

**San Francisco International Airport**

**AIRPORT SHORELINE PROTECTION  
PROJECT**

Fiscal Feasibility Study

March 2019



## I. Introduction

The San Francisco International Airport is submitting this fiscal feasibility study to the Board of Supervisors for its proposed Shoreline Protection Program. A fiscal feasibility study is required under Chapter 29 of the Administrative Code because the Shoreline Protection Program would exceed \$25 million in costs, using over \$1 million in public monies, and requires California Environmental Quality Act (CEQA) review.

In 2015, the Board of Supervisors reviewed and approved a fiscal feasibility study for a proposed \$58 million Shoreline Protection Program; this project proposed improvements to about half of the Airport’s existing Bay-facing shoreline protection system and would protect against 11 inches of sea-level rise. But on March 14, 2018, the State of California adopted new Sea-Level Rise Guidance,<sup>1</sup> requiring the Airport to update the Shoreline Protection Program. The updated Shoreline Protection Program proposes construction of a new shoreline protection system around the entire perimeter of the Airport, including along Highway 101, and would protect the Airport assets and runways, with a 99.5% level of confidence, to approximately 2085 by adopting a design criterion that protects against a 100-year storm and 36 inches of sea-level rise. The updated project is estimated to cost \$587 million. Given significantly increased scope of the proposed Shoreline Protection Program, the Airport is submitting this updated fiscal feasibility study for Board of Supervisor approval before initiating CEQA review.

## II. Background

The City and County of San Francisco owns and operates San Francisco International Airport (the “Airport” or SFO), which is the primary commercial service airport for the San Francisco Bay Area. The Airport serves the Bay Area with domestic and international passenger flights as well as all-cargo flights. SFO is one of the busiest airports in the United States and provides economic benefits to the City of San Francisco and the entire Bay Area. According to Airports Council International data, SFO was ranked 7<sup>th</sup> in the United States in terms of total passengers with 55,823,712 annual passengers and ranked 15<sup>th</sup> in terms of air cargo in calendar year 2017.<sup>2</sup> SFO is one of the country’s principal international gateways for Pacific Rim traffic. It serves as a hub for United Airlines, and it is one of Alaska Airlines’ primary bases of operations.

The Airport occupies approximately 5,171 acres of land, with approximately eight miles of shoreline along the west side of the San Francisco Bay. A report released by the San Francisco Bay Conservation Development Commission in 2011 suggested that 72% of the Airport would be at risk from a 16-inch sea level rise. Currently, more than six of the eight miles of shoreline are protected by engineered earthen berms, concrete seawalls, and vinyl sheet piles that were constructed in the early 1980s. However, there are gaps in our shoreline protection system at the U.S. Coast Guard Air Station, Mel Leong Wastewater Treatment Plant, the Airport’s north and south boundaries, and specific drainage outfall locations. These gaps, as well as occasional wave overtopping of some flood protection structures, would allow water to enter the airfield. That water is captured in the storm drain system and is pumped back out into the Bay.

<sup>1</sup> Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future (National Research Council, 2012)

<sup>2</sup> Airports Council International and Airports Council International - North America Airport Statistics (2017).

In 2015, SFO completed a Shoreline Protection Feasibility Study to understand the deficiencies in the existing shoreline protection. The Study also provided recommendations on improvements needed to protect the Airport from a 100-year flood and sea level rise, based on the 2012 National Research Council Sea-Level Rise projections.<sup>3</sup> At that time, the Airport Commission proposed a \$58 million shoreline protection project (“Shoreline Protection Program”), which was limited to enhancements of about half of the Airport’s existing Bay-facing shoreline protection system for flood protection and to address 11 inches of sea level rise.<sup>4</sup> In December 2015, the Airport submitted a fiscal feasibility study based on this proposal. The Board of Supervisors determined under Chapter 29 of the San Francisco Administrative Code that the Shoreline Protection Program was fiscally feasible and responsible.

