

10. MILLBRAE INTERMODAL STATION

Bay Area Rapid Transit (BART) and Peninsula Corridor Joint Powers Board (PCJPB)

VULNERABILITY SUMMARY

The Millbrae Intermodal Station (Station) is **moderately vulnerable** to sea level rise. The Caltrain and BART tracks are at grade, and exposure to flooding is moderate, with on-going groundwater intrusion into the BART tunnels. Roughly 24 inches of water level increase is needed for water to reach the Station. The Station is extremely sensitive, and trains would not function if power systems or the tracks were flooded. Adaptive capacity is moderate as the asset is an end-of-line stop for BART, and Caltrain could run "bridge" bus service around the Station during repairs to maintain service. Impacts would be high with costly damages, and flooding could affect over 58,000 riders/day.

SENSITIVITY High	EXPOSURE Moderate	ADAPTIVE CAPACITY Moderate	CONSEQUENCES High
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ASSET CHARACTERISTICS

200 Rollins Rd | Millbrae

Asset Description and Function:

The Station is a passenger train station for BART and Caltrain, and is served by SamTrans buses as well. It is jointly owned by a Joint Powers Board and BART. All trains on the Caltrain system (Gilroy to San Francisco) must pass through this Station on their way through the peninsula, and it is an end-of-line stop for BART, though an important node for access to San Francisco International Airport. Roughly 11,000 total riders use the station daily. There is also a Historical Train Depot on the property.



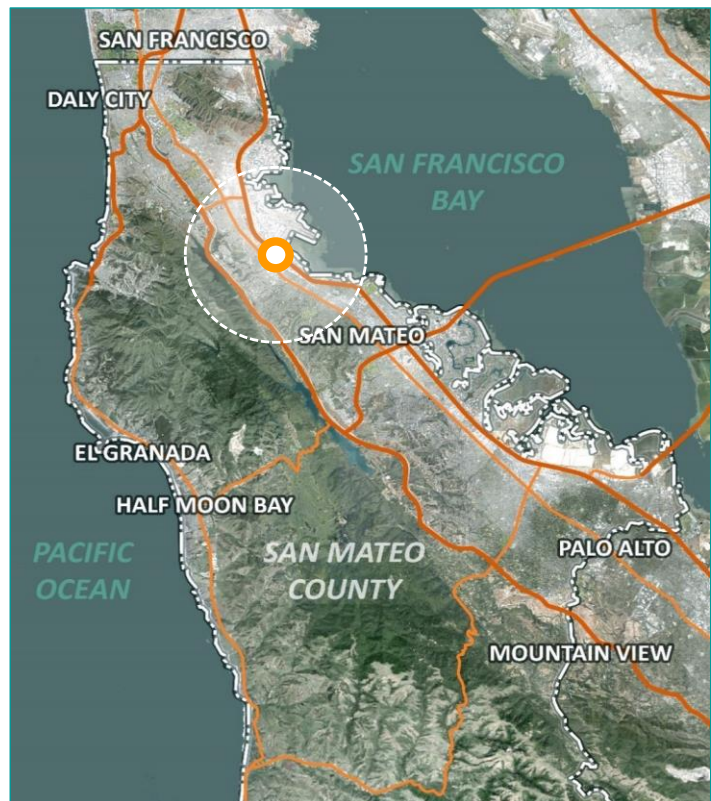
Asset Type	Public Transportation Infrastructure
Asset Risk Class	3
Size	20.7 acres
Year of Construction	2003
Elevation	12 feet, BART datum
Level of Use	11,000 daily riders
Annual O&M cost	Unknown
Special Flood Hazard Area	Asset is in SFHA
Physical Condition	Good
Landowner	County of San Mateo Transit District

Underground Facilities

BART tracks and third-rail power supply are below grade.

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.



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ASSET SENSITIVITY

Asset sensitivity is high, as flooding of the parking lots and nearby roads (which would be the first components to flood) affects bus drop offs, and station access. BART operations would also be affected if inundated, because the BART train control room, switching station, and substations at the site are sensitive to flooding, and BART service would stop if they were flooded. Both BART and Caltrain tracks are sensitive to flooding, particularly from saltwater due to corrosion. If the tracks were flooded, trains on both systems would stop service.

BART's underground facilities have a sump pump to mitigate groundwater seepage and potential nuisance flooding, however the sump does not have sufficient capacity to address major flooding, as could be caused by a severe coastal storm or overtopping of the nearby Highline Canal, which abuts the tracks (see map below).

Caltrain's power system is located offsite and has not been evaluated as part of this assessment for its vulnerability to flooding. Any Caltrain power sources that are low-lying could be flooded and disabled, potentially affecting Caltrain service at the Station.

Entrance to BART tunnel at Millbrae Intermodal Station.



