Flood Risk Profile

Mission Bay

Subarea 3-4

Subarea Description

Mission Bay (Subarea 3-4) is a recently developed area and site for several landmarks, including the newly opened Chase Center, Bayfront Park, the Pier 52 boat launch, and UCSF and Kaiser Medical Centers. The UCSF Mission Bay Medical Center provides health services for the wider area and conducts medical research. Chase Center, home of the Golden State Warriors, also serves as a venue for concerts and major events. Critical infrastructure includes Fire Station 4 and the Public Safety Campus, a future landing site for the Mission Bay Ferry, a Red Cross operations and resources area (at Pier 54), the Muni T-line, and wastewater assets including the Mariposa Pump Station. The Corinne Woods boat launch at Pier 52, the city's only public trailered / motorized boat launch, is also used by the Police Department's Marine Unit and the U.S. Coast Guard.

The entire shoreline along this subarea is hardened, either by engineered structures or fortified with rock armoring. The primary flooding pathway is overtopping along the shoreline. Flooding first occurs near Pier 52, resulting in localized flooding near the shoreline. Eventually overtopping of the shoreline within this subarea is conveyed by Terry Francois Boulevard into the adjacent Subarea 3-3, resulting in impacts even before the shoreline in Subarea 3-3 is overtopped. Higher Bay water levels would result in overtopping along the entire Bay shoreline within this subarea, allowing floodwaters to extend several streets inland and comingle with flooding from the adjacent subareas.

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Flood Risk Profile

Mission Bay

Subarea 3-4

Assets and Landmarks

Maritime

1. Pier 52
2. Corinne Woods Boat Launch (Pier 52
3. Red Cross Operations and Resources (Pier 54)
4. Seawall Lot 337 MB1
5. Seawall Lot 337 South
6. Seawall Lot 337 MB2
7. Seawall Lot 343
8. Seawall Lot 345
9. Mission Bay Ferry (planned)

Disaster Response

2. Boat Launch / Landing Ramp (Pier 52)
3. Red Cross Operations and Resources (Pier 54)
9. Mission Bay Ferry (planned)
10. Small Boat Berth (Pier 52)
11. Staging Area (Pier 54)
12. Fire Station 4
12. Bureau of Fire Investigation (Public Safety Campus)
13. EWFS Suction Connections (3)
14. Illinois Street

Transportation

15. Muni T-Line

Utilities

Wastewater

16. Mariposa Pump Station
17. Mariposa Transport / Storage Box
18. Combined Sewer Discharge Outfalls (1)

Open Space and Ecology

19. Agua Vista Park
20. Bayfront Park (planned)
21. Waterfront Park (Pier 52)
22. San Francisco Redevelopment Agency Promenade (planned)
23. Bay Trail / Blue Greenway
23. Blue Greenway
24. Bay Water Trail Launch

Mission Bay

Subarea 3-4

Critical Facilities

12. Public Safety Building (Public Safety Campus)
12. Southern District Station (Public Safety Campus)
12. Police Headquarters (Public Safety Campus)

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							
• Seawall Lot 345	24" (8.4 ft. NAVD)	High tide + 24" SLR	>2150	2112	2070	2059	2051
		5-YR + 0" SLR	Today	Today	Today	Today	Today
• Boat Launch (Pier 52)	36" (9.4 ft. NAVD)	High tide + 36" SLR	>2150	2144	2091	2074	2063
		50-YR + 0" SLR	Today	Today	Today	Today	Today
• Seawall Lot 337 MB1 • Seawall Lot 337 MB2 • Mission Bay Ferry (planned)	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 7" SLR	2092	2049	2033	2026	2024
• Pier 52	52" (10.7 ft. NAVD)	High tide + 52" SLR	>2150	>2150	2120	2092	2076
		100-YR + 11" SLR	2142	2067	2045	2036	2032
• Seawall Lot 337 - South • Seawall Lot 343	66" (11.9 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 25" SLR	>2150	2116	2072	2061	2053
• Red Cross Operations and Resources (Pier 54)	77" (12.8 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
		100-YR + 36" SLR	>2150	2145	2092	2075	2063

