

Aquatic Park

Subarea 1-1



Subarea Description

Aquatic Park (Subarea 1-1) covers historic and recreational resources and facilities. Most of this area’s waterfront belongs to the San Francisco Maritime National Historic Park, including Hyde Street Pier and its historic vessels, the Maritime Museum in the historic bathhouse, and Aquatic Park Pier (also known as Municipal Pier), which provides public access while sheltering Aquatic Park Cove from wave hazards. Aquatic Park Cove’s small sandy beach with a stepped concrete seawall provides access for swimming and the Dolphin and South End Rowing clubs. The subarea also includes a portion of Fort Mason Golden Gate National Recreation Area (GGNRA), and parts of the Marina and Russian Hill neighborhoods. Critical infrastructure include an Emergency Fire Water System (EFWS) suction connection and EFWS Pump Station No. 2, located to the west of Aquatic Park Pier, for disaster response.

The subarea shoreline is mostly engineered (i.e., hardened with shoreline protection structures), but the western limits between Aquatic Park Pier and Fort Mason is a natural rocky bluff at higher shoreline elevations. The breakwater wall supporting Aquatic Park Pier that surrounds Aquatic Park Cove and Fisherman’s Wharf provides shelter from wave hazards, however higher Bay water levels may overtop the structure and allow waves to impact the landward shoreline.

Flooding would initially occur at the eastern edge of this subarea adjacent to the Subarea 1-2 boundary near Hyde Street Pier. Flooding will occur as water levels exceed the lower-lying shoreline at the Dolphin Club and South End Rowing Club, but will remain localized near the existing shoreline until higher water levels overtop broad stretches of seawall and inundate the Aquatic Park Cove promenade (Bay Trail). Due to the higher landward topography in this subarea, coastal flood risk in the residential neighborhoods is not expected.



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Assets and Landmarks



Maritime

1. Hyde Street Pier
2. Small Boat Launch (Aquatic Park Cove)
3. Municipal Fishing Pier



Disaster Response

4. EFWS Pump #2
5. EFWS Suction Connections (1)



Transportation

6. Hyde Street Cable Car Turnaround



Utilities

Wastewater

7. North Beach Tunnel



Open Space and Ecology

Open Space



8. Bay Trail
9. Aquatic Park Cove
10. Dolphin Rowing Club
11. South End Rowing Club
12. Russian Hill Open Space
13. Fort Mason National Recreation Area
14. San Francisco Maritime National Historic Park

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Timing of Exposure: Assets and Landmarks


Assets / Landmarks	Flood Scenario	Equivalent Events	Timing				
			USACE Low	USACE Inter.	OPC Most Likely	USACE High	OPC 1-in-200
 Maritime							
<ul style="list-style-type: none"> Small Boat Launch (Aquatic Park Cove) 	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 6" SLR	2080	2044	2030	2023	2022
<ul style="list-style-type: none"> Hyde Street Pier 	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 24" SLR	>2150	2113	2071	2059	2052
<ul style="list-style-type: none"> Municipal Fishing Pier 	84" (13.1 ft. NAVD)	High tide + 84" SLR	>2150	>2150	>2150	2121	2100
		100-YR + 42" SLR	>2150	>2150	2103	2082	2068
 Disaster Response							
<ul style="list-style-type: none"> EFWS Suction Connections (1) 	12" (7.1 ft. NAVD)	High tide + 12" SLR	>2150	2070	2047	2038	2034
		1-YR + 0" SLR	Today	Today	Today	Today	Today
<ul style="list-style-type: none"> EFWS Pump #2 	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 24" SLR	>2150	2113	2071	2059	2052

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Timing of Exposure: Assets and Landmarks

Assets / Landmarks	Flood Scenario	Equivalent Events	Timing				
			USACE Low	USACE Inter.	OPC Most Likely	USACE High	OPC 1-in-200
 Utilities							
<ul style="list-style-type: none"> North Beach Tunnel 	--	--	--	--	--	--	--
 Transportation							
<ul style="list-style-type: none"> Hyde Street Cable Car Turnaround 	> 108"	--	--	--	--	--	--
 Open Space and Ecology							
<ul style="list-style-type: none"> Dolphin Rowing Club South End Rowing Club 	36" (9.2 ft. NAVD)	High tide + 36" SLR	>2150	2144	2091	2074	2063
		50-YR + 0" SLR	Today	Today	Today	Today	Today
<ul style="list-style-type: none"> Bay Trail San Francisco Maritime National Historic Park 	66" (11.7 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 25" SLR	>2150	2115	2072	2061	2053
<ul style="list-style-type: none"> Russian Hill Open Space Fort Mason National Recreation Area 	> 108"	--	--	--	--	--	--
<ul style="list-style-type: none"> Aquatic Park Cove 	--	--	--	--	--	--	--

