Flood Risk Profile

Fisherman's Wharf

Subarea 1-2

Subarea Description

Fisherman's Wharf (Subarea 1-2) includes most of Fisherman's Wharf, an active fishing industry and popular tourist area that includes such destinations as Hyde Street Harbor and Piers 39 to 49, which are the sites for historic buildings and assets, restaurants, hotels, fishing, water recreation, San Francisco's commercial fishing fleet and terminals for San Francisco Bay Ferry, Blue & Gold Fleet, and Red & White Fleet. Some piers provide additional shoreline access and there are several small landscaped open space areas throughout Fisherman's Wharf. Critical infrastructure include disaster response assets such as oil spill response equipment at Hyde Street Harbor, fuel docks, Emergency Firefighting Water System (EFWS) fireboat manifolds and suctions connections, and assembly and staging areas, as well as two wastewater treatment facilities, the Northshore Pump Station and the North Point Wet-Weather Facility. The North Point Wet-Weather Facility is the City's oldest wastewater treatment facility. Jefferson Street was recently transformed with streetscape and public realm improvements.

The shoreline is mostly engineered and hardened. The breakwater surrounding Aquatic Park Cove and Fisherman's Wharf provides significant shelter from wave hazards. Other piers and breakwaters in this subarea provide similar protection for the Embarcadero shoreline, but some areas are subject to wave impacts. The primary flood pathway is from overtopping of the shoreline, initially at Pier 43½, resulting in inundation of a small portion of the Embarcadero Promenade and roadway. Overtopping along the Pier 49 shoreline also results in localized inundation. Higher Bay water levels will overtop most of the shoreline (including the piers) allowing inundation to broadly spread landward to North Point Street. The Embarcadero roadway will also act as a conduit to convey floodwater across the adjacent subareas.

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Flood Risk Profile

Fisherman's Wharf

Subarea 1-2

Assets and Landmarks

Maritime

1. Aquarium of the Bay (Pier 39)
2. Hyde Street Pier
3. Hyde Street Fuel Dock
4. Hyde Street Small Boat Harbor
5. Kingspoke Maritime Store
6. Pier 49
7. Pier 47
8. Pier 45
9. Belt Railroad Headhouse (Pier 43)
10. Ferry Terminal (Pier 39, Blue and Gold)
11. Ferry Terminal (Pier 41)
12. Ferry Terminal (Pier 43.5, Red and White)
13. Fisherman's Wharf
14. Fisherman's Wharf Harbor
15. Seawall Lot 301
16. Seawall Lot 302
17. Seawall Lot 303
18. Seawall Lot 311
19. Seawall Lot 313
20. Aboveground Storage Tank (20,000 gal.) (Hyde St. Pier)
21. Aboveground Storage Tank (Pier 41)
22. Aboveground Storage Tank (Pier 45)
23. Aboveground Storage Tank (Pier 43.5)
24. Aboveground Storage Tank (Red & White)
25. Aboveground Storage Tank (Blue & Gold)
26. Frank's Fisherman Maritime Store
27. Water Taxi (Pier 39)
28. Water Taxi (Hyde Street Pier)

Disaster Response

3. Hyde Street Fuel Dock
29. Hyde Street Fuel Tank Farm
30. Hyde Street Harbor Oil Spill Response Equipment
4. Hyde Street Small Boat Harbor
31. Police Department / Port Joint Operations and Security Center
32. Police Department Marine Unit Headquarters
33. EFWS Fireboat Manifold
34. EFWS Suction Connections (5)
35. Fire Station 28
36. Assembly Area (Pier 39 Promenade)
15. Assembly Area (Seawall Lot 301)
10. Ferry Terminal (Pier 39, Blue and Gold)
11. Ferry Terminal (Pier 41)
12. Ferry Terminal (Pier 43.5, Red and White)
37. Fuel Dock (Pier 41)
38. Embarcadero Roadway
27. Water Taxi (Pier 39)
28. Water Taxi (Hyde Street Pier)

Transportation

38. The Embarcadero
39. Muni E-Line, Muni F-Line
40. Kirkland Yard

Fisherman's Wharf

Subarea 1-2

Assets and Landmarks

Utilities

Wastewater

41. North Point Wet Weather Facility
42. North Beach Tunnel
43. North Shore Pump Station
44. Combined Sewer Discharge Outfalls (1)