In 2016, SFO began developing a conceptual design for the Shoreline Protection Program based on these recommendations. However, in March 2018, the State of California issued a report “Rising Seas in California: An Update on Sea Level Rise Science.”<sup>5</sup> This report provides guidance to state and local agencies for incorporating sea level rise into design, planning, permitting, construction, investment, and other decisions. The 2018 report contained improved science and policy with a better understanding of risks quantified as probabilities. The Airport accordingly updated the proposed Shoreline Protection Program to respond to these more stringent criteria. The proposed Shoreline Protection Program now covers the entire perimeter of the Airport, including along Highway 101, and assumes 36 inches of sea level rise at an estimated cost of \$587 million.

Under Chapter 29 of the San Francisco Administrative Code, before initiating environmental review for a proposed project, as defined by CEQA, which is estimated to have implementation and/or construction costs greater than \$25 million and use more than \$1 million in public monies, the proposal must be submitted to the Board of Supervisors to determine whether the plan for undertaking and implementing the project is fiscally feasible and responsible. The proposing City department must prepare a feasibility study and submit it to the Board of Supervisors prior to submitting the project to the Planning Department for CEQA review.

The Airport is submitting this fiscal feasibility study to the Board of Supervisors to comply with Chapter 29 of the Administrative Code because the Shoreline Protection Program would exceed \$25 million in costs, using more than \$1 million in public monies, and will require CEQA review.

### III. Project Overview

The proposed Shoreline Protection Program was developed based on projections in the 2018 State of California guidance document. The updated Shoreline Protection Program would protect the Airport assets and runways, with a 99.5% level of confidence, to approximately 2085 by adopting a design criterion that protects against a 100-year storm and 36 inches of sea-level rise.

<sup>3</sup> The 2012 NRC projections forecast sea-level rise of 11” and 36” by 2050 and 2100, respectively.

<sup>4</sup> The 2015 Airport Shoreline Protection Project included building walls at Mel Leong Wastewater Treatment Plant, U.S. Coast Guard, and south end boundary along the perimeter of the airfield; stabilizing the embankments at end of Runway 19s and at the intersection of Taxiways Lima and Charlie; installation of seepage cutoff walls at Runway 19s; and providing closures at outfall pump stations and downstream of San Bruno Channel.

<sup>5</sup> California Natural Resources Agency & California Ocean Protection Council, “Rising Seas in California: An Update on Sea Level Rise Science” (March 2018).

To significantly reduce flood risk and enhance the safety of the airfield facility and Airport passengers, the Shoreline Protection Program includes the entire Airport perimeter.

The Airport has been collaborating with adjacent neighbors at the Cities of San Bruno and South San Francisco to the north and the Cities of Millbrae and Burlingame to the south, as well as the County of San Mateo and the California Department of Transportation (Caltrans). Specifically, we are looking for opportunities to connect with shoreline protections that these neighboring agencies might develop to coincide with the completion of the construction of the Airport's Shoreline Protection Program. However, at this time, they are only in the initial stages of identifying vulnerabilities to flooding and future sea level rise, and it is unlikely that they would have protection systems in place in the next 10 years. As a result, we have included a west side or front side section (along Highway 101) to protect the Airport against flood risk in the event that the neighboring agencies do not develop any protection systems.

An estimate of probable construction costs is provided in the table below. More details regarding the project costs are shown in Appendix I.

**Table 1**  
**Airport Shoreline Protection Project Costs<sup>6</sup>**

<b>Airport Shoreline Protection Project Component</b>	<b>Amount</b>
Seawall Improvements	\$ 548,118,558
Environmental Mitigation	\$ 39,000,000
<b>TOTAL</b>	<b>\$587,118,558</b>

The **Airport Shoreline Protection** project components are diagrammed in Appendix II and would include:

- **Seawall Improvements** - Construction of new sheetpile walls at most of the reaches. New concrete wall would be constructed at the San Bruno Channel, Millbrae Channel, and on the Airport front side along Highway 101. SFO would have to obtain necessary approval from the U.S. government/U.S. Coast Guard before implementing improvements at the U.S. Coast Guard located at SFO. The existing embankment at the runway 19 Ends and runway 28 Ends would be removed.<sup>7</sup> Embankment improvements include installation of riprap on the Bay side of the proposed seawall to attenuate wave energy along the Bay during storm events.
- **Environmental Mitigation** – The Seawall Improvements would involve wetland and Bay fill that would require environmental permits and compensatory mitigation to