SHORELINE VULNERABILITY

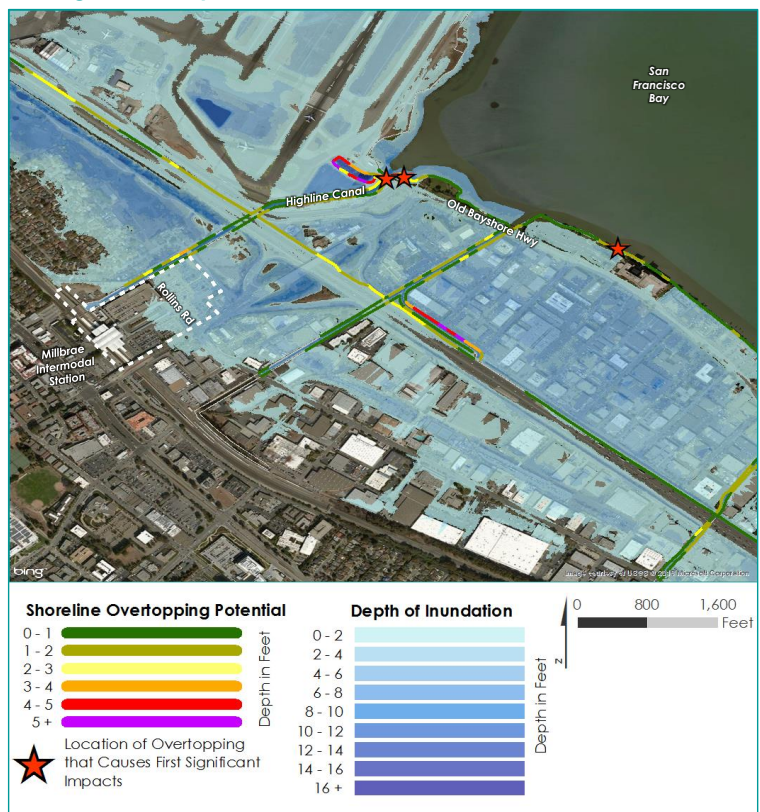
Shoreline Overtopping Analysis

Floodwater from San Francisco Bay (backing up through Highline Canal) is a likely source of flooding at the Station. When water levels reach 0-12 inches above the current mean higher high water (MHHW), water could overtop the shoreline at the Highline Canal Tide Gate (0.5 mile northeast) and Old Bayshore Highway (1 mile east) (red stars on map). With water 24-36 inches above MHHW, Highline Canal would overtop, inundating the parking lot and the area near the BART tunnel entrance.

Cross-Cutting Vulnerabilities

The asset is an end-of-line stop for BART, and could be closed without affecting the rest of the system, though it does provide access to San Francisco International Airport. Caltrain service through the peninsula must pass through this Station. If tracks were damaged or flooded, the sections of the train network running to San Francisco and Gilroy would be severed. Back-up on the Highline Canal is exacerbated by the tide gate, which is not fully functioning, see profile on Highline Canal Tide Gate (AVP #11).

First Significant Impacts: 36 inches above MHHW.



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SEA LEVEL RISE EXPOSURE ANALYSIS

Exposure Discussion

Exposure of the Station to the impacts of sea level rise is moderate. The asset has not experienced any surface water flooding; however, groundwater seepage is already apparent in some of the underground BART facilities. Furthermore, the asset could be flooded under 36" of water level rise resulting from sea level change or from an extreme storm.

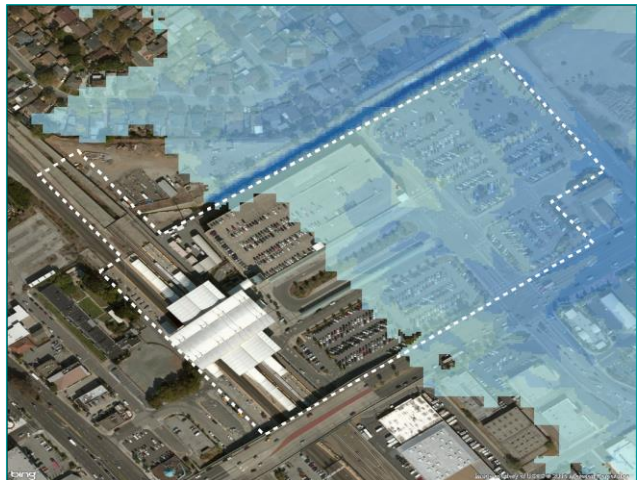
Because the site is flat and there are currently no barriers to prevent water entry, flooding could affect the BART tracks, substation (power), and train control rooms (at-grade). The Caltrain station platform and the base of the station platform, including the stairways, fare machines, and elevators, are also at grade and could be flooded. This means that other sensitive equipment located on the platform could be exposed to flooding, including the tracks, and critical signal and mechanical systems. BART underground facilities have vent structures along the tracks, and could provide entryway for surface water flooding.

