longirostris obsoletus*) was reported from salt marsh habitat of San Bruno Point in 1975, however it is unlikely that the small areas of pickleweed in the project vicinity are sufficient in size to support a local population of this subspecies (CSSF, 1997). Survey results from the 2012 Invasive Spartina Project (ISP) confirm no recent observances of the California Ridgway's rails in or adjacent to the project area (Olofson Environmental, 2012). Survey results were taken from two points near the project area; one in the navigable slough northwest of the project area and the other from Colma

Creek, adjacent to the WQCP. The last observance of a California Ridgway's rail was in 2011 at the navigable slough northwest of the project area. A more recent survey (2018) from BioMaAS, Inc. confirmed that there are no rails currently living in the project area. This status is likely to persist until the native Spartina becomes reestablished in the marshes near the WQCP.

San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)

The San Francisco garter snake is found on the San Francisco Peninsula in San Mateo and Santa Cruz counties. The species inhabits marshlands that border ponds and sloughs, riparian cover along streams, and bordering meadows with scattered brush. Suitable habitat is not available in the project area.

Callippe Silverspot Butterfly (*Speyeria callippe callippe*)

Colonies of the federally endangered callippe silverspot butterfly (*Speyeria callippe callippe*) are known only to exist approximately 2 miles north of the project area within the San Bruno Mountain habitat. Because of the extensive urbanization within its historical range, no suitable habitat remains for the species other than at the two sites at which it is currently known to persist (USFWS, 1997) outside of the project area and butterflies are not expected to be impacted by the proposed action. As such, callippe butterfly is not discussed further in this report.

Steelhead (*Oncorhynchus mykiss*), Central California Coast DPS and Critical Habitat

The NMFS listed the Central California Coast (CCC) steelhead Distinct Population Segment (DPS) as threatened under the federal ESA in 1997. Suitable habitat includes all naturally spawned populations of steelhead in coastal streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers; and tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), exclusive of the Sacramento-San Joaquin River Basin of the California Central Valley. Colma Creek is a tidal channel that has water in it year-round; however, it has hardened banks, bars with marsh vegetation and mudflats that are exposed at low tide. Insufficient information exists to assess the historical distribution of salmonids in the Colma Creek watershed. The watershed currently does not contain suitable habitat to support salmonids (Leidy et al., 2005). However, there could be migrating adults or rearing juveniles that utilize the tidal portions of the creek.

Critical habitat was established for the Central California Coast steelhead DPS on 2 September 2005 (50 C.F.R. 226). Designated critical habitat includes all portions of San Francisco Bay below the ordinary high water line. The designation includes natal spawning and rearing waters, migration corridors, and estuarine areas that serve as rearing areas. In tidally influenced waters, the lateral extent of this critical habitat is defined by the mean higher high water (MHHW) line (NMFS, 2005). One of the primary constituent elements (PCEs) of steelhead critical habitat essential to the conservation of the species is present within the study area (PCE #4). This PCE consists of estuarine areas free of obstruction with water quality, water quantity and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

These features are essential to conservation because without them juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean. Similarly, these features are essential to the conservation of adults because they provide a final source of abundant forage that will provide the energy stores needed to make the physiological transition to fresh water, migrate upstream, avoid predators, and develop to maturity upon reaching spawning areas. Although Colma Creek includes these PCEs for CCC steelhead (albeit in a somewhat degraded form), juvenile steelhead are expected to make limited use of the project area. The habitat along channel margins is often not inundated except during high tides, making the tidal marsh inaccessible much of the time. However, the tidal marshes along these sloughs likely provide cover from predation when submerged during higher tides.

Green Sturgeon, Southern DPS and Critical Habitat

The NMFS listed the Southern DPS (sDPS) of the North American green sturgeon as threatened under the ESA in 2006 (50 C.F.R. 223). Green sturgeon are anadromous fish that spend most of their lives in estuarine or marine waters and return to natal rivers to spawn. Adult southern DPS green sturgeon spawn in the reaches of the Sacramento River watershed with swift currents and large cobble. Adult green sturgeon enter San Francisco Bay between late February and early May, as they migrate to spawning grounds in the Sacramento River (Heublein et al., 2009). Post-spawning adults may be present in San Francisco Bay during the spring and early summer for months prior to migrating to the ocean. Green sturgeon larvae begin feeding approximately 10 to 15 days after hatching, and approximately 35 days later metamorphose into juveniles. After hatching, young-of-the-year (i.e., first-year juvenile) green sturgeon move into the Delta and Estuary where they may remain for 2 to 3 years before migrating to the ocean (Allen and Cech Jr., 2007; Kelly et al., 2007). Sub-adult and non-spawning adult green sturgeon use both ocean and estuarine environments for rearing, foraging, and feeding on benthic invertebrates, crustaceans, and fish (Moyle, 2002). The actual historical and current distribution of where this species spawns is unclear because the original spawning distribution may have been reduced due to harvest and other anthropogenic effects and because they make non-spawning movements into estuaries during summer and fall (Lindley et al., 2008). Actual spawning has been documented (by the presence of juveniles) in the Rogue (Erickson et al., 2002), Klamath, Trinity (Scheiff et al., 2001), Sacramento, and Eel rivers (Lindley et al., 2008). There is no evidence that green sturgeon have utilized Colma Creek; however, there is a potential for the species to be present in Bay waters surrounding the study area.

Critical habitat for Southern DPS of green sturgeon was designated on 9 October 2009 and includes all tidally-influenced waters of the San Francisco Bay (NMFS, 2009). The PCEs essential for the conservation of the Southern DPS of green sturgeon that may occur in estuarine habitats within the Action Area include:

1. Abundant prey items within estuarine habitats and substrates for juvenile, subadult, and adult life stages.
2. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages.
3. A diversity of depths necessary for shelter, foraging, and migration of juvenile, subadult, and adult life stages.
4. Sediment quality (i.e., chemical characteristics) necessary for normal behavior, growth, and viability of all life stages.

Similar to the situation for steelhead, the PCEs for green sturgeon in the project area are in a somewhat degraded state relative to their habitat needs.

Essential Fish Habitat (EFH)All subtidal and intertidal habitats within Lower Colma Creek, are designated as EFH for several of species federally managed under the following three Fishery Management Plan (FMPs):

- Coastal Pelagic FMP – northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), mackerel, squid
- Pacific Groundfish FMP – leopard shark (*Triakis semifasciata*), English sole (*Parophrys vetulus*), starry flounder (*Platichthys stellatu*s), and other elasmobranchs (e.g., big skate [*Raja binoculata*], soupfin shark [*Galeorhinus galeus*], spiny dogfish [*Squalus acanthias*])
- Pacific Salmon FMP – Chinook salmon (*Oncorhynchus tshawytscha*)

As defined in the Pacific Groundfish FMP, the San Francisco Bay is designated as an estuary Habitat Areas of Particular Concern (HAPC)—a subset of EFH that is rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPCs are not afforded any additional regulatory protection under MSA. No other HAPCs (e.g., eelgrass) occur in the study area. The inland extent of the estuary HAPC is defined as Mean Higher High Water (MHHW), or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 parts per thousand (ppt) during the period of average annual low flow. The seaward extent is an imaginary line closing the mouth of a river, bay, or sound; and to the seaward limit of wetland emergent, shrubs, or trees occurring beyond the lines closing rivers, bays, or sounds. A detailed discussion of the existing EFH in the study area is provided in the Biological Assessment/Essential Fish Habitat Assessment in Appendix B3 of this report.

2.6 Aesthetic Resources

The vista in the project area largely constitutes the urbanized portion of South San Francisco with commercial buildings on the eastern side toward San Francisco Bay. The view at the WQCP is characterized by commercial buildings and San Francisco International Airport on the south; light industrial facilities to the west and north of the WQCP; and Lower Colma Creek on the north edge of the WQCP extending east into San Francisco Bay. The project site is highly developed with asphalt and paved surfaces, buildings, and wastewater treatment process units and structures. There are several light sources including building and yard lights associated with existing development and street and freeway lights in the vicinity. As the WQCP is an active sewage treatment facility, there can be sewage odors that escape the facility into the surrounding community.

2.7 Recreation

The study area is in a relatively industrialized area with few recreation opportunities except the San Francisco Bay Trail (Bay Trail). The Bay Trail runs along the opposite bank of Lower Colma Creek from the WQCP and crosses the creek via a bridge just northwest of the plant. The 200-foot span pedestrian bridge (Colma Creek Bridge) was constructed west of the WQCP in 2008 to connect the Bay Trail across Lower Colma Creek to an inland alignment that directs Bay Trail users west along Belle Air Road, south along Airport Boulevard, and east along North Access Road. The specific location of this pedestrian bridge was developed in coordination with San Francisco Bay Conservation and Development Commission (BCDC) to reduce risk to recreational trail users in the unfortunate event of a spill or other type of chemical emergency at the WQCP that could be harmful to individuals.

Due to security concerns, public access is not allowed on the facility grounds, except for special escorted occasions. While a proposed Bay Trail alignment has been shown on plant property, past discussions have determined this to be not feasible because of security and safety concerns. The safety concerns are primarily associated with treatment chemicals maintained in bulk quantities at the plant site, described in more detail in Section 2.12 (Hazardous and Toxic Substances). These chemicals are stored throughout the WQCP.

There is insufficient space to have both unrestricted public access and safe and effective wastewater treatment at the WQCP which was acknowledged by BCDC in past permitting requirements. Significant coordination and investment has been undertaken between BCDC and City of SSF to design and install an inland trail alignment that avoids the WQCP. Examples of public access in the project vicinity, and required through various BCDC permits, include:

- A "peninsula park" at the southernmost finger pier with dedicated public parking spaces (BCDC Permit No. 1998.011, Amendment No. 4).
- A San Francisco Bay Trail spur on North Access Road between its intersection with South Airport Boulevard and North Access Road (four-lane) Bridge, and a pathway connection located south of the parking garage, connecting the North Access Road Bridge to the tide gate bridge, leading to the "peninsula" park;
- A Bay Trail path on North Access Road located east of the parking facility, from the eastern tip of the "peninsula" park via a pedestrian bridge to the arrowhead-shaped peninsula to the east of the site (commonly known as Belle Aire Island or Sam Trans Island), and a Bay Trail entrance adjacent to U.S. Highway 101 Northbound on-ramp at the intersection of South Airport Boulevard and the south fork of North Access Road, as required in BCDC Permit No. 1996.002.06; and
- The Bay Trail along South Airport Boulevard from its intersection with North Access Road to the bridge located between Beacon Street and San Marco Way, and the Bay Trail on Belle Aire Road and across the Colma Creek bridge located at the end of Belle Aire Road, as required in BCDC Permit No. 1998.008.05. (Although the permit requires a Class I bicycle and pedestrian path along South Airport Boulevard, the City of South San Francisco does not allow bicycles on sidewalks and, thus, cyclists must use the street, which does not have dedicated lanes.)

South of the WQCP, the public can connect to a Bay Trail loop around SAMTrans peninsula or continue along a south alignment to bypass San Francisco International Airport.

The next closest park to the study area is located approximately 0.5 miles north at Walnut Park in the City of San Bruno.

2.8 Cultural Resources

Cultural resources are defined as several different types of properties ranging from precontact to historic archaeological sites, built-environment architectural properties such as buildings, bridges, or structures, and resources that have traditional, religious, or cultural significance to Native American Tribes such as traditional cultural properties or even sacred sites.

2.8.1 Ethnography and Ethnohistory

The study area is on the ancestral territories of the Ramaytush Ohlone cultural group (Milliken, 1995) who occupied the general vicinity of the San Francisco Bay area's peninsula. Ethnographic, historic, and archaeological research supports this claim. Many variations of culture, ideology, and diverse linguistic groups existed between the subdivisions of around 50 Ohlone villages throughout the Bay Area. This supports an interpretation different from past "static" understandings of California's Native Americans, where the Ohlone saw themselves as members of a specific village related to others by marriage, kinship, and language. The Ohlone engaged in hunting and gathering for subsistence, with their territory encompassing both coastal and further inland valley environments. A wide variety of plant and animal resources were available for the Ohlone people, from grass seeds, acorns, tubers, as well as bear, deer, elk, bird species, antelope, and rabbit which were primary resources in their diet.

Once European contact occurred in 1769, the Ohlone peoples' lifeways and society would be severely disrupted by the Spanish missionization system, disease, and displacement from their ancestral lands and resources. The Ohlone still have a strong presence in the San Francisco Bay Area despite the injustices they faced from the Spanish, Mexican, and American colonial regimes. The Ohlone people are active in preserving their historic and precontact past and finding ways to restore their traditional lifeways in the modern changing environment of the San Francisco Bay Area.

2.8.2 Historical Context

During the start of World War II in the 1940s, a growing need for a warship building industry developed along the San Francisco Bay shoreline. The initial development and filling of Lower Colma Creek's native mudflat and salt marsh environment begins around this time. The Barrett and Hilp Construction Company leveled the salt marsh and tidal lands south of the WQCP, bulldozing the landscape and the hill known as Belle Air Island and backfilling it with excavated marsh material. Six-to-seven 400-feet long drydocks were constructed into the rock and soil. These "finger piers" between the drydocks exist today and are located on of the southern end of the WQCP parcel. The drydock or graving docks were cut into the land, with flooding gates established at the eastern ends so that when closed water could be pumped out and ships or barges are constructed on a dry floor. When ready, water was rushed back in, and the gates reopened for ships and barges to launch (Bloomfield 1998).

To service the wastewater needs of the growing population of the southeastern portion of San Francisco following World War II, the WQCP was initially constructed in 1953, with numerous additions and alterations over time to accommodate continued growth in the area. Around the same time span, the San Francisco International Airport grew much more than the water control plant. Airline's maintenance, storage, and parking have spread almost up to the water plant. North Access Road was built to serve the growing airport activity, although the name and addresses on that road were applied only in 1987. The most recent additions are the SamTrans Bus Facility on the area formerly known as Belle Air Island as well as the Costco store adjacent to the water plant. Both were constructed in 1986 and the area has continued to grow from the light and freight forwarding industries (Bloomfield, 1998). More recently, entrepreneurs and technical companies have gradually urbanized the area (Hoover and Kyle, 2002).

2.8.3 Existing Conditions

Section 106 of the National Historic Preservation Act (NHPA) requires a Federal agency to decide the area of potential effects (APE) for the project or undertaking. The APE is defined under 36 C.F.R. §

800.16(d) as "the geographic areas or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Additionally, the APE "is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."

The APE was defined based on the geographical area where alternatives would have direct impacts to cultural resources from ground disturbing work and the arrangement of staging areas (Appendix C). Literature research completed at the Northwest Information Center located at Sonoma State University identified one unevaluated archaeological site located within the study area.

Historic Built-Environment Resources

No historic built-environment resources were identified as eligible for listing on the National Register of Historic Places due to their lack of historic significance or lacking physical integrity to be considered a significant historic property worth preserving today.

2.9 Air Quality

Regulation of air pollution is achieved through both national and State ambient air quality standards and emission limits for individual sources of air pollutants as required by the federal Clean Air Act. As required by the federal Clean Air Act, the U.S. Environmental Protection Agency (USEPA) identifies criteria pollutants to protect public health and welfare.

The project site is located within San Francisco Bay air basin. Pursuant to the federal Clean Air Act, a State Implementation Plan is required to be developed to reduce emissions of pollutants for which the air basin is designated as non-attainment and to establish emissions thresholds for determining if a project is in compliance. The criteria air pollutants classified for the project area (USEPA, 2018) are listed in Table 2-2.

Table 2-2. Criteria Air Pollutants and current attainment status in the study area.

Criteria Pollutant	Federal Attainment Status
Reactive Organic Gases	Non-Attainment, Marginal
Ozone (O3)	Non-attainment, Marginal
Carbon Monoxide (CO)	Non-Attainment, Moderate
Nitrogen Oxides (NOx)	Attainment, Maintenance
Sulfur Dioxide (SO2)	Attainment, Unclassifiable
PM10	Attainment, Maintenance
PM2.5	Attainment, Unclassifiable

2.10 Noise

The nearest sensitive noise receptor to the proposed construction area would be residential uses on the west side of U.S. 101, approximately 3,500 feet to the west and southwest. These receptors currently experience a relatively high long-term community noise exposure level (CNEL) of 73.1 decibels (dBA) from aircraft operations of San Francisco International Airport (SFIA, 2007) as well as additional contributions from vehicle traffic on U.S. 101 and Interstate 380. Typical 50-foot noise levels from equipment potentially used in this project range from 76 to 95 dBA, but this noise is attenuated further with distance from the source.

2.11 Transportation

The WQCP is located on the shoreline of San Francisco Bay, just north of San Francisco International Airport. Access to the site is from South Airport Boulevard (via Belle Aire Road). The project is located very close (approximately 1 mile) to San Francisco International Airport. The South San Francisco General Plan provision 4.2-G-15 states that a level of service of D or better (volume to capacity less than or equal to 0.9) should be maintained on principal arterials like South Airport Boulevard.

2.12 Hazardous and Toxic Substances

The California State Water Resources Control Board GeoTracker database was queried to identify potential hazardous, toxic, and radioactive waste (HTRW) sites in the vicinity of the project area. A 3,000-foot radius circle from the WQCP's entrance returned 31 total sites. This is a developed and industrial area and the majority of the returned sites are Leaking Underground Storage Tank (LUST) cleanup sites (Figure 2-8). The closest LUST site to the study area is at Pump Station 4 at 249 Harbor Way, but the tank was removed in November 1997 and the case was certified as closed by the San Mateo County Health Services Agency in August 2003. The nearest open site to the study area is at the Shell (Equilon) South San Francisco Terminal at 135 North Access Road (less than 1,000 feet from the WQCP at an adjacent parcel), and this is currently in a verification monitoring phase.

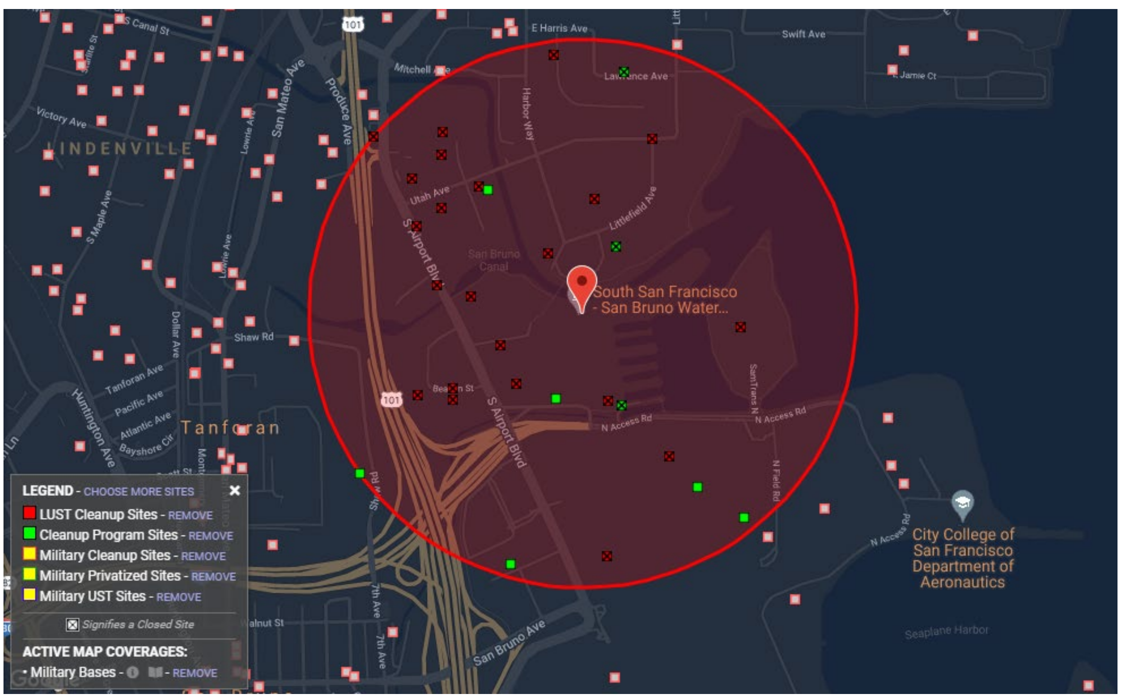

Figure 2-8. Screen capture of GeoTracker 3,000-ft search radius relative to project area. Source: https://geotracker.waterboards.ca.gov/

Besides these existing sites, the WQCP maintains a set of chemicals and fuels onsite instrumental to its operations. In the unfortunate event of a spill or excessive exposure, these chemicals can be harmful to individuals. The WQCP has a strict management protocol for these substances that includes a Contingency Operations Plan and Spill Prevention Control and Countermeasure Plan, as required by its NPDES permit. These chemicals are used to treat wastewater onsite at the WQCP and are stored in bulk quantities.

2.13 Socioeconomic and Environmental Justice

2.13.1 Racial Demographics

The largest racial/ethnic group is Asian, comprising roughly 40 percent of the population, followed by LatinX, comprising roughly 24 percent of the population (Table 2-3). Over three-quarters of the study area residents are people of color. The study area also comprises affluent and majority white communities within the study area, such as Burlingame which has a median household income of approximately $138,000, compared to $75,000 in the State of California (Census.gov, vintage year 2021).

Table 2-3. Estimated populations of persons of color by race/ethnicity and percentage of total population for the study area (BCDC, 2020a, b).

Race/Ethnicity*	Est. Population	Est. Percentage of Total Population within Study Area
Asian	65,297	36.05%
Hispanic/LatinX	44,170	24.39%
Other	19,471	10.75%
Black or African American	2,897	1.60%
Hawaiian and Other Pacific Islander	1,837	1.01%
American Indian and Alaskan Native	395	0.22%

** This data set tracks people of color as a metric in the overall social vulnerability analysis. A "Caucasian only" population breakdown was not provided in the BCDC dataset and is therefore not presented here.*

2.13.2 Low-Income Population

A significant portion of the study area is low income or impoverished (Table 2-4).

Table 2-4. Poverty* in the study area, for the cities of Colma, South San Francisco, and San Bruno (BCDC, 2020a, b).

City	Est. Population under 200% Poverty Level	Est. Percentage of Population under the 200% Poverty Level	Est. HH Under 50% Median AMI**
Colma	1,781	23.72%	840
South San Francisco	12,994	18.75%	5,051
San Bruno	7,275	16.87%	3,421
Millbrae	2601	11.46%	1713
Burlingame/Burlingame Hills	3894	12.44%	2350
Hillsborough	412	5.72%	210

** Very low income was defined by two measures: households (HH) earning less than 200% of the national poverty level, and households with less than 50% of Area Median Income (AMI).*

2.13.3 Social Vulnerability

Being low-income and/or racial minority can increase social vulnerability and the consequences incurred by flood events. There are additional factors which affect a group or person's resiliency in the face of flooding, such as age and mobility. Persons with physical disabilities, crowded households, or not having a vehicle can also make evacuation during a flood event more difficult, thus increasing the likelihood of more significant consequences of a coastal storm event.

An analysis using the BCDC community vulnerability dataset found that there are approximately nine thousand people in the plant's service area in the 'Highest Social Vulnerability' category, and another roughly six thousand in the 'High Social Vulnerability' category. Social vulnerability can be due to age, making it hard to evacuate or respond to emergencies (under 5 years old, or over 65 years). Figure 2-9 shows the vulnerability rankings of polygons located near the WQCP with additional specifics on the social vulnerability indicators in Table 2-5 and Table 2-6. This analysis was corroborated with the CEQ's Climate and Economic Justice Screening Tool. This tool identified two census tracts as disadvantaged communities in the study area, which correspond to the areas of 'Highest Social Vulnerability' identified in the BCDC dataset.

Table 2-5. Social Vulnerability Rankings and their estimated populations (BCDC, 2020a, b) within a 1-mile radius of the study area.

Social Vulnerability Ranking	Est. Total Population	Est. HH, Child Under 5	Est. HH, No Vehicle	Est. HH, with Disability	Est. HH, Single Over 65
Highest	13,653	931	429	773	389
High	17,769	934	443	1262	515
Moderate	41,859	2362	1301	3464	1728
Low	107,841	5405	1360	6530	3154

HH = Households

Table 2-6. Percentage of Population within each Social Vulnerability Ranking (BCDC, 2020a, b) within a 1-mile radius of the study area.

Social Vulnerability Ranking	% Est. Total Population	% Est. HH, Under 5	% Est. HH, No Vehicle	% Est. HH, with Disability	% Est. HH, Single over 65
Highest	8%	10%	12%	6%	34%
High	10%	10%	13%	11%	21%
Moderate	23%	24%	37%	29%	43%
Low	59%	56%	38%	54%	2%

HH = Households

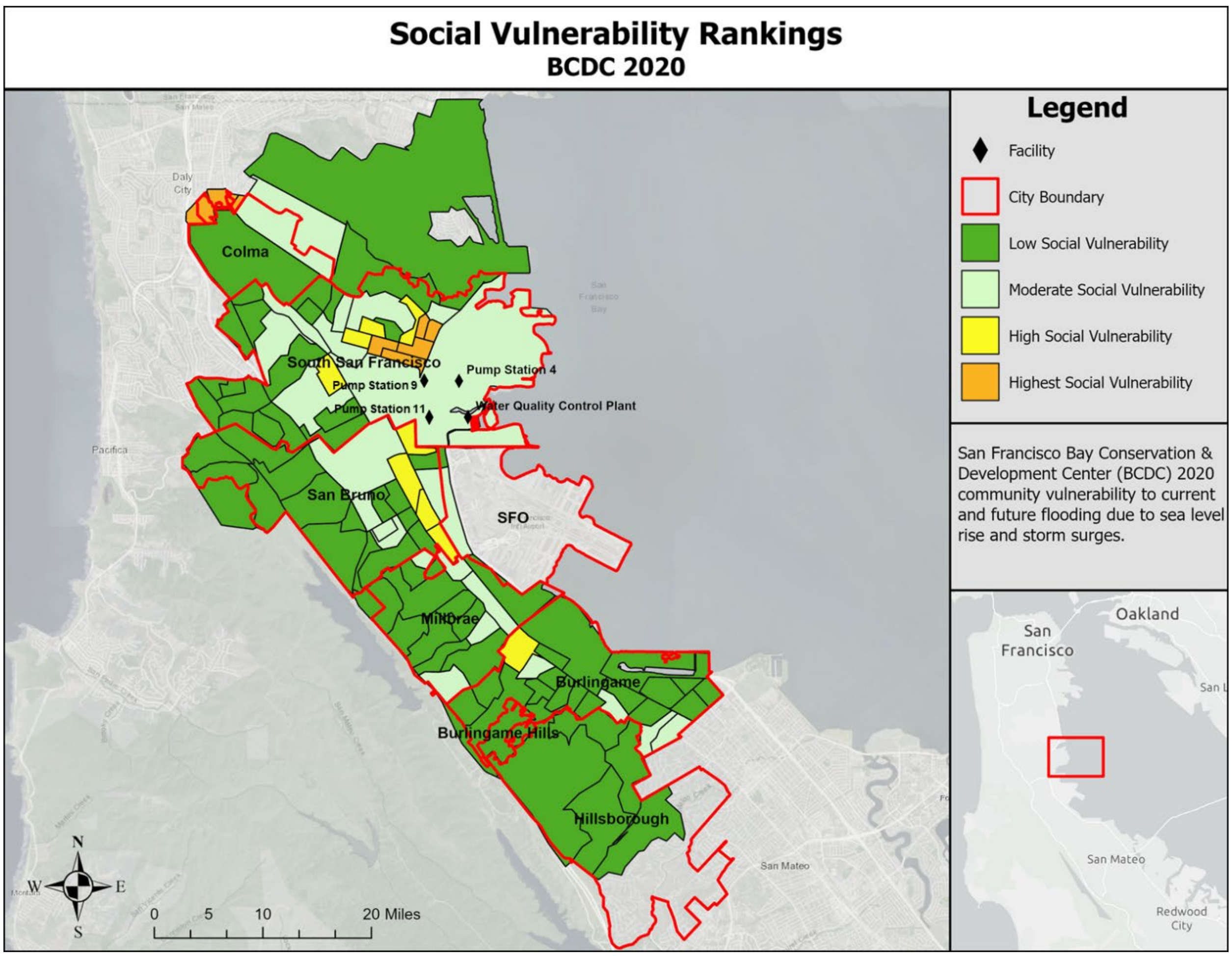

Figure 2-9. Social vulnerability rankings near WQCP service area (BCDC, 2020a, b). Several groups with the highest social vulnerability rankings would be impacted by plant shutdowns and sewage backups.

3.0 PLAN FORMULATION

The following section describes the process utilized to develop the Future Without Project Conditions, which serves as the No Action Alternative, and a reasonable range of action alternatives. A series of three mini-planning charettes were held in February and March of 2021 to develop the problems, opportunities, objectives, and planning constraints, and considerations (POOCCs) for the study. The charettes were attended by the project delivery team (PDT, or team), members of the South Pacific Division review team, and the non-federal sponsor, as well as the non-federal sponsor's contractor, Carollo Engineers, who have performed the design work on the WQCP and pump stations for over 20 years.

