CHAPTER 6

WATER

The City of San Francisco's water assets are managed by the SFPUC Water Enterprise. The three primary water systems are:

- **Regional Water System** – the water supply system that delivers water from the Sierra Nevada Mountains to the City as well as other neighboring communities that are members of the Bay Area Water Supply and Conservation Agency (BAWSCA).
- **Local Potable Water Supply** – the water supply distribution system and low-pressure fire suppression system within the City of San Francisco.
- **Emergency Firefighting Water System (EFWS)** – the high-pressure fire suppression system that is supplied by the local potable water system and saltwater from San Francisco Bay and distributed via a separate distribution pipe network. The EFWS is a separate system from the potable water systems and is designed to provide water for firefighting purposes. This system is described in Chapter 9, *Public Safety*.

The Water Enterprise also manages a recycled water distribution system and groundwater system that are not included within this Assessment because they are outside of the SLR Vulnerability Zone. The recycled water distribution system delivers recycled water from the North San Mateo County Sanitation District to Harding Park Golf Course. The City is also developing its own recycled water treatment facilities at the Oceanside Wastewater Treatment Plant, with storage facilities located at Golden Gate Park to deliver recycled water to Lincoln Park Golf Course, Golden Gate Park, and The Presidio. The groundwater system will comprise a network of six groundwater wells, pump stations, and distribution pipes. Currently, four groundwater wells are active, pumping water from the Westside Groundwater Basin (underlying the southwestern portion of San Francisco County and northern San Mateo County) to supply groundwater to Sunset and Sutro reservoirs and irrigation water to Golden Gate Park.

The following sections describe how each of the three primary water systems operate and provide information about how key assets and asset categories may be vulnerable to SLR and coastal flooding.

6.1 REGIONAL WATER SUPPLY

The SFPUC Water Enterprise manages a complex water supply system stretching from the Sierra to the City, including a series of reservoirs, tunnels, pipelines, and treatment systems (see Figure 6.1). The system is almost entirely gravity fed from the source to the tap. The water supply system serves 2.7 million residential, commercial, and industrial users in the Bay Area. Approximately one-third of the delivered water goes to retail customers in San Francisco, with the remaining two-thirds going to wholesale deliveries to 27 suburban agencies in Alameda, Santa Clara, and San Mateo counties in BAWSCA.

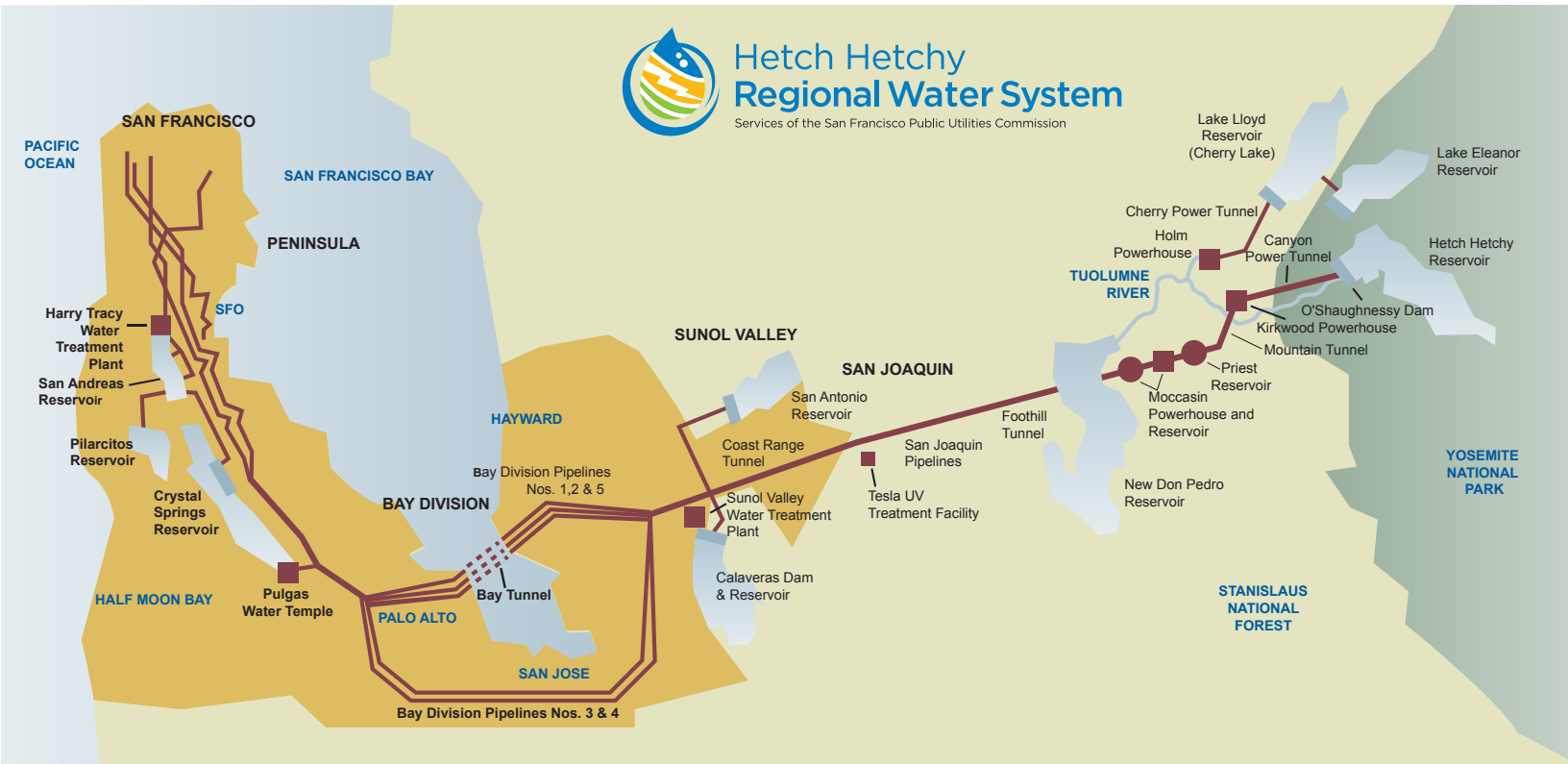
Eighty-five percent of San Francisco's total water needs are provided by the Hetch Hetchy watershed located in Yosemite National Park. Spring snowmelt runs down the Tuolumne River and fills Hetch Hetchy Reservoir, the largest reservoir in the Hetch Hetchy water system. Hetch Hetchy Reservoir can store up to 117 billion gallons of drinking water.