<sup>6</sup> The cost estimates presented are based on planning-level requirements and design drawings and are preliminary in nature. Final cost estimates will be prepared once the environmental process is complete and detailed design drawings are prepared. Please note that Table 1 in the 2015 Fiscal Feasibility Study included subcategories not included here (Embankment Improvements, Geotechnical Improvements, and Closures). These were presented because the 2015 project contemplated the use of embankments, geotechnical improvements, and closures to improve portions of the existing seawall. The current project proposes rebuilding the entire shoreline protection system.

<sup>7</sup> The Shoreline Protection Program may include modifications to the Airport's drainage system, if necessary to meet Federal Emergency Management Agency (FEMA) system certification requirements. If those modifications are needed, they will be reviewed under CEQA before implementation.

offset the fill impacts of the project.

## IV. Environmental Review

The Airport has not yet filed an Environmental Evaluation Application with the City and County of San Francisco’s Planning Department – Environmental Planning Division (SFEP), the lead agency under CEQA. Upon review by the Board of Supervisors of the fiscal feasibility study and a determination that the project is fiscally feasible and responsible, Airport staff will submit the Environmental Evaluation Application for the current project proposal to SFEP for review of potential environmental impacts for each of the 17 resource categories, conducted according to the procedural requirements of CEQA (California Public Resources Code section 21000 *et seq.*), State CEQA Guidelines (Title 14 California Code of Regulations section 15000, *et seq.*), and Chapter 31 of the San Francisco Administrative Code. Airport staff will submit an Initial Study at a future date, which will include environmental analyses of the CEQA resource categories; the Airport anticipates the SFEP Environmental Review Officer will prepare a Mitigated Negative Declaration or an Environmental Impact Report for the Shoreline Protection Program.

The environmental permitting process will be conducted concurrently with the environmental review process to expedite the project. Such permits must be coordinated with the design process to ensure the final design conforms to the conditions and analyses provided in the permit applications to various federal, state, and local regulatory agencies. Staff anticipates permits will be required from the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, National Marine Fisheries Service, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Conservation and Development Commission, and Bay Area Air Quality Management District. Airport staff estimates completion of the environmental review and permitting process for this project within 24 to 36 months from the start of the environmental process. The project will also require review by the Federal Aviation Administration under the National Environmental Policy Act (NEPA).

## V. Fiscal Feasibility Analysis

Under the provisions of San Francisco Administrative Code section 29.2, there are five criteria to evaluate a project’s fiscal feasibility. The five criteria are:

- (1) Direct and indirect financial benefits of the project to the City, including to the extent applicable cost savings or new revenues, including tax revenues generated by the proposed project;
- (2) The cost of construction;
- (3) Available funding for the project;
- (4) The long-term operating and maintenance cost of the project; and
- (5) Debt load to be carried by the City department or agency.

The Shoreline Protection Program is analyzed under five criteria below.

### (1) Financial Benefits to the City

The Airport provides both direct and indirect financial benefits to San Francisco, including employment and tax revenues. This project plans to construct new levees and improve existing

levees at various locations along the shoreline and Highway 101 to provide campus-wide flood protection for the Airport, which would reduce significant air traffic interruption costs due to sea level rise and extreme weather events. In addition, the shoreline protection system would allow the Airport to build on grade without elevating or flood proofing, as would otherwise be required by the Federal Emergency Management Agency (FEMA); this would significantly reduce construction costs for Airport development projects.

Direct Financial Benefits

The City receives numerous direct financial benefits from efficient Airport operations. The Airport Shoreline Protection project is critical to ensure safe operations of air traffic during extreme storm events. This will ensure the City continues to receive the maximum financial benefits including tax revenue generated by visitors, job creation benefits, and the Airport’s annual service payment to the General Fund. The Airport’s economic activity also provides financial benefits to the entire Bay Area economy.