Prior to the charettes, the team held a kickoff meeting where the existing conditions were reviewed in detail, and the non-federal sponsor conducted a virtual flyover tour of the plant and surrounding areas. The first charette focused on the POOCCS, and the second charette delved into existing and future without project conditions, sea level rise, public concerns, and key study risks and uncertainties. At the third charette a trained facilitator led the team in alternative formulation exercises, as well as development of screening criteria, and an initial screening of alternatives. Figure 3-1 and Figure 3-2 are taken from the PowerPoint slide decks at the third charette and illustrate the USACE six step planning process, and risk-informed decision-making planning framework.

Figure 3-1. The USACE Six Step Planning Process was advanced through three mini-planning charettes. This image is taken from Charette 3 which was held on 2 March 2021 where the team formulated alternative plans.

Figure 3-2. The USACE Planning Process is meant to be risk informed, where more information is gathered to reduce uncertainty in decision-making as the project progresses and balance the need for more information with the need to make timely decisions.

3.1 Problems and Opportunities

The following problems and opportunities were identified by the PDT for this project.

3.1.1 Planning Problems

The water resource problem to be solved by the Lower Colma CAP project is inundation of the WQCP facilities during coastal flood events causing the WQCP and/or pump stations to shut down, resulting in raw sewage backing up into homes, overflowing from manholes in streets, and being released untreated into the Bay. The following list of problems currently exist, and coastal flood risk is expected to increase in frequency and magnitude at this location as a result of sea level change.

1. Extreme water levels that are associated with coastal storms cause coastal flood risk to the WQCP and Pump Station 4 which can cause economic damages resulting from damage to infrastructure and contents, plant service shutdown.
2. Extreme water levels that are associated with coastal storms pose coastal flood risk to the homes, businesses, and streets within the service area of the WQCP if a backup of untreated effluent throughout the service area causes damage and there are cleanup costs.
3. There is a risk of service disruption to their roughly 112,000 customers resulting in potential human health impacts to people in the businesses and households should significant coastal flooding occur at the WQCP or at Pump Station 4. Public and environmental health is at risk

should coastal flooding cause the need for emergency releases of untreated effluent into Lower Colma Creek and San Francisco Bay. Human recreational users who swim or kayak in Lower Colma Creek and San Francisco Bay could get sick from exposure to untreated sewage. Illnesses may include gastroenteritis (diarrhea, vomiting), viral infections such as hepatitis, and infections of the skin or eyes.

Sewage contamination may take weeks or months to fully clear, depending on the severity of the sewage release, tides/circulation, sunlight, salinity, and more. Eating uncooked filter feeding fish taken from a contaminated area may also result in illness, such as Hepatitis A and Norovirus. Further, the release of untreated sewage into Lower Colma Creek and San Francisco Bay would elevate nutrients, pathogens, endocrine disruptors, heavy metals, and pharmaceuticals in creek, wetland, and bay ecosystems.

4. The health of the wetlands and Bay ecosystems is at risk should coastal flooding cause the need for emergency releases of untreated effluent into Lower Colma Creek and San Francisco Bay. Contaminants in the untreated sewage can spread to wildlife in the area, both aquatic and birds, and may impact vegetation through algal blooms, and more.
5. The coastal flood risk endangers human life and safety of the WQCP workers and operators should the plant flood during a coastal storm event.
6. Human safety is endangered from direct exposure to untreated sewage backing up in the sewer system and overflowing in toilets and manholes in the service area of the WQCP in the event of a plant shutdown caused by coastal flooding. The consequences would be similar to those described in problem 3, but the magnitude of the consequences is likely to be much higher in this scenario because the likelihood of direct interaction with untreated sewage would increase were it to back up into streets, businesses, and homes.

The following planning objectives were identified during the planning charettes, with input from the vertical team, the non-federal sponsor, and the PDT. The objectives address the CSRM problems and were used to formulate and evaluate alternative plans.

Coastal Storm Risk Management Objectives:

1. Reduce the economic, environmental, and social impacts that result from the loss of wastewater treatment services during a coastal storm flood-induced shutdown of the WQCP system.

2. Reduce the economic damages caused by coastal storm flooding to the structures and contents at the plant and pump stations.

3. Improve management of risk to human health and safety for people in the service area of the WQCP who would be exposed to untreated sewage that backs up or is released into waterways during a plant shutdown due to coastal storm flooding events.

4. Reduce environmental damages that result from releases of untreated wastewater effluent into Lower Colma Creek or the San Francisco Bay associated with coastal storm flood-induced shutdowns of the WQCP system.

5. Improve management of risk to human life and safety of workers at the WQCP and Pump Station 4 who are at risk from coastal storm flooding at the WQCP.

6. Reduce the economic damages (cleanup costs) caused by sewage backup that occurs during a plant shutdown and service disruptions of the WQCP system due to a coastal storm event.

3.1.2 Planning Opportunities

Opportunities are positive future conditions that could result with the implementation of a recommended plan. Addressing problems and taking advantage of opportunities provide a basis for motivating and allocating the partners' pooled resources.

- There is an opportunity to avoid or reduce discharges of untreated effluent into the Bay and avoid water quality degradation and associated impacts to human health and the environment.

The team also investigated opportunities to incorporate recreation features and habitat-friendly designs, or natural and nature-based features into alternative designs.

3.2 Objectives and Constraints

This study is being conducted under the CAP Section 103 for coastal storm risk management (CSRM). The goal of this study is to manage the risk of coastal storm flooding at the WQCP and its pump stations throughout the 50-year period of performance, upon completion of the project. Therefore, the plan formulation prioritized meeting CSRM-related objectives, within the constraints identified.

3.2.1 Planning Objectives

The following planning objectives were identified during the planning charettes, with input from the vertical team, the non-federal sponsor, and the PDT. The objectives address the CSRM problems and were used to formulate and evaluate alternative plans.

Coastal Storm Risk Management Objectives:

7. Improve management of risk to human life and safety of workers at the WQCP and Pump Station 4 who are at risk from coastal storm flooding at the WQCP.
8. Improve management of risk to human health and safety for people in the service area of the WQCP who would be exposed to untreated sewage that backs up or is released into waterways during a plant shutdown due to coastal storm flooding events.
9. Reduce the economic damages caused by coastal storm flooding to the structures and contents at the plant and pump stations.
10. Reduce the economic damages (cleanup costs) caused by sewage backup that occurs during a plant shutdown and service disruptions of the WQCP system due to a coastal storm event.
11. Reduce environmental damages that result from releases of untreated wastewater effluent into Lower Colma Creek or the San Francisco Bay associated with coastal storm flood-induced shutdowns of the WQCP system.
12. Reduce the economic, environmental, and social impacts that result from the loss of wastewater treatment services during a coastal storm flood-induced shutdown of the WQCP system.

3.2.2 Planning Constraints

Planning constraints represent restrictions that limit formulation of alternative plans. The following constraints were identified for this project:

13. The project cannot compromise the safety and security of the WQCP.
14. The WQCP and pump stations must remain operational during a coastal storm event.
15. The project cannot increase existing life risk or create new life risk in the study area or vicinity.
16. The project cannot exacerbate or create new coastal storm flooding within or in the vicinity of the study area.
17. The project cannot increase nesting habitat for birds within the flightpath of SFO to maintain present levels of flight safety risk management efforts regarding risk of airplane bird strikes.

3.2.3 Planning Considerations

The following considerations were identified to help guide the planning process.

1. As part of routine and long-term maintenance, the WQCP is currently undergoing (as of February 2022) upgrades to digesters, various associated control systems, and secondary clarifier 4, and a sodium hydrochloride tank replacement.
2. Much of the existing electrical and pumping infrastructure is located in subterranean facilities that are vulnerable to flood water. Relocating, or raising this infrastructure is very costly and may not be feasible, given the interconnected nature of the facilities' pipeworks system.
3. Existing pipelines and utilities within the project area must be confirmed that concrete grout is applied, and the pipe is clamped to ensure that they remain out of commission. Existing outfall pipes for wastewater treatment will remain functional regardless of a new floodwall being constructed.
4. The wastewater and collection system infrastructure in the area is aging and contributes stormwater to the wastewater system during rainfall events, resulting in larger inflows to the WQCP.
5. Plant workers need to continue to be able to go between treatment facilities during rainfall events.
6. Impacts to the existing California Ridgway's rail habitat adjacent to the project site, and opportunities to generate environmental quality benefits by preventing untreated sewage releases will be considered.

3.3 Future Without Project Conditions/No Action Alternative

The Future Without Project Conditions, or No Action Alternative, describes the anticipated scenario if no project is undertaken to address the water resource problem. A Federal Interest Determination prepared by the San Francisco District of the USACE determined that without a CSRM project, the WQCP facility is at risk of coastal flooding. The primary consequence of this would be loss of wastewater treatment services to more than 120,000 people, discharge of untreated wastewater into San Francisco Bay, and inundation damage to the facility. Additionally, there could be a loss of wastewater treatment services to the service population until damage to the facility infrastructure could be repaired. Flood mapping indicates that flooding during a base year 1 percent annual chance exceedance coastal event is expected to cause flooding and damage the SSF WQCP infrastructure, which could potentially lead to service outages/closures that could have serious public health, safety, and environmental impacts due to untreated sewage backing up into streets, homes (basement toilets), or being released untreated into Lower Colma

Creek or the San Francisco Bay. Over time and with sea level rise, the risk of physical damage due to coastal flooding and associated service interruptions will increase.

3.3.1 Coastal Storm Damage Risk

Water floods over the lowest point of entry on the creek bank next to the Costco at an elevation of 9.3 ft NAVD88 (Figure 3-3). The next lowest points of entry are on the creek bank north of the WQCP area at an elevation of 10.5 ft NAVD88 and in the inlet area by the entrance to the WQCP area at an elevation of 11.1 ft NAVD88. If a wall is built to address these, the next lowest points of entry are along the south bank of the WQCP area at elevations of 11.7 ft, 12.5 ft, and 12.9 ft NAVD88. After that, the next lowest point of entry is from overland flooding from west of the WQCP, which floods the WQCP area at 13.2 ft NAVD88. If any water enters the WQCP area, the buildings may be flooded and damaged according to how the flood water elevation compares to their building floor slab elevations. Additional topographic figures are available in the Appendix H (Hydrology, Hydraulics and Coastal Analysis).

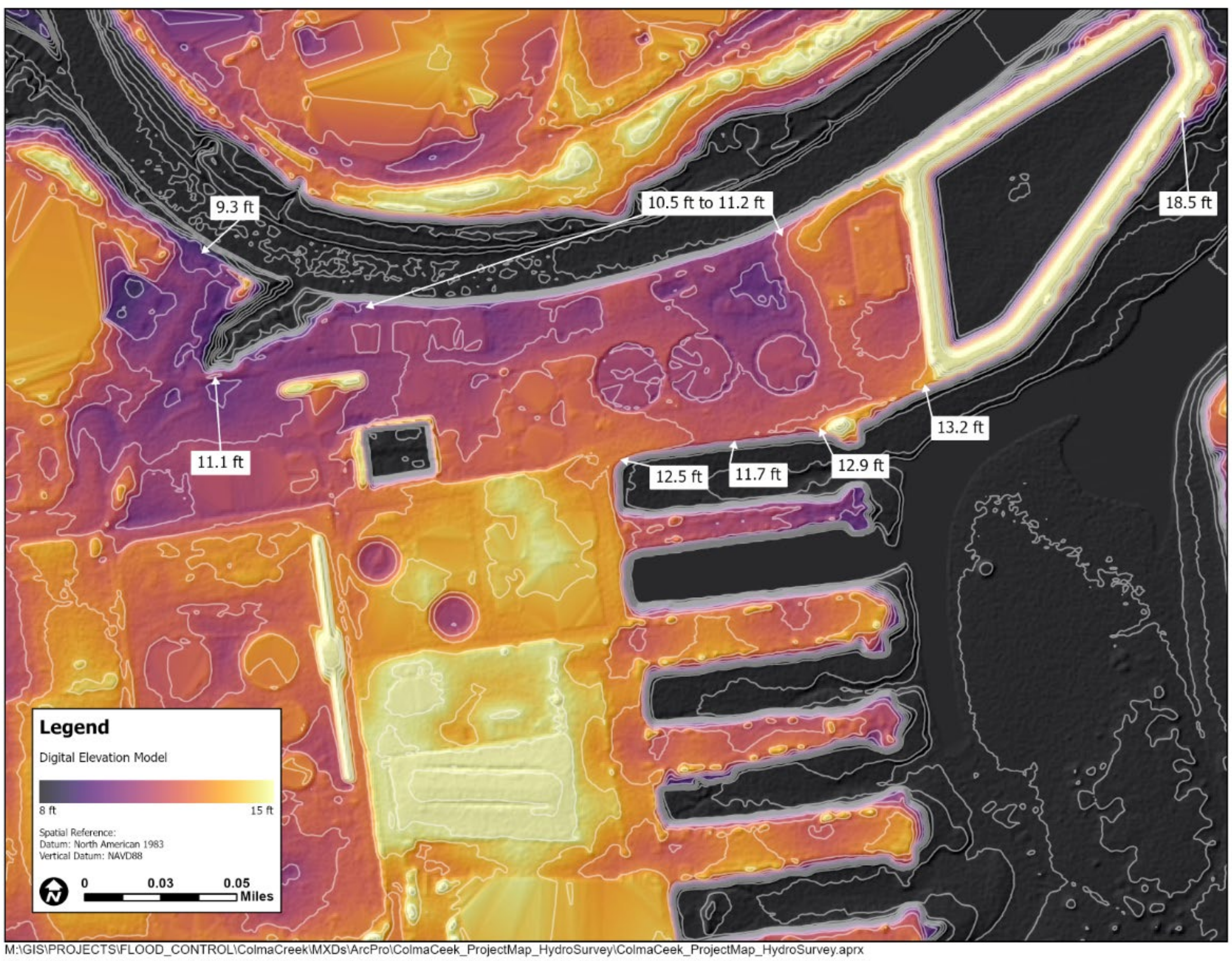

Figure 3-3. Topographic map with contours showing lowest points of entry for floodwaters on the perimeter of the WQCP.

3.3.2 Climate and Sea Level Change

Environmental stressors resulting from climate change can compound local or regional vulnerabilities. A major climate change impact considered in the project is sea level change, given the project location by a tidally connected system. Sea level change because of anthropogenic causes can potentially increase the frequency of extreme water levels, which would likely worsen inundation in the project area and cause damage to infrastructure (Figure 3-4). Inundation at the plant is likely to cause the WQCP to shut down due to electrical systems failures. This would result in the inability to treat the sewage coming into the plant, or already there. Despite the plant being shut down, raw sewage would keep flowing into the plant, as users flush toilets, do laundry, etc. In this emergency scenario, incoming sewage would overflow dormant infrastructure and flow directly to the adjacent Lower Colma Creek. There is a high likelihood that the plant operators would need to evacuate the plant for safety. Once the coastal storm event is over and adjacent flooding is controlled, the subterranean rooms and systems would need to be dewatered by pump, inspected, repaired, and tested prior to returning to service.

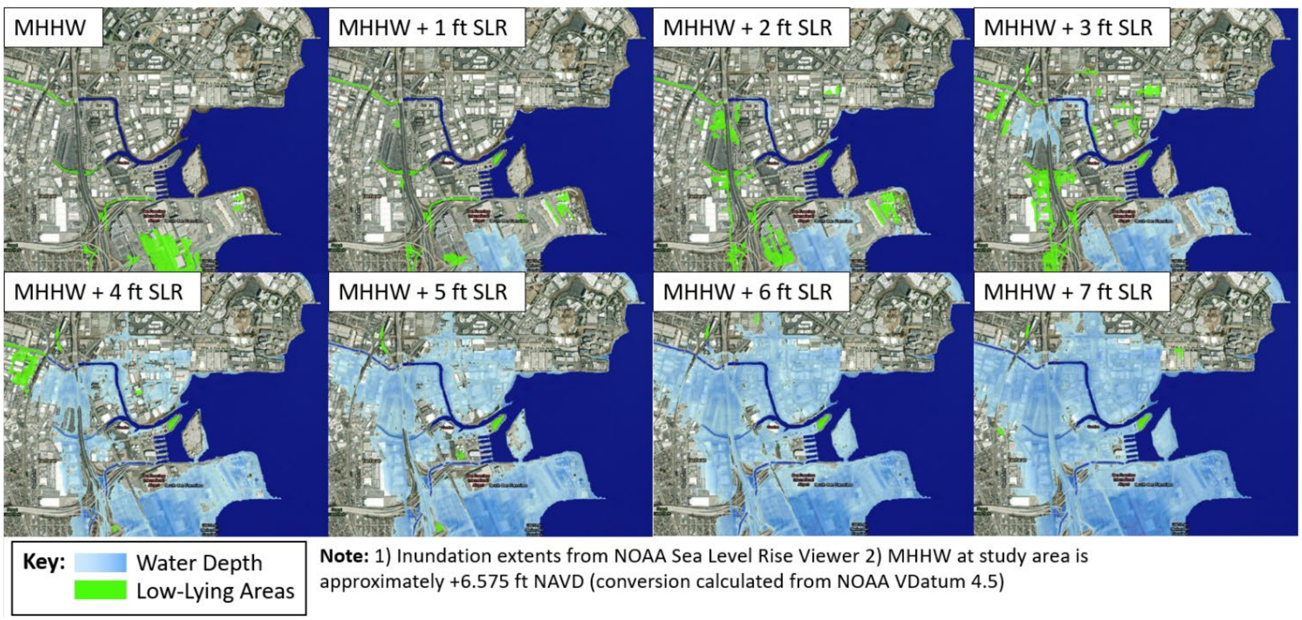

Figure 3-4. Inundation extents from the NOAA Sea Level Rise Viewer for the study area, from 0 ft to 7 ft of sea level rise (Sea Level Rise Viewer v3.0.0. from NOAA Office for Coastal Management, 2022).

Pump Stations 9 and 11 were determined not to have flood damages within the study period of analysis. If Pump Station 4 was to be inundated with coastal flooding, the electrical systems would fail, causing the pump station to shut down. In this scenario, raw sewage would backup and emerge onto nearby streets in the area. As system users continue to flush toilets and discharge water into drains, then further raw sewage backups would occur in the general area until power could be restored to the area to reestablish pumping services. If Pump Station 4 remained out of service for longer than 8 hours, impacts would increase. As users continue to use the system, raw sewage would backup into basements in structures that are using the system. Pump Station 4 is largely comprised of commercial users. These users may be able to bring in portable toilets to keep their business open. However, if sewage backs up in the business, they may need to close until it can be cleaned up. Industrial laundry facilities in the service area, for instance, need to discharge wastewater to operate, similar with biotechnical industries. These businesses which rely on discharging large amounts of wastewater likely would need to close temporarily.

As the frequency of extreme water levels and inundation at the WQCP increases, the frequency of the WQCP needing to utilize the emergency outfall to release untreated sewage into Lower Colma Creek will also increase in the future without project condition. Similarly, in a future without project condition (FWOPC) the service area of Pump Station 4 is likely to incur cleanup damages that increase over time with sea level rise. Business losses are also likely to increase over time, or the businesses may choose to relocate, or develop contingency plans to manage this risk.

The project developed relative sea level change projections for future conditions from the base year, 2023, up to 100 years, 2123, as part of the USACE guidance "Incorporating Sea Level Change in Civil Works Programs"[3]. Planning studies and engineering designs evaluate the entire range of possible future rates of sea level change (SLC), represented by three scenarios of "low", "intermediate", and "high" sea level change. At any location, changes in local relative sea level (LRSL) reflects the integrated effects of global mean sea level (GMSL) change plus local or regional changes of geologic, oceanographic, or atmospheric origin. Sea level change projections have been developed by a variety of different entities and due to the uncertainty and complex nature of sea level change often the projections will vary significantly from one another.

The project used the USACE Sea Level Change Curve calculator and relative sea level change (RLSC) from the NOAA Redwood City tide gauge location to evaluate RLSC projections. The current observed mean sea level trend is 0.0083 feet/year at the NOAA Redwood City tide gauge. The mean sea level RLSC trend using the Redwood City NOAA gauge is most applicable for south San Francisco Bay and reflects greater vertical land movement due to the bay mud formation underlying the south bay shoreline. Figure 3-5 shows the projected amount of relative sea level change across the "Low", "Intermediate" and "High" scenarios from 2011 through 2123, converted to NAVD88 using the NOAA VDatum tool. By 2123, the USACE High curve predicts 10.64 feet NAVD88 of sea level rise at the site. The Intermediate and Low curves predict approximately 5.81 ft and 4.28 ft NAVD88, respectively at that time horizon. Note that the Low curve is essentially linear through the period of analysis (50 years, from 2023 to 2073).

[3] USACE Engineering Regulation (ER), USACE ER 1100-2-8162 (USACE, 2019), incorporates new information, including projections by the Intergovernmental Panel on Climate Change and National Research Council (IPCC, 2007; NRC, 2012).

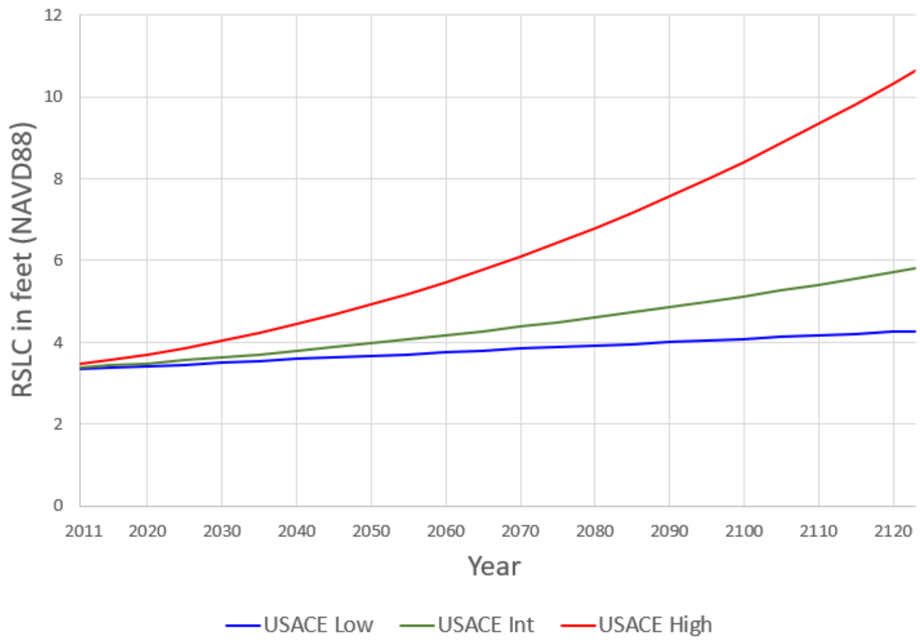

Figure 3-5. Estimated relative sea level change (RLSC) projections for NOAA station 9414523 Redwood City, CA from 2011 to 2123.

The existing relative sea level rise trend from the Redwood City tide gauge tracks between the USACE Low and Intermediate SLR curves. Hence, the intermediate SLR rate was used to formulate and evaluate the alternatives, as it provided both an appropriate and conservative estimate of future conditions. The project used a critical elevation of 9.3 ft NAVD88 for the WQCP which is the current lowest point of entry for floodwaters at the plant on the north side, 11.7 ft NAVD88 for the WQCP lowest point of entry on the south side, and 10.91 ft NAVD88 for Pump Station 4.

A comparison of 100-year coincident water surface profiles for Colma Creek for present conditions with future conditions including SLR values of 1 foot, 2 feet, and 3 feet shows that SLR has a significant impact on flood elevations in the creek for the lowest reach downstream of Utah Avenue. In the reach between Utah Avenue and Highway 101, SLR appears to have a much smaller impact on the water surface profiles. And in the reach upstream of Highway 101, SLR appears to have only a negligible impact on flood stages in the creek (Moffat & Nichol and AGS, 2015). Only coastal influences were considered in the modeling effort because the WQCP project area is dominated by tidal influences, and fluvial influences were determined to be negligible.

However, Pump Station 4 is in a transition zone (Figure 3-6) that may be partially influenced by fluvial and precipitation factors. While the proposed solution to Pump Station 4 is planned to be comprehensive, conservative, and adjustable, the risk of not including fluvial and precipitation in the analysis is acknowledged.

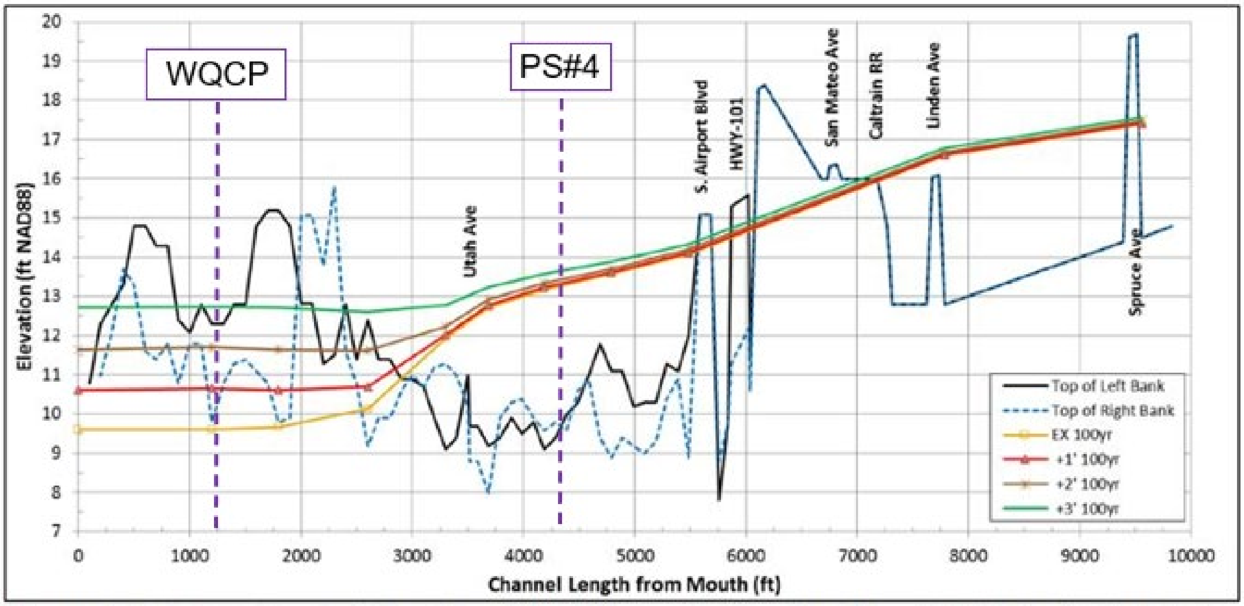

Figure 3-6. Colma Creek 100-year Coincident Water Surface Profiles with SLR of 0 ft, 1 ft, 2 ft, and 3 ft.

3.3.3 Watershed Planning Efforts – Reasonably Foreseeable Actions

The WQCP is currently undertaking a series of capital improvement projects. These projects include a wet weather improvements project to increase capacity during storm periods, a green energy project to install a solar photovoltaic array, and a digester replacement and rehabilitation project. The staff anticipates that this work will be completed prior to construction of this CAP project. The project team has also been coordinating with several other projects in the region to ensure that there are no conflicts. These projects are briefly summarized below.

Lower Colma Creek was included in the Resilient by Design Bay Area challenge in 2017, which was a regional effort to come up with intersectional and equitable solutions to sea level rise around the Bay. The Lower Colma Creek Connector project planning effort focused on finding ways to restore habitat and improve public access to the Bay shoreline near Lower Colma Creek. The team received follow-on grant funding to continue their efforts and prepare further technical studies, undertake community engagement, perform design and engineering work, and develop a permit acquisition plan. The Lower Colma Creek Connector project footprint is adjacent to, but not directly overlapping with, the WQCP property.

3.4 Action Alternative Formulation: Measures to Achieve Planning Objectives

3.4.1 Preliminary Structural and Nonstructural Measures

During the planning charettes, 19 measures were identified for consideration to address the objectives of this study. Both structural and nonstructural measures were identified. Nonstructural measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures in that they focus on reducing the consequences of flooding instead of focusing on reducing the probability of flooding. Natural and nature-based features (NNBFs) were also considered for managing coastal storm risk.

INITIAL SCREENING OF MEASURES

Eleven structural measures, seven nonstructural measures, and one recreation measure were identified for initial consideration. Existing information and rough cost calculations were used to screen the least promising measures from further consideration. This screening is summarized in Table 3-1 and described in greater detail in the "Excluded Measures" section.

SCREENING CRITERIA: Criteria utilized to determine the feasibility of implementing a given measure included 1. meets one or more objective, 2. is within scope of project authority, 3. cost within CAP limits, and 4. constructability.

For cost criteria, CAP Section 103 projects cannot exceed $10 million federal expenditure, including the Feasibility Phase costs. With the 50/50 cost share between non-federal and federal on Feasibility Phase (estimated for this study at $1.5 million, including preliminary design development and environmental and tribal coordination), and a 35/65 cost share split between the non-federal sponsor and the USACE for D&I, this amounts to a roughly $12–15 million total project cost limit, including the study, permitting, design, and construction. Table 3-1 summarizes the initial screening of measures.

