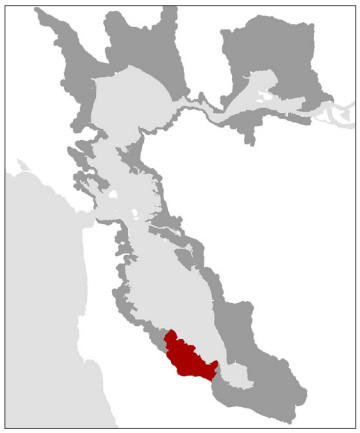
A view from Menlo Park looking northeast to the Bay. Photo by SF Baykeeper, Robb Most and LightHawk.

Local Assessments
Section K:
BELMONT-REDWOOD
Operational Landscape Unit

JURISDICTIONS WITHIN THIS SECTION

San Mateo County

Atherton
Belmont
East Palo Alto
Foster City
Menlo Park
North Fair Oaks
Redwood City
San Carlos



HOW TO USE THE LOCAL ASSESSMENTS

WHO IS THIS FOR?

Anyone interested in understanding their local shared vulnerabilities to flooding and sea level rise.

Local jurisdictions
- Cities
- Counties
- Special Districts
- Utilities Providers

Stakeholder Groups
- Non-profits/NGOs
- For-profits/Private
- Associations
- Interested Parties

General Public
- Residents

State/Regional
- Caltrans
- MTC/ABAG

HOW IS IT ORGANIZED?

Local assessments are organized by four regional systems assessed: Transportation, Vulnerable Communities, Priority Development Areas (PDAs), and Priority Conservation Areas (PCAs).

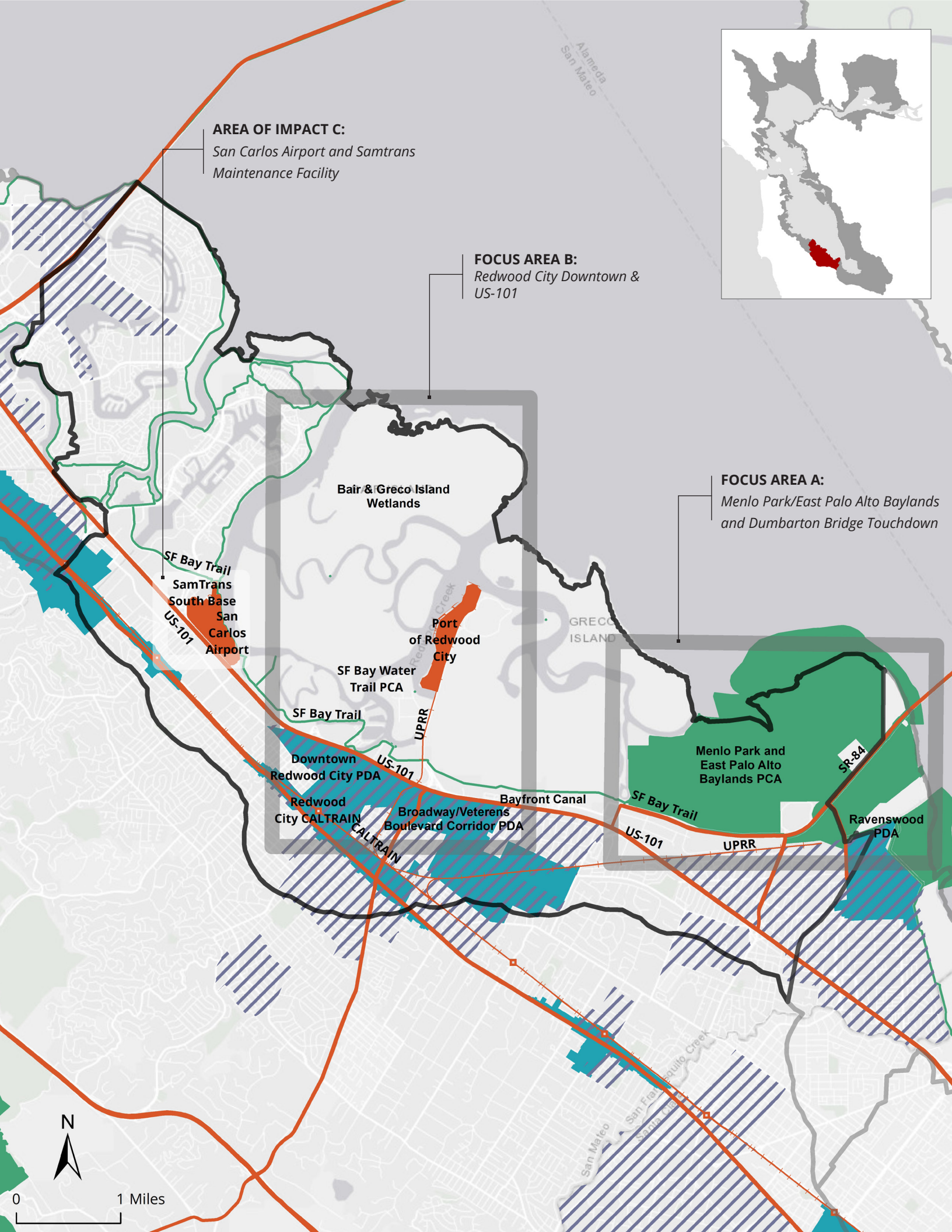
Each part of the local assessment provides varying levels of details at three scales: 1) Operational Landscape Unit (OLU), 2) Individual Descriptions, and 3) Shared Stories of Vulnerabilities in Focus Areas/Areas of Impact. This assessment can be reviewed in whole, or individual parts can be reviewed separately depending on interest and level of detail desired.

WHAT'S IN THIS ASSESSMENT?

Where are we in the region?

This OLU is located in San Mateo County stretching along the shoreline from SR-92 and the San Mateo Bridge touchdown in Foster City to SR-84 and the Dumbarton Bridge touchdown in Menlo Park and East Palo Alto. General uses of this area include single family housing, high density residential housing, mixed-use and entertainment centers and open space for recreation. The characteristics of the shoreline vary, ranging from levees in Foster City surrounding residential homes and commercial development, to the contiguous band of wetlands south of Foster City including the Don Edwards San Francisco Bay National Wildlife Refuge's Bair Island, Greco Island and Ravenswood Ponds and Ravenswood Slough. These wetlands are among the largest remaining and restored wetlands in the San Francisco Bay and home to a variety of threatened and endangered species and serves as an important stop for birds on the Pacific Flyway. This OLU also contains numerous contaminated lands and has among the highest number of contaminated lands impacted by flooding across the Bay Area.

Approximate area of the Belmont-Redwood OLU. NASA satellite imagery of the Belmont-Redwood OLU. Map data © 2019 by Google.


AREA OF IMPACT C:
San Carlos Airport and Samtrans Maintenance Facility
FOCUS AREA B:
Redwood City Downtown & US-101
FOCUS AREA A:
Menlo Park/East Palo Alto Baylands and Dumbarton Bridge Touchdown
Alameda
San Mateo
Bair & Greco Island Wetlands
SF Bay Trail
SamTrans South Base San Carlos Airport
US-101
Port of Redwood City
SF Bay Water Trail PCA
SF Bay Trail
UPRR
Downtown Redwood City PDA
US-101
Redwood City CALTRAIN
CALTRAIN
Broadway/Veterens Boulevard Corridor PDA
Bayfront Canal
Menlo Park and East Palo Alto Baylands PCA
SR-84
SF Bay Trail
US-101
UPRR
Ravenswood PDA
N
0
1 Miles

What regional systems are here?

Operational Landscape Unit (OLU) boundaries were used to organize and help identify regionally significant assets that were co-located together (Methodology can be found in ART Bay Area Section 3.0 Local Assessments).

The map on page 4 shows the entire OLU, including all the regional systems present. Colors are used throughout this document to help navigate across these four regional systems. Individual assets that were assessed as part of this local vulnerability assessment are listed in the bullets below and can also be found on the labels on the map (Figure 1k).