Open Space and Ecology

Open Space

45. Bay Water Trail Launch (Pier 39)
46. Bay Trail
47. Fay Park
48. Joe DiMaggio Playground
49. Joseph Conrad Mini Park
50. Pier 43 Promenade
51. Jefferson Street Plaza
52. Sea Lion Viewing Area (Pier 39)

Critical Facilities

32. Police Department Marine Unit Headquarters
4. Police Department Marine Berths

Fisherman's Wharf

Subarea 1-2

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							
• Pier 49	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 6" SLR	2081	2045	2030	2023	2022
• Hyde Street Pier • Hyde Street Fuel Dock • Kingspoke Maritime Store • Pier 47 • Belt Railroad Headhouse (Pier 43) • Ferry Terminal (Pier 39, Blue and Gold) • Ferry Terminal (Pier 43.5, Red and White) • Fisherman's Wharf • Aquarium of the Bay (Pier 39) • Seawall Lot 301 • Fish Alley (Seawall Lot 302) • Fish Alley (Seawall Lot 303) • Seawall Lot 313 • Aboveground Storage Tank (20,000 gal.) (Hyde St. Pier) • Aboveground Storage Tank (Pier 43.5) • Aboveground Storage Tank (Red & White) • Water Taxi (Hyde Street Pier)	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 24" SLR	>2150	2113	2071	2060	2052

Fisherman's Wharf

Subarea 1-2

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
• Pier 45 • Ferry Terminal (Pier 41) • Seawall Lot 311 • Aboveground Storage Tank (Pier 41) • Aboveground Storage Tank (Pier 45) • Aboveground Storage Tank (Blue & Gold) • Frank's Fisherman Maritime Store	77" (12.5 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
		100-YR + 35" SLR	>2150	2143	2090	2074	2063
• Hyde Street Small Boat Harbor • Fisherman's Wharf Harbor • Water Taxi (Pier 39)	--	--	--	--	--	--	--
Disaster Response							
• EFWS Suction Connections (3 of 5)	12" (7.2 ft. NAVD)	High tide + 12" SLR	>2150	2070	2047	2038	2034
		1-YR + 0" SLR	Today	Today	Today	Today	Today
• The Embarcadero	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 6" SLR	2081	2045	2030	2023	2022
• Hyde Street Fuel Dock • Hyde Street Fuel Tank Farm • Hyde Street Harbor Oil Spill Response Equipment • Police Department / Port Joint Operations and Security Center	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086

Fisherman's Wharf

Subarea 1-2

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
• EFWS Fireboat Manifold • Assembly Area (Pier 39 Promenade) • Assembly Area (Seawall Lot 301) • Ferry Terminal (Pier 39, Blue and Gold) • Ferry Terminal (Pier 43.5, Red and White) • Water Taxi (Hyde Street Pier)	66" (11.6 ft. NAVD)	100-YR + 24" SLR	>2150	2113	2071	2060	2052
• Ferry Terminal (Pier 41) • Fuel Dock (Pier 41)	77" (12.5 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
		100-YR + 35" SLR	>2150	2143	2090	2074	2063
• Fire Station 28	> 108"	--	--	--	--	--	--
• Hyde Street Small Boat Harbor • Police Department Marine Unit Headquarters • Water Taxi (Pier 39)	--	--	--	--	--	--	--
Utilities							
• Combined Sewer Discharge Outfalls (1)	24" (8.1 ft. NAVD)	High tide + 24" SLR	>2150	2112	2070	2059	2051
		5-YR + 0" SLR	Today	Today	Today	Today	Today
• North Point Wet Weather Facility	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 24" SLR	>2150	2113	2071	2060	2052
• North Shore Pump Station	77" (12.5 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
		100-YR + 35" SLR	>2150	2143	2090	2074	2063

Fisherman's Wharf

Subarea 1-2

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
• North Beach Tunnel	--	--	--	--	--	--	--
Transportation							
• The Embarcadero	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 6" SLR	2081	2045	2030	2023	2022
• Muni E-Line, Muni F-Line • Kirkland Yard	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 24" SLR	>2150	2113	2071	2060	2052
Open Space and Ecology							
• Bay Trail • Pier 43 Promenade	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 6" SLR	2081	2045	2030	2023	2022
• Bay Water Trail Launch (Pier 39) • Jefferson Street Plaza • Sea Lion Viewing Area (Pier 39)	66" (11.6 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 24" SLR	>2150	2113	2071	2060	2052
• Fay Park • Joe DiMaggio Playground • Joseph Conrad Mini Park	> 108"	--	--	--	--	--	--
Critical Facilities							
• Police Department Marine Unit Headquarters • Police Department Marine Berths	--	--	--	--	--	--	--