Table 3-1. Initial Screening of Structural and Nonstructural Measures for Lower Colma Coastal Storm Damage Reduction and Recreation.

Measure	Retained / Screened	Screening Criteria Rationale
STRUCTURAL		
Floodwall	Retained	Meets all criteria. There is sufficient space to site a floodwall and cost estimate is within CAP cost limit. Alignment can be pulled back from shoreline as much as practicable to avoid impacts to adjacent marsh near bridge on north end of WQCP. Floodwalls are compatible with plant operability.
Ring Wall	Screened for main WQCP Retained for Pump Station 4	Meets all criteria for Pump Station 4 but fails to meet criteria 4 Constructability for the WQCP due to insufficient space. For Pump Station 4, there is room for a small retaining wall type concrete floodwall around the perimeter station, with a stop log gate for vehicular access. Cost is well within CAP cost limit. Effective measure to be conservative with flood protection here to cover potential additional risk from precipitation and fluvial factors.
Natural and Nature-Based	Screened	Fails to meet criteria 4 Constructability due to existence of concrete. Areas most suitable for NNBFs do not

Measure	Retained / Screened	Screening Criteria Rationale
Features, or NNBFs		correlate well with where NNBFs would be needed for managing coastal storm risk.
Improvements to SF Bay Trail	Screened	Fails to meet criteria 1 Objectives, criteria 2 Scope, and criteria 3 Cost. Rerouting the SF Bay Trail to go around the WQCP along the creek and bayside was screened because it would pose an unacceptable public safety risk and the cost is likely to exceed allowable thresholds for recreation within the CAP limits.
Temporary /Deployable Flood Barriers	Screened	Fails to meet criteria 3 Cost. Not cost effective compared to floodwalls.
Storm Surge Barrier at the Mouth of Lower Colma Creek	Screened	Fails to meet criteria 3 Cost. Exceeds the cost limit of CAP
Ecotone Levee Combo with Floodwall	Screened	Fails to meet criteria 4 Constructability. Insufficient space, given the required side slopes for ecotone levees, an ecotone levee providing CSRM for the WQCP would fill in the entire creek width in order to provide sufficient coastal flood risk management.
CSRM Improvements to Finger Piers (storage and parking area)	Screened	Fails to meet criteria 2 Scope. Insufficient damages to support CSRM measures in this location.
Drainage Pump System (structural as they would be implemented in combination with tide gates or storm surge barriers)	Screened	Fails to meet criteria 3 Cost. Exceeds the cost limit of CAP
Standard Levee	Screened	Fails to meet criteria 4 Constructability. Insufficient space
Standard Levee/Floodwall Combo	Screened	Fails to meet criteria 4 Constructability. Insufficient space
Dredging Lower Colma Creek	Screened	Fails to meet criteria 1 Objectives, criteria 2 Scope, and criteria 3 Cost. Not effective in addressing coastal flood risk / meeting objectives
Tide Gates	Screened	Fails to meet criteria 3 Cost. Exceeds the cost limit of CAP

Measure	Retained / Screened	Screening Criteria Rationale
NONSTRUCTURAL		
Dry Floodproofing of Key Structures	Retained	All criteria potentially met with further analysis needed to assess screening criteria 4 Constructability. Dry floodproofing prevents entry of flood waters by waterproofing the structure. Cost is competitive compared to other measures. As SLR progresses, frequency of operation to seal plant from flooding would increase. Impacts to operability and performance of plant are likely to increase over time. Safety to workers is also a concern that was identified during initial screening, as operating during flood conditions could endanger workers at the plant.
Flood Warning System	Retained	All criteria met. For the nonstructural operation, the flood warning system is necessary to ensure all flood proofed doors, windows, and stop log vehicular access gate are closed and properly sealed. Because these facilities will be used daily, with doors and gates opened for access, these would need to be closed for the nonstructural plan to be effective.
Wet Floodproofing	Screened	Wet floodproofing would allow flood waters to enter the enclosed areas. Wet floodproofing is infeasible/not cost effective compared with dry floodproofing.
Raising Critical Assets in Place	Screened for most assets Retained for subterranean electrical system only	It is not cost effective compared to dry floodproofing to raise the buildings and other assets at the WQCP. However, since the electrical system is subterranean and highly vulnerable to flooding, it is not feasible to dry floodproof the subterranean electrical system. It is also particularly hazardous should the electrical system flood. See Figure 3-13Figure 3-14 depicting the buried conduits that connect eleven dispersed motor control centers. Thus, the measure would be to raise the electrical system above flood water elevation. All criteria potentially met with further analysis needed to assess screening criteria 4 Constructability. Raising subterranean electrical only was retained.
Relocate Entire Treatment Facility	Screened	Fails to meet criteria 3 Cost. Cost (in the billions of dollars) exceeds benefits and CAP cost limit
Relocate Structures of Concerns	Screened	Fails to meet criteria 3 Cost. Infeasible/not cost efficient
Leverage Another Treatment Facility	Screened	Fails to meet criteria 1 Objectives and criteria 2 Scope. Not effective as other nearby treatment facilities are also at risk for coastal flooding

EXCLUDED MEASURES

Measures Screened Due to Exceeding the CAP 103 Threshold:

The following measures were identified as exceeding the CAP 103 cost threshold:

Tide Gate with Pump Station and Storm Surge Barrier with Pump Station

The San Bruno Creek / Lower Colma Creek Resiliency Study (SFIA, 2015) identified two larger scale structural measures to manage coastal flood risk on, adjacent to, and upstream of Lower Colma Creek. These are a tide gate with pump station and a storm surge barrier. Storm surge barriers typically also require at least one pump station to functionally manage the risk of flooding. The pump station(s) are needed to pump water back outside of the gate or barrier when it is closed during a flood event unless interior drainage rainfall and flood water can be stored via surface storage or detention until flood waters recede and the tide gate or storm surge barrier can be opened again. Figure 3-7 below shows three potential alignments identified for the tide gate in this 2015 report and Figure 3-8 shows three potential alignments identified for the storm surge barrier.

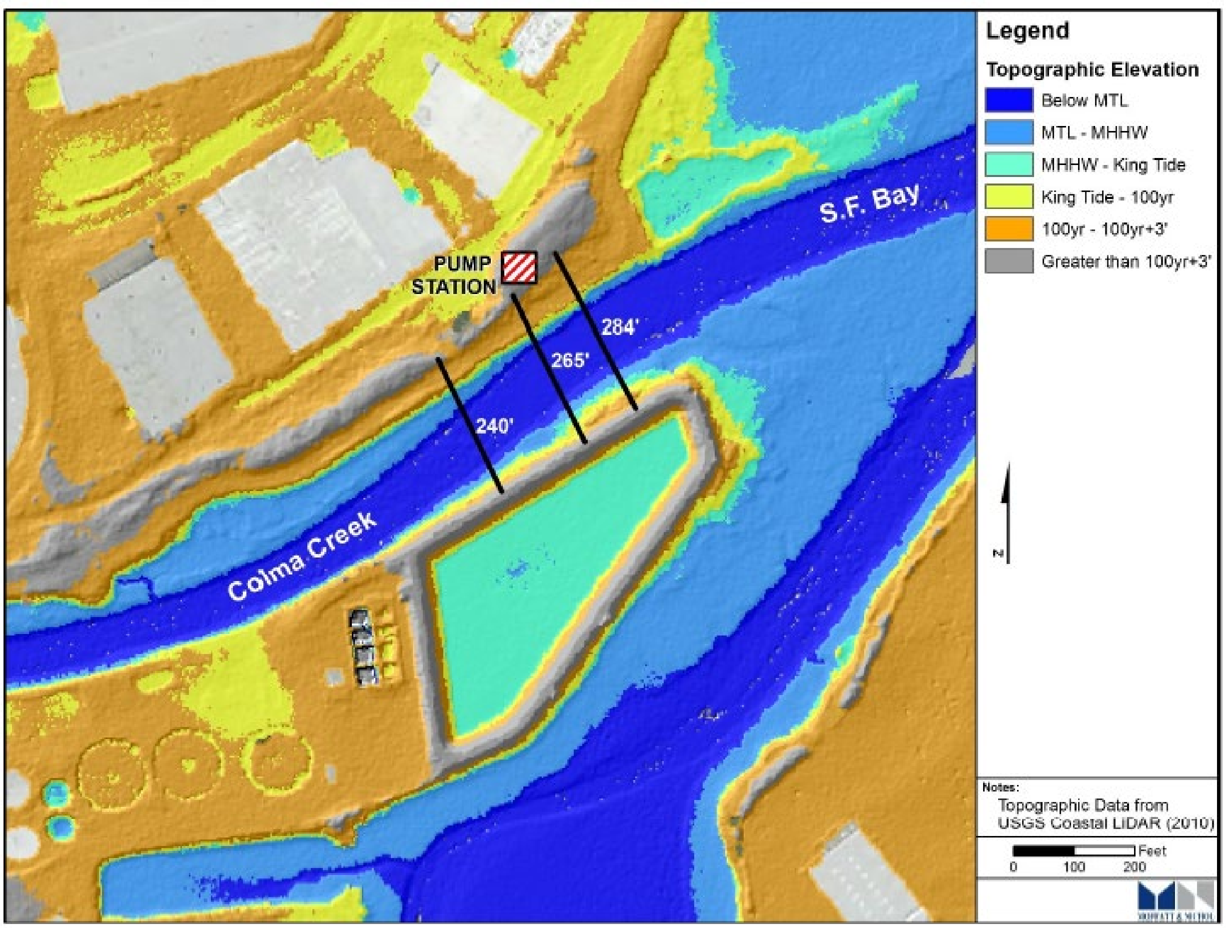

Figure 3-7. Potential Alignments for Tide Gate and Pump Station on Lower Colma Creek. Source: San Bruno Creek / Lower Colma Creek Resiliency Study (SFIA, 2015).

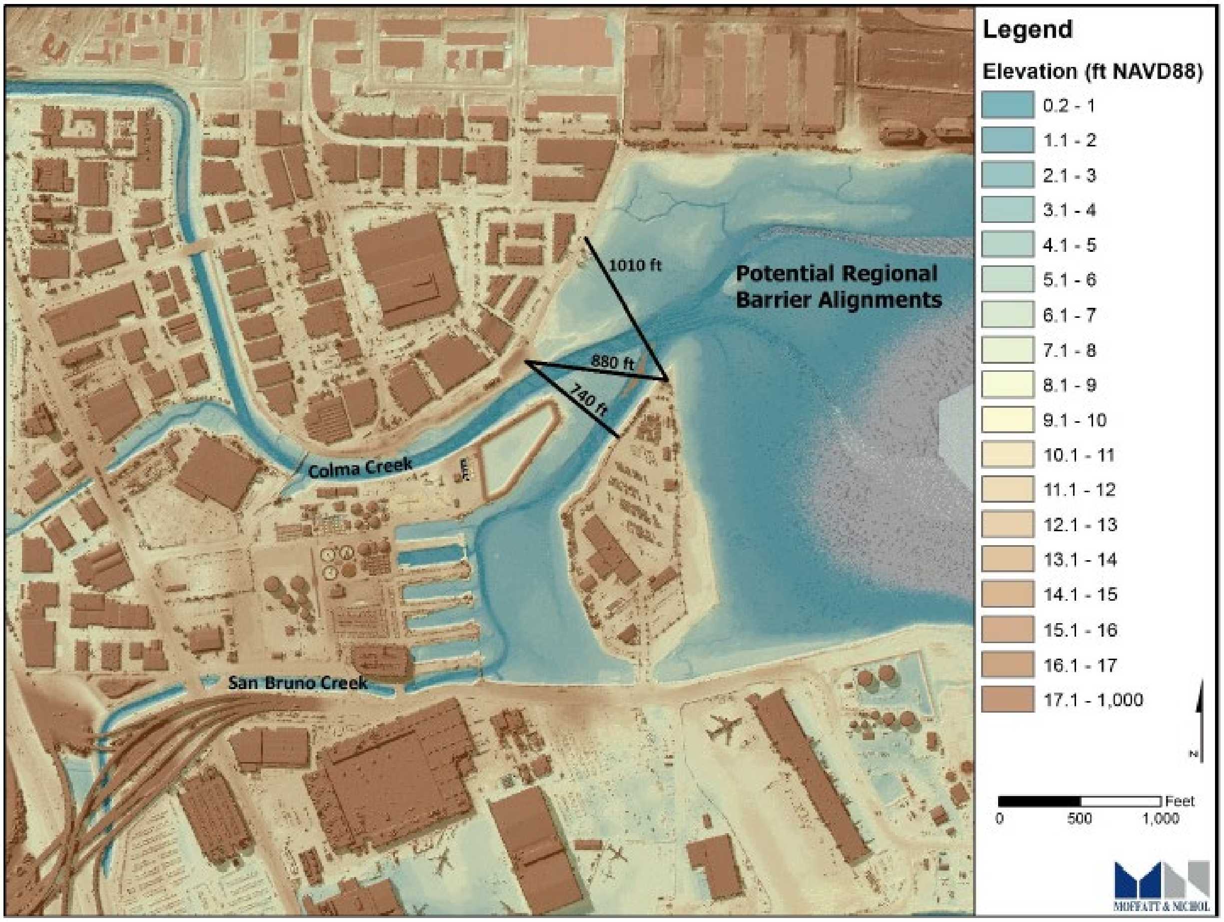

Figure 3-8. Potential Alignments for a Storm Surge Barrier along Lower Colma Creek. Source: San Bruno Creek / Lower Colma Creek Resiliency Study Final Report (SFIA, 2015)

A tide gate is generally much smaller than a storm surge barrier and typically they are designed to be used once or twice a day during high tide to prevent tide-induced flooding. Tide gates are much more common than storm surge barriers, though functionally they perform similarly in that they can be opened and closed to prevent coastal flooding up to their design event.

Because both tide gates and storm surge barriers are permanent structures built in a channel and connecting to high ground adjacent, their construction and operation may impact the tidal influence, ecology, and habitat around and under them. Depending on the ecological sensitivity of the area, this could result in associated environmental mitigation costs, a need to avoid impacts, or even a conclusion that impacts are unmitigable and unacceptable. The ecological impacts and acceptability of these measures was not performed for these measures, as they were screened based on construction cost alone. However, should either be further investigated, this would require a full impact analysis.

The PDT used parametric costs estimates developed by USACE for projects throughout the country to provide screening level rough estimates on what these measures would cost.

The team assumed the middle alignment with a length of 265 feet and a pump station, which would need to tie into existing high ground adjacent to the WQCP. The team costed out a 30-foot total height/depth of the tide gate which includes the underwater portion (top elevation of the gate would be NAVD 12.99 feet). This height was roughly based on managing the risk of a 1 percent AEP event in year 2073 with a high sea level rise curve assumption.

The cost of a pump station is correlated with how many cubic feet per second (cfs) it will need to pump. This is highly dependent on regional rainfall, local hydrology, correlation/volume of inflow of water, duration of the tide gate or barrier closure for the event, how much storage for water is available inside the gate closure, size of potential storm surge, expected wave size and setup, and more. If there is insufficient space to store floodwaters, a larger pump station is needed.

For rough screening cost purposes, the team assumed that a pump station would be constructed that could pump the 2-year cfs, or approximately 2,127 cfs[4]. The lowest cost "basic" pump station is estimated to cost $22,000 per cfs (certified cost from USACE Walla Walla Cost Engineering Center, 2020). Therefore a 2,000 cfs pump station, to be paired with a tide gate, at this location would cost $44 million. A 3,000 cfs basic pump station would cost $90 million to construct. A small 575 cfs Argentine pump station is estimated to cost $15 million. The tide gate cost would depend on the specification of the design, but would add multiple millions of dollars, plus environmental mitigation, design, and project management costs. Therefore, the tide gate plus pump station and storm surge barrier plus pump station measures can be screened based on the cost of the pump station alone exceeding what can be constructed in the CAP.

Storm Surge Barrier

The storm surge barrier for Colma, referred to in Figure 3-8 as the Regional Barrier, is roughly estimated cost between $57.3 million and $134.2 million, not including the cost of tie-ins nor pump station(s).

Of these measures, the storm surge barrier with pump stations may warrant further general investigation outside of the CAP as a means of managing the residual coastal flood risk for the larger study area residences and businesses, which was outside of the scope of this effort and what is achievable under the CAP cost limit.

Relocating the WQCP

During the planning charettes at the outset of the study the team discussed whether the whole plant could be relocated further inland to reduce coastal flood risk. Plant operators and Carrollo Engineers who have performed maintenance and upgrades to the WQCP since 1999 estimated that this cost would be in the billions of dollars range, due to the complex and expensive embedded infrastructure, which includes a system of sewage pipes, pumps, and treatment facilities and discharges. The system is largely gravity fed, which is based on location, and needs access to discharge points within the SF Bay, which makes proximity to water a benefit for the plant, though it comes with coastal flood risk. It was determined to be impractical and cost prohibitive to relocate the WQCP and this measure was screened without the need for further analysis.

[4] Cfs discharge is taken from the South San Francisco/San Bruno Water Quality Control Plant Flood Protection Study, 2012, which used USACE's Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) to calculate discharges at various locations along Lower Colma Creek and Navigable Slough. This cfs is from Utah Avenue location on Lower Colma Creek, proximate to the SSF - SB WQCP.

Measures Screened Due to Insufficient Space

The following measures were overlaid in the project area using best professional judgement for width, height, and alignments and were shown to very clearly not fit within the project area due to insufficient space:

Levees, Combination of Levees and Floodwalls, and Ecotone Levees

To construct a levee for CSRM at the WQCP, Civil Engineering estimates that roughly 75 feet would be needed along the alignment to accommodate the width of the levee. The existing widths around the WQCP were measured in GoogleEarth and found to be between approximately 13 and 26 feet. Thus, there is no location along the edge of the WQCP with enough space to accommodate a levee, so the levee measure and the combination of levees and floodwalls measure were both screened early for this reason.

The team also considered the nature-based more ecologically beneficial ecotone levee measure. Ecotone levees are gently sloping levees that extend out into the channel to provide marsh/wetland habitat and coastal storm risk management (Figure 3-9; SFEI, 2018) In essence, ecotone levees can replace lost or absent natural resiliency that marshes and wetlands can provide in coastal systems.

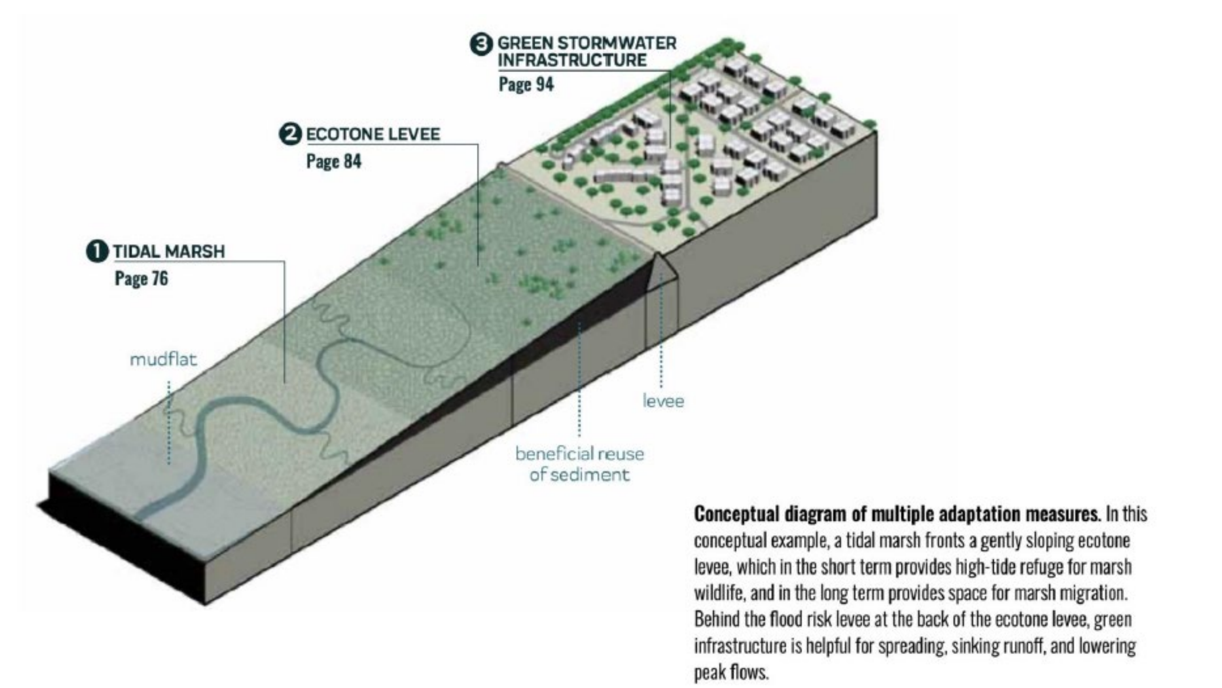

Figure 3-9. Concept drawing of an ecotone levee to reduce the risk of flooding from coastal storm events or storm surge. Source: SFEI, 2018.

The USACE Shoreline II feasibility study project delivery team which is evaluating the feasibility of constructing ecotone levees in this region estimate that ecotone levees should have slide slopes of 12:1 or 15:1. In drawing out the ecotone levee measure for Lower Colma Creek, these side slopes would mean that the entire creek would need to be filled in, creating, in effect, a dam. Therefore, this measure was screened as not being suitable for this location.

Measures Screened Based on Professional Judgement

The following measures were screened based on professional judgement that they would not be effective in meeting the objectives of the study:

Dredging

The team considered whether dredging and maintaining the Lower Colma Creek channel to a deeper depth could provide the intended flood conveyance capacity to manage the coastal flood risk. Reduced conveyance capacity from sediment accumulation increases the flooding risk for areas surrounding the channel. In the vicinity of the WQCP sediment include watershed derived sediments as well as marine sediments from tidal exchange. While the relative contribution of each of these sources is not known, it is hypothesized that a large fraction of the sediment in the channel is derived from watershed sources (County of San Mateo, 2016). It is expected that this may provide a slight reduction in coastal flood risk for fluvial events but would not be a significant reduction for coastal events and flooding due to future sea level rise, where the majority of the damages in the future without condition are projected. Dredging was therefore determined to not be an effective measure and was screened from further analysis.

Leveraging Another Wastewater Treatment Facility

The team considered whether another wastewater treatment facility could be leveraged to phase out or augment the WQCP. However, all the nearby additional wastewater treatment plants in the vicinity are also located on the coast and face similar coastal flood risk. Therefore, this would not be an effective nor complete solution, so this measure was screened.

NNBFs

NNBFs such as wetlands and marshes can provide erosion control when placed in front of a CSRM feature, like a berm, which is subject to erosion, or to avoid undercutting due to erosion for a floodwall foundation. The study team considered placing NNBFs in front of proposed CSRM features, in this case floodwalls, where wave action might warrant the need for erosion control features. In this case, the north floodwall alignment already has an articulated concrete mat revetment along the existing bank which is intended to protect the bank and the WQCP from erosion due to wave runup. Other areas north and west further upstream Lower Colma Creek have existing fringe marsh or are outside of the more active wave zone. The same is true for the south floodwall location, which is protected from wave action due to its position. There are areas along the storage pond or finger piers which could accommodate NNBFs, but those locations do not correlate well with where NNBFs would be needed for managing coastal storm risk. Thus, NNBFs as erosion control were screened out.

Recreation Trail Realignment

Routing the trail along the Bay adjacent to the WQCP poses an unacceptable safety risk to trail users who could risk exposure to dangerous airborne chemicals. For this reason, the pedestrian/bicycle bridge was originally sited well upwind of the plant.

The study evaluated the public access trail proposed by the Bay Trail and concluded that it is infeasible for a variety of reasons. The rough cost of this measure well exceeds the allowable 10 percent of the total project cost for recreation. It would additionally exceed the federal spending limit for the CAP 103 projects, if included. Finally, and significantly, the trail alignment proposed by the Bay Trail would cause unacceptable safety and security concerns which cannot be mitigated as acknowledged in prior permits issued by BCDC to the City of South San Francisco.

As referenced above, the current Bay Trail alignment was modified inland based upon BCDC's determination that public access along the Bay was infeasible, acknowledging the serious security and safety concerns presented by the WQCP.[5] Nothing has changed to mitigate those concerns. As understood in previous permits, rerouting the potential future SF Bay Trail to go around the north side of the WQCP along the creek and bayside would pose an unacceptable public safety risk of exposure to deadly airborne chemicals in the event of an accident. Further, there is not sufficient space for a paved trail and the cost is likely to exceed allowable thresholds for recreation within this project's financial limits. Finally, a trail along the WQCP is likely to degrade the olfactory experience of trail users and may not be considered an aesthetic improvement by trail users for this reason. Therefore, this project does not propose any modifications to the current proposed inland Bay Trail alignment.

The local partner, the City of South San Francisco, has already constructed an alternative recreation trail as part of previous negotiations with BCDC on this topic for a separate project. The alternative inland alignment selected by BCDC (Permit No. 1998.011.07), in addition to the various public access improvements required by BCDC, were recently completed by non-federal sponsor and are pending close-out with BCDC.

The following measures were found to not be cost effective compared to other measures which were retained:

Temporary or Deployable Flood Barriers

Temporary or deployable flood barriers can be used where it is preferable in day-to-day non-flood conditions to have access, such as in a roadway, or crossing. They are more costly than a normal floodwall that is always in place, but in some instances the added functionality or operability can justify that cost. In this case, there is no added benefit for constructing a deployable floodwall, so this measure was screened as not being cost effective compared to a regular floodwall.

Relocated Key Structures of Concern

Each facility within the WQCP has its function, and this function often involves interaction with the neighboring structures, such as conveying effluent from one treatment tank to the next for various phases of treatment. They function as a system and relocating key structures piecemeal is not a cost-effective way to manage risk, nor is it likely to be implementable within CAP due to the high cost of the complex infrastructure. For example, the primary treatment system was constructed in 1999 and cost roughly $18 million (1999 dollars), including tanks, pumping, and control systems which are concrete and capped in place. To relocate just this one system, the old one would need to be demolished and a new one constructed. Then, the primary treatment pipes would need to be run to the headworks to connect it to incoming sewage, and also connected outbound to aeration basins for biological treatment. Finally, the old connections would need to be decommissioned.

The same conditions exist for the secondary clarifier system. Secondary clarifier 4 construction was completed in 2022 for roughly $1.5 million dollars. Although this is a singular structure, its pumping electrical and control systems are connected to several other structures and processes within the WQCP.

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[5] The Commission and Design Review Board acknowledged in BCDC Permit No. 1998.011.07 that *"constraints to public access at the WQCP are substantially greater than those at other treatment facilities, including the hazards associated with this water treatment plant, the limited space available for the plant facilities, the irregular shoreline, and the potential disturbance of wildlife"* and concluded that *"on-site access was undesirable, and the alternative inland alignment was selected."*

There are three secondary clarifiers, four primary clarifiers, and support buildings, pumps, drives, and other related equipment that this example applies to. For the relocation to be complete, all of the connected structures would need to be relocated, and the old subterranean network would need to be decommissioned, and new ones added. These examples only represent two of the many treatment systems at the WQCP.

This measure was therefore screened early using professional judgement that it would not be cost effective compared to other measures still in consideration, such as floodwalls.

RETAINED MEASURES

Five measures were retained and developed into alternatives.

Structural Measures
These structural measures were retained for further analysis.

1. Floodwall
2. Ringwall, with stop log gate for only pump station 4

Nonstructural Measures
These nonstructural measures were retained for further analysis.

2. Dry floodproofing
3. Flood warning system
4. Raising only the electrical system

3.5 Formulation and Comparison of Alternative Solution Sets*

Three action alternatives and one no action alternative were formulated as the focused array of alternatives. Of the three action alternatives, two were carried forward as the final array of alternatives, along with the No Action Alternative. The No Action Alternative, also described as the Future Without Project Conditions, evaluated the impacts of forecast conditions in the absence of future work in the project area. The No Action Alternative serves as a comparison standard for understanding how the two final array action alternatives might contribute to resolving the coastal storm risk flooding problem at the WQCP as well as comparing the plans' respective potential environmental impacts.

Three action alternatives were formulated to assess the performance of different approaches to protecting the WQCP from flood waters. These differing approaches involved a single floodwall protecting the WQCP, two floodwalls protecting the WQCP, and dry-proofing the WQCP without use of a floodwall. All three action alternatives sought to maintain operability of the Pump Station 4 via a concrete ringwall to prevent flood waters from entering that building. A standalone ringwall around Pump Station 4 was not included as an alternative as it would not meet key project objectives, such as preventing damages at the WQCP, preventing raw sewage releases into Colma Creek, and maintaining wastewater treatment services during a coastal storm event. Since the pump stations are hydraulically linked to the WQCP and operate as an interdependent system, they are not considered separable.

The three action alternatives are referred to as Alternative 1: North Plant Floodwall Alternative, Alternative 2: North and South Plant Floodwalls Alternative, and Alternative 3: Plant Floodproofing Alternative.