Mission Bay

Subarea 3-4

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
Disaster Response							
• EFWS Suction Connections (1 of 3)	12" (7.4 ft. NAVD)	High tide + 12" SLR	>2150	2070	2047	2038	2034
		1-YR + 0" SLR	Today	Today	Today	Today	Today
• Mission Bay Ferry (planned) • Fire Station 4 • Bureau of Fire Investigation (Public Safety Campus)	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 7" SLR	2092	2049	2033	2026	2024
• Boat Launch / Landing Ramp (Pier 52)	52" (10.7 ft. NAVD)	High tide + 52" SLR	>2150	>2150	2120	2092	2076
		100-YR + 11" SLR	2142	2067	2045	2036	2032
• Illinois Street	66" (11.9 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 25" SLR	>2150	2116	2072	2061	2053
• Red Cross Staging and Operations (Pier 54) • Staging Area (Pier 54)	77" (12.8 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
		100-YR + 36" SLR	>2150	2145	2092	2075	2063
• Small Boat Berth (Pier 52)	--	--	--	--	--	--	--
Utilities							
• Combined Sewer Discharge Outfalls (1)	36" (9.4 ft. NAVD)	High tide + 36" SLR	>2150	2144	2091	2074	2063
		50-YR + 0" SLR	Today	Today	Today	Today	Today
• Mariposa Pump Station	66" (11.9 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 25" SLR	>2150	2116	2072	2061	2053

Mission Bay

Subarea 3-4

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
• Mariposa Transport / Storage Box	--	--	--	--	--	--	--
Transportation							
• Muni T-Line	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 7" SLR	2092	2049	2033	2026	2024
Open Space and Ecology							
• Bayfront Park (planned) • Waterfront Park (Pier 52) • San Francisco Redevelopment Agency Promenade (planned) • Bay Trail / Blue Greenway • Bay Water Trail Launch	36" (9.4 ft. NAVD)	High tide + 36" SLR	>2150	2144	2091	2074	2063
		50-YR + 0" SLR	Today	Today	Today	Today	Today
• Agua Vista Park • SFRA Promenade (planned)	66" (11.9 ft. NAVD)	High tide + 66" SLR	>2150	>2150	2143	2106	2086
		100-YR + 25" SLR	>2150	2116	2072	2061	2053
Critical Facilities							
• Public Safety Building (Public Safety Campus) • Southern District Station (Public Safety Campus) • Police Headquarters (Public Safety Campus)	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
		100-YR + 7" SLR	2092	2049	2033	2026	2024

Mission Bay

Subarea 3-4

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	36" (9.4 ft. NAVD)	High tide + 36" SLR	>2150	2144	2091	2074	2063
			50-YR + 0" SLR	Today	Today	Today	Today	Today
Tipping Point	Engineered	48" (10.2 ft. NAVD)	High tide + 48" SLR	>2150	>2150	2113	2088	2073
			100-YR + 7" SLR	2092	2049	2033	2026	2024
Long Term >2050	Engineered	77" (12.8 ft. NAVD)	High tide + 77" SLR	>2150	>2150	>2150	2116	2095
			100-YR + 36" SLR	>2150	2145	2092	2075	2063