Sources in the Alameda and Peninsula watersheds provide the remaining 15 percent of the total water supply. The Alameda watershed, located in Alameda and Santa Clara counties, contributes surface water supplies captured and stored in two reservoirs: Calaveras and San Antonio. The Sunol Filter Galleries, located near the Town of Sunol, are a groundwater source supplying less than one percent of San Francisco's water. The Peninsula watershed in San Mateo County contributes surface water supplies captured and stored in lower and upper Crystal Springs and San Andreas Reservoirs, and in two smaller reservoirs, Pilarcitos and Stone Dam. The six reservoirs in the Alameda and Peninsula watersheds capture rain and local runoff, and some also store Hetch Hetchy water for use by San Francisco.

SFPUC adopted a large-scale capital improvement program in 2002 to secure regional water delivery reliability for the future. The Water System Improvement Program was designed and implemented to:

- Provide high-quality water to reliably meet current and foreseeable local, state, and federal requirements;
- Reduce system vulnerability to damage from earthquakes;

Figure 6.1 Regional Water System



- Increase system reliability by improving redundancy needed to accommodate outages;
- Improve short-term water supply reliability and drought protection;
- Set forth long-term options to address water supply shortages and manage drought;
- Enhance sustainability through improvements that optimize protection of the natural and human environment; and
- Provide improvements resulting in a cost-effective, fully operational water system.

Photo 6.1 Hetch Hetchy Aqueduct in Fremont, California

6.1.1 Potentially Vulnerable Assets

Although most of the Regional Water System is in upland areas outside of the SLR Vulnerability Zone (i.e., the area that could be inundated with 66 inches of SLR and a one percent annual chance storm surge condition), there are three areas located outside of the City of San Francisco's jurisdiction that could be inundated by SLR or an extreme storm surge event before the end of the century: the connections to the Bay Tunnel crossing in Newark and Ravenswood, and the pipeline crossing in Santa Clara at the Guadalupe River. Within these three areas, the primary assets are transmission lines, valves and connections, air release / air vacuum valves, and control and monitoring systems.

6.1.1.1 Transmission Lines

Hetch Hetchy Aqueduct (Bay Division Pipelines Nos. 1, 2, and 5) carries water from Hetch Hetchy Reservoir in Yosemite to the Crystal Springs Reservoir west of San Carlos. The transmission lines could be inundated at the Bay Crossing from Newark to Ravenswood and near the Guadalupe River crossing in the South Bay (see Figure 6.2).

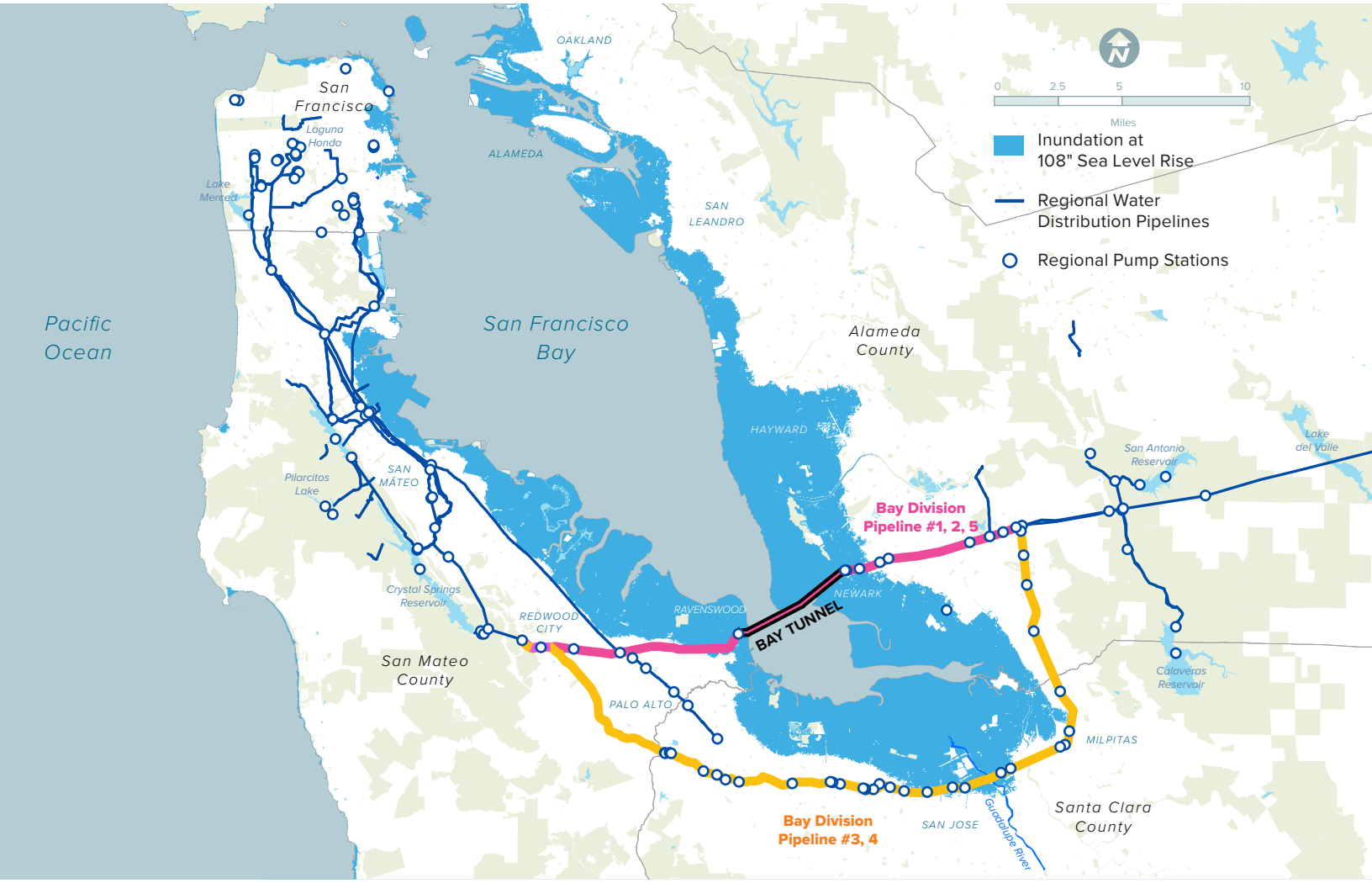
The aboveground pipelines in this area (see Photo 6.1) were replaced in 2014 with an underground pipeline and a Bay Tunnel crossing that runs about 100 feet under the Bay. Photo 6.1 highlights the low sensitivity of the pipelines to saltwater. The original pipelines were constructed in the 1925 (Pipeline No. 1) and 1936 (Pipeline No. 2) and have been subjected to tidal inundation multiple times over the past several decades with limited corrosion. The primary reason for replacing the Bay crossing infrastructure was to improve the seismic stability of pipelines. In general, both the previous Bay crossing infrastructure and the new Bay Tunnel have low adaptive capacity, meaning they are difficult to adapt or retrofit to address changing conditions without significant investments. However, the new Bay Tunnel has capped watertight tunnel shafts, and the Bay Tunnel and shafts are not expected to be affected by SLR.