Fisherman's Wharf

Subarea 1-2

Timing of Exposure: Subarea

Adaptation Focus	Shoreline Type	Flood Scenario	Timing: Return	Timing: USACE Low	Timing: USACE Inter.	Timing: OPC Most Likely	Timing: USACE High	Timing: OPC 1-in-200
Immediate	Engineered	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
			100-YR + 6" SLR	2081	2045	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	2060	2052
Long Term >2050	Engineered	77" (12.5 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
			100-YR + 35" SLR	>2150	2143	2090	2074	2063

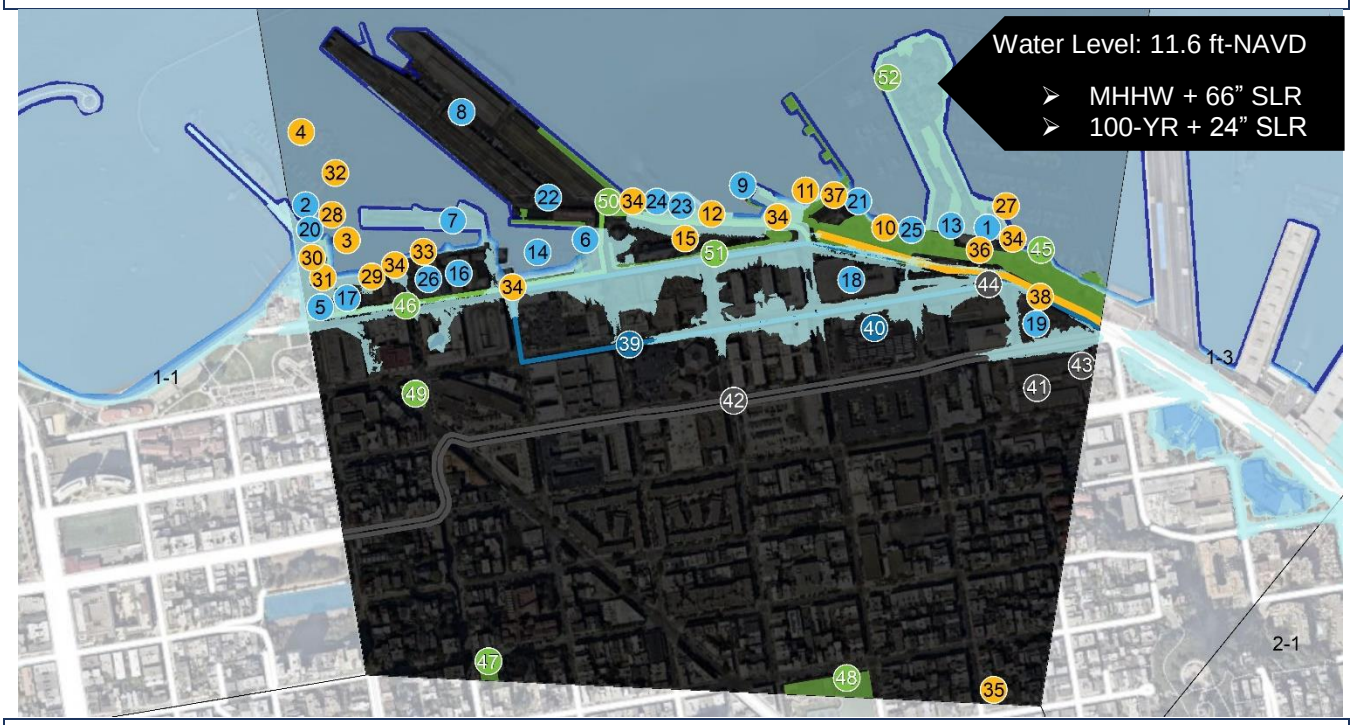
Flood Progression

Immediate Flood Risk

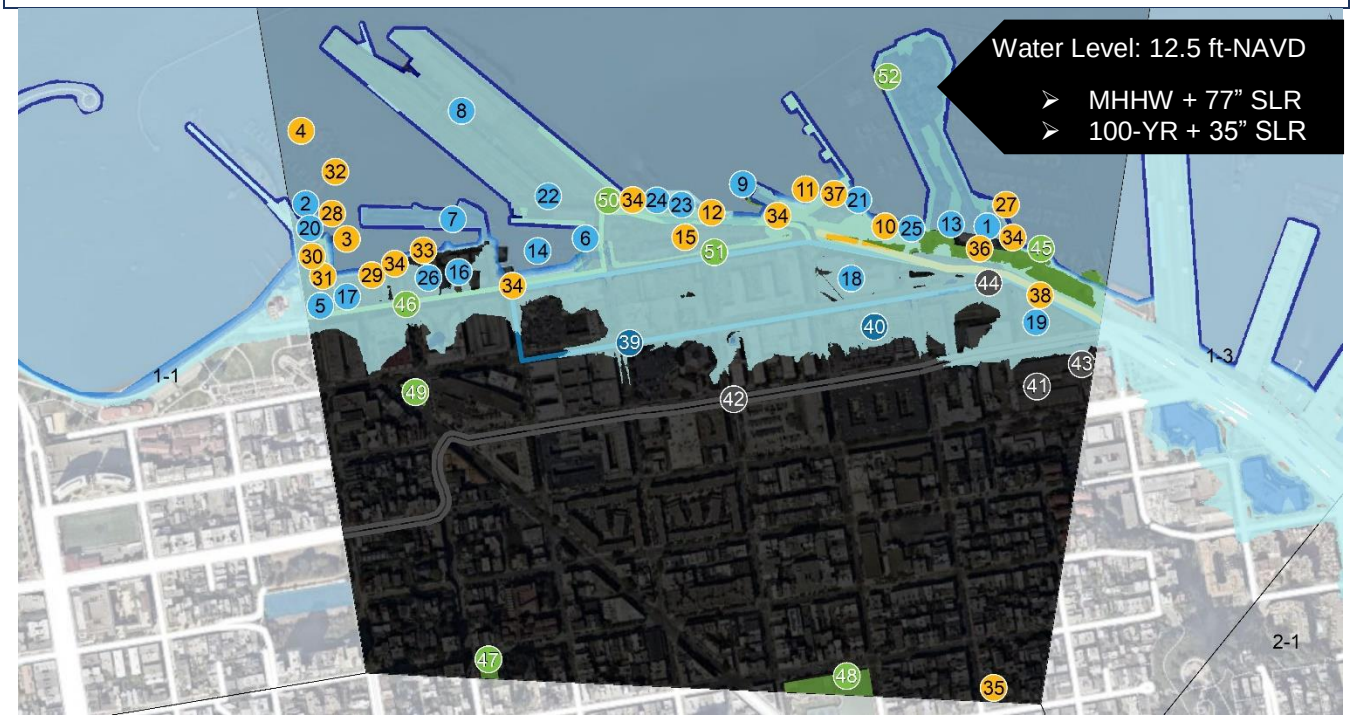
Fisherman's Wharf

Subarea 1-2

Substantial Flood Risk (Tipping Point)



Long-Term Flood Risk (>2050)



Flood Risk Profile

Fisherman's Wharf

Subarea 1-2

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 2-2.

Flood Scenario	Assets	Consequences				
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** Three fire suction connections (part of the emergency firefighting water system) that allow fire engines to draw water from the Bay for fire suppression are 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		**Disaster Response** Two additional fire suction connections at the shoreline would be inundated.				
		Utilities The higher Bay water levels may reduce the gravity-driven flow of excess combined wastewater and stormwater from the transport / storage boxes to the Bay. This impact is only of concern during intense and prolonged rainfall events that exceed the capacity of the large underground transport / storage boxes that ring the city. This could result in an increase in localized flooding in low-lying areas. The Beach Street combined sewer discharge outfall (Jackson transport/storage box) in this subarea will have backflow prevention installed under the SFPUC Sewer System Improvement Program to delay the onset of impacts to the sewer system during higher Bay water levels.				
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
Water Level Elevation: 9.1 ft. NAVD88	--	**--** --				