Figure 1k. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN BELOW:

TRANSPORTATION

- Union Pacific Railroad
- US-101
- SR-84
- SR-92
- Redwood Caltrain Station
- Port of Redwood City
- SamTrans South Base Maintenance Facility
- San Carlos Airport
- Local Roads

VULNERABLE COMMUNITIES

- Redwood City/ North Fair Oaks Community
- Foster City Community
- Belle Haven Community
- East Palo Alto Community

PRIORITY DEVELOPMENT AREAS (PDAs)

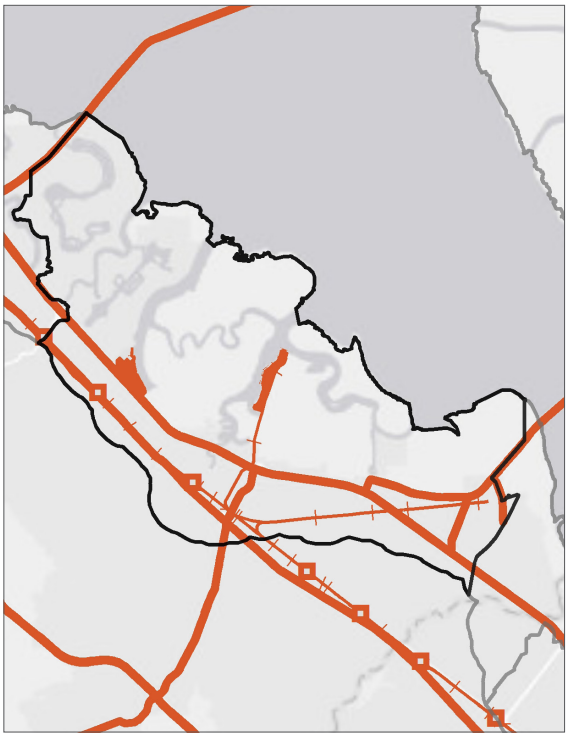
- Downtown Redwood City PDA
- Broadway/ Veterans Boulevard Corridor PDA
- Ravenswood PDA

PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- San Francisco Water Trail (4) PCA
- Proposed Menlo Park/East Palo Alto Baylands PCA

What was assessed?

TRANSPORTATION



Dumbarton Bridge touchdown. Map data © 2019 by Google.

Union Pacific Railroad • The Union Pacific Railroad (UPRR) is an important heavy freight rail supporting the reliable movement of goods to market across the Bay Area. The rail connects many Bay Area ports and moves goods to areas across the region. In this OLU, it is connected to the Port of Redwood City and moves critical goods down the peninsula to cities in the South Bay. It is within low-lying areas at 12" TWL and first exposed to flooding impacts at 24" TWL at the Port of Redwood City. At 36" TWL, the rail line overtops and leads to flooding of the Belle Haven community.

US-101 • The US-101 is the primary north-south transportation artery through the San Francisco Peninsula, providing important access to the East Bay via connections to State Routes 92 and 84. The US-101 provides important commuter transportation service in this area for local, regional and inter-regional automobile and truck traffic, averaging 214,000 vehicles[1] and 9,346 trucks[2] per day. It is also a designated emergency route for the Bay Area.[3] Within this OLU, the US-101 is an 8-lane freeway and is first exposed to flooding at 12" TWL at Redwood Creek Bridge with additional impacts at the US-101/SR-84 intersection beginning at 24" TWL. Significant flooding occurs at 48" TWL inland of US 101 when Pulgas Creek and Cordilleras Creek overtop.

SR-84 • Traversing the Dumbarton Bridge, SR-84 is an east-west highway and in this particular area it overlaps with a segment of the US-101 from Marsh Road in Menlo Park to Woodside Road in Redwood City where it is called the Bayfront Expressway. SR-84 intersects with other main highways including SR-109 (University Avenue) and SR-114 (Willow Road) at grade intersections. It is an important route connecting commuters and residents from cities across the Peninsula as well as across the Bay, averaging 72,500 vehicles[4] and 2,620 trucks[5] per day. It becomes exposed to flooding at the Dumbarton Bridge touchdown area beginning at 24" TWL.

SR-92 • Traversing the San Mateo Bridge, SR-92 is an east-west highway in the Bay Area that critically serves the region by connecting commuters and residents across the Bay. The route provides services to commuters, truck cargo, access to Bay Trail segments, and is a designated emergency route.[6] It interchanges with three major transportation networks in this area, including US-101, SR-82, and I-280. SR-92 averages 116,000 vehicles[7] and 7,853 trucks[8] per day. It becomes exposed to flooding at 52" TWL affecting the on-ramp at Foster City Boulevard as well as impacts to the western bridge touchdown.

Redwood Caltrain Station • Located within Redwood City, the Redwood Caltrain Station is an important component of the peninsula's public transportation network. It provides Caltrain service between San Francisco and the Santa Clara Valley and connections to SamTrans and other public transportation services in San Mateo County. It is also a transfer station that provides important linkages for commuters to other transportation routes in the region. In 2018, it was the fifth busiest station for weekly ridership.[9] It also has high bicycle boardings.[10] The tracks over Jefferson street become exposed to flooding at 66" TWL, and the station is exposed at 77" TWL.

View of the Redwood Caltrain Station. Photo by Jarek Piorkowski licensed under CC BY-NC 2.0.

A view from Redwood City including the Cargill Salt Ponds and Port of Redwood City. Photo by SF Baykeeper, Robb Most, and LightHawk.

Port of Redwood City • The Port of Redwood City is the only deep-water port in the South Bay. Its strategic location has made it one of the fastest growing small bulk ports in California and a major supplier of construction materials for Silicon Valley. In FY 2017-2018 the Port did $8.6 million in annual revenue and 2.3 million metric tons of cargo.[11] The Port is governed by a five-member board of commissioners, appointed by the Redwood City, City Council to serve terms of four years each. The Port of Redwood City, City of Redwood City and Water Emergency Transportation Agency (WETA) are collaborating on a potential Redwood City Ferry Terminal Project. The Port is one of only four Bay Area ports identified as a FEMA Designated Federal Staging Area (FSA). The Port is also designated as a Bulk Fuel Distribution Point and commodity staging for federal disaster response to a regional catastrophic earthquake.[12] Wharves 1 and 2 were rebuilt in 2013 to accommodate 1.5 ft SLR. The Port of Redwood City is first exposed to flooding at the terminus of Hinman Road. Large sections of the Port facility as well as access from Seaport Boulevard and UPRR rail are impacted at 24" TWL. At 48" TWL, the majority of the Port is flooded.

San Carlos Airport • San Carlos Airport is a reliever airport for the nearby San Francisco International Airport (SFO) and it supports roughly 350 flights per day, hosting private aircraft from several large companies in the County. The asset hosts over 400 aircraft, one airstrip, and an aviation museum that offers special programs for children. The Sheriff's Air Squadron on site stores equipment for the California Office of Emergency Services (CalOES) and manages and fuels airplanes and helicopters during emergency situations.[13] All runways are impacted at 48" TWL.

SamTrans South Base Maintenance Facility • The South Base opened in 1984 and is a 13-acre site located east of US-101, off Redwood Shores Parkway. South Base is designed to house 150 standard buses and contains administration, fueling and service buildings, a tire shop, a bus wash facility, and 14 maintenance bays. South Base is currently storing 131 revenue vehicles and 14 service support vehicles. It also serves as an operator training facility. The entire facility is flooded at 48" TWL. While the SamTrans North Base may provide some redundancy, it is also impacted at 36" TWL.

Local Roads • Local roads including SR-119 (University Avenue) exposed at 24" TWL, SR-114 (Willow Road) exposed at 36" TWL, and Veterans Boulevard exposed at 36" TWL, serve as main arterials throughout this OLU and are exposed to flooding.

Redwood City. Map data © 2019 by Google.

Redwood City/North Fair Oaks Community • For the purposes of this report, 11 block groups were assigned to a functional community called "Redwood City/ North Fair Oaks." The block groups that were assessed can be referenced in the Appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Redwood City area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

SOCIAL VULNERABILITY RANK:

- ☐ Low
- ☒ **Moderate**
- ☒ **High**
- ☒ **Highest ***

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

This includes parts of downtown Redwood City, including the areas of Centennial, Staumbaugh Heller and North Fair Oaks, which make up approximately 35,000

people. In this description, we acknowledge that we are not members of the community and thus we cannot speak on behalf of the lived experiences of its residents. Our intent is to elevate this community as part of the region's interconnected systems and use this description to help set a sense of place.