Hetch Hetchy Aqueduct (Bay Division Pipelines Nos. 3 and 4) crosses under the Guadalupe River, and Hetch Hetchy Trail has been constructed on top of the aqueduct at this location (see Figure 6.2). The most vulnerable components of the transmission system are the buried pipelines and the pump stations that keep the water flowing through the distribution system. As sea level rises and the groundwater rises and becomes more saline, corrosion could shorten the life expectancy of the buried infrastructure, requiring more frequent repair and replacement. The pump station infrastructure, including sensitive electrical equipment, is also vulnerable to overland coastal flooding.

6.1.1.2 Valves and Connections

The flow of water through the Regional Water System is mechanically controlled by pump stations and valves, and the flow of water out of the system to customers and other agencies is controlled by connections. The Ravenswood and Newark areas have valves with electric actuators, which allow the

Figure 6.2 Bay Division Pipelines and Bay Crossing in the South Bay



valves to be opened and closed remotely. Although the valves are designed to be watertight, the electric components are sensitive to inundation. The valves could be operated manually in a temporary flood situation. However, if the valves become permanently inundated by SLR, the electric actuators would need to be replaced with a hydraulically operated system to be controlled remotely.

The Ravenswood and Newark areas have six service connections and an intertie connection that supplies water to the East Bay Municipal Utility District water supply network. The Guadalupe River crossing has two service connections. This infrastructure is designed to be watertight and is not sensitive to inundation, although increased saltwater-induced corrosion could shorten the life expectancy of these assets.

6.1.1.3 Air Release / Air Vacuum Valves

Air release valves help to automatically exhaust unwanted air during system operation to protect against unwanted surges and maintain system efficiency. Air vacuum valves are safety valves that admit air if the pressure within the pipeline is less than that of the atmosphere to prevent a pipeline collapse. Along the Bay Division Pipelines (including at Newark, Ravenswood, and the Guadalupe River Crossing), combination air release / air vacuum valves are typically located at high points in the system where unwanted air may collect. Air release / air vacuum valves are vulnerable assets because they cannot perform their function if inundated – they must maintain a connection to the atmosphere. If an air release / air vacuum valve is inundated, it could contaminate the potable water supply in the

pipelines. Even brief inundation is an issue and is prohibited by the State Water Resources Control Board. Per state regulations, air release valves must be above FEMA 100-year flood elevations. The air release valves near the Guadalupe River crossing were designed to be higher than the state requirements due to their proximity to the Bay and the Guadalupe River, which has a potentially higher flood risk. As sea levels rise, the 100-year flood elevations will also rise, and the air release valves will need to be raised to accommodate this change.

6.1.1.4 Control and Monitoring Systems

The Ravenswood and Newark areas include control buildings and other assets that are sensitive to inundation, particularly saltwater inundation. The control buildings include meters and equipment for remote monitoring and control of the system (supervisory control and data acquisition, SCADA). These assets control or collect data from the mechanical and electromechanical components of the system. Temporary flood protection measures could be implemented to address temporary flood events (i.e., sandbags, flood baffles, wet flood proofing). However, significant cost and effort would be required to redesign and elevate/relocate this equipment to address permanent inundation. The control and monitoring systems are the most vulnerable assets in the Regional Water System.

6.1.2 Exposure Assessment

The exposure of the Regional Water Supply assets was evaluated relative to the 10 SLR scenarios (see Chapter 2, *Climate Science*). The miles of buried water distribution pipeline exposed to SLR are presented in Table 6.1, and the regional pump stations located within the SLR Vulnerability Zone are presented in Table 6.2. Although the air release / air vacuum values and the control and monitoring systems are vulnerable to SLR and coastal flooding if they are exposed, a detailed exposure assessment could not completed for the Regional Water System because the locations of this equipment are not included the GIS geodatabase for the Regional Water System.