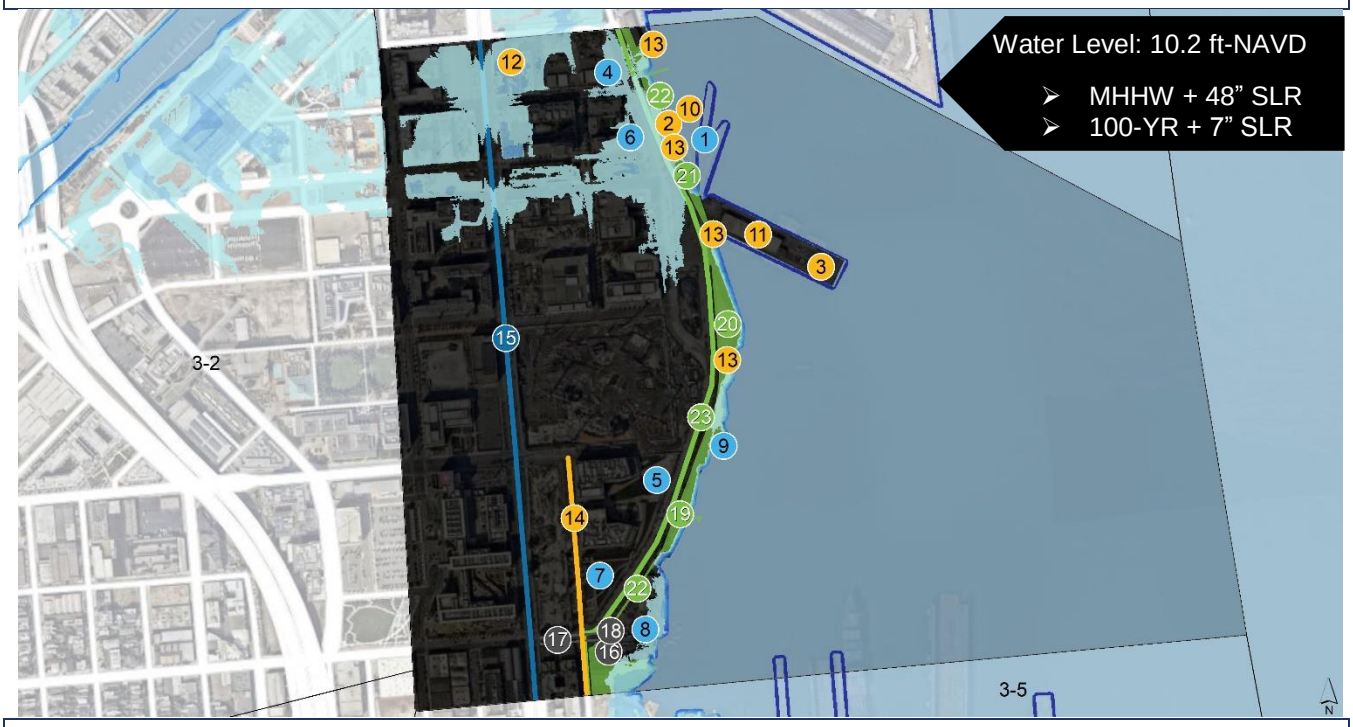
Flood Progression

Immediate Flood Risk

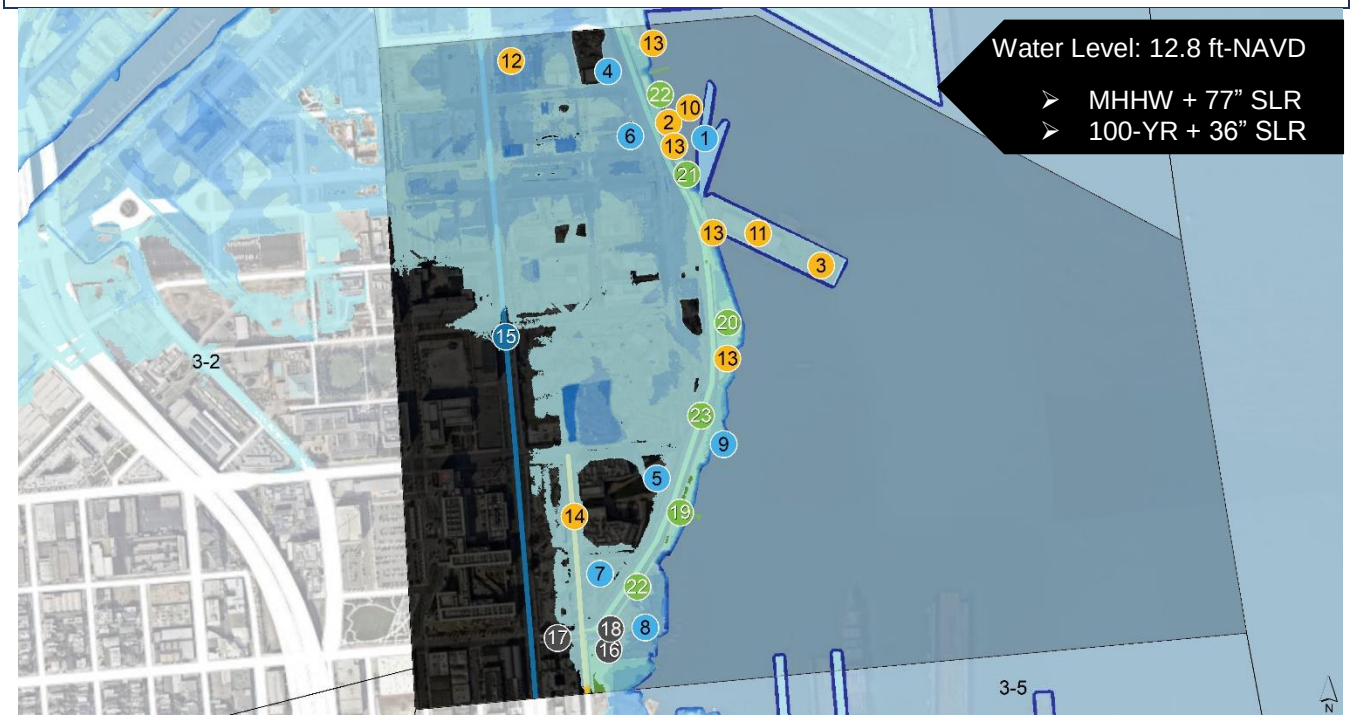
Mission Bay

Subarea 3-4

Substantial Flood Risk (Tipping Point)



Long-Term Flood Risk (>2050)



Flood Risk Profile

Mission Bay

Subarea 3-4

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 3-4.

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: 7.4 ft. NAVD88		**Disaster Response** One fire suction connection (part of the Emergency Firefighting Water System, EFWS) 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: 8.4 ft. NAVD88		**Maritime** Seawall Lot 345 is inundated. Seawall Lot 345 houses a restaurant, a small private boatyard leased by San Francisco Boatworks, self-storage units, and the Ruby Sailing Charter Company. The boatyard and restaurant may be able to continue operations with localized flooding by using deployable flood measures during high water events and flood proofing the facilities to reduce damage during temporary flood events. Flooding of the boatyard could mobilize hazardous materials that are used by the boatyard, degrading water quality.				
		Disaster Response Three additional fire suction connections would be inundated.				
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: 9.4 ft. NAVD88		**Maritime** The Corinne Woods Pier 52 Boat Launch is inundated. The boat launch is an important asset as there are limited public boat launches in San Francisco. This is the only public motorized boat launch in the city. In addition to providing important public access to the Bay, the boat launch is used by the Port maintenance crews as launch access for pier maintenance activities and emergency response.				

Mission Bay

Subarea 3-4

Flood Scenario	Assets	Consequences