The Caltrain Historical Train Depot is at-grade with no flood barriers and could also be inundated with other at-grade infrastructure. Caltrain has no underground assets onsite, but it relies on underground utility assets, making groundwater seepage a potential concern. Flood depths onsite (near parking lot) could reach up to 11 feet deep in the high-end scenario.

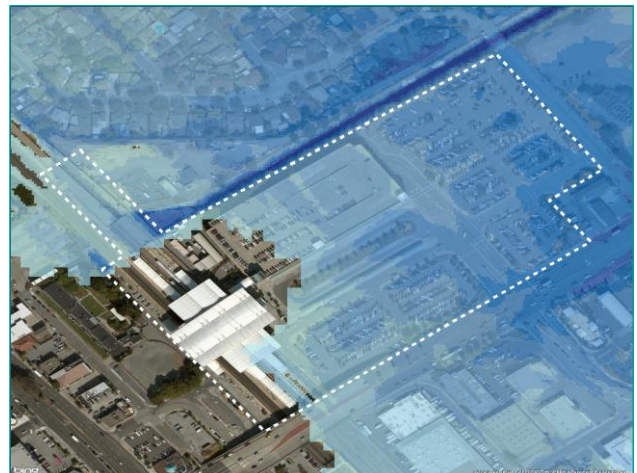
Baseline Scenario: Asset not yet inundated.



Mid-Level Scenario: Parking lot inundated.



High-End Scenario: Most of asset property inundated.



Exposure Analysis Results

Potential Inundation Depth (feet)		
Scenario	Minimum	Maximum
First Significant Impacts (36 inches)	0	5
Baseline 1% Flood	0	0
Mid-Level 1% + 3.3 feet	0	7
High-End 1% + 6.6 feet	0	11

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ADAPTIVE CAPACITY, CONSEQUENCES, AND POTENTIAL ADAPTATION

Adaptive Capacity

Adaptive capacity of the asset is moderate. BART has emergency equipment throughout the system, including sandbags, tarps, and mobile pumps; however, these measures would not be sufficient to maintain BART function for long-duration or permanent flooding. If BART or Caltrain operations at the Station were lost due to flooding, "bridge" service would be made available to pick up and drop off from the adjacent stations using a bus. While, this would cause delays, decreasing level of service, other stations would still maintain their function. Lastly, there is no alternate for the historic train depot from a historic and cultural resources perspective. Often building restrictions (due to historic landmarks) are limiting, which could present additional challenges in near-term protection or long-term adaptation of the depot. Adaptive capacity in the longer-term (or from any potential permanent inundation) is likely to be less effective than it is now, as frequent floods that require frequent use of "bridge" service would likely be too disruptive or costly. This could force a decision to adapt with either an asset-specific or regional approach.

Consequences

Consequences of temporary or permanent flooding of the asset are high, with regional geographic impacts. Flooding could damage both BART and Caltrain infrastructure and would cause a major disruption of service. The asset is a key node in the Caltrain line, so loss of service could affect transit of up to 58,000 commuters and other travelers each day. This in turn has economic impacts associated with delays and the value of commute hours. A loss of this critical service would disproportionately affect those populations who rely heavily on public transportation for getting to work and who do not have a back-up mode for transit. This often includes lower income populations and those with functional and access needs. Shut down of the BART station is likely to have cascading impacts, as often disruption at one station affects the whole system. Repair and replacement would come with steep economic costs as well: damage to the Caltrain system could cost up to \$2.2 million for the station and over \$6.75 million for tracks; estimates for replacing the BART station are over \$85 million. Even if train service were not disrupted, flooding of the parking lot would limit access and the current bus turn-around would be inaccessible, leading to bus detours and time delays.

Additional Important Information

The City of Millbrae plans to convert a portion of the parking lot, a portion of which is vulnerable to sea level rise as shown in the inundation maps, to transit-oriented development. Ongoing BART and Caltrain upgrade and construction projects consider sea level rise, generally through the CEQA process.

Asset Specific Adaptation

Increasing the height and improving the function of the Highline Canal tide gate could limit Bay water travelling up the canal. The facility itself could be adapted to present day rain-driven flooding and future sea level rise by dry floodproofing existing infrastructure, elevating and floodproofing the BART and Caltrain mechanical/electrical systems, and by closing the grates/vents along the tunnel. Future development and roadways to access the development may require elevation or dry floodproofing as well. Green infrastructure could help mitigate some early impacts related to interior (stormwater) flooding.

Vulnerable Rail Stations

This is the only Asset Vulnerability Profile on vulnerable rail stations in the County. The vulnerability assessment analysis shows that there are two vulnerable Caltrain stations (Redwood City and Hayward Park) and one vulnerable BART station (SF International Airport) in the County.

Trains and train platform at Millbrae Station.