Table 6.1 Regional Water Supply Distribution Pipelines

	Miles of Buried Water Distribution Pipelines within Each Sea Level Rise Scenario									
County	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Alameda	-	-	-	-	0.2	0.4	0.5	0.5	0.7	0.8
San Mateo	-	-	1.0	2.0	2.3	3.1	3.5	3.7	4.1	4.9
Santa Clara	-	-	-	0.2	0.3	1.4	1.8	1.9	1.9	2.4
Bay Crossing	0.5	0.9	1.3	1.4	2.2	2.2	2.4	2.4	2.4	2.4
Total	**0.5**	**0.9**	**2.3**	**3.6**	**5.0**	**7.1**	**8.2**	**8.5**	**9.1**	**10.5**

Table 6.2 Regional Water Supply Pump Stations

	Regional Pump Stations within Each Sea Level Rise Scenario									
County	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Alameda	-	-	-	-	1	3	4	4	4	4
San Mateo	-	1	1	1	1	1	1	1	1	1
Santa Clara	-	-	-	-	-	1	1	1	1	2
Total	**-**	**1**	**1**	**1**	**2**	**5**	**7**	**7**	**7**	**8**

6.1.3 Consequence Summary

KEY ISSUE: The Regional Water System is a critical source and delivery system of potable water not only for San Francisco, but for much of the San Francisco Bay Area. Although emergency reserves within the system are intended to meet basic needs for at least 72 hours after an emergency or natural disaster, longer disruptions to this system could have cascading impacts on local water supply and fire suppression systems that serve both commercial and residential customers throughout the Bay Area. In addition, impacts to the power generation or distribution system can impact the Regional Water System. Although limited infrastructure is located within the SLR Vulnerability Zone, rising sea levels and coastal flooding could impact the control systems, resulting in widespread water shortages.

Society and Equity: Potable water is critical for meeting basic needs and for providing emergency response. Any unforeseen, short- or long-term disruption of water supply could impact all customers. Vulnerable populations, such as the elderly or young children who are particularly reliant on safe drinking water, will be the most impacted. Health issues and disease may spread if public and private sanitary systems are inoperable. If potable water is no longer available on tap, San Francisco residents and visitors will be forced to buy bottled water, which would disproportionately impact already vulnerable communities even more.

Economy: If a short- or long-term water shortage occurs, potable water-dependent industries will be impacted. This includes office buildings, hotels, restaurants, and other industries within the affected area. The longer the water shortage occurs, the larger the impacts to the local and regional economy. Water infrastructure will require inspections and repairs if water delivery is interrupted for a lengthy period and the pipelines are contaminated with saltwater or they become depressurized.

Environment: If potable water is limited or unavailable, irrigation, and other outdoor uses of water will be limited as potable water will likely be prioritized for other uses. Parks, golf courses, and other green spaces that rely on outdoor water use may be damaged, especially if limited use extends to the dry summer months. Animals and wildlife that depend on the open spaces may also suffer. Open spaces that rely on recycled, non-potable water will likely be the most resilient.

Governance: Multi-agency cooperation, public-private partnerships, and coordinated local and regional action will be necessary to help communities meet basic water needs. Coordinated and prioritized distribution of potable water (i.e., via bottled water, portable water tanks, or other means) will be required.

6.2 LOCAL POTABLE WATER SUPPLY SYSTEM

San Francisco's Regional Water System supplies water to three terminal reservoirs within the City (e.g., the Sunset, University Mound, and Merced Manor reservoirs). Terminal reservoirs are shared by San Francisco and its wholesale suburban water customers during emergencies. From these reservoirs, the water is gravity fed or pumped into eight covered distribution reservoirs and tanks. The terminal and distribution reservoirs (see Figure 6.3) can hold nearly 416 million gallons (MG) at full capacity – about a five-day supply for the City. In an emergency, the City can draw upon the surface water supplies in Lake Merced and Laguna Honda, which together hold 2.6 billion gallons of water.

The Sunset Reservoir is the City's largest, located in the Sunset District at 24th Avenue and Ortega Street (Photo 6.2). The subterranean reservoir has a total capacity of 177 MG. The reservoir has 25,000 solar panels installed on the roof, generating five mega-watts of power. University Mound Reservoir, located in the Portola District at University Avenue and Felton Street, has a storage capacity of 141 MG. Together, the Sunset and University Mound reservoirs supply over half of the City's water supply. The third terminal reservoir is Merced Manor Reservoir located at Sloat Boulevard and 23rd Avenue, with a total storage capacity of 9.5 MG. College Hill Reservoir located at Appleton Avenue and Elise has a capacity of 13.5 MG and other smaller distribution reservoirs are scat-tered on the heights across the City serving nearby neighborhoods. The underground transmission pipelines distribute water primarily by gravity from the reservoirs throughout the City.

6.2.1 Potentially Vulnerable Assets

The Local Potential Water Supply System assets within the SLR Vulnerability Zone include distribution pipe-lines, air release / air vacuum vales, the Bay Bridge Pump Station, and low-pressure fire hydrants (LPFH).

Photo 6.2 Sunset Reservoir.