City Revenue

Under the current Lease and Use Agreement between the Airport and the airlines, SFO provides 15% of gross concession revenues to the City’s General Fund. These General Fund revenues can be applied to any use determined by policy makers. The annual service payments provided by the Airport to the City’s General Fund over the previous five fiscal years totaled \$212.6 million. In FY 2018, the Airport transferred \$46.6 million in revenue to the City. The five-year breakdown of the annual service payments is shown in the table below.

**Table 2**  
**Annual Service Payment**  
**FY 2014 to FY 2018**  
**(in millions)**

<b>Fiscal Year</b>	<b>Annual Service Payment</b>
FY 2014	\$ 38.0
FY 2015	\$ 40.5
FY 2016	\$ 42.5
FY 2017	\$ 45.0
FY 2018	\$ 46.5
<b>Total</b>	<b>\$ 212.5</b>

*Source: San Francisco International Airport Annual Financial Statements*

The average annual payment received by the City over the most recent five fiscal years was \$42.5 million, with the FY 2018 payment representing an increase of 22% from FY 2014 to FY 2018. The current Lease and Use Agreement between the Airport and signatory airlines operating at the Airport includes the annual service payments through FY 2021. The Airport expects the annual service payments to continue to increase with passenger volumes and concession spending during that period.

### Direct Employment

The Airport is an economic driver for the City and County of San Francisco and the entire Bay Area. A key measure of economic activity is the direct employment based on activities related to the Airport. These are jobs that would not exist without the Airport, and they would be impacted by any reduced airport activity. These jobs are within the aviation sector, transportation, professional services, and construction services.

According to Economic Development Research Group, Inc., a total of 42,828 direct jobs are dependent on the activity of SFO. These jobs would be discontinued immediately if airport activity ceased. These jobs would also likely be impacted as a result of changes in number of flights and passenger levels. The table below provides a breakdown of the types of direct jobs by category created by the Airport.

**Table 3<sup>8</sup>**  
**Direct Job Impacts from SFO**

<b>Job Category</b>	<b>Direct Jobs</b>	<b>Percent</b>
Passenger Airlines	14,962	34.9%
Airport Retail & Concessions	4,904	11.5%
FBOs & General Aviation & Aviation. <b>Services</b>	4,062	9.5%
Taxi Cabs	2,809	6.6%
Limos/Buses/Vans/Transit	2,618	6.1%
Rental Car	2,238	5.2%
Transportation Network Companies (TNCs)	2,131	5.0%
On-Airport Construction	2,041	4.8%
Security Firms	2,011	4.7%
City of San Francisco Airport Commission	1,998	4.7%
Federal Government	1,814	4.2%
Other	1,240	2.9%
<b>TOTAL</b>	<b>42,828</b>	<b>100.0%</b>

*Source: Economic Development Research Group, Inc., July 2017*

**Table 4**  
**Estimated Airport Shoreline Protection Project Job Impact**

Construction Component	Estimated Job	
	Amount	Impact
San Bruno Channel	\$15,500,000	92
Treatment Plant Sub-reach 2A	1,500,000	9
Treatment Plant Sub-reach 2B	8,500,000	50
Treatment Plant Sub-reach 2C	1,800,000	11
Sea Plane Harbor 1	2,700,000	16
Coast Guard	6,500,000	39
Sea Plane Harbor 2	6,700,000	40
Superbay	8,600,000	51
19 End Sub-reach 7A	40,000,000	237
19 End Sub-reach 7B	93,000,000	551
19 End Sub-reach 7C	5,000,000	30
19 Edge	7,500,000	44
Intersection 1	2,500,000	15
Intersection 2	2,500,000	15
28R	10,600,000	63
28End	13,900,000	82
28L	16,500,000	98
Mudflat	17,500,000	104
Millbrae Channel	12,600,000	75
Airport Westside	110,000,000	652
<b>TOTAL</b>	<b>\$383,400,000</b>	<b>2,272</b>

*Notes: Amounts exclude contingencies, design-build fees, and environmental mitigation. Totals may not add due to rounding.*

*Economic Multipliers from Office of Economic Analysis, Controller’s Office, Regional Economic Models, Inc. (REMI) Model Outputs.*

The construction impact is a one-time job creation impact for the City and County of San Francisco, but the project duration spans several years.