In combining measures into alternatives, the team sought to establish a reasonable range of coastal storm risk management alternatives via a smaller floodwall alignment on only the lowest lying side of the plant (north side of the plant only), tying into high ground, and a second taller and more comprehensive alignment that included a floodwall along the southern side of the plant as well (see Figure 3-10). The remaining boundaries of the plant were determined to be either sufficiently high in elevation to not require a floodwall, as they did not overtop for any scenario that was modeled; or in the case of the finger piers, to flood slightly during some modeled events but to not incur significant damage. Where the San Francisco Bay Trail crosses the alignment by the Costco parking lot, the elevation is already high. There is a low spot directly east of that which would be filled to raise it to the minimum elevation, to not create a low point where water can flow across the floodwall. The trail would therefore be unimpeded and continue to allow recreation. The floodwall would tie into the trail just east of where the green line begins in the left of Figure 3-10. This floodwall would vary in height above grade based on the ground elevation, but is roughly 3–4 high.

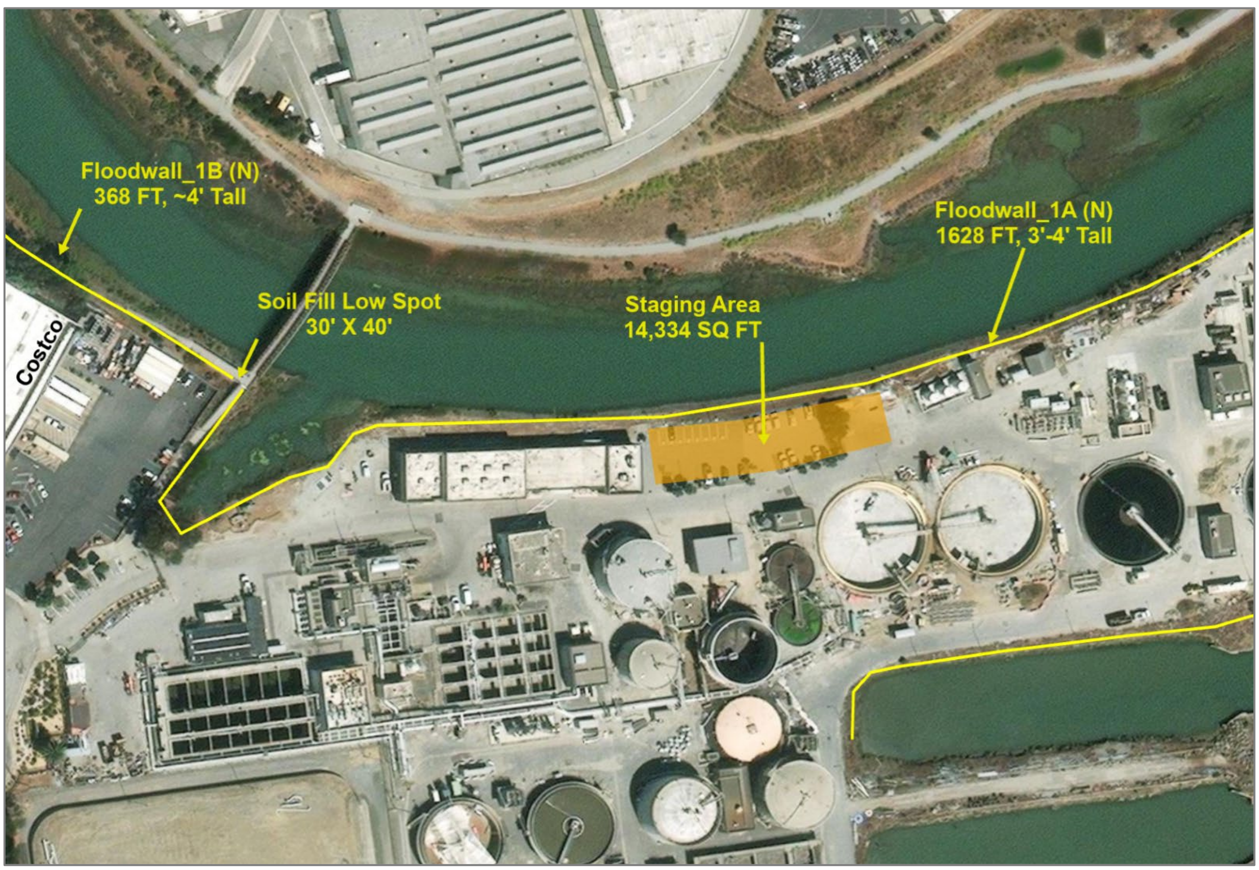

Figure 3-10. The floodwall on the North side of the WQCP is included in Alternatives 1 and 2, and would extend from the creek side of Costco, east to tie into higher elevation by the eastern side of the plant. The existing SF Bay Trail will not be impeded.

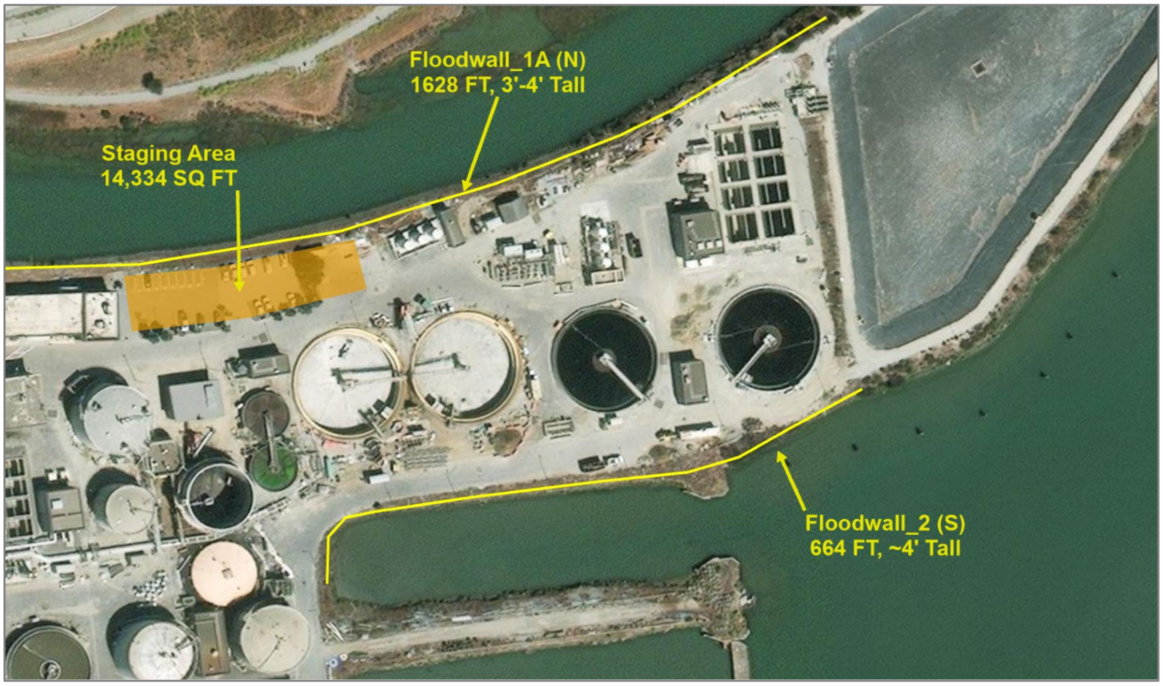

Figure 3-11. Alternative 2 also includes a shorter floodwall along the southern edge of the plant where elevations are lower, in addition to the north wall shown in Figure 3-10.

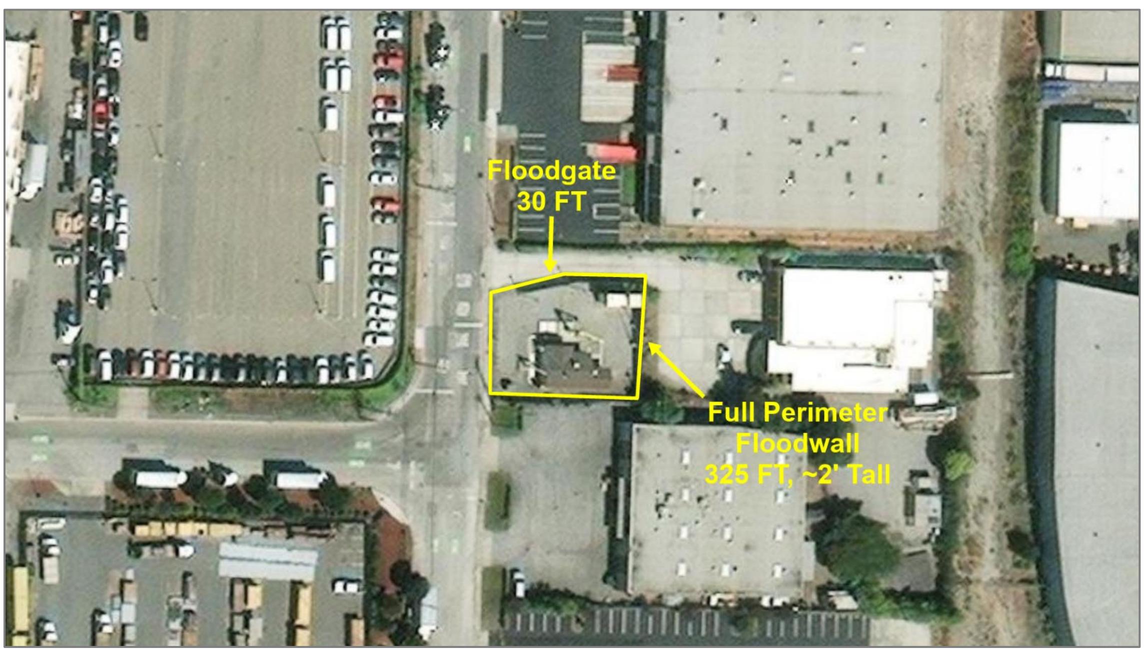

Figure 3-12. Alternatives 1, 2, and 3 all include a ring floodwall at sanitary Pump Station 4, which is roughly 2 feet high at grade, with a stop log gate which would need to be closed in a flood event to keep water out.

There is no critical infrastructure at risk in the finger pier location. The finger piers are currently used by the City of South San Francisco for miscellaneous storage, for example old streetlights, and overflow airport parking to Park SFO, which rents space just south of the plant (Figure 1-1). Damages in this location are not significant enough to justify measures here, and these uses could be relocated to avoid coastal flood damage. Therefore, all three action alternatives include a concrete ring floodwall around Pump Station 4, which was determined to be at high risk from flooding from tidal influences along with additional potential risk from precipitation and fluvial influences due to its position in a transitional zone. This will likely be a small-scale concrete T-wall which does not require excavation, roughly two feet high at grade on average, with a stop log gate to provide vehicular access. The subterranean control room and infrastructure at this location result in high consequences from flooding, including sewage backups into residences and streets, flowing through manholes and toilets. Pump Stations 9 and 11 were determined not to have flood damages within the study period of analysis, and so do not have any CSRM measures in the recommended plan.

Floodproofing Pump Station 4 was considered and determined to be infeasible, and a smaller perimeter alignment was also considered, but determined to impede operations as vehicles access the grated access panels. Pump Station 4 is remotely controlled and monitored via telemetry and cellular coms. However, scheduled periodic servicing, repairs, and maintenance require vehicular access from the stop log gate. Flood proofing was not feasible to protect the "at-grade" 480-Volt Motor Control Center (MCC), a 12kV utility power (PG&E) transformer, an emergency standby-by power generator, and multiple subgrade conduit vaults that connect the station's equipment to their respective power sources. These structures would be inundated with flood water, causing all utility and emergency backup power supplied to the station to fail. This would ultimately cease operation of the station to convey sewage, subsequently, causing the station to overflow. Thus, a full perimeter wall, 2 feet above grade on average, with stop log vehicular gate access, was included. An early flood warning system is also necessary to ensure that the stop log gate is sealed prior to flood waters reaching them. Once sealed for a coastal storm event, Pump Station 4 can continue to be run remotely and managed via telemetry to maintain pumping services during a coastal flooding event. The pump stations and main WQCP act as one continuous unit / water treatment system, and are hydraulically connected. The pump stations were determined to be non-separable from the main WQCP. Thus, the CSRM alternatives were formulated to manage risk and reduce damages to the system.

The proposed project does not include any residential components and the proposed improvements would not likely be significantly damaged if flooding occurs.

3.5.1 Focused Array of Alternatives Plan Descriptions

Three action alternatives were included in the focused array for comparison, plus a No Action alternative. The non-federal sponsor did not request consideration of a Locally Preferred Plan.

No Action Alternative—in this scenario, the federal government would take no action to address coastal storm flood risk at the WQCP and pump stations. Also described as the Future Without Project, coastal storm flood risk would increase over time under this alternative.

Alternative 1—North Plant Floodwall Alternative includes an I-wall (sheetpile) floodwall, approximately 3 to 4 feet above grade at WQCP at the north side of the WQCP adjacent to the right-bank of Lower Colma Creek (Floodwall 1A North, and 1B North). At Pump Station 4, a perimeter concrete T-wall (Ringwall), approximately 2-4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that plant operators would know to ensure that the stop log gate is sealed. This alternative would reduce the damages to all 29 structures within the main WQCP and prevent approximately 19,000 structures from clean-up cost associated with sewage backup.

Alternative 2—North and South Plant Floodwalls Alternative includes an I-wall (sheetpile) floodwall, approximately 3 to 6.5 feet above grade at the north side of the WQCP adjacent to the right-bank of Creek (taller than what is proposed in Alternative 1) (Floodwall 1A North, and 1B North), as well as a second shorter approximately 2- to 4-foot-high floodwall south of plant adjacent to San Francisco Bay (Floodwall 2S). For Alternative 2, the overall line of defense elevation was raised to also address flooding from the south side of the WQCP that will occur during more extreme events. Correspondingly, the north wall height was raised for a consistent line of defense around the plant. At Pump Station 4, a perimeter concrete T-wall (ringwall), approximately 2-4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that plant operators would know when to seal the stop log gate. This alternative would protect all 29 structures within the main WQCP from flooding and prevent approximately 19,000 structures from clean-up cost associated with sewage backup.

Alternative 3—Plant Floodproofing Alternative would dry floodproof 23 structures at the main WQCP by installing watertight doors and windows and using membranes to waterproof structures. The subterranean interconnected electrical system is not practicable to flood proof and would need to be elevated. At Pump Station 4, a perimeter concrete T-wall (ringwall), approximately 2-4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that plant operators would know when to seal the stop log gate.

3.5.2 Evaluation and Comparison of the Focused Array of Alternatives

The three action alternatives were evaluated on anticipated performance if implemented and compared to the No Action Alternative. The alternative plans were assessed to ensure agreement with the previously described planning objectives, considerations, and constraints. Then, in accordance with the Principles, Requirements and Guidelines (2013), the analysis of the alternatives evaluated plan performance under the four criteria of completeness, effectiveness, efficiency, and acceptability.

Effectiveness measures how well the plans meet the study objectives. Effectiveness at meeting objectives was evaluated for each objective. All the alternatives were determined to be highly effective for reducing economic damages from flooding (objectives 3 and 4) and reducing damages to the environment from flooding and effluent releases into Lower Colma Creek and SF Bay (objective 5), based on the initial assessment. For managing risk to human life and safety of plant workers (objective 1), there are concerns that Alternative 3 could pose safety hazards to plant operators who were going between buildings and operating the plant when up to 3.77 feet of floodwaters surround the buildings. Measures to manage this risk for Alternative 3 were added, such as raising the electrical system and elevated exits and walkways. Nonetheless, the team concluded that Alternative 3 was less safe to plant operators, than the structural alternatives where there is less risk of floodwaters entering the plant property and endangering operator safety. Therefore Alternative 3 ranked medium for meeting the objective to keep the plant operational during a coastal flood event and ranked well for Alternatives 1 and 2 on this metric. The plant operators would need to evacuate should the risk of overtopping occur for Alternatives 2 and 3. Alternatives 1 and 2 ranked well for protecting human health and safety by preventing exposure to raw sewage due to plant shutdown (objective 2). Alternative 3 has the risk that raw sewage would still be released into Colma Creek and SF Bay should plant staff evacuate and treatment temporarily cease, so it ranked as medium for this objective. Plant staff evacuating under Alternative 3 also makes this alternative medium in meeting the objective of reducing the economic, environmental, and social impacts that result from the loss of wastewater treatment services during a plant shutdown (objective 6). This comparison is summarized visually in Table 3-3

Efficiency was analyzed in the context of cost effectiveness, in this case initially using rough costs and then again using net National Economic Development (NED) benefits. The NED benefits are compared in Table 3-2 and ranked in Table 3-3. Table 3-2 compares the annual net NED benefits between the alternatives. Alternative 2 has the highest net NED benefits and is the NED plan. It also has the highest benefit-to-cost ratio (BCR). Alternative 1 has the second highest NED benefits. Alternative 3 has substantial negative net benefits and a BCR below unity, meaning it is not economically justified based on NED benefits. The main NED benefit categories include economic damages from coastal flooding avoided due to avoided cleanup costs from sewage backups, as well as avoided damages to structures and their contents. For more information, please refer to the Economic Appendix (Appendix D), which includes a detailed description of how NED benefits were calculated. The analysis of benefits was conducted over a 50-year period of analysis beginning in base year 2023. This analysis included NED, Other Social Effects (OSE), Environmental Quality (EQ), and Regional Economic Development (RED) benefits, which were assessed comprehensively to compare the alternatives.

Table 3-2. Economic Analysis of Project Focused Array of Alternatives.

Equivalent Annual Damages & Damages Reduced (April 2022 Price Level, FY 23 Federal Discount Rate - 2.5%)				
	No Action (Intermediate SLR)	**Alternative #1 (Intermediate SLR)**	**Alternative #2 (Intermediate SLR)**	**Alternative #3 (Intermediate SLR)**
Avg Annual Flood Damage	$1,959,857	$959,551	$0	Not analyzed as it is outside the CAP funding limit
Annual Damages Reduced	--	$1,000,306	$1,959,857	
Project Costs				
Project Cost	$0	$7,463,000	$10,214,000	$149,125,000
PED	$0	$1,443,000	$1,569,000	$25,948,000
Construction Management	$0	$663,000	$816,000	$11,930
IDC	$0	$7,686	$9,920	$153,581
Real Estate Cost	$0	$1,411,000	$1,411,000	$0
Cultural Mitigation	$0	$0	$0	$0
Environmental Mitigation	$0	$0	$0	$0
Total Investment Costs	$0	$10,987,686	$14,019,920	$175,238,511
Average Annual Costs	$0	$387,404	$494,315	$6,178,569
Annual O&M Costs	$0	$33,500	$67,000	$0
Total Average Annual Costs	$0	$420,904	$561,315	$6,178,569
Results				
Annual Net Benefits	--	$579,402	$1,398,542	-$6,178,569
Benefit-to-Cost Ratio	--	2.38	3.49	Below 1.0

Acceptability refers to whether the plan is legally implementable. Completeness is the extent to which a given alternative provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. All the alternatives were determined to be acceptable and complete.

Alternative 2 ranked high in all categories, followed by Alternative 1, which ranked high in all but efficiency, where it ranked medium because it has fewer net benefits than Alternative 2. Alternative 3 was low in efficiency due to the very high cost of $72 million before a 107% contingency is added. The contingency was developed during an Abbreviated Cost and Schedule Risk Analysis which documents great uncertainty and complexity associated with final design and cost of this alternative. Alternative 3 also ranked medium for constructability, as it involves specialized construction, and medium for life safety since plant operators would be operating the plant in a flood condition, with water surrounding the buildings.

The evaluation of the Focused Array of Alternatives for how effective, efficient, complete, and acceptable they are summarized in Table 3-3. The team used existing analysis, collective expertise, and professional judgement to assess and evaluate the alternatives. A more comprehensive evaluation of benefits, in addition to effectiveness, efficiency, completeness, and acceptability was performed on the focused array of alternatives and is summarized in Table 3-4 and described below. The metrics are noted in Table 3-3 and Table 3-4. Where the metrics are qualitative, the rationale for ranking is explained.

Table 3-4 summarizes the comprehensive benefit screening that the team performed to identify a plan that maximizes benefits across all benefit categories. The four benefit accounts that the USACE analyzes are National Economic Development (NED), Environmental Quality (EQ), Other Social Effects (OSE), and Regional Economic Development (RED). While the primary objectives of the study are all related to managing the risk of flooding due to coastal storms and tide driven events, the team looked to maximize the benefits that the alternatives could provide. Cleanup costs for sewage backups in the service area are measured in the NED account, as are repair or replacement of damaged property. However, OSE was an important benefit category for this project due to the serious impact to people and society that would come from large scale raw sewage exposure and contamination in homes and streets, which this project aims to manage the risk of. These impacts could be to human health, mental health, and animal health, as well as economic impacts associated with a public health disaster. No monetary value has been placed on this, nor life safety, but the benefit to the nation of avoiding these damages to society are captured qualitatively in the OSE account. There were also life safety components to consider for plant operators, since an objective of the study is to keep the plant operational during a coastal storm, plant operators would need to be able to safety remain on site, without undue risk to their lives. Finally, much of the communities that this WQCP services are socially vulnerable communities who have been historically disadvantaged. Impacts to these communities can be harder to recover from as they may have less resources, options, and access to services. This was evaluated with screening criteria 6b, looking at equity in benefits to environmental justice communities.

Table 3-3. Comparison and Evaluation of the Effectiveness, Efficiency, Completeness, and Acceptability of the Focused Array of Alternatives.

	Screening Criteria: Effectiveness Achieves Primary Objective to Manage Coastal Flood Risk					Screening Criteria: Efficiency	Screening Criteria: Completeness	Screening Criteria: Acceptability
Qualitative Ranking Categories **Green = High** **Yellow = Med** **Red= Low**	**PRIMARY PROJECT OBJECTIVE #1: Manage risk to plant workers' human life and safety**	**PRIMARY PROJECT OBJECTIVE #2: Manage risk to human health & safety from exposure to sewage**	**PRIMARY PROJECT OBJECTIVES #3 & #4: Reduce Economic Damages from Flooding**	**PRIMARY PROJECT OBJECTIVE #5: Reduce damages to env from flooding and effluent releases**	**PRIMARY PROJECT OBJECTIVE #6: Reduce damages due to lost wastewater treatment services**	**Cost Effectiveness** *($/Net Benefits)*	**Benefits Realized Without Further Action from Others** *(Yes/No)*	**Legally Implementable** *(Yes/ Yes, but requires significant coordination / No)*
Alternative 1: North Floodwall + Pump Station 4								
Alternative 2: North & South Floodwall + Pump Station 4								
Alternative 3: Nonstructural Only - Raise electrical system + Flood proofing + Pump Station 4								

Table 3-4. Comprehensive Benefit Evaluation and Comparison of Focused Array of Alternatives.

	Screening Criteria #1: Effectiveness (meets primary objectives)	**Screening Criteria #2: Efficiency ($ cost effective $)**	**Screening Criteria #3: Acceptable (Implementable)**	**Screening Criteria #4: Completeness (standalone)**	**Screening Criteria #5a: Environmental Quality (EQ) habitat**	**Screening Criteria #5b: Environmental Quality (EQ) Cultural Resources**	**Screening Criteria #6a: Other Social Effects (OSE), life safety**	**Screening Criteria #6b: Other Social Effects (OSE), environmental justice**	**Screening Criteria #6c: Other Social Effects (OSE), impact to people/society of raw sewage exposure**	**Screening Criteria #6d: Regional Economic Development (positive impact on regional economy)**	**Screening Criteria #7: Operability**	**Screening Criteria #8: Performance**
Focused Array of Alternatives	Green = High Yellow = Med Red = Low	Green = High Yellow = Med Red = Low	Green = High Yellow = Med Red = Low	Green = Yes Yellow = Complete for all but the very infrequent flood events where plant workers would leave due to safety and plant would shut down Red= No	Green = High Yellow = Med Red = Low	Green = No impacts to Cultural Resources Yellow = Medium impacts to cultural resources Red= High impacts	Green = manages risk Orange = Unsure/medium Red = Negative Impact	Green = Equitable benefits/damages and avoids impacts to vulnerable Orange = Unsure/medium Red = Negative or Unequitable Impact/Benefits	Green = Equitable benefits/damages and avoids impacts to vulnerable Orange = Unsure/medium Red = Negative or Unequitable Impact/Benefits	Green = High Yellow = Med Red = Low	Green = High Yellow = Med Red = Low	Green = High Yellow = Med Red = Low
Alternative 1: North Floodwall + Ring Floodwall at Pump Station 4 with gate + flood warning system												
Alternative 2: North & South Floodwall + Ring Floodwall at Pump Station 4 with gate + flood warning system												
Alternative 3: Nonstructural Only - Raise electrical system + Flood proofing 23 structures + ring floodwall at Pump Station 4 + Flood warning system												

Operability is defined as the ability to efficiently operate and maintain a facility or facilities over their life cycle when the facility is built according to the project's plans and specifications. In this case, not all plans would have the same operability for the WQCP. In particular, the nonstructural alternative would alter the way the WQCP operates in both a normal and flood environment and would require changes to how the operators move around the plant and between buildings, as well as how the electrical system functions. The work to elevate the electrical system may require periodic outages during construction, which would impact plant performance. Plant performance would also be impacted if the plant operators needed to evacuate the plant due to unsafe flooding, which is more likely in Alternatives 1 and 3.

There is also the performance of the CAP 103 CSRM project, which is a safety risk assessment category to measure how the project will perform when subjected to these events. It has to do with failure probabilities. This was measured qualitatively prior to release of the draft report and a failure analysis will be performed on the recommended plan to inform final design. In the initial comparison of alternatives for performance, the nonstructural plan was considered most at risk for failure since there is a high risk that one or more doors or panels would be left open/unsealed prior to an event, since there are so many entry points to the plant's subterranean system and they are accessed multiple times a day.

The Regional Economic Development (RED) account displays changes in the distribution of regional economic activity (e.g., income and employment). This account is typically used to capture the regional impacts of a large capital infusion of project implementation dollars on income and employment throughout the study area through the use of income and employment multipliers. A large infrastructure project in South San Francisco, of roughly $15 million, will have a positive impact on local income and employment. High paying construction jobs are expected to come to the area and local establishments, including dining and shopping, are expected to see an increase in spending due to the amount of construction related activities in the area.

EQ analysis was broken into comparison of each plan's effects on habitat EQ and cultural resources EQ, as they performed differently. Cultural resources EQ is negatively impacted by more ground disturbance exposing archaeological sites. Alternatives 1 and 2 proposes structural work near the banks, which have the possibility of disturbing buried cultural deposits as well as Native American ancestral remains. The EQ benefits for habitat are tied to avoiding emergency releases of untreated effluent into Lower Colma Creek and San Francisco Bay. In that sense, Alternatives 2 and 3 are more effective than Alternative 1, which mitigates less risk than Alternatives 2 and 3.

One of the planning constraints is that plans must allow for maintained operability of the WQCP during a flood event to avoid loss of pumping and wastewater treatment services throughout the service area. Flood proofing can cost effectively protect the buildings and their contents from damages, however, as a standalone measure it would not meet all the objectives of the project. Flood proofing alone would not allow for the WQCP to be operated, nor would it be a safe environment for plant operators. In assessing the nonstructural only plan, the team realized that the plant operators would need to be able to access valves and control panels during a flood state where the buildings are sealed off. To safety do so with up to roughly 3.8 feet of water in some places, elevated walkways and exits would need to be constructed.

Furthermore, flood proofing the electrical system was determined to be infeasible as well as too high a risk for life safety.

Figure 3-15 is a map of the subterranean electrical system. There are 11 motor control centers (circled in red), that operate and power various parts of the plant, located throughout the plant. Each has at least one subgrade vault to provide access to cables and conduits when they need to be checked or maintained, with cables and conduits going between them underground.

These subterranean vaults are located throughout the plant and need to be accessed for operation. Figure 3-15 shows a map of the many motor control centers circled in red that are connected through myriad subterranean conduits (pictured in Figure 3-14) which could conduct water throughout the system. A photo of a motor control center is shown in Figure 3-13. Since one constraint is to keep plant operational in a flood state, the only feasible way to protect the electrical system nonstructurally, is to elevate it. Elevation is also safer from a worker safety perspective to manage the risk of electrocution during a flood since plant operators would still be present in a flood state to maintain treatment services/pumping.

