

8. PUMP STATION NUMBER 4

City of South San Francisco

VULNERABILITY SUMMARY

Pump Station Number 4 (Pump Station 4) is a **highly vulnerable**, critical facility that is a key component of the wastewater collection and treatment system for the South San Francisco (SSF) Service Area. The electrical and power distribution system is a key vulnerability and highly sensitive, whereby severe inundation could compromise the electrical system and cause the pump station to lose service altogether. The adaptive capacity of the facility to a flood hazard is low, as there is no alternate pump station that could serve its 30,000 customers (and industrial area). Loss of service could impact the service area and also the surrounding businesses.

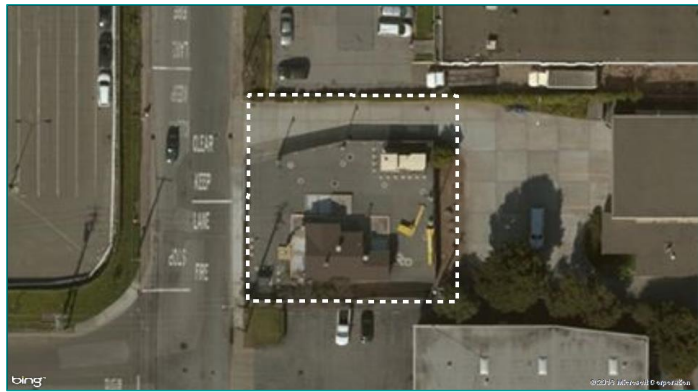
SENSITIVITY High	EXPOSURE Moderate	ADAPTIVE CAPACITY Moderate	CONSEQUENCES High
----------------------------	-----------------------------	--------------------------------------	-----------------------------

ASSET CHARACTERISTICS

249 Harbor Way | South San Francisco

Asset Description and Function:

Pump Station 4 collects wastewater from five smaller pump stations in the industrial area of SSF, and conveys it to the SSF San Bruno Water Quality Control Plant (SSF SB WQCP) through a force main for treatment. Pump Station 4 has four pumps, two sewage grinders, and a backup generator. It serves roughly 30,000 people in the area of SSF, east of Highway 101.



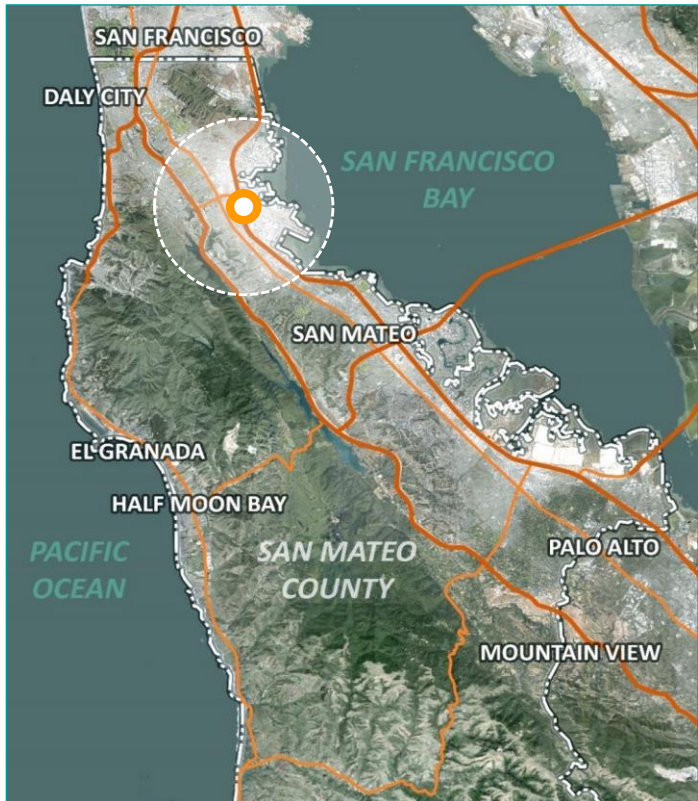
Asset Type	Wastewater Pump Station
Asset Risk Class	3
Size	2,000 square feet
Year of Construction	1957
Elevation	Pump room floor: -11 ft (Datum unknown)
Level of Use	1.6 million gallons/day
Annual O&M Cost	\$125,000
Special Flood Hazard Area	Asset is in SFHA
Physical Condition	Good
Landowner	City of South San Francisco

Underground Facilities

There are underground sewer pipes, electrical system, pumps, and sewage grinders.