Redwood City has historically provided a home for low- and middle-income families on the Peninsula. Directly abutting Redwood City is the unincorporated community of North Fair Oaks, however mailing addresses for this community are designated as Redwood City causing confusion over the area's identity. The ongoing economic revitalization in the downtown area has raised concerns surrounding displacement and loss of affordable housing options for residents of Redwood City, San Mateo County, and the Bay Area. Residential households in the Redwood City/North Fair Oaks Community begin to be impacted by flooding starting at 36" TWL and increasing significantly at 48" TWL.

Eleven block groups are considered moderate, high, or highest social vulnerability. Ten social vulnerability characteristics are exhibited in at least one block group in the 90th percentile, with two characteristics in the 70th percentile in the region (Figure 2k).

GENTRIFICATION AND DISPLACEMENT RISK:

- ☐ Ongoing Exclusion
- ☒ **Low Income - Not Losing Low Income Households**
- ☒ **At Risk of Gentrification and/or Displacement ***
- ☒ **Ongoing Gentrification and/or Displacement**

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

SOCIAL VULNERABILITY PERCENTILES IN REDWOOD CITY/ NORTH FAIR OAKS

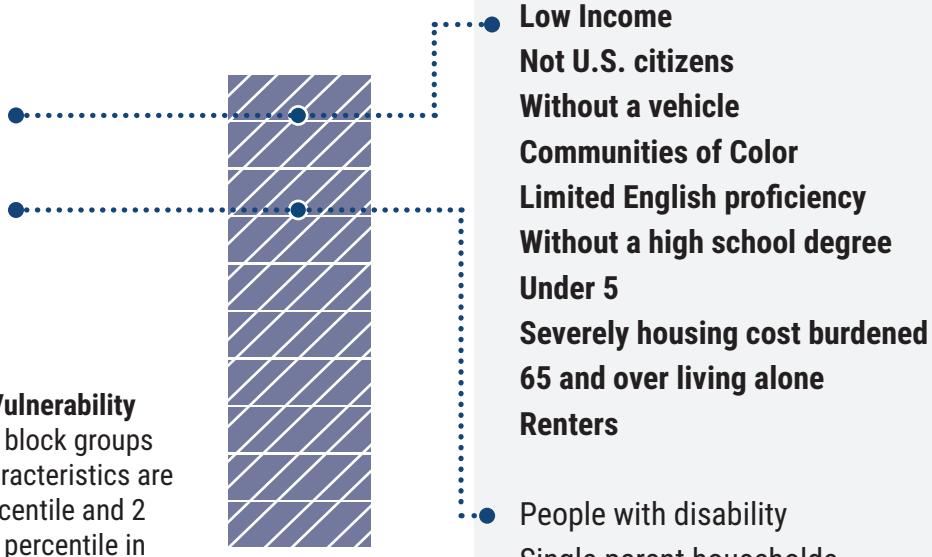


Figure 2k. Social Vulnerability Characteristics: In block groups considered, 10 characteristics are within the 90th percentile and 2 are within the 70th percentile in the region.

Homes, business and industry in Redwood City. and Port of Redwood City. Photo by SF Baykeeper, Robb Most, and LightHawk.

In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not also in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

The following contamination burden is exhibited in at least one block group in the 90th percentile (Figure 3k). The following characteristics are above the 70th percentile, with those in the 90th percentile bolded.

CONTAMINATION BURDEN RANK:

- [X] **Low ***
- [ ] Moderate
- [ ] High
- [ ] Highest

*In block groups considered, this ranking occurred most frequently.

CONTAMINATION BURDEN PERCENTILES IN REDWOOD CITY/ NORTH FAIR OAKS

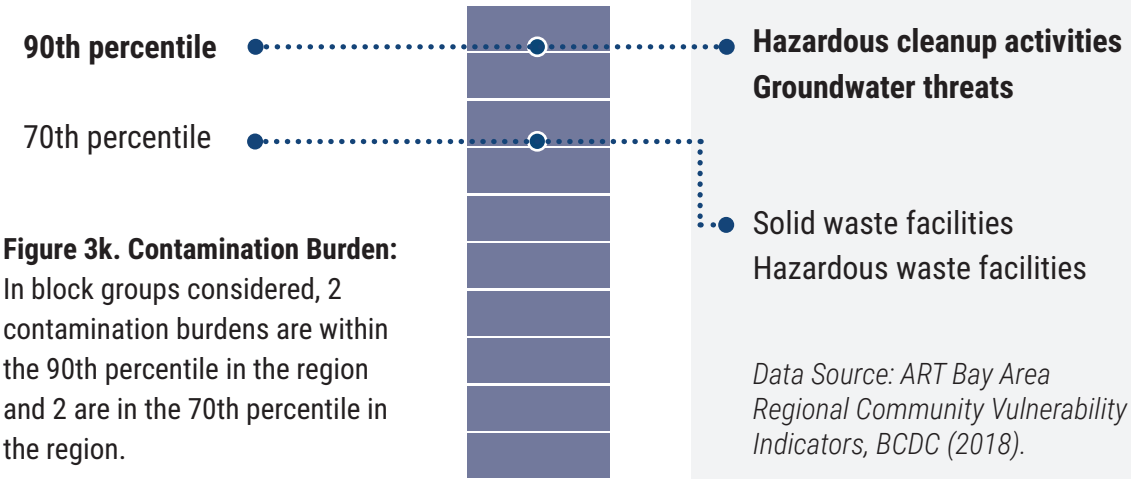


Figure 3k. Contamination Burden: In block groups considered, 2 contamination burdens are within the 90th percentile in the region and 2 are in the 70th percentile in the region.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

Foster City Community • For the purposes of this report, 4 block groups were assigned to a functional community called "Foster City." The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Vallejo and American Canyon area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

Four block groups are considered moderate or high social vulnerability. Ten social vulnerability characteristics are exhibited in at least one block group in the 90th percentile, with two characteristics in the 70th percentile in the region (Figure 4k).

SOCIAL VULNERABILITY PERCENTILES IN FOSTER CITY

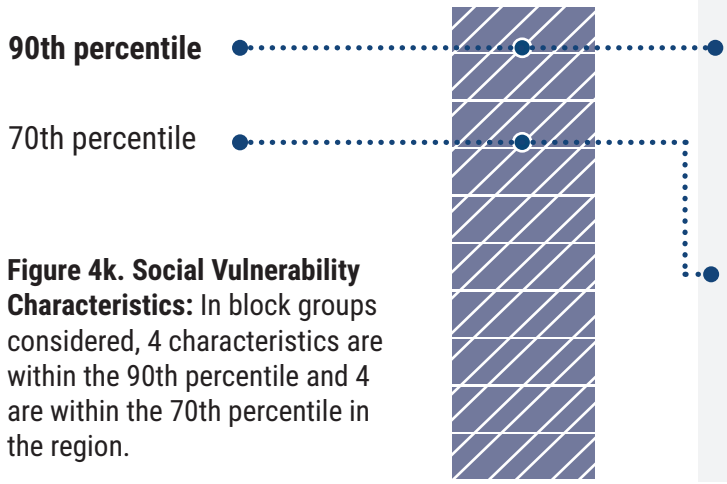


Figure 4k. Social Vulnerability Characteristics: In block groups considered, 4 characteristics are within the 90th percentile and 4 are within the 70th percentile in the region.

SOCIAL VULNERABILITY RANK:

- ☐ Low
- ☒ **Moderate ***
- ☒ **High ***
- ☐ Highest

GENTRIFICATION AND DISPLACEMENT RISK:

- ☒ **Moderate High Income - At Risk of Exclusion ***
- ☐ Low Income - Not Losing Low Income Households
- ☐ At Risk of Gentrification and/or Displacement
- ☐ Ongoing Gentrification and/or Displacement

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

Not U.S. citizens
Severely housing cost burdened
65 and over living alone
Renters

Without a vehicle
Communities of Color
Limited English proficiency
Under 5

Table 1k. FIRST EXPOSURE OF CRITICAL SERVICES AND FACILITIES FOR BOTH REDWOOD CITY/NORTH FAIR OAKS AND FOSTER CITY

First exposure of critical services and facilities. "M" refers to minor impacts such as impacts to access roads. Blue bars represent when asset is first exposed to flooding.