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Timing of Exposure: Subarea

Adaptation Focus	Shoreline Type	Flood Scenario	Timing					
			Return	USACE Low	USACE Inter.	OPC Most Likely	USACE High	OPC 1-in-200
Immediate	Engineered	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
			100-YR + 6" SLR	2080	2044	2030	2023	2022
Tipping Point	Engineered	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
			100-YR + 24" SLR	>2150	2113	2071	2059	2052
Long Term >2050	Engineered	77" (12.5 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
			100-YR + 35" SLR	>2150	2142	2090	2074	2063

Flood Progression

Immediate Flood Risk



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Substantial Flood Risk (Tipping Point)



Long-Term Flood Risk (>2050)



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The following describes the progression of potential extreme tide and sea level rise flooding, along with a brief discussion of the assets that will be impacted within Subarea 1-1.

Flood Scenario	Assets	Consequences				
		USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200

High tide + 12" SLR	1-YR + 0" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		Today	Today	Today	Today	Today

Water Level Elevation: 7.1 ft. NAVD88



Disaster Response

One fire suction connection (part of the emergency firefighting water system) that allows fire engines to draw water from the Bay for fire suppression is inundated. Suction connections become unusable if they are inundated, primarily due to limitations related to fire truck access.

High tide + 24" SLR	5-YR + 0" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		Today	Today	Today	Today	Today

Water Level Elevation: 8.1 ft. NAVD88

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High tide + 36" SLR	50-YR + 0" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		Today	Today	Today	Today	Today



Open Space and Ecology

The Dolphin Rowing Club and South End Rowing Club will begin to experience inundation.

High tide + 48" SLR	100-YR + 7" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		2080	2044	2030	2023	2022

Water Level Elevation: 10.2 ft. NAVD88



Maritime

Access to the Small Boat Launch at Aquatic Park Cove will be impacted due to inundation along the shoreline edge of the Dolphin Rowing Club.

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Flood Scenario	Assets	Consequences				
		USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
High tide + 52" SLR	100-YR + 11" SLR	2130	2063	2042	2034	2030

Water Level Elevation: 10.4 ft. NAVD88

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Flood Scenario	Assets	Consequences				
		USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
High tide + 66" SLR	100-YR + 25" SLR	>2150	2113	2071	2059	2052

Water Level Elevation: 11.6 ft. NAVD88



Maritime

The Hyde Street Pier will be inundated. This pier houses a fuel dock, as well as the historic vessels, including the USS Pampanito, a decommissioned World War II era submarine, and the Balclutha, a 19th-century cargo ship. The pier is also located behind a breakwater wall that if overtopped could expose the city shoreline to high wave activity. Access to this pier will also be blocked by inundation of the surrounding streets.



Disaster Response

EFWS Pump Station 2 is located at the foot of Van Ness Avenue near Fort Mason. This pump station contains four diesel-driven pumps, each with a pumping capacity of 2,700 gpm at 300 psi. An approximately 160-foot concrete intake tunnel located underneath the pump station floor conveys seawater from the Bay to the pumps. Seawater can be seen in the wet wells during King Tides, and flooding of the lower levels of the pump station could occur at an earlier sea level rise scenario. The pump station includes sensitive electrical equipment that is at and below grade and sensitive to any inundation.



Open Space and Ecology

Streets and pathways within Fisherman’s Wharf and the San Francisco Maritime National Historic Park will be experience inundation. The Bay Trail that parallels the waterfront and overlaps with these areas will also be inundated.