However, the indirect impact of jobs resulting from the economic activity of the Airport is also significant:

- A total of 14,974 of indirect jobs are generated in the local economy from purchases of goods and services by firms completely dependent upon activity of SFO.
- A total of 20,008 jobs are induced in the region from purchases of goods and services by the direct jobs created by activity at SFO.

Tax and Economic Benefits

In addition to the direct and indirect job impact, activities from SFO generate significant tax revenues for San Francisco and the Bay Area. State and local taxes linked to the Airport were estimated at \$2.9 billion in Fiscal Year 2015-16, including approximately \$1.6 billion from direct activities and \$1.3 billion from purchases of supplier goods and services and re-spending of



worker income.

SFO also serves as an economic driver for San Francisco and the Bay Area as a whole. In Fiscal Year 2015/16, SFO directly accounted for approximately \$8.4 billion of business activity. Off-site business activities that depend directly on local air service for staff movements, cargo deliveries, or visitor spending result in a direct airport economic contribution to the Bay Area totaling an estimated \$35.6 billion in business sales. Additionally, there are regional spin-off activities associated with suppliers and services to the directly affected businesses, and the re-spending of additional worker income on consumer goods and services. Adding in these indirect effects brings SFO's total economic footprint within the Bay Area to approximately \$62.5 billion in business sales, including \$20.9 billion in total payroll, and more than 300,000 jobs in the region.

## (2) Costs of Construction

The total project cost is estimated to be \$587 million for the entire Airport Shoreline Protection project. This amount includes environmental mitigation, as well as construction costs, soft costs for Airport staff, external professional services to provide project management and construction management support, and associated design and engineering work for the project. The full breakdown of the project costs including construction costs and soft costs are shown in the table below.

**Table 5**  
**Airport Shoreline Protection Total Project Costs**

<b>Airport Shoreline Protection Project Component</b>	<b>Total Amount</b>	<b>Construction Costs</b>	<b>Soft Costs*</b>
Seawall Improvements	\$548,118,558	\$468,514,800	\$79,603,758
Environmental Mitigation	\$39,000,000	\$39,000,000	\$0
<b>TOTAL</b>	<b>\$587,118,558</b>	<b>\$507,514,800</b>	<b>\$79,603,758</b>

\* Soft costs include project management, design, inspection, and construction management.

Source: SFO

Detailed construction cost estimates are included in Appendix I. The direct construction costs are \$508 million and the construction costs related to the project include: earth moving, seawall foundation installation, new sheetpile and concrete seawall installation, wall cap installation, riprap installation, concrete forming and pouring. Standard general conditions and design contingency allowances for the conceptual design stage are also shown.

## (3) Available Funding

The Airport anticipates having sufficient funding for the Shoreline Protection Program to fund with internal sources. The Airport anticipates utilizing debt financing through General Aviation Revenue Bonds to fund the project. Upon completion of the CEQA review, the Airport will seek funding opportunities from the State of California through the Office of Emergency Services (Cal OES) FEMA's Hazard Mitigation Assistance Grant Program.

## (4) Project Long-term Operating and Maintenance Costs

The long-term operating and maintenance costs from the proposed project are minimal. These activities will be performed by SFO Maintenance and Engineering & Construction Services, and include typical costs of routine inspection of seawalls, recording of findings, and preparation of repair recommendations per FEMA certification guidelines.

## **(5) Debt Load Carried by the Airport**

The Airport will have to finance the construction costs associated with this project and thus will incur additional debt. The Airport has an active debt finance department to fund capital projects and manage the Airport's \$7.5 billion debt portfolio.

The Airport anticipates funding the full cost of the Shoreline Protection Program with debt; however, it will pursue any federal and state grant funding that the project may qualify for.