		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.
		Open Space and Ecology Several open space assets will experience inundation, including the Waterfront Park at Pier 52, Bay Water Trail (Corinne Woods) boat launch at Pier 52, the Bay Trail, and the Blue Greenway. The shoreline edge of Bayfront Park will begin to experience inundation. Bayfront Park is currently a large open lot with parking and a bike path. The park will be improved and expanded as part of the Mission Bay Redevelopment Plan.

High tide + 48" SLR	100-YR + 7" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		2092	2049	2033	2026	2024
Water Level Elevation: 10.2 ft. NAVD88						

Maritime

Seawall Lot 337 (MB1 and MB2) is inundated. H&H Ship Service Company formerly treated waste sludge and wastewater in various steel aboveground storage tanks at Seawall Lot MB1. The site was previously a permitted facility for the treatment and storage of hazardous wastes. Soil and groundwater were found to be contaminated with arsenic, polychlorinated biphenyls, and polynuclear aromatic hydrocarbons. The facility was cleaned up and closed, with a Land Use Covenant that restricts future usage of the site to commercial / industrial uses in the terms of closure. The City is pursuing redevelopment plans for this location to transform it into a mixed-use residential and commercial area with open park areas. Seawall Lot MB1 and MB2 are part of the Mission Rock Mixed-Use Development Project, which includes SLR adaptation.

The future ferry landing site of the Mission Bay Ferry is also impacted at this scenario.

Disaster Response

Disaster response assets inundated at this scenario include the future ferry landing site of the Mission Bay Ferry, the Bureau of Fire Investigation at the Public Safety Campus, and Fire Station 4.