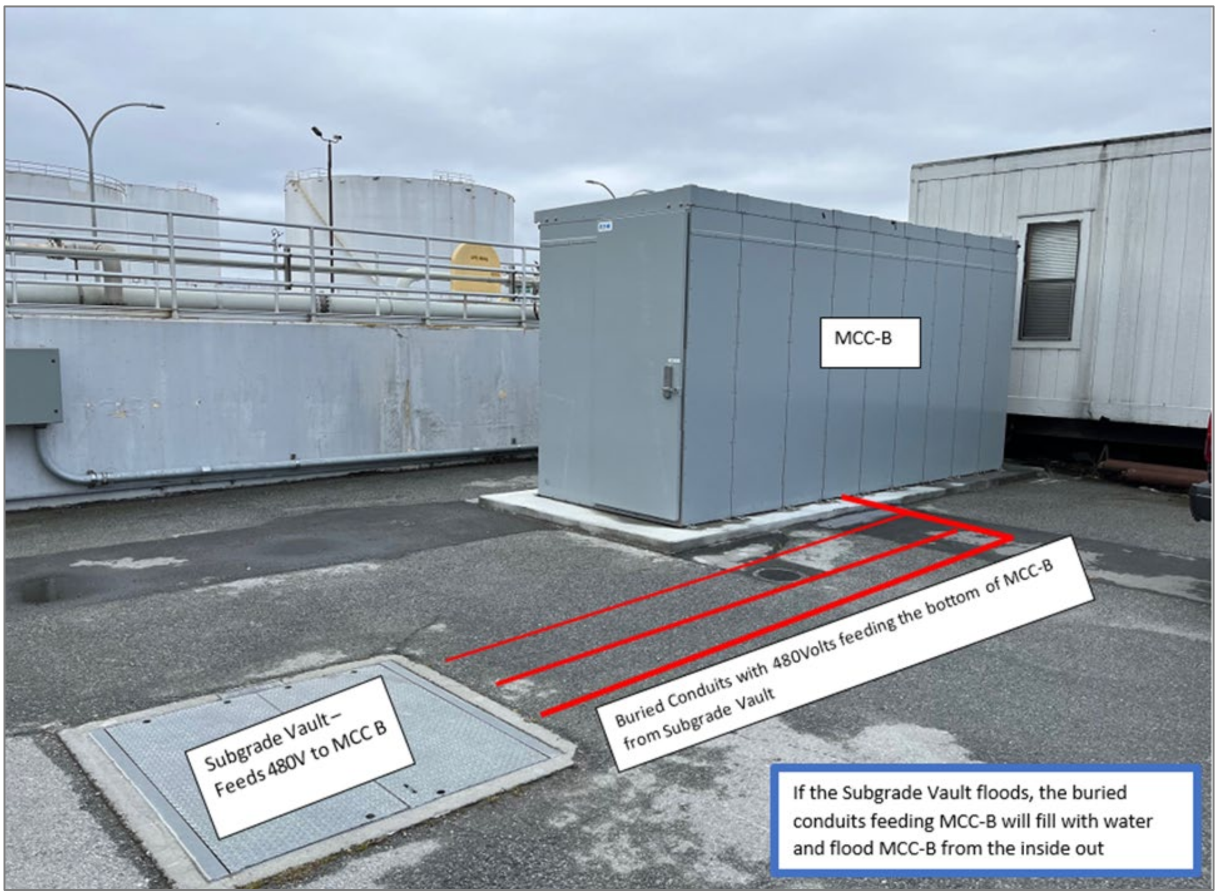

Figure 3-13. Photo of one of the eleven Motor Control Centers (MCC) at the WQCP, which each have buried conduits connecting through a subgrade vault. These conduits are vulnerable to flooding and could funnel water to the MCCs, which power various facilities throughout the plant.

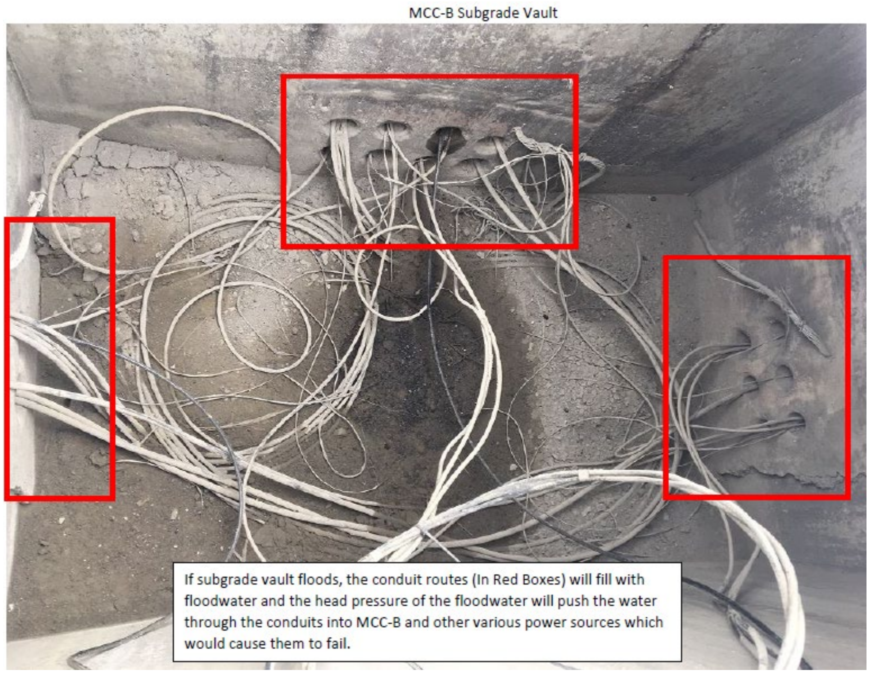

Figure 3-14. Image of the inside of a subgrade vault at the WQCP, like the one pictured in Figure 3-13, with electrical conduits which connect the MCCs to the various plant facilities to power them.

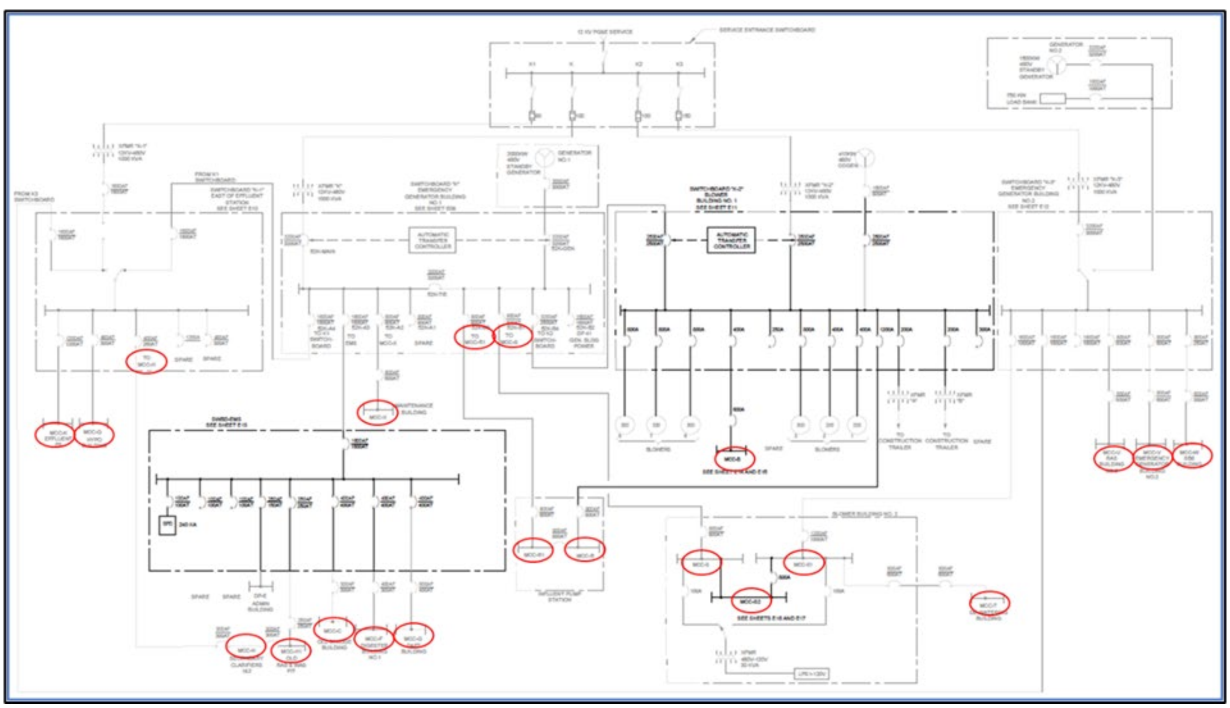

Figure 3-15. Map of the WQCP Electrical Single-Line Diagram showing the layout and connections of the subterranean electrical system that powers the plant.

The Flood Damage Reduction Analysis (HEC-FDA) 1.4.3 software developed by the USACE Hydrologic Engineering Center (CEIWR-HEC) provides the capability to perform an integrated hydrologic engineering and economic analysis in the evaluation of coastal storm risk management plans. Due to the nature of the flooding in the study area, which will result as a combination of sea level rise and coastal storms leading to flooding withing the Main WQCP, rather than as a result of wave attack and erosion, HEC-FDA is considered to be the appropriate modeling tool for this effort.

To carry out the flood damage analysis for this study, two HEC-FDA models were built for each SLR scenario: one model to estimate flood damages from the base year, 2023 to 2053, and a second model to estimate damages from 2053 to 2073 (50-year period of analysis). Using two time periods is how SLR is calculated in HEC-FDA. Inputs to both HEC-FDA models will include base/first year and future year without- and with-project water surface elevation (WSEL) for all eight AEP events: 0.2 percent, 1 percent, 2 percent, 4 percent, 10 percent, 20 percent, 50 percent, and 100 percent. Additional model inputs include depth-damage curves for each of the structure types, contents for each structure type and floodplain structure elevations. HEC-FDA will calculate flood depths at each structure from the WSEL, which provide the water's stage, and structure elevations. This approach to estimating flood depths minimizes the potential future work required to re-run the HEC-FDA models if there are changes to the coastal modeling.

HEC-FDA combined flood depths and frequencies with the floodplain asset information to compute equivalent annual damages (EAD), AEP, and other performance statistics both without- and with-project. The final without- and with-project equivalent annual damage (EAD) estimates under each SLR scenario will be calculated from the EAD outputs from each model. This will be done via post-processing in a spreadsheet outside of the FDA model. Table 3-2 displays the computed EAD and benefits for the analyzed alternatives.

In looking at the comprehensive benefits as a whole, Alternative 2 maximizes net comprehensive benefits as is the Comprehensive Benefit Plan.

3.5.3 Final Array of Alternatives

Based on the analysis of the focused array of alternatives, which showed that Alternative 3 was less effective at meeting project objectives than the other action alternatives, less efficient, and garnered the fewest comprehensive benefits for life safety, operability, and project performance, Alternative 3 was screened from further consideration. The final array of alternatives carried forward for impact analysis were:

No Action Alternative—in this scenario, the federal government would take no action to address coastal storm flood risk at the WQCP and pump stations. Also described as the Future Without Project Conditions coastal storm flood risk would increase over time.

Alternative 1—North Plant Floodwall Alternative includes an I-wall (sheetpile) floodwall, approximately 3 to 4 feet above grade at WQCP at the north side of the WQCP adjacent to the right-bank of Lower Colma Creek (Floodwall 1A North, and 1B North). At Pump Station 4, a perimeter concrete T-wall (ringwall), approximately 2–4 feet above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that plant operators would know to ensure that the stop log gate is sealed. This alternative would reduce the damages to all 29 structures within the main WQCP and prevent approximately 19,000 structures from clean-up cost associated with sewage backup.

Alternative 2—North and South Plant Floodwalls Alternative includes an I-wall (sheetpile) floodwall, approximately 3 to 6.5 feet above grade at the north side of the WQCP adjacent to the right-bank of Creek (taller than what is proposed in Alternative 1) (Floodwall 1A North, and 1B North), as well as a second shorter approximately 2 to 4-ft-high floodwall south of the WQCP adjacent to San Francisco Bay (Floodwall 2S). For Alternative 2, the overall line of defense elevation was raised to also address flooding from the south side of the WQCP that will occur during more extreme events. Correspondingly, the north wall height was raised for a consistent line of defense around the plant. At Pump Station 4, a perimeter concrete T-wall (ringwall), approximately 2-4 ft above grade, would be constructed, with stop log gate for vehicular access and early flood warning system so that plant operators would know when to seal the stop log gate. This alternative would protect all 29 structures within the main WQCP from flooding and prevent approximately 19,000 structures from clean-up cost associated with sewage backup.

3.6 Preferred Plan*

The Tentatively Selected Plan (TSP) milestone was held in March 2022, where it was determined that Alternative 2 was the TSP. Alternative 2 is the NED Plan with the highest net NED benefits and was found to have a higher benefit to cost ratio than Alternative 1. However, both alternatives were found to have positive benefit to cost ratios. Alternative 2 is also the comprehensive benefit plan that maximizes comprehensive benefits. After incorporating feedback from the comment period on the Draft Report, Alternative 2 was confirmed as the agency preferred plan under NEPA selected to move forward to complete design on and construct.

3.6.1 Preferred Plan Description

Alternative 2—the **North and South Floodwall Alternative** includes a 2,000-foot-long I-wall (sheetpile) floodwall, approximately 3 to 6.5 ft above grade at the north side of the WQCP adjacent to the right-bank of Creek, as well as a second 700-foot-long approximately 2 to 4-foot above grade floodwall south of plant adjacent to San Francisco Bay. The sheetpile flood walls will be topped with a concrete cap. The decommissioned petroleum pipeline previously used for SFO would be cut off at the intersection of the floodwall and recapped. The intersections of the floodwall at the buried utilities, such as the discharge pipes and storm drains will be filled in with concrete grout. The footprint of disturbance will be limited to eight feet on land side of the wall centerline due to limited space between the existing utility structures and city sidewalks. Small excavators and manual excavation will be utilized to restrict the footprint of disturbance to eight feet on land side of the wall. At Pump Station 4, a perimeter concrete T-wall, approximately 2 to 4 ft above grade, would be constructed, with stop log gate for vehicular access and early warning system so that plant operators would know when to seal the stop log gate.

Alternative 2 meets the CSRM objectives of managing risk to human life and safety by reducing the risk of the WQCP and Pump Station 4 flooding, up to an extreme tide elevation of 12.34 feet NAVD88 which is equivalent to the WSEL expected during a 0.2 percent AEP event with 50 years at the Intermediate SLR rate from the base year of 2023 as well as an extreme tide elevation of 12.99 feet NAVD88 which is equivalent to the WSEL expected during a 1 percent AEP event with 50 years at the High SLR rate from the base year of 2023, with a wall crest elevation of 13.5 ft NAVD88. The existing relative sea level rise trend from the Redwood City tide gauge tracks between the USACE Low and Intermediate SLR Curves, so the intermediate SLR rate is the most appropriate and conservative estimate of future conditions.

Design will be finalized during the Design and Implementation Phase. The Alternative 2 design includes a wall crest elevation approximately 13.5 to 15.5 ft NAVD88, which prevents flooding through the low spots on the north side from the Lower Colma Creek channel and through the low spots on the south side of the WQCP area. With Alternative 2 in place, the WQCP is still susceptible to overland flow from the west, but this flooding was found to enter the WQCP area only at extreme tide elevations greater than 13 ft NAVD88. This would allow plant operators to keep the plant operational and avoid emergency releases of raw sewage into Lower Colma Creek and San Francisco Bay due to plant shutdowns. It would also manage the risk of coastal flooding causing raw sewage to back up into homes and streets if pump stations were to fail or the plant were to not be able to accept pumped sewage. Alternative 2 reduces economic damages that could occur annually by $1,959,857 and has annual net benefits of $1.4 million and a benefit to cost ratio of 3.49. It improves resiliency to sea level rise for the project area region. The likely recommended plan also improves social justice by managing risk of impacts to human health and safety, as well as aesthetic impacts of raw sewage in socially disadvantaged communities. In addition, Alternative 2 will generate an estimated 121 cubic yards excavated material that will either be reused onsite or hauled off to an appropriate disposal facility (Appendix F).

Finally, Alternative 2 is relatively straightforward and simple to implement, with the majority of construction and staging occurring on WQCP property, limited excavation required, and low and mitigatable impacts to habitat and cultural resources. Because the sheetpile I-walls with concrete caps proposed for Alternatives 1 and 2 cannot be raised later, they are not inherently adaptable. While Alternative 1 is still vulnerable to 0.2 percent AEP events with 20-50 years at the Intermediate SLR rate from the base year of 2023, Alternative 2 manages risk including 0.2 percent annual chance events with 50 years at the Intermediate SLR rate from the base year of 2023. Alternative 1 is vulnerable to 10 percent AEP events with 50 years at the High SLR rate and 0.2 percent AEP events with 25 years at the High SLR rate, while Alternative 2 is vulnerable only at 0.2 percent AEP events with 50 years at the High SLR rate. In this sense, Alternative 2 reduces the risk of needing future adaptation based on higher rates of future SLR and is a more resilient plan. Because the additional cost for this added resiliency is not very high, the net benefits from the project increase with this added increment.

Alternative 2 can be implemented under CAP authority with a cost exceedance waiver, as discussed in Section 3.6.3. Any future expansions of the WQCP should incorporate known coastal flood risk into future facilities designs, elevating entry points above the maximum modeled flood depths, and reviewing flood maps as part of the design. Where practicable, elevating electrical systems and walkways for future expansions should also be considered. Proper drainage plan should also be implemented for future expansions to ensure water does not pond and travel across the plant, potentially inundating and damaging subterranean infrastructure.

The estimated duration of the construction for the floodwall and utility modification under Alternative 2 is 12 months (Appendix F). Sheetpile installation will occur from land therefore an in-water work window is not proposed. While no work in the creek is anticipated, environmental restrictions could be put in place that only allow a 6 month work window. Therefore, it is expected that the construction would occur during two construction seasons.

3.6.2 Risk and Uncertainty

RESIDUAL RISKS

The reliability of structural flood protection lies in its design, height, and location. The structure must be strong enough to withstand the forces of the flood waters, tall enough to not be overtopped in a flood event and located properly to block flood waters completely. Failure in any of these categories will result in flood waters reaching behind the structure. While unlikely, a more extreme event than was included in the design phase could occur, and a flood wall cannot perform for an event it was not designed for.

Similarly, nonstructural flood protection systems must be properly designed and executed. Raising electrical systems is effective only if they are raised high enough. Flood warning systems are only effective if they operate properly and provide accurate information far enough in advance, and if people take the needed actions to evacuate and/or deploy nonstructural flood protection measures. Floodproofing doors, windows, and other entrances or at-risk systems is only effective if the floodproofing measure is properly applied or executed, leaving room for human error in the high-pressure environment of a flood disaster.

No coastal flood protection project can ever reduce coastal flood risk to zero. Even the most well-built levees and floodwalls carry a residual risk of failure or overtopping during large floods. Damages could be exacerbated by the failure of a structure, as flood waters pouring over or bursting through a barrier could have more energy, pressure, and debris load than a gradual inundation.

The with-project project performance metric table from FDA in the Economic appendix shows the conditional non-exceedance probability by events. This probability ranges from 99.98 percent non-exceedance for a 10 percent AEP event to a 99.50 percent non-exceedance for a 0.2 percent AEP event. The selected alternative performs with little risk over the project lifetime of 50 years, up to the highest modeled AEP event of 0.2 percent.

RISK TO LIFE SAFETY

Projected flood depths during coastal flood events at the WQCP and pump stations are shallow—between 0.01 to 3.77 ft for a 0.2 percent AEP event in 2073, using the USACE intermediate sea level rise curve for without-project conditions. Flood water velocities are not expected to exceed 1.0 feet per second in the WQCP area. These factors indicate lower risk to life safety as the waters are relatively shallow and slow moving. However, life safety was still a key factor in evaluating the alternatives, as plant operator safety needed to be evaluated and considered carefully, especially since many of the WQCP facilities are subterranean, so could be fully flooded in the future without project condition and pose serious life threat to any plant operator who did not evacuate.

For the WQCP to function, it must have workers on site and able to go safely between buildings. In evaluating the nonstructural alternative, buildings would be flood proofed, but floodwater would otherwise be ponding around them. One objective of this study is to avoid plant shutdowns and loss of wastewater treatment services during a coastal storm event. Given the need for workers to manage flows and levels of the treatment tanks, etc., human life/safety assurance was a key factor for evaluating the alternatives. The PDT evaluated the safety of the operating environment for the wastewater treatment plan for workers during a flood event, and nonstructural measures such as operating safety standards were also be evaluated. This was important to include as even shallow water can knock someone off their feet if attempting to walk through it. It is important to note that all proposed measures would not negatively impact access needed to maintain operation of the plant during a coastal flood event.

ENVIRONMENTAL RISK FACTORS

Only minor uncertainty risks exist under environmental factors. Currently there is no compensatory mitigation for the project; however, if the project needs to undergo the state water quality certification process mitigation may be required as a part of the permit conditions. Potential features may include a marsh migration zone, vegetation/tree plantings along the stream corridor, or methods of construction (best management practices). Prior to construction of the project, a qualified biologist will conduct endangered species and nesting bird surveys. Based on current knowledge of the environmental resources and potential impacts of the project, no further uncertainty is known.

ENGINEERING RISK FACTORS

There is the risk that fluvial (i.e., riverine) flood influences could unexpectedly be more of a factor in the project coastal flood risk than assumed due to sudden changes in global conditions or other unpredictable events. This could increase the coastal flood risk beyond what the team formulated plans to address. The assumption that fluvial flood influence is negligible was based on analysis of previous studies which showed tidal dominance in this area. Alternative 2 is the largest of the plans analyzed, which would mitigate this risk should it be realized.

There is also a risk that overland flooding could behave differently than modeled and threaten the WQCP where structural measures are not proposed. To mitigate this risk, the team performed additional H&H model refinement and ran unsteady downstream tidal events to increase confidence in model results.

Potential unexpected changes in rainfall volume and frequency could impact the flooding hazard by increasing the fluvial flood influence or inundating areas solely through rainfall.

Lastly, there is a risk that a seismic event may impact a constructed CSRM project in the study area. The area experiences a significant amount of seismic activity and there is a high likelihood that a seismic event will occur during the 50-year period of analysis. Strong ground shaking during major earthquake events (moment magnitude 6.7 or greater) may cause lateral spreading which could lead to some deformation of CSRM structures (i.e., sheet pile and floodwalls). However, the probability of such an event occurring is low. Geo-hazards such as landslides and subsidence are not likely to occur and would not impact the CSRM structures. Therefore, the seismic risk to the project is considered low.

IMPLEMENTATION RISK FACTORS

There is a risk that unanticipated buried utilities will need to be relocated, which could increase the cost and duration of construction. The team has reviewed existing information and conducted a comprehensive review of as-built drawings, and aligned the proposed floodwall to reduce/mitigate this risk.

There is a risk that outside factors, such as the price of materials, inflation, weather, and workforce availability could increase construction costs. The contingency for the cost estimate considered and included these risks, which should manage this risk to implementation.

SENSITIVITY OF ALTERNATIVE 2 TO VARYING SEA LEVEL RISE SCENARIOS

Table 3-5 looks at the sensitivity of our tentatively selected plan to the full range of SLR scenarios (low, intermediate, and high). It was determined that SLR has little effect on the performance of our

Tentatively Selected Plan over the 50-year period of analysis. This is because Alternative 2 only overtops with the most extreme of the modeled 153 events, namely the 0.2 percent AEP (1 in 500 chance of being equaled or exceeded) high sea level rise scenario in year 2073. In other words, the Tentatively Selected Plan is very resilient to sea level rise over the period of analysis (50 years, from 2023 to 2073).

Table 3-5. With Project Equivalent Annual Damages Reduced, or Projected Economic Benefits to the Nation, with Varying Degrees of and High Sea Level Rise in the Future

Equivalent Annual Damages & Damages Reduced (April 2022 Price Level, FY 23 Federal Discount Rate - 2.5%)				
Sensitivity Analysis on the Tentatively Selected Plan (TSP)				
	No Action (Low SLR)	Alternative #2 (Low SLR)	No Action (High SLR)	Alternative #2 (High SLR)
Avg. Annual Flood Damage	$1,270,512	$0	$12,706,880	$221,590
Annual Damages Reduced	--	$1,270,512	--	$12,485,289
Project Costs				
Project Cost	$0	$10,214,000	$0	$10,214,000
PED	$0	$1,569,000	$0	$1,569,000
Construction Management	$0	$816,000	$0	$816,000
IDC	$0	$9,920	$0	$9,920
Real Estate Cost	$0	$1,411,000	$0	$1,411,000
Cultural Mitigation	$0	$0	$0	$0
Environmental Mitigation	$0	$0	$0	$0
Total Investment Costs	$0	$14,019,920	$0	$14,019,920
Average Annual Costs	$0	$494,315	$0	$494,315
Annual O&M Costs	$0	$67,000	$0	$67,000
Total Average Annual Costs	$0	$561,315	$0	$561,315
Results				
Annual Net Benefits	--	$709,197	--	$11,923,974
Benefit-to-Cost Ratio	--	2.26	--	22.24

Figure 3-16 below plots with-project critical elevations at Pump Station 4 and the main WQCP over 100 years against varying rates of SLR. This comparison shows the main WQCP overtopped during a 1 percent AEP event with high sea level rise around year 2074, roughly 51 years after construction. Pump Station 4 does not get overtopped during the 1 percent AEP with high SLR until roughly 67 years after construction. After the critical thresholds for the 1 percent AEP are exceeded, the frequency of overtopping would be expected to increase more as SLR continues. Pump Station 4 floodwalls could be raised prior to these thresholds being met, and the stop log gate replaced. This can also be used to address any potential additional threshold increases due to precipitation and fluvial influences over time in addition to SLR. However, the floodwalls at the main WQCP may require replacement past the 50-year project life, depending on how quickly sea levels rise.

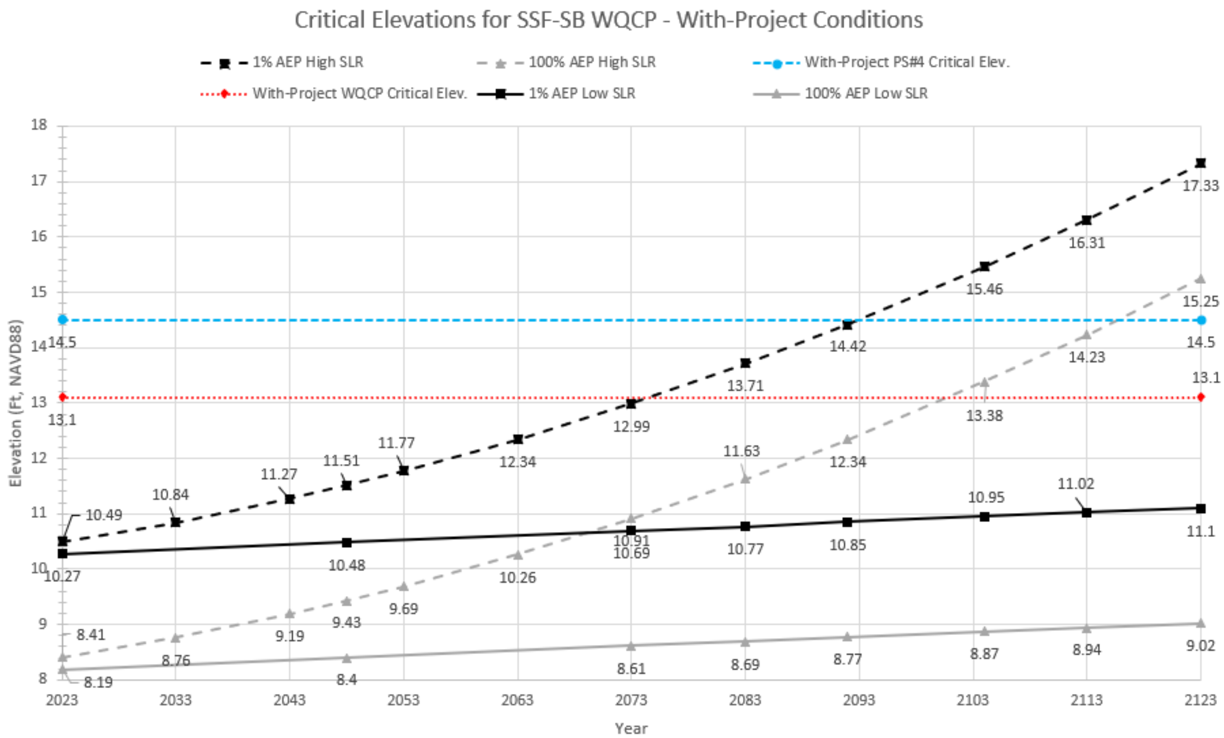

Figure 3-16. Critical elevations for Pump Station 4 (blue, circle, dashed) and the WQCP area (red, diamond, dotted) shown with various RLSC projections to visualize when and how often impacts may occur in Future With-Project conditions.

AGENCY REQUIREMENTS

Project implementation requires approval of the DPR first and foremost. Following report approval, the project is eligible for design and implementation. The design and implementation phase of the project can begin after USACE approves the DPR and receives funding, and the non-federal sponsor approves a project agreement.

Once federal construction funds are appropriated, USACE and the non-federal sponsor would enter into a Project Partnership Agreement (PPA). This PPA would define the federal and non-federal responsibilities for implementing, operating, and maintaining the project.