The debt service costs associated with this project will not impact the General Fund. Rather, the debt service payments will increase the costs borne by the airlines doing business at the Airport, through the rates and charges they pay the Airport. The issuance of debt for the project would result in estimated annual debt service payments of approximately \$57.9 million (after the capitalized interest period), or a total of \$1.7 billion over the 30-year term of the bonds. This assumes a conservative all-in true interest cost of 6% and a 36-month capitalized interest period.

## **VI. Conclusion**

Implementing this proposed Airport Shoreline Protection project is essential to reduce flood risks at SFO by providing protection against 100-year floods and sea level rise. The Airport believes this project is both fiscally responsible and feasible. The project would enable the City of San Francisco to maintain a world class airport and continue to be the airport of choice for the Bay Area. The project would ensure that the Airport is able to continue to provide the City and the entire Bay Area region with significant financial and economic benefits.

If the Shoreline Protection Program is not implemented, the Airport will be subject to flood risks posed by tidal flooding, storm surge and sea level rise. Consequently, the Airport would incur significant operational and cost impacts, as a result of flooding. In addition, the Airport would be required to elevate or flood-proof all new structures and substantial improvements to existing structures, as required by FEMA and the City and County of San Francisco Flood Management Ordinance. This would increase construction costs of future developments at the Airport. Failure to implement the Shoreline Protection Program could in turn adversely affect Airport revenue, reduce annual service payments by the Airport to the City's General Fund, reduce employment provided from Airport activities, and negatively impact the City's economy.



## Appendix I Airport Shoreline Protection Program Costs

REACH #	REACH NAME	FEMA + 36" SLR ALTERNATIVE	TOTAL COST TO MEET DESIGN CRITERIA
1	SAN BRUNO CHANNEL	Reinforced Concrete Wall	\$ 15,500,000
2A	TREATMENT PLANT SUB-REACH 2A	Steel Sheet Pile Wall	\$ 1,500,000
2B	TREATMENT PLANT SUB-REACH 2B	Steel Sheet Pile Wall	\$ 8,500,000
2C	TREATMENT PLANT SUB-REACH 2C	Steel Sheet Pile Wall	\$ 1,800,000
3	SEA PLANE HARBOR 1	Steel Sheet Pile Wall	\$ 2,700,000
4	US COAST GUARD	Steel Sheet Pile Wall	\$ 6,500,000
5	SEA PLANE HARBOR 2	Steel Sheet Pile Wall	\$ 6,700,000
6	SUPERBAY	Steel Sheet Pile Wall	\$ 8,600,000
7A	19 END SUB-REACH 7A	King Pile Wall	\$ 40,000,000
7B	19 END SUB-REACH 7B	King Pile Wall	\$ 93,000,000
7C	19 END SUB-REACH 7C	Steel Sheet Pile Wall	\$ 5,000,000
8	19 EDGE	Steel Sheet Pile Wall	\$ 7,500,000
9	INTERSECTION 1	Steel Sheet Pile Wall	\$ 2,500,000
10	INTERSECTION 2	Steel Sheet Pile Wall	\$ 2,500,000
11	28R	Steel Sheet Pile Wall	\$ 10,600,000
12	28 END	Steel Sheet Pile Wall	\$ 13,900,000
13	28L	Steel Sheet Pile Wall	\$ 16,500,000
14	MUDFLAT	Steel Sheet Pile Wall	\$ 17,500,000
15	MILLBRAE CHANNEL	Reinforced Concrete Wall	\$ 12,600,000
16	AIRPORT WESTSIDE	New Reinforced Concrete Wall	\$ 110,000,000
<b>Subtotal Construction Costs (2019 dollars)</b>			<b>\$ 383,400,000</b>
<b>Design &amp; Bid Contingencies, , Design build fees (2019 dollars)</b>			<b>\$85,114,800</b>
<b>Soft Costs (2019 dollars)</b>			<b>\$79,603,758</b>
<b>Environmental Mitigation (37 Acres)</b>			<b>\$39,000,000</b>
<b>Total Project Costs</b>			<b>\$ 587,118,558</b>

## Appendix II Airport Shoreline Protection Project Overview