Mission Bay

Subarea 3-4

Flood Scenario	Assets	Consequences
		Utilities Streetlights within this subarea would experience inundation.
		Transportation The Muni T-Line will be impacted. The Muni T-Line is track-based and cannot be rerouted.
		Critical Facilities The Public Safety Campus will be inundated, impacting the Public Safety Building, Southern District Station, and the Police Headquarters. The Southern District includes the SoMa neighborhood, from the Ferry Building and extending south from Mission Street to Mariposa Street and east to the Bay

High tide + 52" SLR	100-YR + 11" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		2142	2067	2045	2036	2032
Water Level Elevation: 10.7 ft. NAVD88						

	Maritime Pier 52 is inundated. It serves as a wave attenuator to the adjacent public boat launch, which is the city's only motorized / trailered boat launch.
	Disaster Response The Boat Launch / Landing Ramp at Pier 52 is impacted.

High tide + 66" SLR	100-YR + 25" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		>2150	2116	2072	2061	2053
Water Level Elevation: 11.9 ft. NAVD88						

	Maritime Seawall Lot 337 South and Seawall Lot 343 become inundated. Seawall Lot 343 provides open space and houses an SFMTA substation that is extremely sensitive to inundation.

Mission Bay

Subarea 3-4

Flood Scenario	Assets	Consequences
		Disaster Response Illinois Street will be impacted. Illinois Street is rated for heavy truck traffic. Closures along Illinois Street would increase traffic and congestion for the remaining transit network.
		Utilities The Mariposa Pump Station is inundated. The Mariposa Pump Station has a 15-mgd pumping capacity, conveying both dry weather and wet weather flows for the entire Mariposa drainage basin. SFPUC is currently rehabilitating Mariposa Pump Station under the Sewer System Improvement Program and is incorporating flood resilience strategies into its design.
		Open Space and Ecology Inundation occurs at Agua Vista Park and across the planned San Francisco Redevelopment Agency Promenade. Agua Vista Park is a small landscaped park and fishing pier located in Mission Bay. It includes picnic benches and public art. The park will be redesigned and upgraded in 2020 to incorporate stormwater treatment and shoreline protection measures.

High tide + 77" SLR	100-YR + 36" SLR	USACE Low	USACE Int.	OPC Most Likely	USACE High	OPC 1:200
		>2150	2145	2092	2075	2063
Water Level Elevation: 12.8 ft. NAVD88						

	Maritime Pier 54 will be fully inundated. The eastern side of Pier 54 is an open paved area where floats are built for various events and parades, including Burning Man, Carnival, and Bay-to-Breakers. The pier also includes a shed that houses the American Red Cross operations and resources, the Chinese Chamber of Commerce, and a variety of construction consultants. The pier also has one long-term lay berth.
	Disaster Response Disaster response assets located at Pier 54 will be impacted, including the Red Cross Operations and Resources area and Staging Area.

Mission Bay

Subarea 3-4

Flood Scenario	Assets	Consequences				
High tide + 84" SLR	**100-YR + 43" SLR**	**USACE Low**	**USACE Int.**	**OPC Most Likely**	**USACE High**	**OPC 1:200**
		>2150	>2150	2104	2083	2069
Water Level Elevation: 13.4 ft. NAVD88	--	--				
		--				
High tide + 96" SLR	**100-YR + 55" SLR**	**USACE Low**	**USACE Int.**	**OPC Most Likely**	**USACE High**	**OPC 1:200**
		>2150	>2150	2126	2096	2078
Water Level Elevation: 14.4 ft. NAVD88	--	--				
		--				
High tide + 108" SLR	**100-YR + 67" SLR**	**USACE Low**	**USACE Int.**	**OPC Most Likely**	**USACE High**	**OPC 1:200**
		>2150	>2150	2146	2108	2087
Water Level Elevation: 15.4 ft. NAVD88	--	--				
		--				

Mission Bay

Subarea 3-4

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	8.7 ft. NAVD	1.0	2.6	800	10.7%	Today	Today	Today	Today	Today

Flood Pathways

- Localized flooding first occurs from overtopping of short stretch of the engineered Bay shoreline at Waterfront Park (Corinne Woods Pier 52 Boat Launch), resulting in impacts to the adjacent Mission Bay Commons Park and Terry Francois Boulevard. Inundation of Terry Francois Boulevard will impact mobility across this subarea.