In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not ALSO in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

Critical services and facilities that provide education, medical care, community cohesion, and emergency services will also be impacted by flooding. First exposure of assessed critical facilities begins at 24" TWL (Table 1k).

CONTAMINATION BURDEN RANK:

- [X] **Low ***
- [ ] Moderate
- [ ] High
- [ ] Highest

*In block groups considered, this ranking occurred most frequently.

CONTAMINATION BURDEN PERCENTILES IN FOSTER CITY

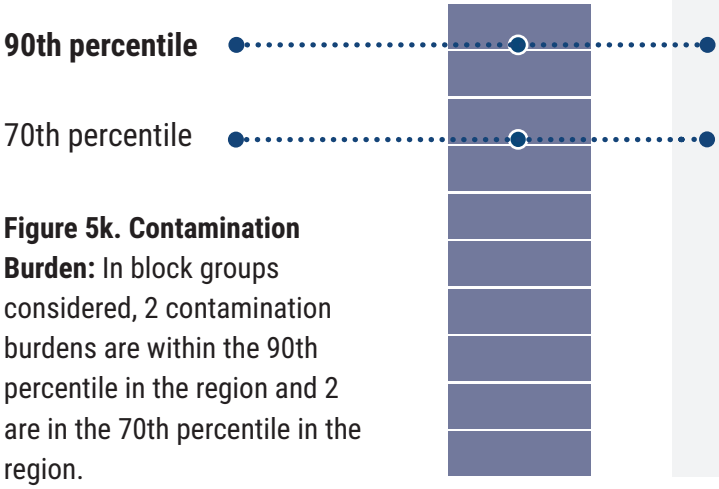


Figure 5k. Contamination Burden: In block groups considered, 2 contamination burdens are within the 90th percentile in the region and 2 are in the 70th percentile in the region.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Health Clinics	Telecare (Veterans Boulevard, Redwood City)										
	Kaiser Permanente Medical Center (Veterans Boulevard, Redwood City)										
	Mental Health Association (Spring St, Redwood City)										
	Kaiser Permanente Redwood City Medical Center Hospital (Veterans Boulevard)										
	Mental Health Association (Bayshore Drive)										
	Crisis Services (Brewster Ave, Redwood City)										
Police and Fire Stations	Redwood City Police Department (Maple Street, Redwood City)		M	M							
	Redwood City Fire Department Station 9 (Marshall Street, Redwood City)										
	Redwood City Fire Department Station 11 (2nd Avenue, Redwood City)										
Schools	Redwood City School District Offices (Convention Way, Redwood City)										
	Youth and Family Enrichment Center (Price Ave, Redwood City)										
	Everest Public High School (Main Street, Redwood City)										
	Redwood City School District (Bradford Street, Redwood City)										
	Orion Elementary School (Allerton Street, Redwood City)										
	Summit Preparatory Chapter School (Broadway Street, Redwood City)										
	Arbor Bay School (Cedar St, San Carlos)										
	Peninsula Christian Schools (Middlefield Road, Redwood City)										
	Hoover Elementary School (Charter Street, Redwood City)										
	Sequoia Union High School District Warehouse (James Avenue, Redwood City)										
	Palo Alto University (Arastradero Rd, Palo Alto)										
	Taft Elementary School (10th Avenue, Redwood City)										
Other	Maple Street Correctional Center (Maple St, Redwood City)		M	M							

Belle Haven Community • For the purposes of this report, 3 block groups were assigned to a functional community called "Belle Haven." The block groups that were assessed can be referenced in the appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the Belle Haven area. We have provided some history and context for these areas, primarily gathered via desktop research, and in some cases stakeholder and community vetting. This should be considered a starting point. Before this is used for any planning purposes, this data should be ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

SOCIAL VULNERABILITY RANK:

- ☐ Low
- ☐ Moderate
- ☐ High
- ☒ **Highest ***

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

In this assessment, we include the details for three block groups in this OLU that exhibit social vulnerability characteristics and are exposed to flooding impacts and refer to this as the "Belle Haven Community." This includes three block groups,

SOCIAL VULNERABILITY PERCENTILES IN BELLE HAVEN

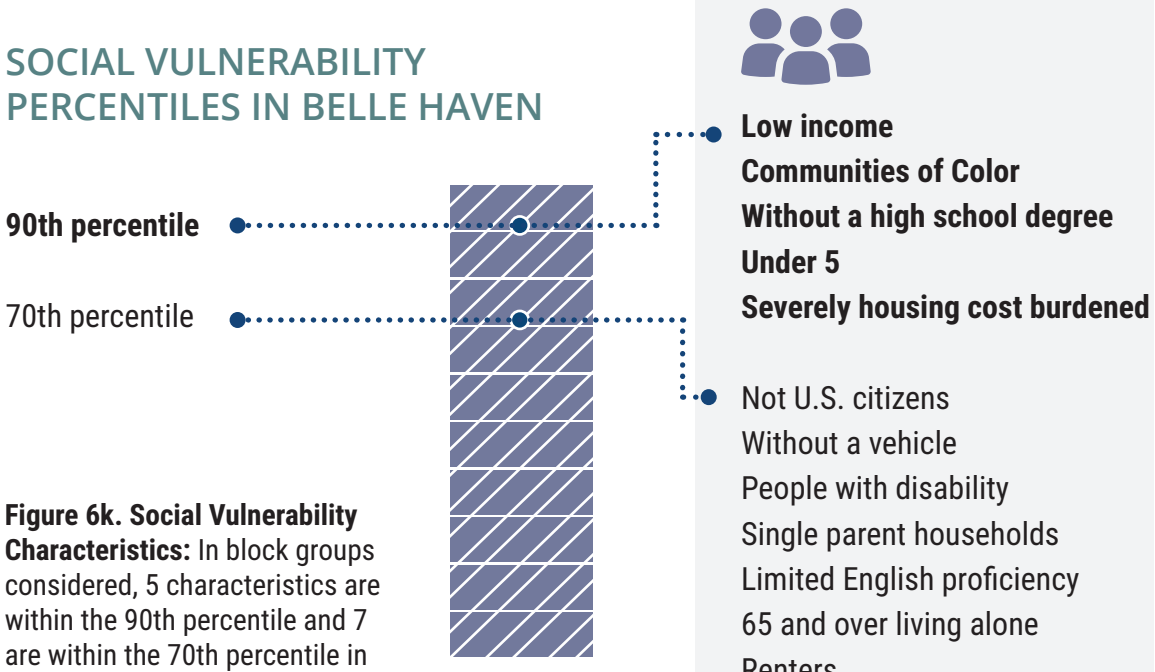


Figure 6k. Social Vulnerability Characteristics: In block groups considered, 5 characteristics are within the 90th percentile and 7 are within the 70th percentile in the region.

A sign of Belle Haven Park from August 1960. This community is part of the City of Menlo Park, but disconnected in many ways, both physically and from a decision-making perspective. Photo courtesy of Creative Commons Public Domain.

which make up approximately 6,000 people. In this description, we acknowledge that we are not members of the community and thus we cannot speak on behalf of the lived experiences of its residents. Our intent is to elevate this community as part of the region's interconnected systems and use this description to help set a sense of place.

The Belle Haven community is comprised of three block groups, all of which are considered the highest social vulnerability. Residents within the Belle Haven community block groups have slightly different characteristics, however, the following twelve (all) social vulnerability characteristics are exhibited in at least one block group in the 70th percentile, with six characteristics in bold in the 90th percentile (Figure 4j). Residents are exposed beginning at 36" TWL.

Belle Haven was the only housing development created by the city of Menlo Park during the Great Depression and was not completed until the 1950s as further jobs were brought to the adjacent area. Belle Haven is located in the most eastern portion of the City of Menlo Park, geographically separated by the US 101 from the remainder of the city. This community comprises only 15 percent of the total population of Menlo Park and characteristics of residents in Belle Haven differs significantly from the City of Menlo Park as a whole. Belle Haven also suffers from a lack of public transportation with no Caltrain or BART operations serving the community. This area, however, is rapidly changing as former industrial land is in high demand for technology, office, and research and development uses.[14] Increasing jobs in these sectors have created fears that Belle Haven will be gentrified, and current residents displaced.[15]

In this section, social vulnerability was used as the starting place for analysis. Contamination burden was assessed only for the block groups included in the functional community groupings. This means that there could be block groups that score in the moderate, high, or highest for contamination burden that were not also in the designated functional community grouping that were not considered. In short, we only look at areas that have contamination burden if they are also ranked as socially vulnerable.