Flood Risk Profile

Fisherman's Wharf

Subarea 1-2

Flood Scenario	Assets	Consequences				
High tide + 48" SLR	**100-YR + 7" SLR**	**USACE Low**	**USACE Int.**	**OPC Most Likely**	**USACE High**	**OPC 1:200**
		2081	2045	2030	2023	2022
Water Level Elevation: 10.2 ft. NAVD88		**Maritime** A portion of the Ferry Terminal for the Red and White fleet at Pier 43½ will be inundated. This location will be a flood pathway that allows shoreline overtopping to inundate a section of the Embarcadero promenade (Pier 43 promenade) and roadway. Inundation will be localized to small portion of the subarea. Pier 49 could potentially be inundated, impacting the existing restaurants on the pier.				
		Disaster Response The Embarcadero roadway that is used for disaster response will be partially inundated.				
		Transportation The westbound lanes of the Embarcadero roadway will be inundated, impacting mobility across the subarea.				
		Open Space and Ecology A portion of the Bay Trail, which overlaps with the Embarcadero roadway, will be inundated. The Pier 43 promenade (open space adjacent to the shoreline edge) will also be inundated.				
High tide + 52" SLR	**100-YR + 11" SLR**	**USACE Low**	**USACE Int.**	**OPC Most Likely**	**USACE High**	**OPC 1:200**
		2132	2064	2043	2034	2031
Water Level Elevation: 10.4 ft. NAVD88	--	**--** --				

Fisherman's Wharf

Subarea 1-2

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	2060	2052

Water Level Elevation: 11.6 ft. NAVD88

Maritime

At this water level scenario, several piers will experience inundation. This includes the Hyde Street Pier (commercial fishing, fish processing, historic vessels, recreational boating, Water Taxi, and Fuel Dock), Pier 43 (Belt Railroad Headhouse), Pier 43 ½ (ferry terminal for Red and White fleet), Pier 47 (restaurants, Fisherman's Wharf, retail, public serving), and the iconic Pier 39 (Aquarium of the Bay, ferry terminal for Blue and Gold fleet, restaurants, retail, public space). The function of the Hyde Street Harbor will be impacted. The Kingspoke Maritime Store on Hyde Street will be inundated.

Several seawall lots will also be inundated, including Seawall Lots 301 (parking and restaurants), Seawall Lots 302 (industrial, restaurants, and fish processing) and 303 (businesses, industrial, restaurants, and retail) known as Fish Alley, and Seawall Lot 313 (businesses).

Aboveground storage tanks located on the Hyde Street Pier, Pier 43 ½, and for the Red and White fleet will be impacted.

Disaster Response

Several assets supporting disaster response and emergency operations will be impacted, including those located at the Hyde Street Pier (Fuel Dock, Fuel Tank Farm, and Oil Spill Response Equipment), Pier 39 (ferry terminal for the Blue and Gold fleet and Assembly Area), Seawall Lot 301 (Assembly Area). The Police Department / Port Joint Operations and Security Center will also be impacted.

One EFWS Fireboat Manifold will also be impacted; however, it can remain in service if a fireboat can safely establish a connection.

Utilities

The northern edge the North Point Wet Weather Facility will be impacted. However, because the potential for flooding is limited, the treatment plant is likely to retain most of its operational capacity if a flood event occurs when this facility is in operation.

Fisherman's Wharf

Subarea 1-2

Flood Scenario	Assets	Consequences
		The North Point Wet-Weather Facility is the City's oldest wastewater treatment facility, originally built in 1951. The treatment plant is only brought online during wet weather when the Southeast Treatment Plant approaches capacity (i.e., approximately 250 mgd). With the North Point facility online, an additional 150 mgd of capacity is added to the citywide treatment capabilities. The treatment processes at the North Point facility occur over numerous facilities both above and below ground. Most facilities have a unique configuration of mechanical and electrical equipment and are interconnected to other facilities through a network of conduits or tunnels. Many of these facilities have both belowground and aboveground components that could potentially be exposed to floodwaters or convey floodwaters to other areas. While the treatment facilities will likely recover after repairs, it may take several days to restore full function. Streetlights within this subarea would experience inundation.
		Transportation The Muni E-Line and F-Line route will be partially inundated, resulting in service impacts across multiple subareas. The Kirkland Yard will also be partially inundated. This facility is located on a 2.6-acre site between North Point, Beach, Stockton, and Powell streets. This facility provides bus storage, operations, and limited maintenance for 135 40-foot hybrid buses. The site includes mostly flat, paved surfaces with small operations and maintenance structures and underground storage tanks. If this facility is flooded, water can enter the underground storage tank through openings such as fill pipes, vent pipes, gaskets, loose fittings, covers, and sumps.
		Open Space and Ecology The Bay Water Trail launch and sea lion viewing area at Pier 39 will be impacted. Jefferson Street Plaza along the edge of Seawall Lot 301 will also be inundated. Inundation occurs over most of the Pier 43 Promenade.