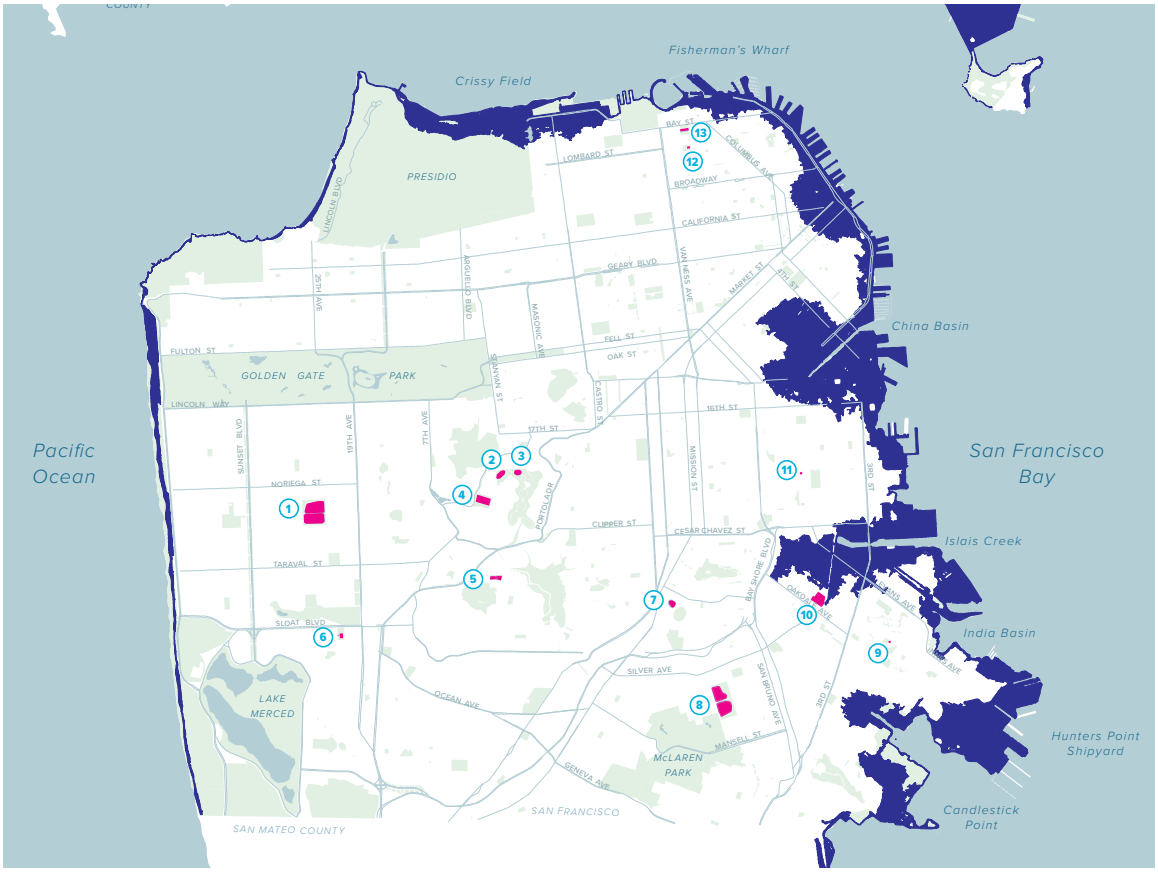


Figure 6.3
Reservoirs and Storage Tanks

2. Summit Reservoir
3. Twin Peaks Reservoir
4. Sutro Reservoir
5. Stanford Heights Reservoir
6. Merced Manor Reservoir
7. College Hill Reservoir
8. University Mound Reservoir
9. Hunters Point Reservior
10. CDD Yard
11. Potrero Heights Reservoir
12. Lombard Reservoir
13. Francisco Reservoir (not is use)