No contamination vulnerability characteristics are exhibited in the 90th percentile, with two characteristics in the 70th percentile in the region (Figure 7K).

Critical services and facilities that provide education, community cohesion, medical care, and emergency services will also be impacted by flooding. First exposure of assessed critical facilities begins at 36" TWL (Table 2K).

CONTAMINATION BURDEN PERCENTILES IN BELLE HAVEN

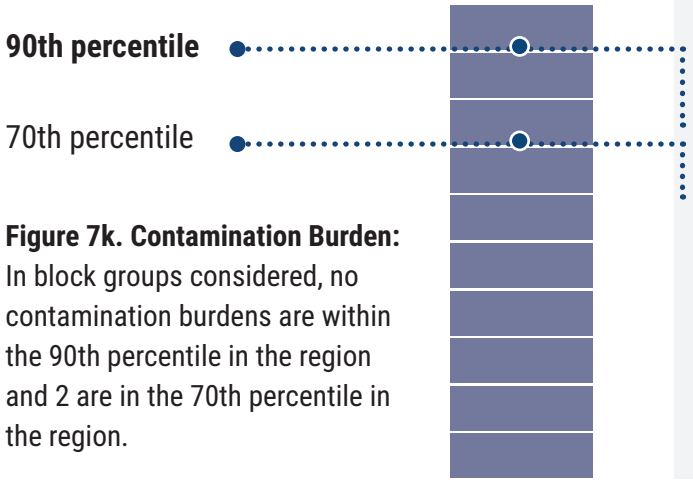


Figure 7k. Contamination Burden: In block groups considered, no contamination burdens are within the 90th percentile in the region and 2 are in the 70th percentile in the region.

GENTRIFICATION AND DISPLACEMENT RISK:

- ☐ Ongoing Exclusion
- ☐ Low Income - Not Losing Low Income Households
- ☐ At Risk of Gentrification and/or Displacement
- ☒ **Ongoing Gentrification and/or Displacement ***

CONTAMINATION BURDEN RANK:

- ☒ **Low ***
- ☐ Moderate
- ☐ High
- ☐ Highest

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

N/A

Hazardous cleanup activities
Hazardous waste facilities

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

FIRST EXPOSURE OF CRITICAL SERVICES AND FACILITIES FOR BELLE HAVEN

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Police and Fire Stations	Menlo Park Fire Protection District Station 77 (Chilco Street, Menlo Park)										
	Belle Haven Community Police (Willow Road, Menlo Park)										
Schools	Belle Haven School (Ivy Drive, Menlo Park										
	Mid-Peninsula High School (Willow Road, Menlo Park)										
	Beechwood School (Terminal Ave, Menlo Park)										

Table 2k. First exposure of critical services and facilities. Blue bars represent when asset is first exposed to flooding.

East Palo Alto welcome sign on University Avenue. Photo by BCDC.

East Palo Alto Community • For the purposes of this report, 14 block groups were assigned to a functional community called "East Palo Alto." The block groups that were assessed can be referenced in the Appendix. This is a placeholder designation for a set of block groups that have a moderate, high, or highest social vulnerability ranking within the East Palo Alto area. We have provided some history and context for these areas, primarily gathered via desktop research, and in the case for East Palo Alto, there was also limited stakeholder and community vetting. However, this should still be considered a starting point. Before this is used for any planning purposes, this data should be further ground-truthed and vetted with the communities considered. Similarly, block groups or communities with a similar vulnerability rank could and likely will have very different needs, considerations, and capacities that are critical to bring into the planning process.

SOCIAL VULNERABILITY RANK:

- ☐ Low
- ☐ Moderate
- ☒ **High ***
- ☒ **Highest ***

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

In the following description, we acknowledge that we are not members of the community and thus we cannot speak on behalf of the lived experiences of its residents. Our intent is to elevate this community as part of the region's interconnected systems and use this description to help set a sense of place.

East Palo Alto, which make up approximately 14,000 people, contains five "neighborhoods" known as The Flooda, The Midtown (Mid), The Village (Ville), The Gardens, and Over the Ramp (OTR), according to community members. The Ravenswood area in East Palo Alto was one of the first planned communities and located on what would become unincorporated San Mateo County. The area historically considered East Palo Alto was much larger than the city's current 2.5 square miles, as large tracts of land were annexed from Menlo Park and Palo Alto in the 1940s through 1960s.

GENTRIFICATION AND DISPLACEMENT RISK:

- ☐ Ongoing Exclusion
- ☒ **Low Income - Not Losing Low Income Households**
- ☐ At Risk of Gentrification and/or Displacement
- ☒ **Ongoing Gentrification and/or Displacement ***

*In block groups considered, this ranking occurred most frequently.

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

SOCIAL VULNERABILITY PERCENTILES IN EAST PALO ALTO

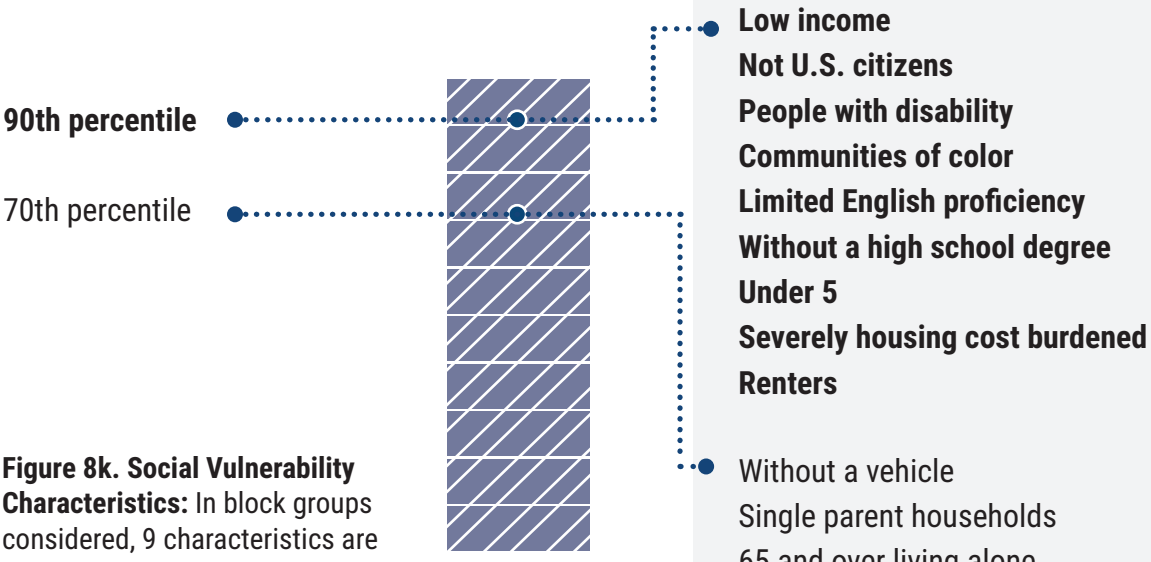


Figure 8k. Social Vulnerability Characteristics: In block groups considered, 9 characteristics are within the 90th percentile and 3 are within the 70th percentile in the region.

Homes along the San Francisco Bay Trail in East Palo Alto. Photo by Jaclyn Mandoske, BCDC.

In 1983, the City of East Palo Alto was incorporated. The demographics of East Palo Alto have shifted over the years, and today, the city is a thriving multi-lingual and multi-ethnic community, with a large number of Hispanic and Pacific Islander populations. The community is undergoing a period of rapid economic transformation as new technology companies and employment centers are being developed. East Palo Alto rests between Menlo Park, home to Facebook, and Palo Alto, home to Stanford University and many affluent tech company founders, raising concerns of ongoing gentrification and displacement.[16]

Residential households in this community begin getting impacted by flooding at 24" of TWL in the northwest corner of the community. A flooding threshold occurs at 36" TWL when overtopping of embankments leads to widespread flooding of the community. Flooding extent occurs up to 108" of TWL, where nearly the entire community is flooded. There are eight block groups that make up the East Palo Alto community, with the US-101 cutting through portions of the community. All block groups within the East Palo Alto community are considered high or highest social vulnerability. Residents within the East Palo Alto community block groups have slightly different characteristics, however, the following twelve (all) social vulnerability characteristics are exhibited in at least one block group in the 70th percentile, with eight characteristics in the 90th percentile (Figure 8k).