Following the signing of the PPA and the design approval, USACE would officially request the sponsor to acquire the necessary real estate for project implementation. The advertisement of the construction contract(s) would follow the certification of the real estate acquisition and right-of-entry. The final acceptance and transfer of the project to the non-federal sponsor would follow the delivery of an operation and maintenance manual and as-built drawings. Assuming full funding, the first structural component of the recommended plan would be constructed by the year 2025.

3.6.3 Cost Share Requirements and exceptions

A typical projects cost share would be controlled by Section 103 of WRDA 1986 (33 USC 2213), where the non-federal cost share for structural coastal storm risk management is a minimum of 35 percent of total costs for the project, including 5 percent in cash, with LERRD value credited toward the sponsor's cost share, with the sponsor's total share capped at a maximum of 50 percent; and (ii) nonstructural coastal storm risk management is a flat 35 percent of total costs for project elements allocated to nonstructural coastal storm risk management, with LERRD value credited toward the sponsor's share. Subject to available appropriations, the sponsor's LERRD expenses will be reimbursed to the extent those expenses are creditable and exceed the sponsor's required cost share. Table 3 6 describes the cost share provisions for the recommended plan. It should be noted that the total D&I Phase in table 3-6 includes an extra $88,000 to account for Federal Real Estate Administration Costs. These costs are a 100% federal cost and are not creditable towards the NFS.

In this instance, the recommended project's estimated cost exceeds the Federal limit of $10 million. To address that fact, a cost exceedance policy waiver was applied for and approved. With the cost exceedance waiver granted, the NFS has agreed to pay 100 percent of all costs over the $10 million federal cost. This results in a $351,550 overage, bringing the NFS total project cost share to an estimated $6,107,000. In addition, any LERRD costs that exceed the sponsor's 35% share of the total project cost will not be reimbursed since that would cause the project to further exceed the Federal limit of $10 million.

Table 3-6. Cost Provisions for the recommended plan (rounded to $1,000s).

	Fed	Non-Fed	Total	Notes
Feasibility Phase				
Total Feasibility Phase	**$610,000**	**$510,000**	**$1,120,000**	Total Feas. Phase Costs
D&I Phase				
Construction	$10,896,000	$0.00	$10,896,000	
PED	$1,642,000	$0.00	$1,642,000	
Federal Real Estate Admin	$88,000	$0.00	$88,000	
Construction Management	$866,000	$0.00	$866,000	
LERRD	$0	$1,495,000	$1,495,000	100% NF and includes $12k in relocations
	$13,492,000	$1,495,000	$14,987,000	
Adjustments				
Non-Fed Cash Contribution	($3,750,450)	$3,750,450	$0	To Increase Non-Fed Share to 35%
Total D&I Phase	**$9,741,550**	**$5,245,450**	**$14,987,000**	
	65%	35%		
Feasibility & D&I Phases				
Feasibility Phase	$610,000	$510,000	$1,120,000	
D&I Phase	$9,741,550	$5,245,450	$14,987,000	
Total Cost Apportionment	**$10,351,550**	**$5,755,450**	**$16,107,000**	
Adjusted Per Fed Limit	**$10,000,000**	**$6,107,000**	**$16,107,000**	Adjusts Fed share to Fed limit of $10M for Sec. 103 projects
TOTAL	62.1%	37.9%		For All Costs (Including Sunk Feas. Phase costs)
D&I Phase - Adjusted				
Adjusted D&I Cost Sharing	**$9,390,000**	**$5,597,000**	**$14,987,000**	For D&I Phase to limit Fed costs to $10M
	62.7%	37.3%		

The target implementation schedule is shown in Table 3-7 for the Lower Colma Creek Section 103 CAP project. This is the schedule to complete the Feasibility Phase, enter into the Design and Implementation Phase, and the tentative schedule to achieve the first construction contract for the project. The D&I

schedule will be confirmed pending receipt of funds and updated based on resources and capability. Completion of Plans and Specifications could take longer (up to roughly 1 year).

Table 3-7. Implementation Schedule.

Milestone	Schedule	Executed Date
Feasibility Cost Sharing Agreement		November 2020
Tentatively Selected Plan (TSP) Milestone		March 31, 2022
Interagency & stakeholder meetings (USFWS, NMFS, BCDC, Water Board, USEPA, Lower Colma Creek Citizens Advisory Committee)	March 2022	March 2022
Draft Detailed Project Report (DPR)	May 27, 2022	May 27, 2022
ATR/Public/Policy & Legal Reviews of Draft DPR/EA	May 27, 2022 to July 8, 2022	May 27, 2022 to July 8, 2022
Public Meeting	June 2022	June 2022
DPR edits from reviews	July 9, 2022 to January 15, 2023	July 9, 2022 to November 10, 2023
Complete and Submit Final Report	June 26, 2023	
Final Report Milestone / Approval	September 6, 2023	
Initiate D&I Phase	Fall 2023	
Execute PPA	Winter 2023	
Site Design Surveys – Initiate Design	Winter to Spring 2024	
Complete Plans and Specifications	Spring 2024	
Agency Reviews P&S through BCOES	Summer 2024	
First Construction Contract Award	Fall 2024	

3.6.4 Non-Federal Sponsor Responsibilities

Sponsor Support and Capability. The non-federal sponsor fully supports the implementation of Alternative 2 and submits a statement of self-certification of financial capability to accompany the final report package. They are willing and financially able to support the project moving forward through plans and specifications (P&S) and implementation. The sponsor has conducted significant construction efforts for the WQCP in the past and has a dedicated funding stream to implement coastal storm damage reduction projects through the City's 5-year sewer rate plan approved by City Council in 2021. The sponsor has clear legal authority to conduct coastal storm risk management projects with federal partners. There is no locally preferred plan (LPP).

Implementation Schedule. USACE proposes that Alternative 2 would begin implementation shortly following approval of the detailed project report (DPR). This would signify implementation starts in FY24. Details provided in Table 3-7.

Sponsor Responsibilities. As part of the implementation of the selected plan, the City of South San Francisco would acquire all necessary lands, easements, relocations, rights-of-way, and disposal areas (LERRDs) and seek crediting or reimbursement for those costs in excess of the required cost share.

To obtain work in kind credit, all work must be performed in accordance with federal, state, and local laws and regulation. Any regulated materials recovered as part of the abatement process would be disposed of in a certified landfill. Cost-share responsibilities are defined in Sections 3.6.3 and 3.6.4.

The non-federal sponsor shall provide the real property interests, placement area improvements, and relocations required for construction, operation, and maintenance of the project.

If providing in-kind contributions as a part of its 35 percent cost share, the non-federal sponsor shall obtain all applicable licenses and permits necessary for such work. As functional portions of the work are completed, the non-federal sponsor shall begin operation and maintenance of such work. Upon completion of the work, the non-federal sponsor shall so notify the Government within 30 calendar days and provide the Government with a copy of as-built drawings for the work.

When the District Commander determines that construction of the project, or a functional portion thereof, is complete, the District Commander shall so notify the non-federal sponsor in writing within 30 calendar days of such determination, and the non-federal sponsor, at no cost to the Government, shall operate, maintain, repair, rehabilitate, and replace the Project, or such functional portion thereof. The Government shall furnish the non-federal sponsor with an Operation, Maintenance, Repair, Rehabilitation, and Replacement Manual (hereinafter the "OMRR&R Manual") and copies of all as-built drawings for the completed work.

The non-federal sponsor shall conduct its operation, maintenance, repair, rehabilitation, and replacement responsibilities in a manner consistent with the project's authorized purpose and in accordance with applicable federal laws, regulations, and the Government's specific directions in the OMRR&R Manual. The Government and non-federal sponsor shall consult on any subsequent updates or amendments to the OMRR&R Manual.

At least annually and after storm events, the non-federal sponsor, at no cost to the Government, shall monitor and perform surveillance of the Project to determine losses of material and provide results of such surveillance to the Government.

Not less than once each year, the non-federal sponsor shall inform affected interests of the extent of risk reduction afforded by the project.

The non-federal sponsor shall ensure participation in and compliance with applicable Federal floodplain management and flood insurance programs. The non-federal sponsor may execute agreements with other non-federal entities to ensure such participation and compliance.

The non-federal sponsor shall prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of coastal storm risk reduction the Project affords, hinder operation and maintenance of the Project, or interfere with the project's proper functional. For shores, other than federal shores, protected pursuant to this Agreement using federal funds, the non-federal sponsor shall ensure the public use of, and access to, such shores by all on equal terms in a manner compatible with the authorized purpose of the Project.

Notwithstanding any other provision of this Agreement, the non-federal sponsor shall be responsible for all costs in excess of the Federal Participation Limit.

Following DPR approval, this project would be eligible to enter into a PPA to advance the project from Feasibility phase into final design.

4.0 ENVIRONMENTAL EFFECTS OF THE FINAL ARRAY OF ALTERNATIVES*

This section discusses the potential environmental effects of the final array of alternatives, including the No Action alternative and two action alternatives: Alternative 2 (the preferred plan) and Alternative 1. An impact will be considered significant if it has an adverse and unmitigable effect to any resource relative to the existing conditions described in Section 2 above.

As discussed in Section 3.0, the project features of Alternative 1 and 2 are similar, with Alternative 2 having higher floodwalls along the north side of the WQCP and an additional floodwall (floodwall 2 South) along the south side of the WQCP adjacent to San Francisco Bay. Specifically, Alternative 2 proposes floodwalls 1A North and 1B North with a height of 3–6.5 feet above grade, and Floodwall 2 South approximately 2–4 ft above grade. Alternative 1 proposes floodwalls 1A North and 1B North with a height of 2–4 ft above grade in the same area as Alternative 2; however, floodwall 2 South would not be constructed. Both alternatives propose a T-wall (ringwall) approximately 2-4 feet above grade around Pump Station 4 with a stop log gate for vehicular access and an early flood warning system. Construction of Alternatives 1 and 2 would be similar, with additional time required to construct floodwall 2 South under Alternative 2. Because of the similarities between the action alternatives, the environmental consequences of construction either action alternative would be similar. Therefore, the discussion of impacts of Alternatives 1 and 2 are combined where applicable.

Construction activities that could result in environmental impacts include:

- **Construction duration and timing:** Construction would last for approximately 12 months, spanning two construction seasons.
- **Clearing and grubbing:** All areas approximately 4 feet wide along the floodwall alignment would be cleared, grubbed, and excavated prior to installation of floodwalls including bush/shrub removal along the existing rock slopes. Marsh habitat will be avoided. Clearing and grubbing consists of the removal of weeds, grasses, and other vegetative materials, and the removal of surface soils. Construction debris will be stored at a designated staging area (an existing parking lot; Figure 3-10) and either reused or disposed of, as appropriate.
- **Construction of floodwalls:** Floodwalls consist of sheetpile walls with 2-foot by 2-foot concrete reinforced caps on the tops of the walls. Construction of floodwalls includes driving approximately 12 feet of prefabricated sections below the grades. Depending on the soil conditions, sheetpiles may be vibrated into ground instead of being hammer driven. The full sheetpile wall will be formed by connecting the joints of adjacent sheetpile sections in sequential installation. Alternative 1 would result in approximately 2,000 linear feet of the sheetpile floodwalls installed (floodwalls 1A North and 1B North), and Alternative 2 would result in approximately 2,700 of linear feet of floodwall installed (approximately 2,000 linear feet for floodwalls 1A North and 2A North and 700 linear feet for floodwall 1 South).
- **Construction of the ringwall around Pump Station 4:** A perimeter concrete T-wall, approximately 2 to 4 feet above grade, would be constructed, with stop log gate for vehicular access and early warning system.
- **Hydroseeding and replanting:** following construction, areas where clearing and grubbing occurred will be reseeded and replanted with native plants, as appropriate.

- **Total project footprint:** Alternative 2 would result in a total permanent footprint of approximately 5,100 square feet and a total temporary footprint of approximately 16,500 square feet, for a total impact area of 21,000 square feet. Alternative 1 would result in slightly less impacted area due to floodwall 1 South not being constructed.

A summary of environmental effects for the No Action alternative and action alternatives (Alternatives 1 and 2) are presented in Table 4-1.

Table 4-1. Summary of Expected Environmental Effects of Alternatives.

	No Action Alternative	**Alternative 2 North and South Plant Floodwalls (Preferred Alternative) & Alternative 1 North Plant Floodwall**
Surface Waters and Other Aquatic Resources	• Negative impacts to the WQCP during storm and high tide events leading to significant negative impacts on the water quality from releases of untreated wastewater which would become increasingly worse with future sea level rise	• Minor increases in sedimentation and bank erosion that could get into surface waters during clearing and grubbing and sheetpile installation. • Long-term benefit of reducing flood hazard to the WQCP. • No direct or indirect impacts to wetlands.
Climate	• Baseline Emissions from Emergency Response and Sewage Effluent Clean-Up	• Direct GHG emissions during the construction of the project from equipment emissions
Soils and Geology	• No measurable effect	• Minimal impacts on subsurface drainage from the constructed floodwall that extends approximately 12 feet below the ground surface. • Estimated 121 cubic yards excavated material that will either be reused onsite or hauled off to an appropriate disposal facility.
Biological Resources	• Tidal habitats would migrate upslope as much as possible within the limited margin available between the Bay and the developed area of the WQCP. • The risk of untreated sewage discharge would increase over time with sea level rise, along with the corresponding risks of acute toxicity and harmful algal blooms to fish and wildlife adjacent to the plant area.	• Temporary moderate impacts to ruderal grassland on artificial. • Significantly reduce the associated risks of acute toxicity and harmful algal blooms to fish and wildlife adjacent to the plant area due to the emergency raw sewage releases.
Threatened and Endangered Species	• The risk of untreated sewage discharge would increase over time with sea level rise, along with the corresponding risks of acute toxicity and harmful algal blooms to fish and wildlife adjacent to the plant area.	• No effect on threatened or endangered species that fall under USFWS jurisdiction. • Not likely to adversely affect CCC steelhead, southern DPS green sturgeon, their critical habitats, or EFH and FMP-managed species. • Significantly reduce the associated risks of acute toxicity and harmful algal blooms to fish and wildlife adjacent to the plant area due to the emergency raw sewage releases.

	No Action Alternative	Alternative 2 North and South Plant Floodwalls (Preferred Alternative) & Alternative 1 North Plant Floodwall
Aesthetics	• No immediate impacts to aesthetic resources. • the potential for future untreated wastewater releases could negatively impact this resource.	• Some aesthetic impacts associated with the floodwalls, but as the entire study area is already developed and industrialized, the overall nature of the viewshed would not change.
Recreation	• No immediate impacts to recreational resources. • With future sea level rise, the Bay Trail could be vulnerable to closures during storm events. • The potential for future untreated wastewater releases could negatively impact this resource.	• The Bay Trail may be closed at times when work is occurring immediately adjacent to the trail alignment, but access to the pedestrian bridge will be maintained.
Cultural	• No adverse effects to archaeological sites though these sites may be affected by natural forces such as erosion of the creekbanks that could expose cultural deposits	• Impacts are expected only for precontact archaeological sites if exposed or disturbed from ground disturbing work.
Air Quality	• No measurable effect	• No measurable effect.
Noise	• No measurable effect	• The loudest activity (vibratory pile driving) would be reduced to 59 dBA which is below the typical ambient noise level for the residential area on the west side of U.S. 101 (receptors).
Transportation	• No measurable effect	• Effects to traffic volume will be less than significant.
Hazardous and Toxic Substances	• No measurable effect	• No measurable effect.
Socioeconomics and Environmental Justice	• Major impact on people in the area because of the potential for raw sewage to flow back into homes. • Disproportionate negative impacts to a community served by Pump Station 4 which has a significant population in the highest social vulnerability category	• Some minor adverse effects from increased emissions during construction, but these would be limited to a relatively short time period and minor in comparison to the emissions from the surrounding area. • Significant beneficial effects by increasing the flood resiliency of critical infrastructure that serves economically disadvantaged and socially vulnerable communities.

4.1 Surface Waters and Other Aquatic Resources

For the purposes of this analysis, an effect on water quality may be considered significant if an alternative would do any of the following:

- Substantially degrade water quality through long-term alteration of physical and chemical characteristics (i.e., temperature, salinity, pH, and dissolved oxygen);
- Substantially degrade water quality because of long-term increased turbidity;
- Violate any water quality standards; or

- Substantially degrade surface or groundwater water quality because of mobilization of contaminated sediments or release of hazardous materials.

4.1.1 No Action Alternative Effects

The No Action Alternative would allow existing conditions to continue with negative impacts occurring during storm and high tide events. Releases of untreated wastewater associated with a flooded WQCP would have significant negative impacts on the water quality of Lower Colma Creek and San Francisco Bay. These negative impacts would become increasingly worse with future sea level rise. Figure 4-1 shows the inundation that would result from a 0.2 percent AEP event following 50 years of sea level rise under the USACE Intermediate curve. Although flood depths are shallow at both the WQCP and Pump Station 4, damages are significant because of extensive below-grade infrastructure that is vulnerable to flood damages.

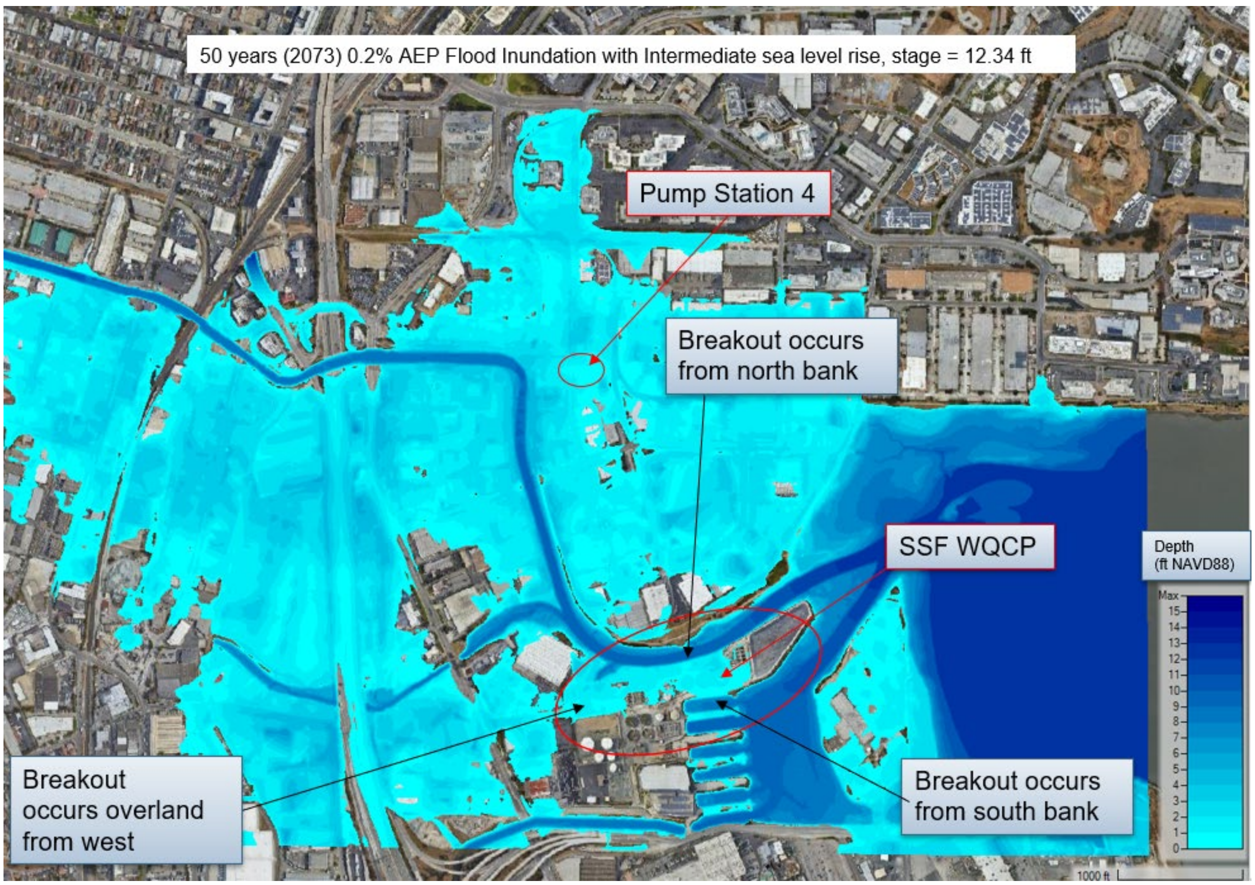

Figure 4-1. Flood inundation (no action) resulting from 0.2% AEP with 50 years of intermediate sea level rise.

4.1.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Construction of the floodwalls under Alternatives 1 and 2 could cause minor increases in sedimentation and bank erosion during clearing and grubbing and sheetpile installation, which could result in sediment entering surface waters. Should this occur, there is potential for contaminants associated with eroded sediment to enter the waterway. Prior to and during construction, best management practices (BMPs) will be implemented to prevent sediment and associated contaminants from entering the water. BMPs may include silt fences and other barriers around construction activities and staging areas to protect waterways from being impacted by sedimentation and associated contaminants. Following construction, disturbed areas will be seeded and replanted to further protect waterways from storm runoff. Following completion of the project, long-term benefits of reducing flood hazard to the WQCP and reducing the frequency of untreated wastewater discharges to surrounding surface waters associated with a plant shut down are expected.

As discussed, a wetland delineation[6] was prepared to identify wetlands within and adjacent to the study area. Figure 4-2 below shows the preferred plan alignment relative to jurisdictional waters in the project area. Using the wetland delineation, the project will be constructed to avoid impacts to wetlands.

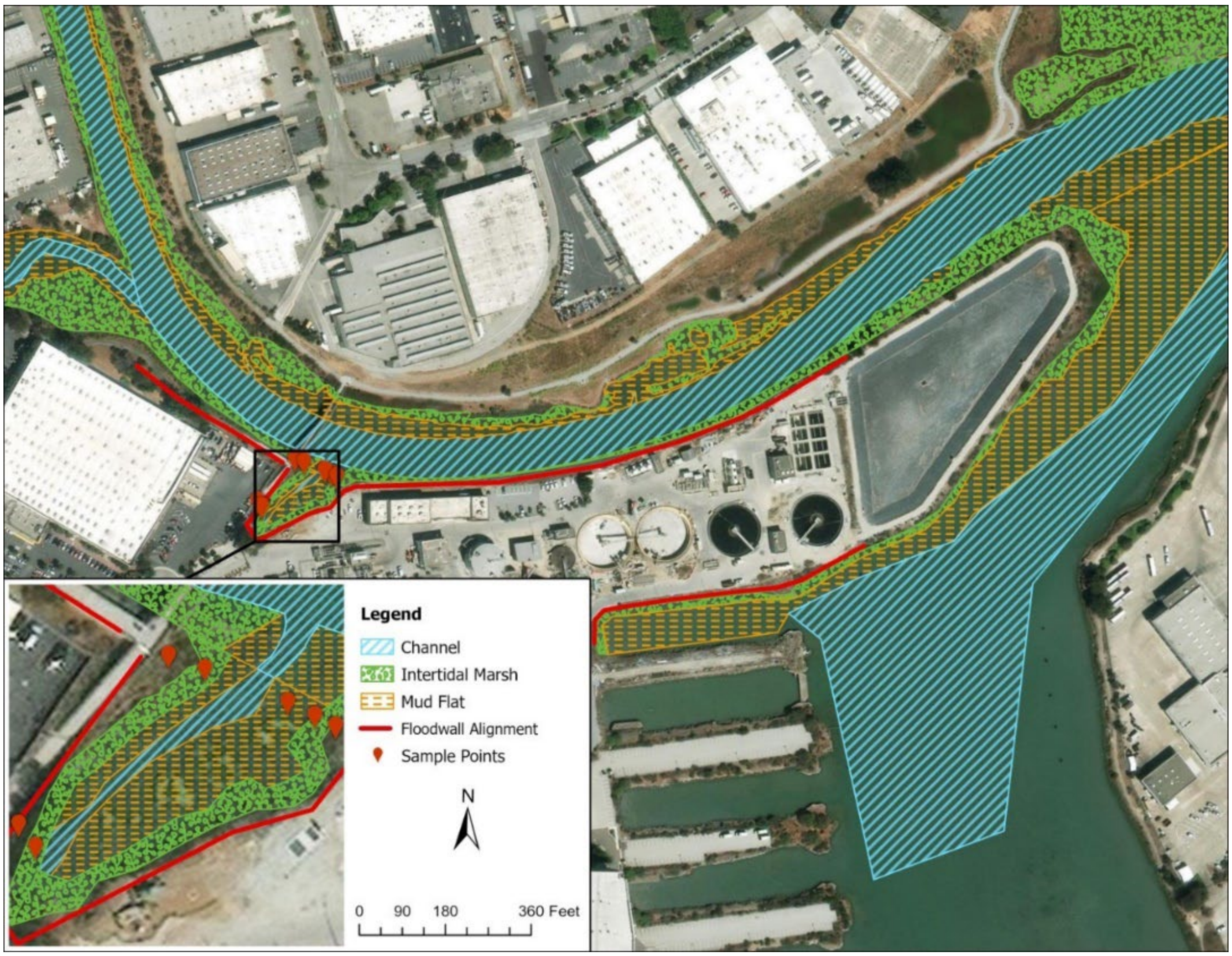

Figure 4-2. Floodwall alignment (preferred plan) relative to jurisdictional waters. The wetland delineation informed the project design so that the floodwall alignment would be outside of jurisdictional waters. Pump Station 4 is not shown because it is not adjacent to jurisdictional waters.

[6] While the recent Supreme Court ruling narrowed the definition of jurisdictional waters, using the prior definition in the absence of updated guidance is reasonable and would not affect the ultimate conclusion regarding impacts to jurisdictional waters.

The floodwalls will manage coastal flood risk for the WQCP for the duration of the study's economic period of analysis. The wall crest height of 13.5 ft NAVD88 will protect against the extreme tide elevation of 12.34 ft NAVD88 from a 0.2 percent AEP event in 50 years of sea level rise under the USACE Intermediate curve, as well as the extreme tide elevation of 12.99 ft NAVD88 from a 1 percent AEP event with 50 years of sea level rise under the USACE High curve. An example realistic tidal event with a maximum tide elevation of 12.65 ft NAVD88 was modeled to show the effects of Alternative 2 (Figure 4-3).

Induced flooding was evaluated, and impacts are all located south of Colma Creek, to the west of the WQCP area. With the project in place, flooding is observed in the adjacent parcels in areas primarily used for parking lots (Figure 4-3). This flooding does not exceed 1 foot depth and is not expected to significantly impact these areas. Everyday flows reach peak tide elevations of approximately 5–7 ft, which do not break out of the channel and will not be impacted by the project, which influences flooding at the 10.5–13.5 ft peak tide elevation range. For more information, see the hydrology, hydraulics, and coastal Appendix F.

Because construction of the project will avoid wetlands and other surface waters and BMPs will be used to further protect waters from being impacted by construction activities, Alternatives 1 and 2 are not expected to result in impact to wetlands or surface waters that would rise to the level of significant. In addition, the project would protect surface waters from the potential release of raw sewage and Alternatives 1 and 2 would result in long-term benefits to surface water quality, compared to the No Action Alternative.

Figure 4-3. With-project floodwall alignments shown in red. Flood inundation displayed is resulting from an example tidal event with maximum elevation of 12.65 ft NAVD88.

The sheetpile floodwall would act as an impermeable or semi-permeable barrier to groundwater flow. The design tip elevation is -12 ft, except in limited areas where bedrock is shallower, and groundwater can still flow under the tip of the sheetpile. It should be noted that the soils are fairly impermeable. The Bay Mud in particular has low permeability. The groundwater level beneath the site will likely not fluctuate with short-term changes, such as tidal fluctuations in the channel. The groundwater level beneath the site would likely increase with long-term rises in the regional ground water or rise in the median sea water level, but it is unlikely that regional ground water levels would rise above the ground surface.

4.2 Climate

4.2.1 Greenhouse Gas Emissions Analysis Baseline (No-Action Alternative)

The baseline (no-action alternative) greenhouse gas emissions from additional vehicle trips for emergency response, clean up, and inspection resultant from a sewage effluent backflow event of the system were calculated for each user in the water system within the area of the base year 1 percent annual chance exceedance coastal event. An average trip of 40 miles was assumed for vehicle trips for staff to clean the affected businesses each day, where a passenger car would come from 20 miles away and return back another 20 miles for a total of 40 miles. First responders were assumed to travel from a distance of 30 miles away, for a daily trip distance of 60 miles. Additional vehicle trips specifically to assess damages for insurance purposes, bring pumps and cleaning supplies, and for a health inspector visit were also calculated for the 216 businesses that would be affected by sewage effluent within the flooded area. Please see Appendix B for more information on how greenhouse gas emissions were calculated.

There are currently no Federal thresholds of significance established for greenhouse gas emissions, and so it is the responsibility of the NEPA lead agency to decide how significant effects will be determined. To this end, significance for greenhouse gas emissions was determined by comparing the greenhouse gas emissions produced for each project alternative to governmental greenhouse gas reduction goals, while not formally adopting the greenhouse gas reduction goal per se.