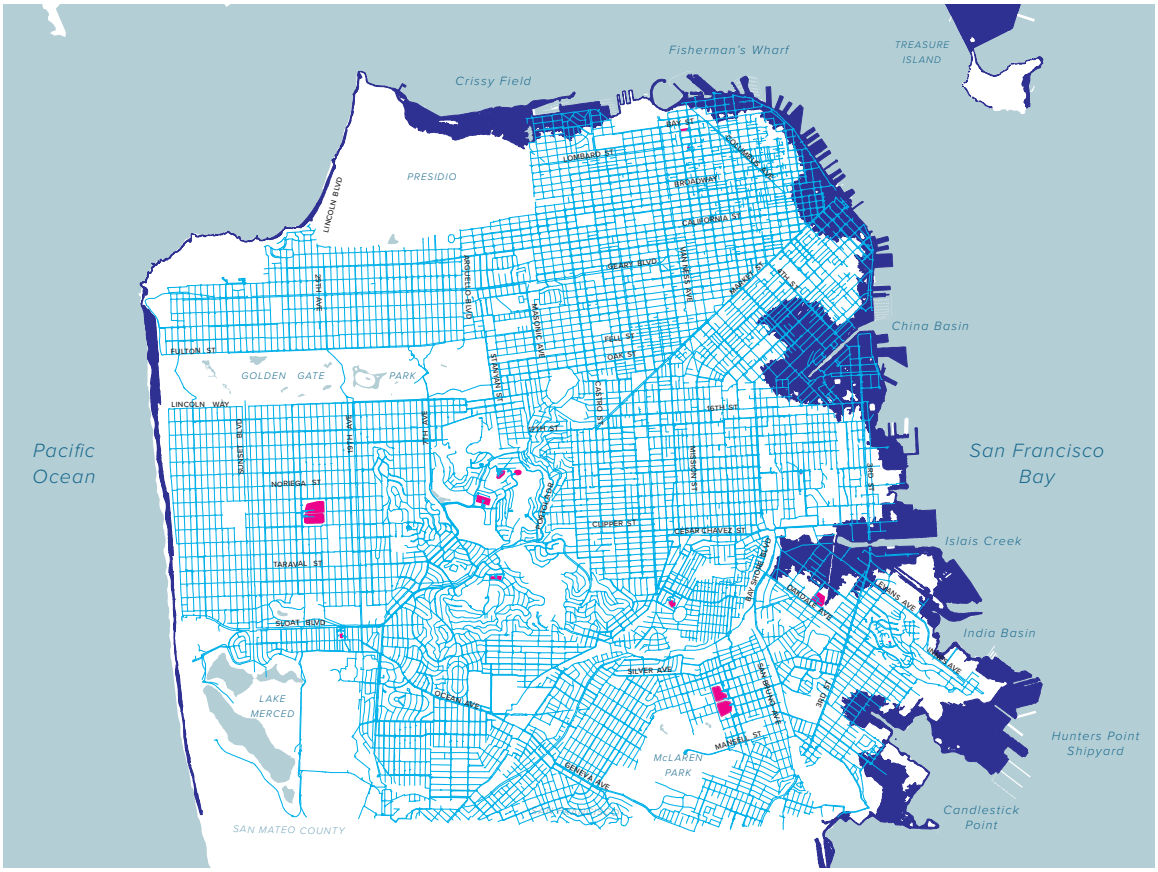


Figure 6.4
Potable Water Supply Distribution Pipelines

6.2.1.1 Potable Water Distribution Pipelines

The underground potable water distribution pipelines, ranging in size from 60 to six inches in diameter, distribute water throughout the City primarily by gravity (see Figure 6.4). Local connections to the distribution pipelines supply water directly to the residential, commercial, and industrial customers. The pipelines are not sensitive to temporary inundation that could occur during an extreme coastal flood event because the infrastructure is buried underground. However, as sea levels rise, and the shallow groundwater table rises and increases in salinity near the shoreline, corrosion could shorten the life expectancy of the buried pipelines and increase the likelihood of pipelines shifting underground. The repair and replacements cycles would shorten, and the frequency of emergency repairs associated with water main leaks, breaks, and sink holes could increase.

In general, buried infrastructure is not easily adaptable to rising sea levels or increases in salinity. All adaptation measures would likely require significant investments, and disruptions to roadways and traffic during repairs and modifications to address changing conditions.

6.2.1.2 Air Release / Air Vacuum Valves

Similar to the Regional Water System (see Chapter 6.1.1.3), air release valves are vulnerable to flooding because they cannot perform their function if inundated – they must maintain a connection to the atmosphere. If an air release / air vacuum valve is inundated, it could contaminate the potable water supply in the pipelines. Even brief inundation is an issue and is prohibited by the State Water Resources Control Board. Per state regulations, air release valves must be above FEMA 100-year flood evaluations. As sea levels rise, the 100-year flood elevations will also rise, and the air release valves will need to be raised to accommodate this change.

6.2.1.3 Pump Stations

The local potable water supply system includes 17 pump stations of varying capacities to supply the reservoirs and tanks at higher elevations. Only the Bay Bridge Pump Station (see Photo 6.3) is located inside the SLR Vulnerability Zone (see Figure 6.5).

Figure 6.5 Bay Bridge Pump Station Location

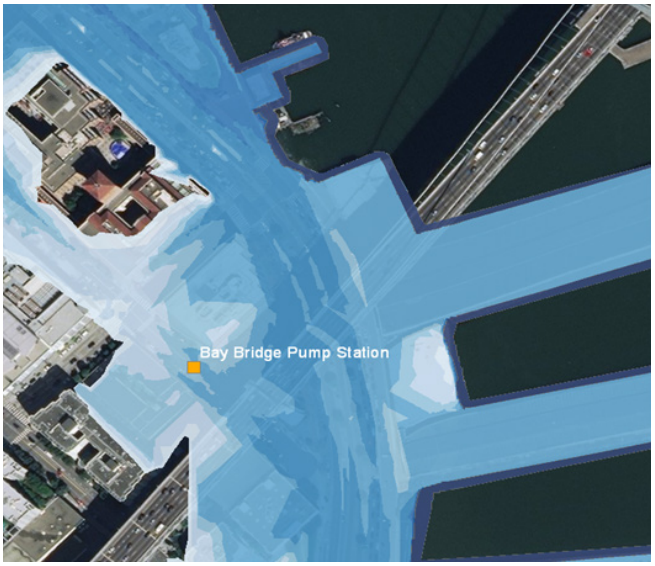


Photo 6.3 New Bay Bridge Pump Station

The Bay Bridge Pump Station is located at the intersection of Bryant and Main Streets in San Francisco. This pump station was originally constructed in 1938 and was housed inside the bridge pier at the intersection of Spear Street and Main Street. It was relocated to its present location in 2003 due to seismic upgrades to the Bay Bridge. This pump station serves as the sole source of water to the Treasure Island/Yerba Buena water distribution system. The pump station transfers water from the University Mound pressure zone to the Treasure Island/Yerba Buena water distribution system. If the Bay Bridge pump station is impacted by SLR or coastal flooding, potable water would not be delivered to Treasure Island.

The Bay Bridge Pump Station has at- and below-grade components, including electrical equipment that is sensitive to any inundation. Multiple flood pathways are available to allow floodwaters into the pump station (i.e., doorways, vents, conduits). Temporary flood protection measures such as sand bags and inflatable baffles could be used to provide short-term protection in advance of a storm event. However, no short-term measures are currently stored onsite, so advance notice of a storm event is required to provide protection. In the longer term, the structure could be modified to include dry flood-proofing measures that would seal the structure and prevent floodwaters from entering.

6.2.1.4 Low Pressure Fire Hydrants

Water for firefighting is supplied to the San Francisco Fire Department by the Local Potable Water Supply System. Throughout the City, white LPFH hydrants are connected directly to the local potable water supply distribution system (see Figure 6.6).

Temporary inundation could make hydrants inaccessible if the roadways are not passable, or if the hydrant is entirely underwater. If inundation is less than 20 inches (i.e., firetruck safe passage depth), a hydrant is likely still usable. However, if an LPFH is inundated, the closest Emergency Firefighting Water System high-pressure fire hydrant should be used to avoid cross-contamination with the local potable water supply.