The area also has a history of contaminated lands in soil and groundwater from former and current industrial uses near the shoreline.[17] The East Palo Alto community overlaps with the Ravenswood PDA in this OLU. It is in this Ravenswood PDA area of East Palo Alto that contains the greatest concentrations of affected sites, which occur near Bay Road and Cooley Landing, and contain harmful

materials such as PCBs and petrochemicals.[18] Additionally, residents within the East Palo Alto community have expressed concerns with water sources and water quality during two community forums held in partnership with Nuestra Casa, a community-based organization, as part of the Community Engagement work for ART Bay Area. While it is known that there is groundwater contamination in some areas,[19] it is unclear how current or future flooding from sea level rise and storms may exacerbate existing contamination issues and/or impact groundwater levels or freshwater supply to residents and businesses.

A majority of block groups in the East Palo Alto community have high and moderate contamination vulnerability, with some block groups having lower contamination vulnerability. Within at least one block group in East Palo Alto the following sources are in the 70th percentile, with three in the 90th percentile (Figure 9k).

**Note: This community spans the border between the Belmont-Redwood OLU and San Francisquito OLU. The community descriptions are the same in both Local Assessments, even though block groups cross OLU boundaries. The Focus Area in this Local Assessment will discuss impacts where flooding occurs from overtopping in this OLU. Please see the San Francisquito OLU for details on flooding and overtopping that occur from the San Francisquito OLU.*

CONTAMINATION BURDEN PERCENTILES IN EAST PALO ALTO

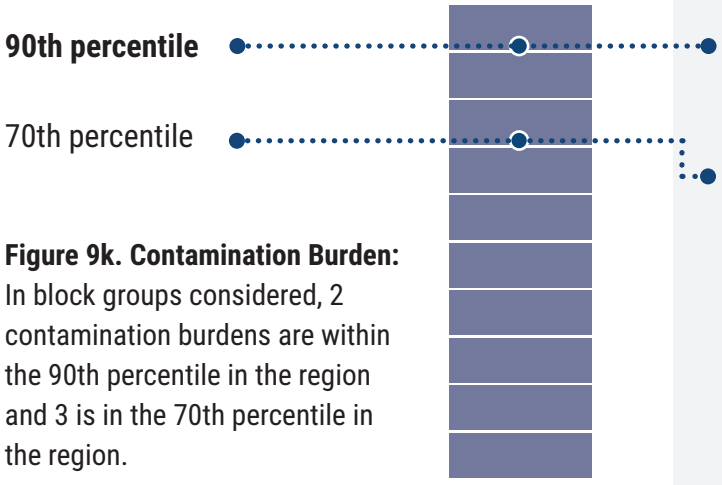


Figure 9k. Contamination Burden: In block groups considered, 2 contamination burdens are within the 90th percentile in the region and 3 is in the 70th percentile in the region.

CONTAMINATION BURDEN RANK:

- [X] **Low ***
- [X] **Moderate**
- [X] **High ***
- [ ] Highest

*In block groups considered, this ranking occurred most frequently.

Impaired water bodies
Groundwater threats burden

Solid waste facilities
Hazardous waste facilities
Hazardous cleanup activities

Data Source: ART Bay Area Regional Community Vulnerability Indicators, BCDC (2018).

Community Engagement Mapping Exercise in East Palo Alto with Nuestra Casa

The ART Bay Area project worked in partnership with the Bay Area Health Inequities Initiative (BARHII), a nonprofit coalition of public health agencies and Nuestra Casa, a community-based organization in East Palo Alto, to conduct two community engagement meetings on flooding and resilience. Two community forums, one in English and one in Spanish, were held in March 2019 and included a total of 42 community participants. The meetings served to provide a baseline education on sea level rise issues in East Palo Alto and improve capacity of community members and local government staff around the risk and sea level rise and the intersection of seal level rise with urgent local issues such as housing, water quality, language access, immigration, and other concerns.

In addition to sharing information with community members on the impacts of current and future flooding in East Palo Alto, community members were asked to engage in an exercise called, "Show Us Your Shoreline," to help us understand and capture the locations of things they cared about, utilized, or knew to be important to the community at large. This was a mapping exercise where community members were provided a map of their city and the locations of relevant assets were captured on the maps. This mapping exercise resulted in a total of seven maps where participants placed over 180 points to identify places where they live, work, access job, schools, places of recreation, or any other critical services they felt was important.

An analysis was conducted to identify the points mapped by community members and compare it against the data layers used to evaluate exposure of critical services and facilities in the community. These mapped points were reviewed and those that were in areas exposed up to 108" TWL were recorded. Not all of the community points identified were exposed to flooding and thus were not included in further analysis. Community data points exposed to flooding were noted as either new assets mapped in the community or identified as confirming existing assets. While some community data points were able to be identified to a specific place and incorporated into the "Exposure of Critical Services and Facilities within East Palo Alto" table below, others were not identifiable due to their placement on the map or inability to determine a specific point of interest. In Table 3k, new community-identified assets have been incorporated, and an asterisk (*) denotes whether the asset was new to our assessment and added into our dataset.

Top photo: Nuestra Casa's Julio Garcia presents to community members in Spanish during a community forum about flooding impacts that could occur in East Palo Alto in the absence of adaptation. Bottom photo: BCDC and Nuestra Casa conducted community engagement mapping exercises with community members in East Palo Alto. Photos by Jaclyn Mandoske, BCDC.

EXPOSURE OF CRITICAL SERVICES AND FACILITIES IN EAST PALO ALTO

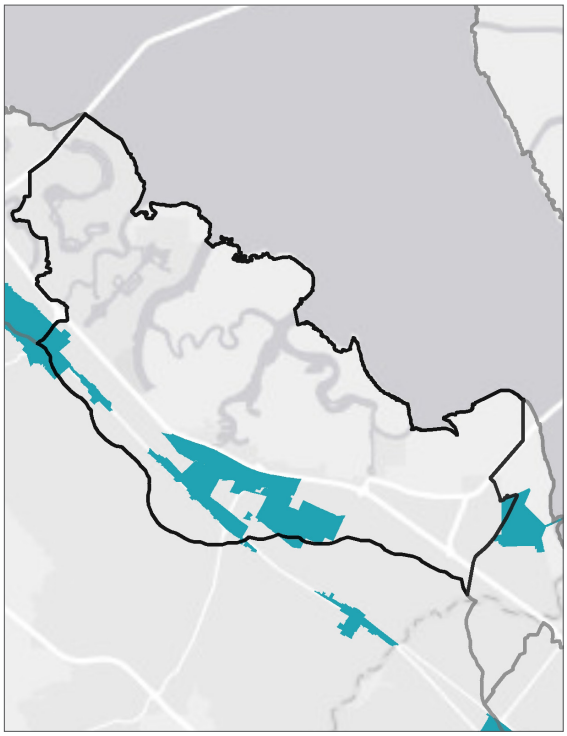
	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Police and Fire Stations	Menlo Park Fire Protection District Station 2 (University Avenue, East Palo Alto)									●	
	East Palo Alto Police Department (Demeter Street, East Palo Alto)									●	
Schools	East Palo Alto Charter School (Runnymead Street, East Palo Alto)			●							
	Eastside College Preparatory (Pulgas Avenue, East Palo Alto)			●							
	Ronald McNair Middle School (Pulgas Avenue, East Palo Alto)			●							
	Mid-Peninsula High School (Willow Road, Menlo Park)			●							
	KIPP Valiant Community Prep (Pulgas Ave, East Palo Alto)*			●							
	East Palo Alto Academy (Myrtle St, East Palo Alto)*			●							
	Costano Elementary School (Fordham Street, East Palo Alto)						●				
	Green Oaks Elementary School (Ralmar Avenue, East Palo Alto)						●				
	Ravenswood City School District (Clarke Ave, East Palo Alto)						●				
	The Primary School (O' Connor St, East Palo Alto)*						●				
	Brentwood Elementary School (Clarke Ave, East Palo Alto)*						●				
	Aspire Public School Offices (Bay Road, East Palo Alto)						●				
	Cesar Chavez Elementary School (Ralmar Ave, East Palo Alto)*							●			
	Au P'tit Monde de la Péninsule (Clarke Ave, East Palo Alto)*							●			
	Laevngamalid Christian Academy (Green Street, East Palo Alto)							●			
Health Clinics	Ravenswood Family Health Center (Bay Rd, East Palo Alto)					●					
	Ravenswood Family Dentistry (Bay Road, East Palo Alto)								●		