Shoreline Focus

- Isolated adaptation measures at the overtopping locations within this subarea would address flooding at the MHHW + 36" scenario.

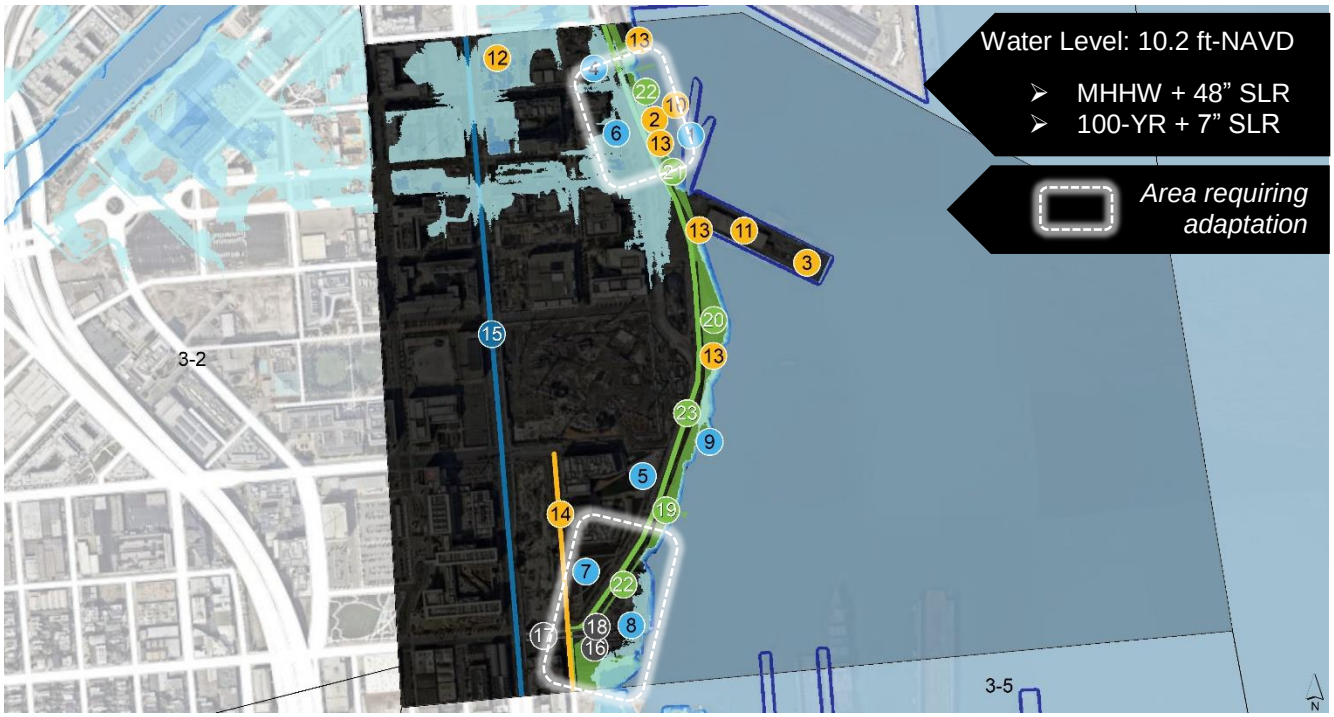
Adaptation Considerations

- Higher water levels will eventually overtop the entire shoreline within this subarea. Adaptation measures should consider embedding capacity to adapt to higher water levels over time.

Mission Bay

Subarea 3-4

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	9.2 ft. NAVD	1.2	3.6	2,000	26.8%	2092	2049	2033	2026	2024

Flood Pathways

- Overtopping occurs over longer stretch of the Bay shoreline between Pier 52½ and Pier 52, resulting in widespread inundation of the subarea (not including the piers) and impacts to mobility across the subarea.
- Terry Francois Boulevard acts as a conduit to convey floodwaters into the adjacent Subarea 3-3, resulting in widespread inundation.
- Low-lying shoreline areas at the southern end of this subarea are also overtopped, resulting in localized inundation of the adjacent Port seawall lots.