The vulnerabilities associated with fire hydrants are directly related to the flooding and vulnerabilities along the roadways (see Chapter 5, *Transportation*). Areas with inaccessible (i.e., flooded) LPFH will not have direct access to fire suppression services from fire engines. Services should resume after floodwater recedes. Fire hydrants in flooded areas will require inspections for corrosion to ensure each hydrant is fully operational in the event of an emergency. Properties located on the edge of the flood zone (i.e., within approximately 500 feet) may still have access

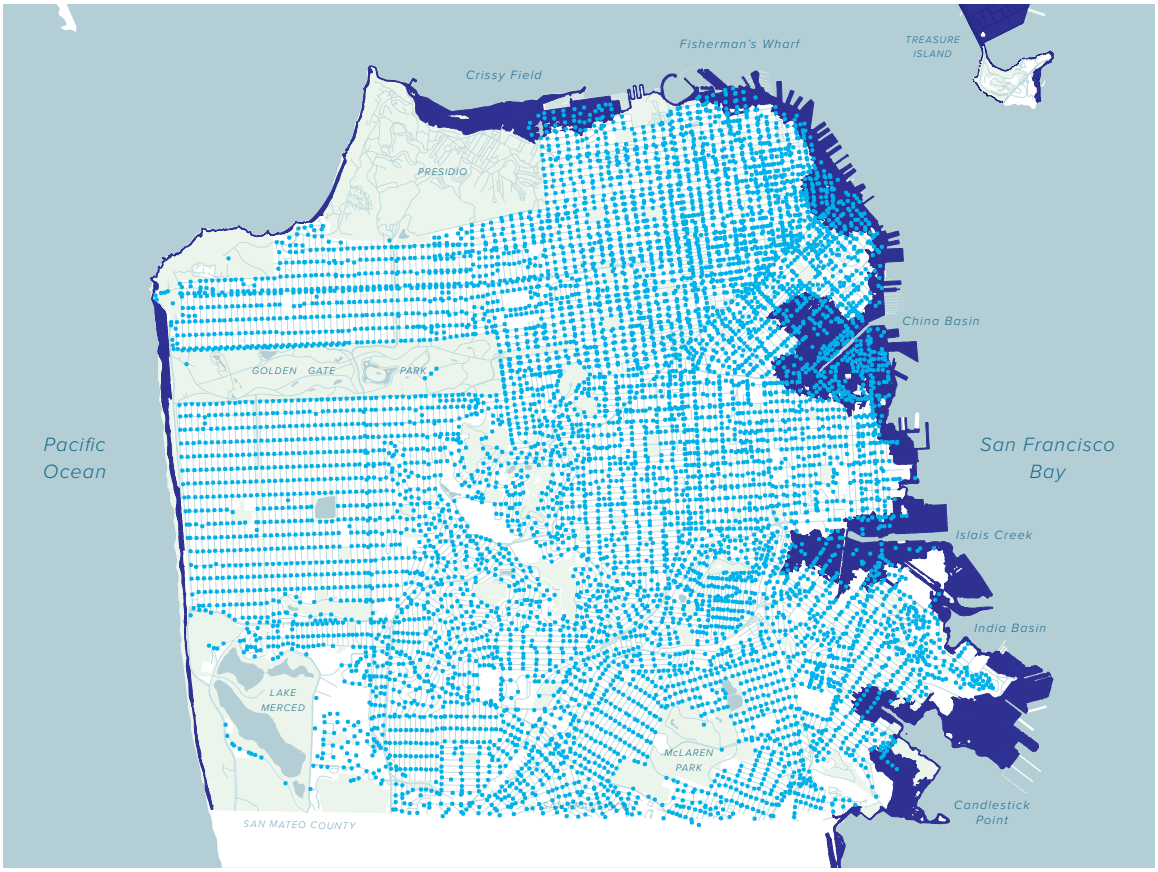


Figure 6.6
Low-Pressure Fire Hydrants

to working hydrants either outside the inundated area or in areas with minimal inundation. If sufficient water or pressure is not available from the local potable water supply system, high-pressure fire hydrants and cisterns are also available to provide redundancy in some areas (see Section 6.3).

6.2.2 Exposure Assessment

The exposure of the Local Potable Water Supply System assets was evaluated relative to the 10 SLR scenarios (see Chapter 2, *Climate Science*). Table 6.3 presents the miles of buried potable water distribution pipeline within each SLR scenario, and Table 6.4 presents the same information by the type of pipeline material. Most of the potentially exposed pipelines are connected to the University Mound pressure zone. Cast iron corrodes quickly when exposed to seawater; however, generally only the surface layer of the pipeline corrodes and then the corrosion stops. Ductile iron pipelines have largely replaced cast iron pipelines for potable water distribution systems, and these pipelines include protective internal lining and external coating to inhibit corrosion. The older, cast iron pipelines are likely the most vulnerable to salinity-related corrosion.

Table 6.5 presents the number of air release / air vacuum valves that are potentially exposed within each SLR scenario[1]; however, the elevation of each air release valve was not available. Because the air release valves are often elevated above the ground surface, they may be inundated under a later scenario than presented in Table 6.5. As with the

1 Although the locations of the air release / air vacuum valves were not available for the Regional Water System, the locations for the Local Potable Water Supply System were available within the GIS geodatabase, and the exposure of the valves could be assessed.