Fisherman's Wharf

Subarea 1-2

High tide + 77" SLR	100-YR + 36" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		>2150	2143	2090	2074	2063

Water Level Elevation: 12.5 ft. NAVD88

Maritime

Pier 45 (public spaces, entertainment, and fish processing) and Pier 41 (ferries and offices) will be inundated. The aboveground storage tanks on these two piers will also be inundated. An aboveground storage tank adjacent to Pier 39 will also be inundated.

The ferry terminals on Pier 41 and Pier 43½ (Red and White) will be impacted.

Frank's Fisherman Maritime Store and Seawall Lot 311 (garage) will be inundated.

Disaster Response

The Fuel Dock on Pier 41 and the ferry terminals at Pier 41, and Pier 43½ will be impacted.

Utilities

The Northshore pump station will be inundated. This is an aboveground 30-mgd dry-weather pump station that serves the Northshore drainage basin, conveying wastewater to Channel pump station. The pump station is located at 2001 Kearney Street, at the intersection of Kearney Street and Bay Street. During wet weather, the North Point Wet-Weather Facility can treat up to 150 mgd of combined flows. Impacts at this pump station could result in localized flooding.

High tide + 84" SLR	100-YR + 43" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		>2150	2103	2082	2068	2103

Water Level Elevation: 13.1 ft. NAVD88

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Fisherman's Wharf

Subarea 1-2

High tide + 96" SLR	100-YR + 55" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		>2150	>2150	2124	2095	2077
Water Level Elevation: 14.1 ft. NAVD88		**Utilities** Many structures at the North Point Wet Weather Facility will be inundated.				
		Transportation The SFMTA Kirkland Yard will be fully inundated.				

High tide + 108" SLR	100-YR + 67" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		>2150	>2150	2144	2107	2086
Water Level Elevation: 15.1 ft. NAVD88	--	**--** --				

Fisherman's Wharf

Subarea 1-2

Adaptation Focus: Immediate

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	OPC 1-in-200
Engineered	10.2 ft. NAVD	0.3	0.3	100	0.6%	2081	2045	2030	2023	2022

Flood Pathways

- Overtopping of the shoreline occurs initially at Pier 43½, resulting in inundation of a small portion of the Embarcadero Promenade (Pier 43 promenade) and roadway.
- Overtopping along the Pier 49 shoreline results in localized inundation.

Shoreline Focus

- Isolated adaptation measures at the overtopping locations would address flooding at the MHHW + 48" scenario.

Adaptation Considerations

- There is available open space along the Pier 43½ waterfront edge for adaptation measures to be considered.
- Higher water levels will eventually overtop a broader stretch of the shoreline. Adaptation measures should consider embedding capacity to adapt to higher water levels over time.

Fisherman's Wharf

Subarea 1-2

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	OPC 1-in-200
Engineered	10.8 ft. NAVD	0.8	1.1	8,975	51.3%	>2150	2113	2071	2060	2052

Flood Pathways

- Overtopping of the shoreline occurs between the Hyde Street Pier and Pier 41½ (including the Hyde Street Pier, Pier 49, Pier 47, and Pier 43½), resulting in inundation of the adjacent seawall lots and streets.
- Pier 39 is overtopped, but inundation does not extend landward onto the Embarcadero from this location.
- The Embarcadero roadway and Jefferson Street act as conduits to convey floodwaters across this subarea, and into the adjacent Subarea 1-1.

Shoreline Focus

- Subarea adaptation measures for Pier 39 and the shoreline west of Pier 41½ are required.

Adaptation Considerations

- Flooding comingles with the adjacent Subarea 1-1, requiring 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.

Fisherman's Wharf

Subarea 1-2

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	OPC 1-in-200
Engineered	11.5 ft. NAVD	1.0	2.1	17,385	99.3%	>2150	2143	2090	2074	2063

Flood Pathways

- Almost the entire subarea shoreline is overtopped, including all piers.
- The shoreline overtopping allows inundation to broadly spread landward to North Point Street.
- Flooding comingles with Subarea 1-1 and 1-3 via the Embarcadero roadway and Jefferson Street.

Shoreline Focus

- Subarea wide shoreline adaptation measures are required.

Adaptation Considerations

- Flooding comingles with the adjacent Subareas 1-1 and 1-3, requiring adaptation measures to be coordinated across these subareas and implemented in tandem.