4.2.2 Greenhouse Gas Analysis Considerations for With-Action Alternatives

Direct emissions from construction of the project were quantified for each alternative in the final alternatives array. Long term indirect emissions from operations and maintenance of the wastewater facility were considered but not included in the greenhouse gas analysis as these would not be affected from building the project features since no additional capacity would be added to the plant as a result of this project, nor allow for additional space to expand operations whatsoever. Other maintenance emissions from mowing and tree-trimming were also considered but not included as these emissions would be small and would not differ from the no-action alternative when compared to the with action alternatives considered for the project.

Short term direct emissions from construction would contribute to increased atmospheric greenhouse gases during the 12-month construction period spanning two construction seasons from construction equipment emissions. The greenhouse gas analysis used 126 work days estimated for Alternative 1, and 150 work days estimated for Alternative 2 (preferred plan), which has 24 additional work days estimated to build the south floodwall feature which is unique to the preferred alternative. The results of the greenhouse gas analysis are presented below. For the full analysis please see Appendix B5, which includes the GHG Analysis.

4.2.3 Social Costs of Greenhouse Gas Emissions

The social costs of greenhouse gas emissions are presented below in Table 4-2, and show that both with-action alternatives would result in a net savings to society by completing the project compared to the baseline (no-action alternative) costs to society.

Table 4-2. Social Costs of Greenhouse Gas Emissions.

Total Social Costs of Greenhouse Gases (2020 Dollars)				
	CO_2	**CH_4**	**N_2O**	**Total**
No-Action Alternative	31619.12	30.65	8576.18	40225.95
Alternative 1	12421.23	22.00	19048.23	31491.46
Alternative 2	14787.18	26.19	22676.46	37489.83
Net Social Costs of Greenhouse Gases (2020 Dollars)				
	CO_2	**CH_4**	**N_2O**	**Total**
Alternative 1	-19197.89	-8.65	10472.05	-8734.49
Alternative 2	-16831.94	-4.46	14100.28	-2736.12

Notes:
Negative net values indicate that the alternative is expected to reduce social costs below the baseline no-action costs
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
CH_4 = methane
N_2O = nitrous oxide
Source: Table compiled by USACE in 2023.

4.2.4 Greenhouse Gas Analysis Results and Effects Determination

The results of the greenhouse gas inventory presented in Table 4-3 below show that Alternative 2 (preferred alternative) is expected to emit the most greenhouse gases of the with-action alternatives considered at approximately 586 metric tons of CO_2e, due to the increased work days to build the south wall feature. Compared to the no-action alternative which is estimated to emit approximately 689 metric tons of CO_2e, both with-action alternatives are expected to produce less emissions, decreasing overall atmospheric greenhouse gas additions just by building the project. As the results of this analysis show a relatively small contribution of greenhouse gas emissions for either with-action alternative, and an overall reduction in GHG emissions compared to the no-action alternative, it is not expected that any project alternative would prevent any federal, state, or local climate change or greenhouse gas reduction goals from being met, and from the results of this qualitative analysis no significant effects from GHG emissions and their resultant effects on climate change are anticipated from carrying out the proposed action, as detailed under Alternative 2 (preferred plan).

Table 4-3. Greenhouse Gas Emissions Analysis Results.

Total GHG Emissions by Project Alternative (metric tons)				
	CO_2	CH_4	N_2O	CO_2e
No-Action Alternative	564.63	0.02	0.41	686.78
Alternative 1	221.81	0.01	0.91	492.43
Alternative 2	264.06	0.02	1.08	586.23
Net GHG Emissions by Project Alternative (metric tons)				
	CO_2	CH_4	N_2O	CO_2e
Alternative 1	-342.82	-0.01	0.50	-194.34
Alternative 2	-300.57	0.00	0.67	-100.55

Notes:
A negative net emissions total indicates less atmospheric CO_2 after 50-year project lifetime.
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
CH_4 = methane
N_2O = nitrous oxide
Source: Table compiled by USACE in 2023.

4.3 Soils and Geology

4.3.1 No Action Alternative Effects

The No Action Alternative would maintain the existing conditions.

4.3.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Alternative 2 has an impact area of approximately 0.6 acre from clearing and grubbing and Alternative 1 would result in slightly less. The vast majority of this is in ruderal grassland situated on artificial fill but would also include brush/shrub removal along the existing rock slopes. Clearing and grubbing will generate an estimated 121 cubic yards of excavated material under Alternative 2 that will either be reused onsite or hauled offsite to an appropriate disposal facility (Appendix F). Alternative 1 would result in slightly less area being impacted and slightly less material being excavated due to the 1 South floodwall not being constructed.

Alternatives 1 and 2 would construct floodwalls along parts of the WQCP perimeter, with Alternative 2 constructing an additional floodwall along the south side of the WQCP. Floodwall installation would occur by vibrating or hammer driving sheetpile into the ground, depending on the soils. Installation of floodwalls would disturb soils in the vicinity of the floodwalls. The floodwalls would extend approximately 12 feet below the ground surface and are expected to have minimal impacts on subsurface drainage. It should be noted that the soils are fairly impermeable. The Bay Mud in particular has low permeability. See Section 4.1 for additional discussion of groundwater interactions, and a seepage analysis is provided in Appendix I.

The impacts to soils from clearing and grubbing and installation of floodwalls would be minimal under both action alternatives. Following construction, exposed soils would be reseeded and replanted, as appropriate, which would protect soils following construction. Because the impacts to soils and geology would be temporary and limited to a small construction footprint, Alternatives 1 and 2 are expected to have less than significant impacts to these resources.

4.4 Biological Resources

Based on the biological resources present or potentially occurring in the project area, for the purposes of this analysis, an effect may be considered significant if the alternative would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any terrestrial or pelagic species;
- interfere substantially with the movement of resident or migratory fish or wildlife species;
- cause substantial adverse, long-term effects to the benthic community directly or through habitat loss; or
- harm populations of migratory birds through direct impact or impacts to their migration.

4.4.1 No Action Alternative Effects

Under the No Action Alternative, existing habitat and species would not be impacted by construction activities. However, with sea level rise, tidal habitats would migrate upslope as much as possible within the limited margin available between the Bay and the developed area of the WQCP. The risk of untreated sewage discharge would increase over time with sea level rise, along with the corresponding risks of acute toxicity and harmful algal blooms to fish and wildlife adjacent to the plant area.

4.4.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Alternative 2 has an impact area of approximately 0.6 acre, with Alternative 1 impacting less area because floodwall 1 South would not be constructed. The vast majority of this is in ruderal grassland situated on artificial fill, but also includes bush/shrub removal along the existing rock slopes. Clearing and grubbing could result in loss of habitat for species utilizing upland areas within the project footprint. In addition, should hammer driving of sheetpile floodwalls be required, noise could affect species in the study area, in particular migratory birds. However, as discussed below, avoidance and minimization measures will be implemented to reduce potential impacts to biological resources.

The floodwall alignments are situated to minimize impacts to marsh species and avoid impacts to wetlands (Figure 4-2 and Appendix B). The vegetation within 4 feet of either side of the floodwall alignment will be cleared prior to construction, except in areas where this 4-foot buffer overlaps with tidal marsh vegetation (as mentioned, tidal marsh vegetation will be avoided).

With either action alternative in place, the WQCP is still susceptible to overland flow from the west, but this flooding was found to enter the WQCP area only at extreme tide elevations greater than 13 feet NAVD88. This would allow plant operators to keep the plant operational and avoid emergency releases of raw sewage into Lower Colma Creek and San Francisco Bay due to plant shutdowns. This would also avoid the associated risks of acute toxicity and harmful algal blooms to fish and wildlife adjacent to the plant area due to the emergency raw sewage releases.

During construction, the following measures would be implemented to avoid and minimize impacts to biological resources:

- Prior to construction, the project area will be surveyed by a qualified biologist for nesting birds in accordance with the Migratory Bird Treaty Act (16 USC 703 712). If active nests are found, the biologist will set up a 50-foot buffer until the nests are no longer active. If the nesting bird is a raptor, the biologist will set up a 250-foot buffer until the nest is no longer active.

- Vegetated areas disturbed during construction will be seeded and replanted with appropriate native vegetation.
- Equipment will not be allowed below the level of extreme high tide to minimize impacts to sensitive habitats.
- For any work below the level of extreme high tide, the work area shall be isolated at low tide to allow any fish present in the area to escape to areas with deeper water.

With these measures, it is expected that the effects of both Alternatives 2 and 1 would be less than significant.

4.5 Special Status Species

Based on the special status species and habitats present or potentially occurring in the action area for an alternative, for the purposes of this analysis, an effect may be considered significant if the alternative would do any of the following:

- have a substantial adverse effect, either directly or through habitat modifications, on any species listed as threatened or endangered under, or otherwise protected by, the ESA;
- significantly alter or diminish critical habitat, EFH, or mudflats.

4.5.1 No Action Alternative Effects

The No Action Alternative would not impact existing habitat. However, with sea level rise, tidal habitats would migrate upslope as much as possible within the limited margin available between the Bay and the developed area of the WQCP. The risk of untreated sewage discharge would increase over time with sea level rise, along with the corresponding risks of acute toxicity and harmful algal blooms to threatened and endangered species present near the plant area.

4.5.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

The threatened and endangered species described in Section 2.5 that fall under USFWS jurisdiction include California Ridgway's Rail, Callippe silverspot butterfly, and San Francisco garter snake. The USACE ESA determination (Appendix B) concluded that the project will have no effect on California Ridgway's rail, Callippe silverspot butterfly, or San Francisco garter snake, because of the lack of suitable habitat in the project area for any of these species. The nearest populations and areas of suitable habitat are located at least several miles away from the project. In addition, recent surveys (2018) detected no rails currently living in the project area, and this status is likely to persist until the native Spartina becomes reestablished in the marshes near the WQCP.

The threatened species described above that fall under NOAA Fisheries jurisdiction include the CCC steelhead and southern DPS green sturgeon and their critical habitat. NMFS concurred with the USACE ESA determination (Appendix B) that the project may affect, but is not likely to adversely affect the following species and their designated critical habitats (Appendix B3):

- Central California Coast DPS of steelhead;
- Southern DPS of North American green sturgeon;
- Central California Coast DPS of steelhead critical habitat; and
- Southern DPS (sDPS) of North American green sturgeon critical habitat.

Colma Creek does not contain suitable habitat for steelhead spawning. There may be individuals that use the tidal reaches for rearing or foraging; however, the likelihood of impacts by project construction is minimal. The wall alignment is entirely outside of tidal waters but does cross a stormwater outfall that is inundated at high tide. The stormwater outfall will not be modified as part of the project. As an avoidance and minimization measure, the construction contractor will be directed to isolate this area at low tide, when there is not sufficient water depth to support fish in that area. With this measure, the project is not likely to have adverse impacts on steelhead but does have a small portion that intersects with critical habitat. Preventing discharges of untreated wastewater will avoid the adverse effects of not doing the project.

Colma Creek does not contain suitable spawning habitat for sDPS green sturgeon. Sturgeon are bottom feeders that feed on benthic macroinvertebrates and the likelihood of impacts by project construction is minimal. The avoidance and minimization measure mentioned above for CCC Steelhead will also reduce the potential for impacting green sturgeon and their critical habitat.

The proposed project site and its vicinity coincide with designated critical habitat for CCC steelhead and green sturgeon. As the project involves constructing floodwalls out of the water on existing banks with avoidance and minimization measures, the proposed project may affect, but is not likely to adversely affect CCC steelhead and green sturgeon and their critical habitat.

Under Alternatives 1 and 2, the effects of construction activities to the above-listed fish are reasonably likely to include elevated underwater sound levels, relatively large changes in underwater sound pressure as piles are struck, and degraded water quality (NMFS Concurrence Letter [Appendix B3]). NMFS's assessment of the potential effects concluded that the effects to CCC steelhead and sDPS green sturgeon from elevated underwater sound levels during sheet pile driving activities will be insignificant. Further, NMFS determined that water quality impacts are expected to be insignificant due to the high background turbidity levels, and the ability of tidal water movement to rapidly dissipate elevated turbidity back to background levels (NMFS Concurrence Letter [Appendix B3]). NMFS also concluded that impacts to critical habitat are expected to be insignificant for the same reasons.

Alternatives 1 and 2 were also reviewed for potential impacts to EFH. As the project involves constructing floodwalls out of the water on existing banks with avoidance and minimization measures, the proposed project may affect, but is not likely to adversely affect EFH managed as part of the Pacific Groundfish, Pacific Salmon, Pacific Coastal Pelagic Species, and West Coast Highly Migratory Species fishery management plans.

The potential adverse impacts for FMP-managed species and their EFH are similar to the steelhead and green sturgeon impacts described above. Project activities will adversely affect waters designated as estuary HAPC in the Groundfish FMP. However, NMFS determined that effects during construction activities resulting from degraded water quality and disturbance to benthic substrate are short-term, minimal, and localized. The installation of the floodwall is not expected to impact the existing function of the high intertidal habitat of Lower Colma Creek. Additionally, native vegetation will be planted on the waterside of the wall. Therefore, NMFS had no EFH conservation recommendations to provide NMFS Concurrence Letter [Appendix B3]).

In addition to environmental measures considered in project development (including the moving the wall alignment to uplands) that reduce impacts to estuarine habitats, the project will include the following avoidance and minimization measures to minimize impacts to threatened CCC steelhead and sDPS green sturgeon, and their critical habitat:

- Equipment is not allowed below the level of extreme high tide to minimize impacts to sensitive habitats.
- For any work below the level of extreme high tide, the work area shall be first isolated at low tide to allow any fish present in the area to escape to areas with deeper water.
- All work and staging areas will occur from land; no vessels or work crews will enter Lower Colma Creek waters.
- The Project will implement a Stormwater Pollution Prevention Plan (SWPPP) that will include sediment control measures that will be temporarily installed where active sheet pile installation will occur and may include silt fencing, straw bales, and similar measures.

Further, Fish and Wildlife Coordination Act Report (CAR) concluded the project would protect critical water treatment infrastructure from coastal flooding and consequent release of untreated sewage that would otherwise damage sensitive environmental resources. The CAR recommended that it be constructed as proposed (Appendix B6).

The effect of Alternatives 2 (preferred plan) and 1 on threatened and endangered species, their critical habitat and Essential Fish Habitat is therefore considered to be less than significant.

4.6 Aesthetic Resources

This analysis of visual resources is based on qualitative evaluation of the extent and implications of changes to existing visual resources. Consideration was given to specific changes in the visual composition, character, and valued qualities of the affected environment. For the purposes of this analysis, an effect on aesthetics or scenic resources may be considered significant if the alternative would do any of the following:

- substantially damage scenic resources associated with a designated or eligible scenic highway;
- permanently block or disrupt existing public scenic views or reduce public opportunities to view scenic resources;
- substantially reduce the existing scenic quality from public viewpoints;
- conflict with applicable zoning and other regulations governing scenic quality; or
- create a new source of substantial light or glare which would adversely affect nighttime views in the area.

4.6.1 No Action Alternative Effects

With the No Action Alternative, there would be no immediate impacts to recreational, scenic, and aesthetic resources. With future sea level rise, the Bay Trail could be vulnerable to closures during storm events. While the aesthetic resources will not immediately change without implementation of the preferred plan, the potential for future untreated wastewater releases could negatively impact both resources in the study area.

4.6.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

There would be minor aesthetic impacts associated with 3- to 6.5-foot-tall wall along the Alternative 2 alignment. Alternative 1 does not include the floodwall to the south of the plant and would therefore have even less impact than Alternative 2.

The project area is already developed and industrialized; therefore, the overall nature of the viewshed would not change. A user on the existing Bay Trail is unable to view the Bay through the WQCP along the floodwall alignment; therefore, the project will not impede existing views of the Bay. Similarly, vista points to the WQCP currently look across Colma Creek into the WQCP which will be minimally affected by the building of the flood wall which may impede views of the ground level of the WQCP. The proposed project would not obstruct existing publicly accessible views of the Bay.

The proposed project does not conflict with applicable zoning or other regulations governing scenic quality and does not create a new source of substantial light or glare. The effect of Alternative 2 (preferred plan) and 1 on aesthetic resources is therefore considered to be less than significant.

4.7 Recreation

Effects to recreational facilities were evaluated by considering the potential for construction methods and equipment and the nature of project operation associated with each alternative to modify or alter the nearby recreational resources described in detail in Section 2.7. For the purposes of this analysis, an effect on recreational resources may be considered significant if it would:

- result in a permanent, substantial decrease or loss of existing public access to any waterway or public recreational land;
- create an additional demand for recreational facilities that is beyond their capacity; or
- increase the use of recreational facilities to such a degree that substantial physical deterioration would occur.

4.7.1 No Action Alternative Effects

With the No Action Alternative, there would be no immediate impacts to recreational, scenic, and aesthetic resources. With future sea level rise, the Bay Trail could be vulnerable to closures during storm events. While recreation will not immediately change without implementation of the preferred plan, the potential for future untreated wastewater releases could negatively impact both resources in the study area.

4.7.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

The nearest recreational facility is the Bay Trail that goes through the future project alignment. Alternatives 1 and 2 were designed to avoid impacts to the Bay Trail as much as possible. During construction, the Bay Trail may be closed at times when work is occurring immediately adjacent to the trail alignment, but access to the pedestrian bridge will be maintained.

The study evaluated the public access trail proposed by the Bay Trail and concluded that it is infeasible for a variety of reasons. The rough cost of this measure well exceeds the allowable 10 percent of the total project cost for recreation. Additionally, it would exceed the federal spending limit for the Continuing Authorities Program 103 projects, if included. Finally, and significantly, the trail alignment proposed by the Bay Trail would cause unacceptable safety and security concerns which cannot be mitigated as acknowledged in prior permits issued by BCDC to the City of South San Francisco.

As referenced above, the future proposed Bay Trail alignment around the WQCP was avoided in past permit negotiations and modified inland (inland alignment) based upon BCDC's determination that public access along the Bay was infeasible, and acknowledges both the physical space constraints and the serious security and safety concerns presented by the WQCP.[7] Nothing has changed to mitigate those concerns. As understood in previous permits, the future proposed Bay Trail alignment around the north side of the WQCP along the creek and bayside would pose an unacceptable public safety risk of exposure to deadly airborne chemicals in the event of an accident. Further, there is insufficient space for a paved trail and the cost is likely to exceed allowable thresholds for recreation within this project's financial limits. Finally, a trail along the WQCP is likely to degrade the olfactory experience of trail users and may not be considered an aesthetic improvement by trail users for this reason. Therefore, this project does not propose any modifications to the current inland alignment which reconnects with the Bay Trail south of the WQCP.

The local partner, the City of South San Francisco, has already constructed and committed to an alternative recreation trail and substantial public access improvements as part of previous negotiations with BCDC on this topic. The alternative inland alignment selected by BCDC (Permit No. 1998.011.07), in addition to the various public access improvements required by BCDC, were recently completed by SSF, and are pending close-out with BCDC.

During construction, the Bay Trail will be closed at times when work is occurring immediately adjacent to the trail alignment, but access to the nearby pedestrian bridge will be maintained. The detailed information of road and trail closures will be generated and disclosed during the preconstruction engineering phase of the study prior to construction. USACE will coordinate with the local sponsor to make information about trail closures available to the public. Under Alternative 1, construction would be for a shorter duration with even less potential for Bay Trail closures.

Alternatives 1 and 2 would not reduce current level of public access, create an additional demand for recreational facilities that is beyond their capacity; or increase the use of recreational facilities to such a degree that substantial physical deterioration would occur. The effect of Alternative 2 (preferred plan) and 1 on recreation is therefore considered to be less than significant.

4.8 Cultural Resources

The methodology used for identifying historic properties and cultural resources in the study area includes review and development of environmental, precontact, ethnographic, and historical contexts associated with the project area's cultural resources as well as meaningful consultation with Tribes. The information was also used to provide an initial assessment of discovering unanticipated archaeological resources for certain ground disturbing activities before archaeological testing can be conducted.

4.8.1 No Action Alternative Effects

Under the No Action Alternative, ground disturbance and excavation would not occur. In accordance with Section 106 of the NHPA, archaeological sites would not be adversely affected under the No Action Alternative and would be left undisturbed from the development of the floodwalls. Natural forces in the future, such as erosion of the creekbanks, would potentially expose cultural deposits or be washed away by fluvial processes.

[7] The Commission and Design Review Board acknowledged in BCDC Permit No. 1998.011.07 that *"constraints to public access at the WQCP are substantially greater than those at other treatment facilities, including the hazards associated with this water treatment plant, the limited space available for the plant facilities, the irregular shoreline, and the potential disturbance of wildlife"* and concluded that *"on-site access was undesirable, and the alternative inland alignment was selected."*

4.8.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

An effect to a cultural resource would be considered significant if it rose to the level of an adverse effect, as defined under Section 106 of the NHPA. Section 106 outlines the process in which federal agencies are required to determine the effects of their undertakings on historic properties. Analysis of the potential impacts was based on evaluation of the changes to the existing historic properties that would result from implementation of the project. In making a determination of the effects to historic properties, consideration was given to: specific changes in the characteristics of historic properties in the study area; the temporary or permanent nature of changes to historic properties; the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's historical features; and the existing integrity considerations of historic properties in the study area and how the integrity was related to the specific criterion that makes a historic property eligible for listing in the National Register.

The threshold also applies to any cultural resource that has not yet been evaluated for its eligibility to the National Register or if the proposed action disturbs a traditional cultural property. Analysis of potential impacts to cultural resources may be the result of physically altering, damaging, or destroying all or part of a resource, altering characteristics of the surrounding environment by introducing visual or audible elements that are out of character for the period the resource represents, or neglecting the resource to the extent that it deteriorates or is destroyed. Analysis considers both direct and indirect impacts.

Direct impacts refer to the causality of the effect to historic properties. This means that if the effect comes from the undertaking at the same time and place with no intervening cause, it is considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). Indirect impacts to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable. Any adverse effects on historic properties are significant. Effects are adverse if they alter, directly or indirectly, any of the characteristics of a cultural resource that qualify that resource for the National Register so that the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association is diminished.

Impacts are expected only for precontact archaeological sites being exposed or disturbed from ground disturbing work. Alternative 2 has an impact area of approximately 0.6 acres. The vast majority of this is in ruderal grassland situated on artificial fill. Alternative 2 would construct floodwalls along parts of the WQCP perimeter. The floodwall would extend approximately 12 feet below the ground surface. Alternative 2 will generate an estimated 121 cubic yards excavated material that will either be reused onsite or hauled off to an appropriate disposal facility.

Under Alternatives 1 and 2, ground disturbance and excavation based on the footprint of the north floodwall would potentially impact site CA-SMA-45 depending on its confirmed location and depth within the footprint of the floodwall. The south floodwall (Alternative 2 only) is on an area of fill and no potential impacts to CA-SMA-45 are expected. Therefore, the potential for impacts to cultural resources are the same for Alternatives 1 and 2. Impacts to the site will be better understood after subsurface testing determines the absence or presence of CA-SMA-45 at certain depths along the Lower Colma Creek banks. However, the resource was also determined to be mitigatable during the effects analysis of the proposed action during the feasibility study's Section 106 review and with consulting parties. If potential impacts to CA-SMA-45 are identified, a historic property treatment plan will be developed to avoid, minimize, or mitigate adverse effects to CA-SMA-45.

USACE will minimize impacts to the site during construction by having archaeological and tribal monitors present for any ground disturbing work during construction of the project's floodwalls along Lower Colma Creek. In the event that an adverse effect is identified to a historic property previously identified or discovered during ground disturbing work, USACE will prepare a historic property treatment plan as documented within the Programmatic Agreement (PA) executed with the California State Historic Preservation Officer (SHPO) on September 6, 2023.

The historic property treatment plan will determine mitigation measures and be developed in consultation between the USACE, SHPO, the City of South San Francisco, and affiliated Tribes before implementation. Mitigation measures will address efforts for the project to avoid, minimize, or mitigate impacts for a cultural resource. Mitigation measures may include recordation of cultural deposits uncovered during ground disturbance to contribute to the archaeological record, as well as reburying of recorded cultural material in coordination with all consulting parties involved in the Section 106 process.

In the event that ground disturbance uncovers human remains, all work must be halted in the vicinity of the discovery until a qualified archaeologist and USACE official can visit the site of discovery and determine whether Health and Safety Code § 7050.5, State CEQA Guidelines 15064.5(e), and PRC § 5097.98 should be followed. These state mandates have processes to follow in the accidental discovery of any human remains in a location other than a dedicated cemetery.

In accordance with PRC § 5097.98, the San Mateo County Coroner must be notified within 24 hours of the discovery of potentially human remains. The Coroner must then determine within 2 working days of being notified if the remains are subject to his or her authority. If the Coroner recognizes the remains to be Native American, he or she must contact the Native American Heritage Commission (NAHC) by phone within 24 hours, in accordance with PRC § 5097.98. The NAHC then designates an affiliated Tribe to be the Most Likely Descendant (MLD) with respect to the human remains within 48 hours of notification. The MLD will then have the opportunity to recommend to the project and landowners means for treating or disposing, with appropriate dignity, the human remains and associated grave goods within 24 hours of notification.

The effect of Alternatives 2 (preferred plan) and 1 to cultural resources is therefore considered to be less than significant.

4.9 Air Quality

For the purposes of this analysis, an effect on air quality may be considered significant if the alternative would:

- Substantially contribute to air quality degradation or conflict with a State Implementation Plan to achieve National Ambient Air Quality Standards; or

4.9.1 No Action Alternative Effects

Under the No Action Alternative, there will be no effect to air quality because no construction or other emission producing actions would take place.

4.9.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Based on the federal and regional emissions thresholds established by USEPA and BAAQMD using the NAAQS and CAAQS, an emissions inventory and air quality analysis was performed using the steps below to ensure that project emissions would not exceed these thresholds.

Step 1 (Emissions Inventory). Calculate the total emissions across all the construction equipment for each day for each criteria air pollutant, to calculate the daily emissions expected. For this step emissions factor data will be needed, such as those available through the South Coast Air Quality Management District (SCAQMD 2021a, b, c).

Step 2 (Emissions Inventory). Sum the results of step one for each criteria air pollutant and multiply by the number of working days over the total construction schedule for each calendar year and convert to tons to calculate the total emissions expected to be released for the project, to calculate the yearly emissions expected.

Step 3 (Air Quality Analysis). Compare the results of step one and two with the applicable de minimis threshold to ensure project emissions are below the thresholds for each individual criteria air pollutant.

The results of the air quality analysis for the proposed project action alternative are presented below in Table 4-4. For the full emissions inventory please see Appendix B5. Based on this process for the emissions inventory and air quality analysis, it was determined that the emissions associated with Alternative 2 are below applicable federal thresholds (Table 4-4). For the full air quality analysis please see Appendix B5.

Table 4-4. Air Quality Analysis Results for Alternative 2.

	ROG	CO	NOx	SOx	PM10	PM2.5
Peak Daily Emissions (lbs/day)	2.585	21.718	16.288	0.045	0.680	0.595
Total Project Emissions (Tons)	0.217	1.857	1.380	0.004	0.059	0.052
EPA NAAQS Yearly Significance Thresholds (Tons)	100	100	100	100	100	100
Project Emissions Exceed Federal Yearly Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Since air pollutant emissions are a function of population and human activity, emission reduction strategies set forth in the Bay Area 2010 Clean Air Plan were developed based on regional population, employment, and housing projections. Alternatives 1 and 2 would not facilitate an increase in population in the air basin nor would either Alternative generate housing or substantial employment opportunities leading to increased population or vehicle miles travelled in the region. As such, the assumptions contained within the Bay Area 2010 Clean Air Plan would not change based on the Alternative 1 or 2.

Alternative 1 would have a shorter construction duration and would therefore result in less air pollutant emissions than Alternative 1. However, the air quality analysis showed that emissions for both Alternatives would not exceed state or federal Clean Air Act *de minimus* thresholds. The effect of Alternatives 2 (preferred plan) and 1 to air quality is therefore considered to be less than significant.

4.10 Noise

For the purposes of this analysis, an effect on noise may be considered significant if an alternative would:

- exceed FTA construction noise guidelines criteria of 90 dBA during daytime hours or 80 dBA during nighttime hours at residential receptors, or 100 dBA during any hour at other receptors.

4.10.1 No Action Alternative Effects

Under the No Action Alternative, there will be no change in noise effects to sensitive receptors in the project area.

4.10.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

The nearest sensitive noise receptor to the proposed construction area is the residential area on the west side of U.S. 101, approximately 3,500 feet to the west and southwest. At this distance, noise from the loudest activity (pile driving) would be reduced to 59 dBA (calculated using FTA formula for simplified assessment and not considering the additional attenuation that would be provided by intervening buildings), which would be below the typical ambient noise level for these receptors which currently experience a long-term CNEL of 65–75 from aircraft operations of San Francisco International Airport (SFIA, 2018) as well as additional contributions from vehicle traffic on U.S. 101 and Interstate 380. Alternative 1 also includes pile driving but construction would be limited to just the north floodwall and therefore duration would be shorter. Because of the high levels of background noise, use of cushion blocks to reduce sound, and lack of sensitive receptors adjacent to the project area, the effect of Alternatives 2 (preferred plan) and 1 to noise is therefore considered to be less than significant.