Environmental Considerations

Special status plants, animals, and natural communities may be present in the project area; a more detailed analysis will be needed before implementing adaptation strategies.



PUMP STATION NUMBER 4

ASSET SENSITIVITY

Though the Pump Station 4 is in good condition and many of its components were built to tolerate waterlogged conditions, it is highly sensitive to flooding. To date, the pump station has never been closed for any reason, in part because it has not experienced a major coastal flood, and also because many underground components, including pumps and grinders, were designed to operate in waterlogged conditions. In 2008, Pump Station 4 was rehabilitated and the wet well (the underground area storing sewage) was sealed to prevent groundwater intrusion. However, Pump Station 4 is very sensitive to a loss of power. Its street level electrical system is considered its most sensitive component and would be compromised if exposed to floodwaters.

If the electrical system were compromised, the Pump Station 4 would lose the ability to pump effluent (sewage) through the force main to the Water Quality Control Plant. Wires connecting the transformer pad to the pump house run underground, and if exposed to groundwater or saltwater, the wires and power transfer could potentially be corroded. If the site were to experience 48 inches of sea level increase, the nearby manholes could be overwhelmed, causing saltwater intrusion into Pump Station 4, and subsequently to the Water Quality Control Plant. This would significantly decrease the level of service because saltwater disrupts biological wastewater treatment processes.

Google Street View of Pump Station Number 4.



SHORELINE VULNERABILITY

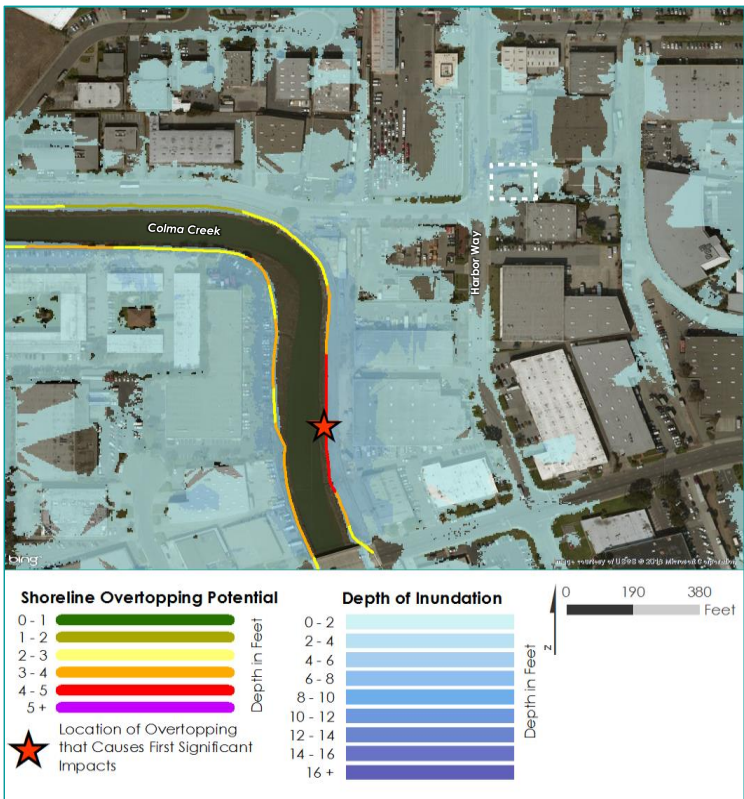
Shoreline Overtopping Analysis

Colma Creek is a likely source of coastal flooding at the Pump Station 4. When water surface elevations increase between 0 and 12 inches above the current mean higher high water (MHHW) level, the creek may overtop the embankment roughly 750 feet southwest of the site (indicated by a red star on the map), creating a potential flow path to the asset. The first damaging inundation to the Pump Station 4, however, would not likely occur until water elevations reach between 36 and 48 inches above MHHW.

Cross-Cutting Vulnerabilities

Pump Station 4 collects sewage from Pump Stations 8, 2, and 14 (Station 14 pumps to Station 2). Stations 8 and 14 are low-lying and close to San Francisco Bay, which makes them vulnerable to saltwater intrusion. Any saltwater or additional stormwater that gets into manholes or those pump stations would make its way to Pump Station 4 and ultimately to the SSF SB WQCP. Saltwater at the plant can ultimately disrupt biological treatment processes at the SSF SB WQCP (see AVP #23).

First Significant Impacts: 48 inches above MHHW.