Table 6.3 Potable Water Distribution Pipeline Exposure Summary

University Mound Pressure Zone	Miles of Buried Water Distribution Pipeline within Each Sea Level Rise Scenario									
	1	2	3	4	5	6	7	8	9	10
Bayview South	-	-	-	-	-	0.6	1.1	1.5	2.3	3.0
Bayview North	-	-	-	0.3	1.4	3.4	4.2	5.0	6.3	8.5
Potrero Hill	-	-	-	-	-	0.3	0.5	0.7	1.0	1.8
South of Market	-	-	0.5	2.4	4.4	12.5	15.6	17.7	20.4	22.7
Financial District	-	-	0.1	0.7	1.3	5.4	6.2	6.9	8.0	9.3
North Beach	-	-	-	-	0.1	3.0	3.9	4.5	5.1	5.7
Russian Hill	-	-	-	-	-	-	0.1	0.1	0.1	0.1
Marina	-	-	-	0.1	0.1	1.2	1.8	2.5	3.4	4.7
Total University Mound	-	-	**0.5**	**3.5**	**7.3**	**26.0**	**33.0**	**39.0**	**47.0**	**56.0**

Table 6.4 Potable Water Distribution Pipeline Exposure Summary by Material

Material	Miles of Buried Water Distribution Pipeline within Each Sea Level Rise Scenario									
	1	2	3	4	5	6	7	8	9	10
Ductile Iron	-	-	0.5	3.1	5.6	16.7	20.5	23.2	27.5	31.9
Cast Iron	-	-	-	0.4	1.7	8.6	11.6	14.3	17.5	22.0
Steel	-	-	-	-	-	0.6	0.7	0.8	0.9	0.9
Unknown	-	-	-	-	-	0.4	0.5	0.6	0.8	1.1

Table 6.5 Air Release / Air Vacuum Valve Exposure Summary

	Number of Air Release / Air Vacuum Valve Exposures under Each Scenario									
Pressure Zone	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
McLaren Park Tank										
Bayview South	-	-	-	-	-	-	-	-	2	2
University Mound										
Bayview South	-	-	-	-	-	8	12	15	31	35
Bayview North	-	-	-	3	8	26	34	41	50	62
Potrero Hill	-	-	-	-	-	1	2	5	12	22
South of Market	-	-	19	51	85	214	259	277	316	338
Financial District	-	-	2	8	21	95	109	127	155	173
North Beach	-	-	-	-	-	63	78	88	98	102
Russian Hill	-	-	-	-	-	-	-	-	-	-
Marina	-	-	-	-	-	3	8	12	15	19

Table 6.6 Bay Bridge Pump Station Exposure Summary

	Pump Station Exposure under Each Scenario (Y/N)									
Pump Station	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Bay Bridge	-	-	-	-	-	-	Y	Y	Y	Y

Table 6.7 Low-Pressure Fire Hydrant Exposure Summary

	Number of Low-Pressure Fire Hydrants Exposed under Each Scenario									
Neighborhood	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Bayview North	-	-	-	-	-	3	7	10	21	28
Bayview South	-	-	-	-	8	31	43	52	64	87
Financial District	-	-	1	3	7	59	68	76	90	107
Marina	-	-	-	-	-	6	15	19	22	33
North Beach	-	-	-	-	-	21	28	31	37	42
Potrero Hill	-	-	-	-	-	3	5	10	17	35
Presidio	-	-	-	-	-	3	3	3	3	3
South of Market	-	-	6	42	66	170	207	229	262	294
Total	-	-	**7**	**45**	**81**	**296**	**376**	**429**	**514**	**622**

potable water supply distribution system, most of the potentially exposed air release / air vacuum valves are associated with the University Mound pressure zone distribution system. The most vulnerable air valves are the automatic air valves that are spring loaded and could fail if pressure was lost; these valves are attached to larger distribution mains.

The Bay Bridge Pump Station is first exposed to SLR and coastal flooding under Scenario 7 (77 inches of SLR, or 36 inches of SLR coupled with a 100-year coastal storm surge event (see Table 6.6). Table 6.7 presents the number of LPFH exposed – by neighborhood – to SLR and coastal flooding under each SLR scenario.

6.2.3 Consequence Summary

KEY ISSUE 1: The Local Potable Water Supply System relies on a complex and interconnected system of reservoirs and pipelines and infrastructure. Although most of this infrastructure is located outside of the SLR Vulnerability Zone, SLR and coastal flooding could impact potable water delivery and availability throughout the City. The largest impacts would likely occur within vulnerable populations located within the SLR Vulnerability Zone and Treasure Island.

Society and Equity: Potable water is critical to meet basic needs within the City. Any unforeseen, disruption of the potable water supply would impact residential and business customers. Vulnerable populations, such as the elderly or young children, are particularly reliant on safe drinking water and would be the most impacted in the event of a water shortage. Health issues may arise if a sufficient safe water supply is not available for sanitation.

Economy: If the local potable water supply is compromised, water-dependent industries would be impacted, affecting business in these areas. Over a longer period, if businesses are not able to operate and residences become uninhabitable, depopulation could have significant impacts on the economy. Repairs to infrastructure, including private systems, could be extensive.

Environment: If local potable water supplies are limited, outdoor irrigation may be limited. Plants and animals that rely on irrigation services or other regular watering in the City's green spaces, especially during the dry summer months, could suffer or perish.

Governance: Multi-agency cooperation, public-private partnerships, and coordinated local and regional action will be necessary to maintain basic services in the event of a water shortage, and to improve the resilience of San Francisco's water-dependent industries.

KEY ISSUE 2: Many LPFH could be affected, reducing the firefighting capabilities in the low-lying areas of the City. Although the Emergency Firefighting Water System provides back-up fire suppression capabilities, a severe coastal flood event could render both systems inoperable (i.e., the inundation that limits the use of LPFH will also limit the use of the high-pressure fire hydrants.

Society and Equity: Fire suppression services would be limited in low-lying areas of the City, especially in vulnerable communities that cannot be readily served by the City's three fireboats.

Economy: If a large-scale fire occurs and spreads before the fire suppression services can be brought back online, the associated damage and recovery costs could be extensive.

Governance: Multi-agency cooperation will be required to maintain life and safety services if fire suppression services are unavailable for an extended period.

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