See also Section 4.5.2 on an assessment of noise impacts to Special Status Species.

4.11 Transportation

For the purposes of this analysis, an effect on land-based transportation may be considered significant if the alternative would do any of the following:

- substantially impact vehicular traffic circulation by causing South Airport Boulevard to have a worse LOS rating than D;
- substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- result in inadequate emergency access; or
- eliminate or substantially inhibit existing public transit, bicycle, or pedestrian circulation.

4.11.1 No Action Alternative Effects

Under the No Action plan, there will be no effect to transportation and vehicle circulation patterns. In the event of flooding and WQCP shutdown, there would likely be an increase in traffic associated with site cleanup after the event.

4.11.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Under Alternatives 1 and 2, construction workers and equipment would access the site via Highway 101, South Airport Boulevard, and Belle Air Road. According to the City of South San Francisco General Plan, South Airport Boulevard has a daily vehicle capacity of 40,000, and existing volume of 22,000 (current LOS rating of B). To maintain an LOS rating of D or better, the volume divided by capacity must be less than 0.9. This means that the traffic volume cannot go above 36,000 vehicles per day. Alternative 2 will result in far fewer than 14,000 trips per day (by several orders of magnitude), and so the effect will be less than significant. Figure 4-4 below shows the haul route entering the main project area from Belle

Air Road. The staging area identified is an existing parking lot that is roughly 14,334 square feet and is shown in orange in the below figure.

The Belle Air Rd Lane right next to the Costco Gas station is expected to need traffic control when the construction equipment goes in and out of the plant through the access roads. During the floodwall construction, a concrete truck is expected to be parked on the Belle Air Rd Lane or Costco parking lot right next to the creek while concrete is pumped to the creek. Construction would be for a shorter duration under Alternative 1.

The effect of Alternatives 2 (preferred plan) and 1 to transportation is therefore considered to be less than significant.

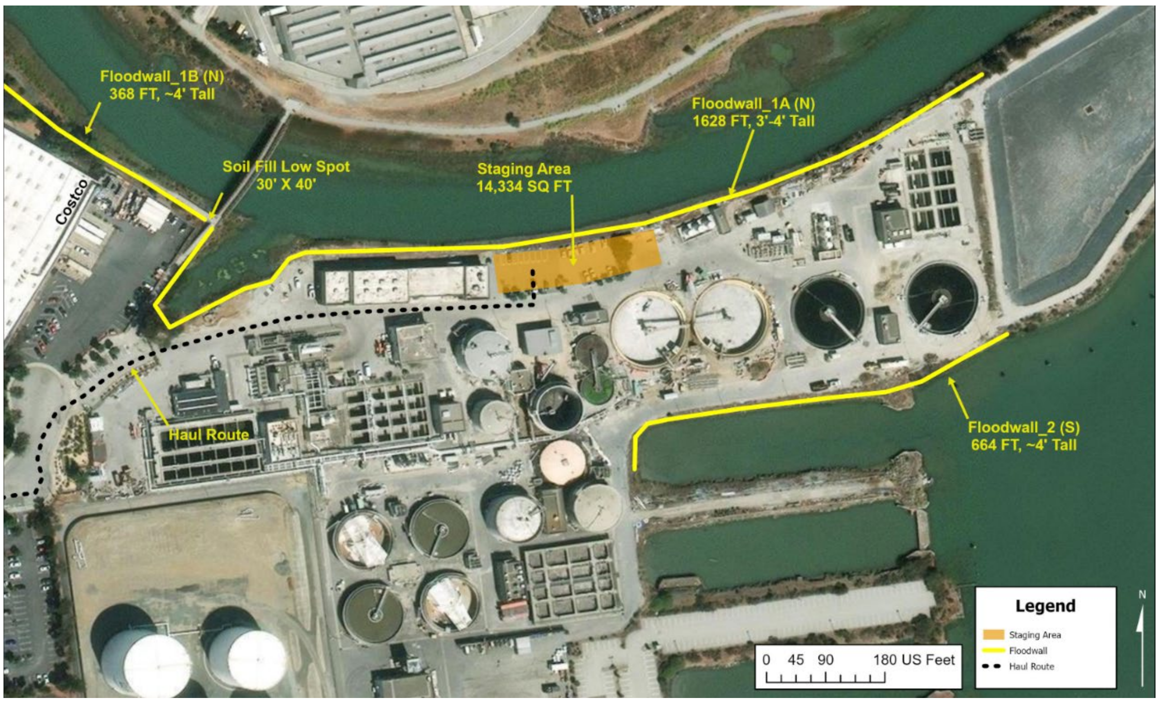

Figure 4-4. Haul Route shown with Alternative 2 alignment.

4.12 Hazardous and Toxic Substances

An alternative's potential effects related to HTRW would be considered significant if the alternative would:

- Create a significant hazard to the public or the environment through the transport, use, or disposal of substantial amounts of hazardous materials or wastes.
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

4.12.1 No Action Alternative Effects

Under the No Action plan, there will be no effect to listed HTRW sites in the project area. However, with increased sea level rise and associated increased coastal flood risk, there will be greater potential for releases of chemicals and raw sewage in the case of WQCP inundation and shutdown.

4.12.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Alternatives 1 and 2 would have no effect on identified HTRW sites in the project area. The nearest identified site, which is the LUST cleanup site at Pump Station 4, has been remediated and closed. Furthermore, the footprint of the ring wall at Pump Station 4 does not overlap with the cleanup footprint. The effect of Alternatives 2 (preferred plan) and 1 to hazardous and toxic substances is therefore considered to be less than significant.

4.13 Socioeconomics and Environmental Justice

To add more specificity to the significance criteria outlined in the beginning of Section 4, the effects of a project alternative would be considered significant if the alternative would have substantial adverse human health or environmental resource impacts that would disproportionately harm low-income or minority communities. According to the BCDC community vulnerability database referenced in Section 2.13 above, there are at least 15,000 people in the high and highest social vulnerability categories who live within a mile of the WQCP and Pump Station 4.

4.13.1 No Action Alternative Effects

Under the No Action plan, coastal flood risk would continue to increase with sea level rise as described in earlier sections of this document. As sea level and the risk of increasingly intense storms both rise, the chances that the WQCP will get inundated and shut down will correspondingly increase. This would have a major impact on people in the area who are considered socially vulnerable compared to surrounding communities. If the pump station 4 and/or WQCP shut down, these communities would be affected disproportionately, by the potential for raw sewage to flow back into homes, as they may not have the resources to find other housing following a disaster. Because of this, the No Action plan has a significant and adverse impact on socially vulnerable communities in the project area.

4.13.2 Alternative 2 (Preferred Plan) and Alternative 1 Effects

Alternatives 1 and 2 would cause some minor adverse temporary effects from increased emissions during construction, but these would be limited to a relatively short time period and minor in comparison to the emissions from the surrounding area. Alternative 1 would result in fewer impacts because the south floodwall would not be constructed.

Alternatives 1 and 2 would have significant beneficial effects by increasing the flood resiliency of critical infrastructure that serves economically disadvantaged and socially vulnerable communities with Alternative 2 providing a higher level of protection with the inclusion of the south floodwall. The effect of Alternatives 2 (preferred plan) and 1 to socioeconomics and environmental justice is therefore considered to be less than significant.

4.14 Cumulative Effects

4.14.1 Past and Present Actions

Based on the WQCP's past actions and community's current needs, this critical infrastructure will continue to operate as it has for the past several decades. The WQCP will soon finish its recent round of capital improvement projects and continue discharging treated wastewater to the Bay. Lower Colma Creek itself is currently a degraded (in terms of habitat) flood control channel. Clearing of the invasive *Spartina* from the area has removed endangered CA Ridgway's rail habitat, but as the native *Spartina* species returns, the rails may return as well.

4.14.2 Reasonably Foreseeable Future Actions

Implementing this project will allow the WQCP to continue operating well into the future as sea level rises. Other regional climate adaptation projects, likely under the direction of One Shoreline, will be implemented with a focus on providing community-oriented benefits like recreation and habitat restoration while still improving flood resiliency. These projects are described in greater detail in Section 3.3 above. While these projects are still not defined well enough to be incorporated into the future without project conditions in any specific way, there is no inherent conflict between them and the preferred plan. With the combination of safe and resilient infrastructure (improved as a result of the preferred plan), habitat restoration and recreation improvements, it is anticipated that the overall quality of the human environment in this area will improve in the coming years, despite climate change and sea level rise.

Thirty-six wastewater treatment plants were identified along the Bayshore or major tributaries to the Bay. These plants have a combined average discharge of approximately 600 million gallons per day and serve over 5.7 million residents. In 2021, The Water Board requested or required several facilities to prepare and submit vulnerability assessments which describe their level of preparedness for SLR. The results of that questionnaire have not been made available yet.

Cumulative impacts to biological resources are not expected to be significant or unmitigable. The project was specifically designed around avoiding impacts to tidal marsh and wetlands. Some native plantings will be included along the disturbed area which might provide a marginal increase in habitat value in an otherwise degraded area. The biggest impact for biological resources is the long-term benefits of reducing discharges of untreated wastewater directly into the Bay due to plant shutdowns.

Cumulative impacts to Native American and indigenous communities are not expected to be significant or unmitigable. This was determined after USACE and SSF consulted with the area's affiliated Tribes, who did not bring up any concerns regarding unmitigable or significant impacts if an unanticipated cultural site is disturbed during construction. Subsurface testing is currently ongoing, but in the event that a cultural resource is identified, mitigation measures, such as reburial of ancestral remains, will be followed and cumulative impacts will be avoided, minimized, or mitigated as documented within the Programmatic Agreement (PA) executed with the California State Historic Preservation Officer (SHPO) on September 6, 2023.

4.14.3 Combined Effects on Resources

When combined with other actions of the past, present, and future and considering the uncertainty of the effects of future population and development growth, the study area would likely be incrementally improved with the combined effects of the project.

5.0 AVOIDANCE, MINIMIZATION AND MITIGATION OF ADVERSE EFFECTS*

Table 5-1 lists the avoidance and minimization measures that will be incorporated into project implementation.

Table 5-1. Avoidance and Minimization Measures to be incorporated into project implementation.

Resource	Measure
Surface Waters and Other Aquatic Resources	• The USACE will implement BMPs to ensure that surface water runoff and associated sedimentation and contamination do not enter waterways (e.g., silt fences).
Biological Resources	• Prior to construction, the project area will be surveyed by a qualified biologist for nesting birds. If active nests are found, the biologist will set up a 50-foot buffer until the nests are no longer active. If the nesting bird is a raptor, the biologist will set up a 250-foot buffer until the nest is no longer active. • Vegetated areas disturbed during construction will be seeded and replanted with appropriate native vegetation. • Equipment is not allowed below the level of extreme high tide to minimize impacts to sensitive habitats. • For any work below the level of extreme high tide, the work area shall be first isolated at low tide to allow any fish present in the area to escape to areas with deeper water.
Special Status Species	• Equipment will not be allowed below the level of extreme high tide to minimize impacts to sensitive habitats. • For any work below the level of extreme high tide, the work area shall be first isolated at low tide to allow any fish present in the area to escape to areas with deeper water. • All work and staging areas will occur from land; no vessels or work crews will enter Lower Colma Creek waters. • The Project will implement a Stormwater Pollution Prevention Plan (SWPPP) that will include sediment control measures that will be temporarily installed where active sheet pile installation will occur and may include silt fencing, straw bales, and similar measures.
Recreation	• Limit trail closures during project construction to the maximum extent practicable. • Coordinate with the non-federal sponsor to make information about trail closures available to the public. • Maintain access to the pedestrian bridge during construction.
Cultural Resources	• Perform subsurface testing and ensure archaeological and tribal monitors are present during any ground disturbing work.

6.0 IMPLEMENTATION REQUIREMENTS

6.1 Project Partnership Agreement

The non-federal sponsor supports the selected plan for the Lower Colma Creek CAP 103 project. The San Francisco District anticipates working with the South Pacific Division Office of Counsel to utilize a model PPA for the project design and implementation phase. PPA negotiations would follow the approval of the final detailed project report (i.e., the Final Report Approval milestone).

6.2 Lands, Easements, Rights-Of-Way, Relocations and Disposal Areas (LERRD)

Land, Easements, Rights-of-Way, Relocation, and Disposal Areas (LERRDs): There are no impacted facilities that require relocation identified at this time, however a small number of utilities will need to be relocated for installation of the flood walls. Lands include the WQCP and Pump Station 4 facilities. The real estate cost estimate for Alternative 2 was developed in accordance with ER 405-1-12 and based upon footprints delineating project requirements developed for feasibility level design by the San Francisco District Engineering Division. Alternative 2 was reviewed for LERRDs requirements and include the types of acquisition as follows:

- An estimated 0.33 acre is required for staging.
- An estimated 0.27 acre is required for construction.

The non-federal sponsor will acquire the minimum interests in real estate to support the construction and subsequent operation and maintenance of the future USACE project. USACE Real Estate Division anticipates Perpetual and Temporary Easement acquisition will be required.

Once the PPA has been executed, the San Francisco District Engineering Division will prepare the final design for advertisement and construction. During this process the tract register, and tract maps will be updated to reflect any modifications to include final staging areas, access requirements, construction haul routes, and recreation features. This information will be used for review of future crediting purposes.

6.3 Operation, Maintenance, Repair, Replacement, and Rehabilitation

Site-specific preliminary estimates of Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) requirements were developed for the preferred plan by PDT members from cost estimating, design, and planning and are incorporated in the analysis. The OMRR&R of this project will be at 100% non-federal expense, however USACE will perform inspections. The Inspection of Completed Works (ICW) program is an Operations and Maintenance program that provides for USACE inspections of federally constructed flood risk management projects, including coastal storm risk management projects. A draft OMRR&R manual will be developed preceding a project's final design state and used by the counties and the USACE to ensure that the project is maintained to USACE standards. Annual and periodic 5-year ICW inspections will be performed for the Lower Colma Creek Project which will be based on the O&M manual requirements and current USACE maintenance standards. The OMRR&R manual will provide a detailed description of the management activities for the floodwall, channel, vegetation, sediment, debris, bank erosion, concrete surfaces, and other activities to provide the design coastal storm risk management of the project. If the project is required to provide compensatory mitigation for unavoidable impacts, a mitigation and monitoring plan will be prepared prior to release of the draft report. Requirements vary by the type of measure being implemented at the site. Based on these requirements and site-specific considerations such as size and location, costs were developed for each site as provided by line item in the Economic Appendix and description of the preferred plan within the detailed project report.

6.4 Regulatory Requirements*

Table 6-1. Summary of Environmental Compliance

Statute	Status of Compliance
Clean Water Act *(33 USC 1257 et seq.)*	Impacts to wetlands associated with flood control measures were evaluated for compliance with Section 404 of the Clean Water Act administered by USACE. The boundary of jurisdictional waters was used to avoid impacts, and therefore a 404(b)(1) evaluation has not been conducted. Section 401 Water Quality Certification is granted in the project area by the SFBRWQCB, but if there is no 404 discharge of fill, a 401 certification is not required. An analysis of impacts to jurisdictional waters can be found in Appendix B. Best Management Practices would be implemented during construction to address erosion and sediment control as work will be performed adjacent to the Bay. The construction contractor will be required to get a Construction General Permit and implement a Stormwater Pollution Prevention Plan. If project plans changed and work was required below the ordinary high watermark or within wetlands, then applicable permitting and analysis would be completed prior to construction.
Clean Air Act *(42 U.S.C. §7401 et seq.)*	The *de minimus* thresholds are not exceeded, therefore a General Conformity Analysis under the CAA is not required. Further, the project would not facilitate an increase in population in the air basin nor would it generate housing or substantial employment opportunities leading to increased population or vehicle miles travelled in the region.
Coastal Zone Management Act of 1972 *(16 USC 1451 et seq)*	The project's consistency with the applicable and enforceable policies of the Bay Plan was assessed. BCDC concurrence with our Consistency Determination is provided as a part of Appendix B4.
Endangered Species Act, as amended *(16 USC 1531 et seq.)*	The project's impacts to species listed under the ESA and their designated critical habitat were assessed and has found that the project is not likely to adversely affect or will have no effect on any of these species or habitats. This was documented through informal consultation with NMFS. The NMFS concurrence letter and draft biological assessment can be found in Appendix B3.
Fish and Wildlife Coordination Act *(16 USC 661 666[c])*	The USFWS provided a Coordination Act Report (CAR) under the Fish and Wildlife Coordination Act. The CAR was generally supportive of the project and can be found in Appendix B6. No additional consultation required.
Magnuson-Stevens Fishery Conservation and Management Act	The proposed action area includes EFH for salmonids managed under the Pacific Salmonid Fishery Management Plan, including coho and Chinook Salmonids. Because the wall alignment is entirely upslope of tidal waters, the potential for

Statute	Status of Compliance
(16 USC Section 1801 et seq.; Pub. L. 104 297; Pub. L. 109 479)	impacting EFH is minimal. The project is not likely to adversely affect CCC steelhead, southern DPS green sturgeon, their critical habitats, and EFH and FMP-managed species, because of avoidance and minimization measures (including the moving the wall alignment to uplands) that reduce impacts to estuarine habitats. This was documented through informal consultation with NMFS. A draft Biological Assessment (BA)/Essential Fish Habitat (EFH) Assessment (EFHA) can be found in Appendix B3 as well as the concurrence letter from NMFS. No EFH conservation recommendations were recommended by NMFS.
Marine Mammal Protection Act *(16 USC 1361 et seq.)*	The wall alignment is entirely upslope of tidal waters and no impacts to marine mammals are expected.
Migratory Bird Treaty Act *(16 USC 703 712)*	Prior to construction, the project area will be surveyed by a qualified biologist for nesting birds. If active nests are found, the biologist will set up a 50 ft buffer until the nests are no longer active. If the nesting bird is a raptor, the biologist will set up a 250 ft buffer until the nest is no longer active.
National Historic Preservation Act of 1966, as amended *(16 U.S.C. § 470)*	The team consulted with Tribes, historic organizations, the SHPO, and the public as required under Section 106 of the National Historic Preservation Act. The SHPO agreed to be a NEPA cooperating agency for this study, and Tribal monitors will be present during the subsurface testing strategy at the archaeological site CA-SMA-45. The study has completed a PA with the SHPO on September 6, 2023. The PA will ensure that additional identification efforts and resolution of adverse effects for historic properties can be completed before construction. The signed PA is included in Appendix C: Cultural Resources.
Noise Control Act *(42 USC Section 4901 et seq.)*	An effect on noise may be considered significant if an alternative would exceed FTA construction noise guidelines criteria of 90 dBA during daytime hours or 80 dBA during nighttime hours at residential receptors, or 100 dBA during any hour at other receptors. Because of the high levels of background noise and lack of sensitive receptors adjacent to the project area, the project's impact on noise is considered less than significant.
EXECUTIVE ORDERS	
Executive Order 11988 *(Engineering Regulation 1165-2-26)*: Floodplain Management	The preferred plan, Alternative 2, avoids impacts to Waters of the U.S. including wetlands, but it is within the base floodplain. For that purpose, the alternatives analysis and NEPA documentation fulfills the requirements of Executive Order (EO) 11988 and the implementing regulations in Engineering Regulation (ER) 1165-2-26. Public review is being conducted as part of NEPA compliance.
Executive Order 11990: Protection of Wetlands	The boundary of jurisdictional waters was used to avoid impacts to wetlands.

7.0 PUBLIC AND STAKEHOLDER INVOLVEMENT*

Table 7-1. Summary of key meetings and coordination.

Date	Description
July 21, 2021	Coordination letters sent
November 4, 2021	Site visit with USFWS for FWCA
January 10, 2022	Interagency meeting
March 3, 2022	USFWS meeting to go over project description for FWCA
March 8, 2022	Tribal and Historical Society letters sent
March 8, 2022	Meeting with Lower Colma Creek Coastal Citizens Advisory Committee
March 21, 2022	USFWS progress check-in meeting
March 30-April 15, 2022	TSP presentations held individually with each resource agency (Waterboard, NOAA Fisheries, BCDC, EPA)
June 29, 2022	Public Meeting

7.1 Public Involvement

The PDT engaged the general public through the June 29, 2022 public meeting and through the public comment period for the draft DPR/EA which concluded July 13, 2022. All public comments and associated responses are provided in Appendix B9. Attendees at the public meeting including a homeowner, stated that their primary concerns were for the environment and public safety. One comment letter was received for the draft DPR/EA centered around habitat enhancement opportunities and outreach to the Association of Ramaytush Ohlone during the tribal consultation process (Appendix B9). Natural and nature-based features and other habitat enhancement actions could be considered under a separate effort/project that could potentially fall under a Continuing Authorities Program (CAP) 206 Aquatic Ecosystem Restoration project, or a General Investigations Feasibility Study, or even another CAP 103 study looking at coastal storm risk management for remaining areas in the study area. However, the scope of this is outside of what can be implemented in the existing project. The PDT identified the six Ohlone tribes through the Native American Heritage Commission's (NAHC) tribal consultation list for traditionally and culturally affiliated Tribes within the geographic area of the Lower Colma project. The Association of Ramaytush Ohlone did not appear on the NAHC tribal consultation list. However, USACE will reach out to the Association of Ramaytush Ohlone and invite them to consult.

7.2 Stakeholder and Agency Coordination

7.2.1 Federal Agencies

U.S. EPA

The USEPA participated as a NEPA cooperating agency for this study. USEPA assisted with NEPA review and provided some input in a coordination meeting with the PDT. They have generally been supportive of the project.

U.S. FISH AND WILDLIFE SERVICE

The USFWS was involved in the project through informal consultation and the process of writing the CAR, but did not participate as a formal NEPA cooperating agency for this study. USFWS attended coordination meetings, site visits, and provided input about the project's impacts to ESA listed species. The final CAR is provided in Appendix B6.

NOAA FISHERIES

NOAA Fisheries participated as a NEPA cooperating agency for this study. NOAA Fisheries attended coordination meetings, site visits, and provided input about the project's impacts to ESA listed species and EFH. NOAA Fisheries concurs with USACE determination that the proposed action is not likely to adversely affect the listed species and designated critical habitats. NOAA Fisheries determined the proposed action would adversely affect EFH for various life stages of fish species managed under the Pacific Coast Groundfish FMP and the Coastal Pelagic Species FMP but did not provide any EFH conservations recommendations. The NMFS concurrence letter is provided in Appendix B3.

7.2.2 State Agencies

BCDC

BCDC staff attended coordination meetings and provided input to the project relative to their jurisdiction. Their primary concern has been that the project evaluates whether or not it is providing maximum feasible public access in the project area. The Letter of Agreement (LOA) from BCDC is included in Appendix B4.

SFBRWQCB

SFBRWQCB staff attended coordination meetings and provided input to the project relative to their jurisdiction. They have advised the PDT on the potential for required compensatory mitigation if the project results in fill in Waters of the U.S.

7.2.3 Local Agencies

The PDT has been coordinating with One Shoreline regarding their projects in the vicinity of the study area. There have been no fundamental conflicts identified, but One Shoreline has expressed a concern that the wall crest elevation is lower than they have typically been using on other projects in the area. However, the proposed floodwalls of the preferred plan are confirmed to be within the range of appropriate crest elevations and are designed to both contain the forecast sea level rise of approximately 0.92–2.43 feet during the 1 percent AEP event as well as withstand the forecast hydrostatic forces of the design storm event.

7.2.4 Non-Governmental Organizations

The team met with the Lower Colma Creek Citizen Advisory Committee on March 8, 2022 and presented information about the study and proposed alternatives and scope. The Committee includes appointed representatives from the surrounding towns and cities (Town of Colma and cities of Daly City, Pacifica, and S. San Francisco).

Historical society consultation letters were sent out on March 8, 2022.

7.2.5 Native American Tribes

The team has initiated consultation with six Native American Tribes.

Tribes and Section 106 Tribal Consulting Parties:

- The Ohlone Indian Tribe (consultation ongoing and occurred early on in April 2021)
- The Amah Mutsun Tribal Band of Mission San Juan Bautista
- The Costanoan Rumsen Carmel Tribe
- Indian Canyon Mutsun Band of Costanoan
- Muwekma Ohlone Indian Tribe of the SF Bay Area
- Rumsen A:ma Tur:ataj Ohlone

Tribes were invited to an interagency meeting held on January 10, 2022 but did not attend. The team consulted with the Ohlone Indian Tribe by phone in February 2022. Formal Section 106 tribal consultation letters were sent out on March 8, 2022. A response was received from the Ohlone Indian Tribe requesting subsurface testing be completed to determine the location of CA-SMA-45 and recommending the presence of tribal monitors during future fieldwork and potentially during construction. No other responses from tribes have been received to date. Subsurface testing to identify the presence or absence of CA-SMA-45 will be completed before the project is implemented as stated in the PA. Tribal monitors will be employed for ground disturbance work associated with this project. The cost to do this has been included in the project cost estimate.

7.3 Finding Of No Significant Impact

A Finding of No Significant Impact (FONSI) is provided with this Final DPR/EA as Appendix A.

8.0 RECOMMENDATION*

I recommend that the selected plan described in this report, which maximizes net economic benefits and incorporates comprehensive benefit opportunities, be authorized for implementation to address coastal storm risk management at the WQCP and associated pump station 4 in the City of South San Francisco, California. The selected plan, Alternative 2: North and South Plant Floodwall Alternative, consists of two steel sheetpile floodwalls capped with concrete on the north and south sides of the WQCP. The selected plan also includes a ringwall constructed to fully surround Pump Station 4.

The ringwall surrounding Pump Station 4 will protect from inundation of critical electrical equipment and maintain safe operating conditions. The floodwalls along the north and south edges of the WQCP will protect a 2,000-foot-long steel sheetpile floodwall, approximately 3 to 6.5 feet above-grade at the north side of the WQCP adjacent to the right-bank of Lower Colma Creek, as well as a second 700-foot-long approximately 2 to 4-foot above-grade floodwall south of plant adjacent to the San Francisco Bay. The sheetpile flood walls will be topped concrete caps. The project will provide significant reductions to the risks of future flooding in the watershed at a presently estimated fully funded total project cost of $16,107,000; provided that, except as otherwise stated in these recommendations, in accordance with the following requirements to which non-federal interest must agree prior to implementation:

- Pursuant to Section 103 of WRDA 1986 (33 USC 2213), the non-federal sponsor will provide a minimum of 35 percent, but not to exceed 50 percent of total flood damage reduction costs for structural measures as further specified below:
    - Provide the required non-federal share of design costs allocated by the Government to flood damage reduction in accordance with the terms of a design agreement entered into prior to commencement of design work for the flood damage reduction features;
    - Provide, during the first year of construction, any additional funds necessary to pay the full non-federal share of design costs allocated by the Government to flood damage reduction;
    - Provide, during construction, a contribution of funds equal to 5 percent of total flood damage reduction costs;
    - Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the flood damage reduction features;
    - Provide, during construction, any additional funds necessary to make its total contribution for flood damage reduction equal to at least 35 percent of total flood damage reduction costs;
    - Provide any additional funds that the non-federal sponsor agrees to contribute as discussed in Section 3.6.3

- Shall not use funds from other federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-federal obligations for the project unless the federal agency providing the federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

- Provide all LERRDs determined by the Government to be necessary for the construction, operation, and maintenance of the project;
- For so long as the project remains authorized operate, maintain, repair, replace, and rehabilitate (OMRR&R) the completed project, or functional portion of the project, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.
- Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon land which the non-federal sponsor, now or hereafter, owns or controls access to the project for the purpose of inspection, and if necessary, after failure to perform by the Non-Federal Sponsor, for the purpose of completing OMRR&R on the project. No completion of OMRR&R by the Federal Government shall operate to relieve the Non-Federal Sponsor of responsibility to meet the Non-Federal Sponsor's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance.
- Hold and save the United State free from all damages arising from the construction, OMRR&R of the project and any project related betterments, except for damages due to the fault or negligence of the United State and its contractors.
- Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under LERRDs that the Federal Government determines to be required for the construction and OMRR&R of the project.
- Assume complete financial responsibility, as between the Federal Government and the Non-Federal Sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under LERRDs the Federal Government determines to be required for construction and OMRR&R of the project.
- As between the Federal Government and the non-federal sponsor, the non-federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability. The sponsor will OMRR&R the project in a manner that will not cause liability to arise under CERCLA.
- Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970, as amended Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring LERRDs for construction and OMRR&R of the project, and inform all affected persons of applicable benefits, policies, and procedures, in connection with said Act.
- Participate in and comply with applicable federal floodplain management and flood insurance programs in accordance with section 402 of Public Law 99-662 and Executive Order 11988.
- Not less than once each year, inform affected interests of the limitations of the protection afforded by the project;
- In addition to these specific actions, the non-federal sponsor will be required by EP 1105-2-58 to uphold the requirements for partnership for the design and implementation phase, signified by the project partnership agreement.

- Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C.1962d-5b), and Section 103(j) of the WRDA 1986 (33 USC 2213(j)), Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher levels within the Executive Branch. Consequently, the recommendations may be modified before they are approved for implementation.

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