Table 3k. Critical Services and Facilities

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Places of Faith	Mount Olive Missionary Baptist Church (Pulgas Avenue, East Palo Alto)										
	24HR Prayer Center (Garden St, East Palo Alto)*										
	Seventh-Day Adventist Church (Beech St, East Palo Alto)*										
	Church of the Living God (Pulgas Ave, East Palo Alto)*										
	Open Doors Church of God (O'Connor St, East Palo Alto)*										
	Eternal Life Church (O'Brien Dr, Menlo Park)*										
	Laurel Avenue Church of Christ (Laurel Ave, East Palo Alto)*										
	Grace Temple Church of God (Clarke Ave, East Palo Alto)*										
	Asambleas de Dios (East Palo Alto)*										
	New Sweet Home (Capitol Ave, East Palo Alto)*										
Civic Centers & Services	My Little Prince Childcare (Baines St, East Palo Alto)*										
	Youth United For Community Action (Clarke Ave, East Palo Alto)*										
	Boys & Girls Club-Peninsula (Ivy Dr, Menlo Park)*										
	College Track East Palo Alto (Bay Rd, East Palo Alto)*										
	Ecumenical Hunger Program (Pulgas Ave, East Palo Alto)*										

Table 3k (cont.). Critical Services and Facilities: First exposure of critical services and facilities. (*): An asterisk denotes whether the asset was new to our assessment and added into our dataset from new community-identified assets.

*Note: The data in this table reflects the information gathered from community members during the Community Engagement Mapping Exercise in East Palo Alto with Nuestra Casa. This table includes both data layers used for the initial assessment with the integration of community data layers that either confirm existing data or adds new data (marked with *). The table includes only data layers from the initial assessment for communities across the focus area.*



Downtown and Veterans Blvd PDAs. Map data © 2019 by Google.

Broadway/Veterans Boulevard Corridor PDA • The Located within the City of Redwood, the Broadway/Veterans Boulevard Corridor is a 431 net-acre area designated as a mixed-use corridor. The northernmost edge of the PDA is bordered by Bayshore Road/SR-101. The PDA boundary extends a few blocks beyond the Broadway/Veterans Boulevard corridor, bound by 2nd Ave to the east and G Street to the northwest. To the immediate southwest of the PDA is the Downtown Redwood City PDA, and it is also connected to the El Camino Real (North Fair Oaks) PDA further south. It is served by SamTrans transport agency as well as local shuttles around the community.

This PDA is currently home to some of Redwood City's largest employers and planned for further job growth and is also home to major facilities for both local city government and the County of San Mateo. It is envisioned to become a diverse, multi-use job growth area in central Redwood City and include light industrial incubator areas, healthcare workplace areas, and high-density mixed uses. A streetcar system has been proposed to link the eastern half of the corridor with Downtown and the Redwood City Caltrain station. Critical facilities within this PDA include the Kaiser Permanente Redwood City Medical Center and Redwood City Fire Department Station 11.

CURRENT AND FUTURE HOUSING AND JOBS IN THE BROADWAY/ VETERANS BOULEVARD CORRIDOR PDA

Residential Housing Units

Existing in 2010:	462
Projections for 2040:	1,770
Percent Growth:	283%

Job Spaces

Existing in 2010:	10,521
Projections for 2040:	13,105
Percent Growth:	25%

Data Source: Plan Bay Area 2040, MTC/ABAG (2017).

Areas within the PDA are exposed to flooding at 24" TWL from overtopping of Redwood Creek and by 48" TWL, nearly all of the PDA is exposed. Critical facilities that provide emergency services and utilities may be impacted by flooding. Table 4k provides details on what critical facilities may be at risk. First impacts begin at 36" TWL and increase through 108" TWL.

FIRST EXPOSURE OF CRITICAL FACILITIES IN THE BROADWAY/VETERANS BLVD CORRIDOR PDA

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Police and Fire Stations	Redwood City Fire Department Station 11 (2nd Avenue, Redwood City)										
Utilities	Natural Gas pipelines (owned by PG&E and running southeast adjacent to the PDA on Industrial Way)										
Health Clinics	Kaiser Permanente Redwood City Medical Center (Veterans Boulevard, Redwood City)										

Table 4k. Critical Services and Facilities: First exposure of critical services and facilities. Blue bars represent when asset is first exposed to flooding.

Downtown Redwood City PDA • Located within the heart of Redwood City, this 192-acre PDA is designated as a City Center and is the city's most urban district. It is generally bounded on the north by Veteran's Boulevard, on the east by Maple Street and the western edge of the Kaiser Permanente Hospital campus, to the southwest by properties located southwesterly of El Camino Real, and to the north by the Broadway/Veterans Blvd. PDA. This PDA is served by the Redwood City Caltrain Station as well as SamTrans bus lines.

Land uses within this PDA include business, commercial and retail areas, public and administrative facilities, and multi-family medium and high-density housing. Its geographic center on the peninsula between the San Francisco and San Jose make it an ideal and strategic location on the peninsula to support growth and revitalization.

This PDA is envisioned to become an entertainment center, dense residential neighborhood, cultural center, dynamic workplace and major transit hub, primarily through infill and densification. Critical facilities within the PDA include the Redwood City Fire Department Station 9. This PDA also include the Redwood Caltrain Station.

Additionally, the Downtown Redwood City PDA overlaps with block groups considered to be medium, high and/or highest social vulnerability. See the Vulnerable Communities section to explore the characteristics of communities in this area.

CURRENT AND FUTURE HOUSING AND JOBS IN THE DOWNTOWN REDWOOD CITY PDA

Residential Housing Units

Existing in 2010:	510
Projections for 2040:	5,312
Percent Growth:	942%

Job Spaces

Existing in 2010:	7,002
Projections for 2040:	8,307
Percent Growth:	19%

Data Source: Plan Bay Area 2040, MTC/ABAG (2017).

Areas within the PDA are exposed near Redwood City Creek at 24" TWL, and households are first exposed at 36" TWL. Critical facilities that provide emergency services and utilities may be impacted by flooding. Table 5k provides details on what critical facilities may be at risk. First impacts begin at 36" TWL and increase through 108" TWL.

Redwood Creek leads into the Downtown Redwood City PDA. **Photo courtesy of California Bay King Tides Project.**

FIRST EXPOSURE OF CRITICAL FACILITIES IN THE DOWNTOWN REDWOOD CITY PDA

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Police and Fire Stations	Redwood City Fire Department Station 9 (Marshall Street, Redwood City)										
Utilities	Natural Gas pipelines (owned by PG&E and running southeast adjacent to the PDA on Industrial Way)										

Table 5k. Critical Services and Facilities: First exposure of critical services and facilities. Blue bars represent when asset is first exposed to flooding.

Ravenswood PDA • Located within the City of East Palo Alto, the Ravenswood PDA is a 275-acre area designated as a transit town center,[20] with its development being guided by the Ravenswood/4 Corners Transit Oriented Development Specific Plan.[21]. It extends from the SamTrans rail line in the north to Weeks Street in the south, and from Ravenswood Open Space Preserve in the east to University Avenue in the west. The Ravenswood PDA is directly adjacent to the Menlo Park and the East Palo Alto Baylands PCA at Cooley Landing. It is served by both SamTrans and AC Transit buses.

Current land uses include a mix of industrial and vacant parcels adjacent to Ravenswood Open Space Preserve and single-family residential in the western portion. The Ravenswood/4 Corners Specific Plan envisions transforming the intersection of University Avenue and Bay Road into a new "downtown" for East Palo Alto, where it can accommodate employment-generating uses, housing, and public spaces.[22] A history of contamination is present and acknowledged in the plans, with future development restricting land use based on contaminant history[23]. Critical facilities within this PDA include the East Palo Alto Police Department. It also contains utilities including the PG&E Cooley Landing Substation and electrical transmission lines.