Shoreline Focus

- Isolated adaptation measures at the overtopping locations within this subarea would address flooding at the MHHW + 48" scenario, including the flooding in Subarea 3-3.

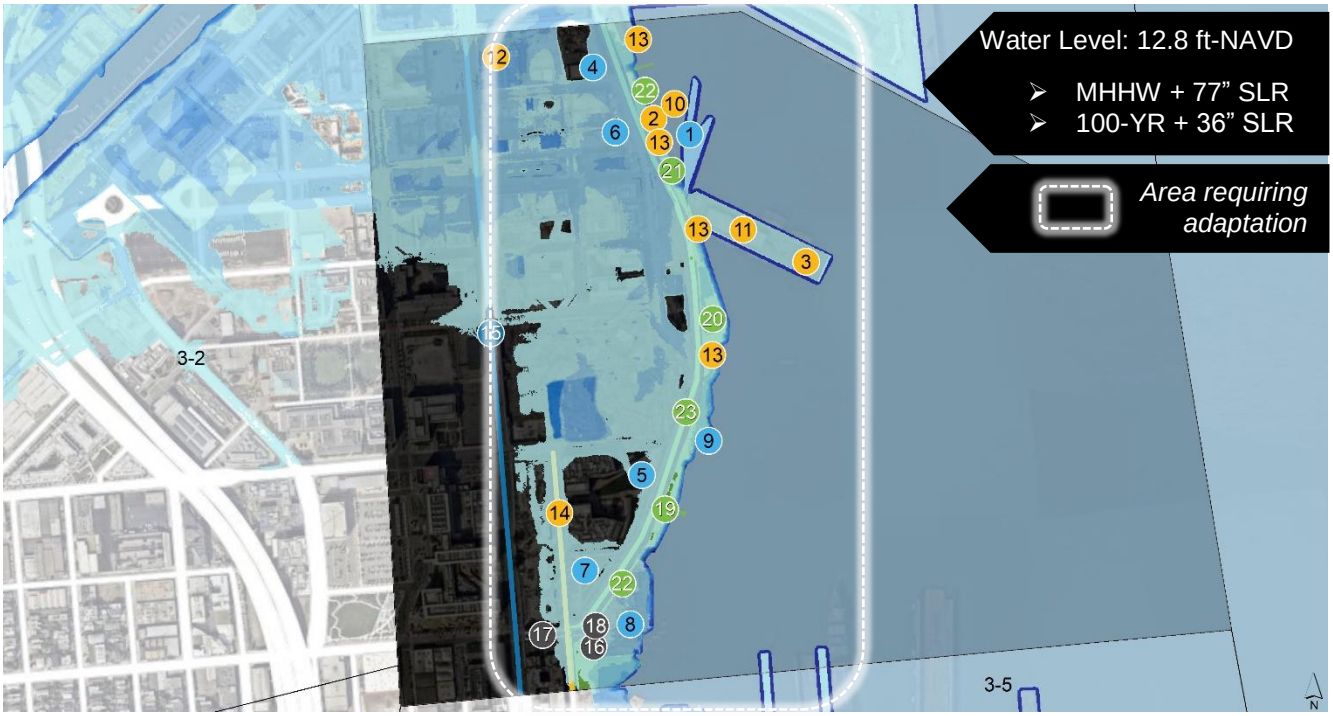
Adaptation Considerations

- Higher water levels will eventually overtop the entire shoreline within this subarea. Adaptation measures should consider embedding capacity to adapt to higher water levels over time.

Mission Bay

Subarea 3-4

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	10.8 ft. NAVD	2.1	7.5	7,450	100.0%	>2150	2145	2092	2075	2063

Flood Pathways

- Overtopping occurs over the entire stretch of the Bay shoreline within this subarea (including the piers), resulting in widespread inundation.
- Flooding comingles with the adjacent Subareas 3-2, 3-3, and 3-5.

Shoreline Focus

- Subarea wide shoreline adaptation measures are required.

Adaptation Considerations

- Due to comingling of flooding with the adjacent Subareas 3-2, 3-3, and 3-5, adaptation measures need to be coordinated across these subareas and implemented in tandem.