PUMP STATION NUMBER 4

SEA LEVEL RISE EXPOSURE ANALYSIS

Exposure Discussion

Exposure of Pump Station 4 is moderate. Though it has not yet been subject to coastal flooding, Pump Station 4 is subject to groundwater seepage as the pump station and its components were built at and below grade. It is also susceptible to saltwater intrusion because waves and saltwater can leak into the underground sewer pipes through manholes, and then be pumped to Pump Station 4. In addition, vulnerabilities at nearby Pump Stations 14 and 8 could have consequences at Pump Station 4. Pump Stations 14 and 8 are both low-lying and close to San Francisco Bay; making them subject to wave action and surface flooding. If either were exposed to saltwater, they would convey that saltwater directly into Pump Station 4.

Pump Station 4 could also be exposed to surface water flooding from Colma Creek, which is tidally influenced. High tides combined with extreme or high rainfall events can prevent Colma Creek from discharging to San Francisco Bay. Water would instead back up and overflow onto the Pump Station 4 site. Though the function of the plant was not impacted during the major storm in December 2014, small amounts of standing rainwater splashed into the Pump Station 4 from passing motorists on Harbor Way.

With rising sea level, groundwater seepage is expected to increase, as well as the frequency with which saltwater could affect Pump Stations 14 and 8 (thereby conveying saltwater to Pump Station 4).

Exposure Analysis Results

Potential Inundation Depth (feet)		
Scenario	Minimum	Maximum
First Significant Impacts (48 inches)	0	3
Baseline 1% Flood	0	0
Mid-Level 1% + 3.3 feet	1	4
High-End 1% + 6.6 feet	6	9

Baseline Scenario: Asset not yet inundated.



Mid-Level Scenario: Asset flooded 1-4 feet deep.



High-End Scenario: Asset under 6-9 feet of water.



PUMP STATION NUMBER 4

ADAPTIVE CAPACITY, CONSEQUENCES, AND POTENTIAL ADAPTATION

Adaptive Capacity

The adaptive capacity of Pump Station 4 is moderate; if the asset lost function all together, there is no alternate pump station to serve the same industrial region. There is an elevated backup generator to provide temporary power to the plant and ensure level of service for a limited time, as long as the generator and critical electrical system components (i.e., the power distribution system) stay dry. A remote-controlled monitoring system is connected to each major component of the pumping station, enabling real-time, 24/7 observation of conditions, processes, and functionality, and improving overall adaptive capacity of the asset. Staff receive alarms and have the ability to respond quickly to any abnormal conditions, thus reducing the likelihood of a loss of service. Under non-flooding conditions, the Pump Station 4 has three standby pumps for redundancy and additional capacity.

Consequences

The consequences of a temporary or permanent loss of this asset are high, and the scale of the impacts caused by disruption would be widespread as explained below. If inundated, direct damages to the Pump Station 4 components and operating equipment, or failure of the pumping station could range from \$45,000 to \$250,000. Given Pump Station 4 is the only conduit between this particular area and the Water Quality Control Plant, loss of service would affect function of the plant as a whole and could shut down the entire service area east of Highway 101. If customers continue to use the system, water could begin to back up in manholes. Overflows in the collection system could end up in the storm drain system, eventually discharging into San Francisco Bay, or could require evacuation of surrounding businesses, the SSF Caltrain Station, and the nearby fire station. If untreated sewage discharged directly into San Francisco Bay, this could cause environmental damages to water quality or adjacent habitat (and result in fines). Nearby businesses would likely be closed until the overflow could be pumped away, the buildings cleaned, and reopened for occupancy; this has economic impacts, as well. Though injuries are unlikely, on-site staff could be exposed to electrocution and hazardous waste during and shortly after inundation.

Additional Important Information

The Pump Station 4 is in good condition and has never been closed, shut down, or out of operation for any reason to date.

Asset-Specific Adaptation

One option is to floodproof the Pump Station 4 directly by building a wall and elevating critical components. It will also be necessary to address the manholes and other pump stations that feed the system to reduce their vulnerabilities.

Vulnerable Wastewater Pump Stations

This is the only Asset Vulnerability Profile on vulnerable wastewater pump stations in the County. The vulnerability assessment analysis shows that there are 66 vulnerable wastewater pump stations (based on available data) in the project area, including those in Daly City (1), Menlo Park (1), Millbrae (2), Pacifica (3), Redwood City (6), San Carlos (3), and SSF (10).

Underground pumps.



Power distribution system.