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Flood Scenario	Assets	Consequences				
		USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
High tide + 77" SLR	100-YR + 36" SLR	>2150	2142	2090	2074	2063
Water Level Elevation: 12.5 ft. NAVD88						
High tide + 84" SLR	100-YR + 43" SLR	>2150	>2150	2103	2082	2068
Water Level Elevation: 13.1 ft. NAVD88						
		Maritime				
The Municipal Fishing Pier will be inundated. This curvilinear pier was constructed as part of the Aquatic Park Cove to attenuate wave hazards and currents while also serving as a recreational space. The pier structure is currently in poor condition and in need of repair.						
High tide + 96" SLR	100-YR + 55" SLR	>2150	>2150	2124	2095	2077
Water Level Elevation: 14.1 ft. NAVD88						
High tide + 108" SLR	100-YR + 67" SLR	>2150	>2150	2144	2107	2086
Water Level Elevation: 15.1 ft. NAVD88						

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Adaptation Focus: Immediate



Shoreline Characteristics	Shoreline Overtopping					Timing of Impact (100-YR)				
	Avg. Elev.	Avg. Depth (ft)	Max Depth (ft)	Length (ft)	%	USACE Low	USACE Inter.	OPC Most Likely	USACE High	OPC 1-in-200
Engineered	9.6 ft. NAVD	0.4	1.5	1,800	30.5%	2080	2044	2030	2023	2022

Flood Pathways

- Flooding during this scenario occurs when water levels exceed the lower-lying shoreline within this subarea adjacent to the Hyde Street Pier, and in front of the Dolphin Club and South End Rowing Club.
- Inundation will occur along the front edges of these facilities, but flooding will be localized near the existing shoreline.

Shoreline Focus

- Isolated adaptation measures within this subarea would address flooding at the MHHW + 48” scenario.

Adaptation Considerations

- Higher water levels will eventually overtop most of the Embarcadero shoreline. Adaptation measures should consider embedding capacity to adapt to higher water levels over time.

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Adaptation Focus: Tipping Point



Shoreline Characteristics	Shoreline Overtopping					Timing of Impact (100-YR)				
	Classification	Avg. Elev.	Avg. Depth (ft)	Max Depth (ft)	Length (ft)	%	USACE Low	USACE Inter.	OPC Most Likely	USACE High
Engineered	11.2 ft. NAVD	0.4	1.5	1,800	30.5%	>2150	2113	2071	2059	2052

Flood Pathways

- Overtopping occurs over a broad stretch of subarea shoreline, including a portion of the seawall along the Aquatic Park Cove shoreline resulting in inundation of the Bay Trail / Aquatic Park promenade. Flooding remains largely localized within the Bay Trail.
- Overtopping also occurs near Black Point resulting in inundation of the Bay Trail.
- Inundation of Jefferson Street occurs from the comingling of flood pathways between this subarea and the adjacent Subarea 1-2.

Shoreline Focus

- Subarea wide shoreline adaptation measures are required.

Adaptation Considerations

- Comingling of flooding with the adjacent Subarea 1-2 requires adaptation measures to be coordinated across these subareas and implemented in tandem.
- Adaptation measures should consider embedding capacity to adapt to higher water levels over time.

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Adaptation Focus: Long-Term >2050



Shoreline Characteristics	Shoreline Overtopping					Timing of Impact (100-YR)				
	Classification	Avg. Elev.	Avg. Depth (ft)	Max Depth (ft)	Length (ft)	%	USACE Low	USACE Inter.	OPC Most Likely	USACE High
Engineered	11.3 ft. NAVD	1.2	2.3	2,118	35.9%	>2150	2142	2090	2074	2063

Flood Pathways

- Overtopping occurs over a broad stretch of Subarea 1-2 shoreline, including a portion of the seawall along the Aquatic Park Cove shoreline resulting in inundation of the Bay Trail / Aquatic Park promenade. Flooding remains largely localized within the landward edge of the Bay Trail.
- Flooding begins to encroach on the landward areas adjacent to the Bay Trail along Aquatic Park Cove.
- Overtopping also occurs near Black Point resulting in inundation of the Bay Trail.
- Inundation of Jefferson Street occurs from the comingling of flood pathways with the adjacent Subarea 1-2.

Shoreline Focus

- Subarea wide shoreline adaptation measures are required.

Adaptation Considerations

- Comingling of flooding with the adjacent Subarea 1-2 requires adaptation measures to be coordinated across these subareas and implemented in tandem.
- Adaptation measures should consider embedding capacity to adapt to higher water levels over time.