CURRENT AND FUTURE HOUSING AND JOBS IN THE RAVENSWOOD PDA

Residential Housing Units

Existing in 2010:	818
Projections for 2040:	1,577
Percent Growth:	93%

Job Spaces

Existing in 2010:	858
Projections for 2040:	1,371
Percent Growth:	60%

Data Source: Plan Bay Area 2040, MTC/ABAG (2017).

Additionally, the Ravenswood PDA overlaps with block groups considered to be medium, high and/or highest social vulnerability. See the Vulnerable Communities section to explore the characteristics of community members in this area.

Flooding of vacant parcels adjacent to Ravenswood Open Space Preserve begins at 12" TWL. At 24" TWL, flooding of residential neighborhoods begins from the north boundary of the PDA, and flooding becomes extensive at 52" TWL. Critical facilities that provide emergency services and utilities may be impacted by flooding. Table 2g provides details on what critical facilities may be at risk. First impacts begin at 36" TWL and increase through 108" TWL. (Table 6k).

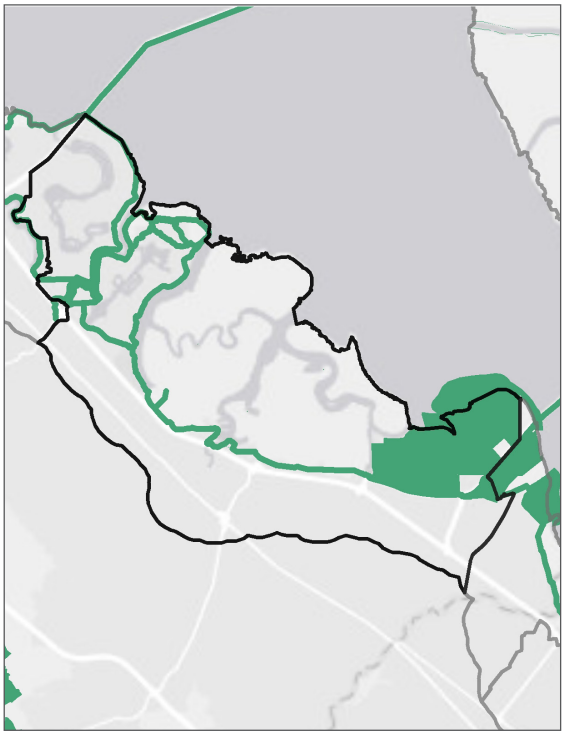
Note: This PDA spans the border between this OLU and the San Francisquito OLU. The majority of the PDA is within the San Francisquito OLU; however, significant overtopping occurs in the portion within the Belmont-Redwood OLU.

The Cooley Landing substation, within the Ravenswood PDA, can be seen in the image above, taken on Bay Road in East Palo Alto in March 2019. Photo by BCDC.

FIRST EXPOSURE OF CRITICAL FACILITIES IN THE RAVENSWOOD PDA

	Critical Facilities/Services Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Police and Fire Stations	East Palo Alto Police Station (Demeter Street, East Palo Alto)										
Utilities	Cooley Landing Substation (Bay Rd, East Palo Alto)										

Table 6k. Critical Services and Facilities: First exposure of critical services and facilities. Blue bars represent when asset is first exposed to flooding.



Baylands PCA. Map data © 2019 by Google

San Francisco Bay Water Trail PCA •

The Water Trail is a network of launching and landings sites for non-motorized watercrafts (e.g. kayaks, wind and kite surf, etc.) around the Bay and its major tributaries.[24] Within this OLU, there are two existing and two planned Water Trail sites in the area providing opportunities for non-motorized small boaters to enjoy and access natural areas such as Redwood Creek, the sloughs Blair Island, which is part of the Don Edwards San Francisco Bay National Wildlife Refuge, and the open water of the San Francisco Bay. The Water Trail sites include existing launch sites at Beaches on the Bay Waterfront Park and Redwood City Municipal Marina, as well planned sites for the Bair Island Aquatic Center and Westpoint Marina. The first sites are exposed at 36" TWL. Access roads to all four sites are exposed at 24" TWL.

PCA DESIGNATION:

- ☐ Natural Landscapes
- ☐ Agricultural Lands
- ☐ Urban Greening
- ☒ **Regional Recreation**

FUNCTIONS/BENEFITS:

- **Recreation**
- **Economic Development**
- **Wildlife Habitat**

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

San Francisco Bay Trail PCA • The San Francisco Bay Trail is a 500-mile regional trail that, upon completion, will circumnavigate the bay. The trail connects people and communities to each other, to parks and open space, to home, work and recreation, and countless areas of cultural and historic interest. provides opportunities for health and fitness, increase transportation options, opportunities to observe, learn about, and care for the environment, and provides economic benefits to the region through increased tourism.[25]

Within this OLU, the Bay Trail is present running immediately adjacent to Highways US-101 and SR-84. This section of the Bay Trail is used for commuters and provides access across the Dumbarton Bridge and from Burlington to Redwood Shores. It connects visitors and residents important recreational sites in the area, including the Don Edwards San Francisco Bay National Wildlife Refuge's Bair Island Trail, City of Menlo Park's Bedwell Bayfront Park and boat launch facilities at the Port of Redwood City for people to access the Bay.

PCA DESIGNATION:

- [X] **Natural Landscapes**
- [ ] Agricultural Lands
- [ ] Urban Greening
- [ ] Regional Recreation

FUNCTIONS/BENEFITS:

- **Recreation**
- **Community Health**
- **Economic Development**
- **Transportation**
- **Environmental Stewardship**

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

There is a total of 30.6 miles of existing (24.7 miles) and proposed (5.9 miles) Bay Trail paths split into 38 segments. The Bay Trail becomes exposed to flooding at 12" TWL and reaches a threshold of flooding at 48" TWL.

San Francisco Bay Trail sign in Redwood Shores. Photo by Jaclyn Mandoske, BCDC.

Proposed Menlo Park/East Palo Alto Baylands PCA • Providing important ecosystem services such as flood risk management, carbon sequestration, and wildlife support, among others, as well as recreation opportunities, this proposed PCA reflects a variety of partnerships among the City of Menlo Park, City of East Palo Alto, Midpennisula Regional Open Space District and US Fish and Wildlife Service. The proposed boundary area covers Bedwell Bayfront Park, Don Edwards San Francisco Bay National Wildlife Refuge, Ravenswood Open Space Preserve, and Cooley Landing Park. These areas are largely connected to one another via the San Francisco Bay Trail.

There are multiple uses, assets, and management objectives for this PCA: the wetlands are protected and managed for endangered species and migratory water bird habitat, as well as for general recreation. The Don Edwards San Francisco Bay Wildlife Refuge's Ravenswood Pond complex is part of the South Bay Salt Pond Restoration Project, which involves restoring salt ponds to tidal marsh, mudflat, and other wetland habitats for species including the endangered California Ridgway's Rail, and Western Snowy Plover.

PCA DESIGNATION:

- [X] **Natural Landscapes**
- [ ] Agricultural Lands
- [ ] Urban Greening
- [X] **Regional Recreation**

FUNCTIONS/BENEFITS:

- **Recreation**
- **Wildlife Habitat**
- **Water Supply and Quality**

Data Source: MTC/ABAG Priority Conservation Areas Program (2017).

The priority of the refuge is to address conservation, management, and restoration of fish, wildlife, and plants and their habitats that take precedent over other purposes in the management and administration of a refuge.[26] Additionally, the Ravenswood Open Space Preserve and Cooley Landing Park provide the only access point to the Bay for East Palo Alto residents. This area also includes a number of critical facilities, including transportation, utilities, and flood control infrastructure serving the region.

There are many ecosystem services of this PCA including providing habitat, recreation, and stormwater services of runoff retention, groundwater recharge, and flood water retention (Figure 10k).

View of the Proposed Menlo Park/East Palo Alto Baylands PCA, with access via the San Francisco Bay Trail and habitats for many species. Photo by Jaclyn Mandoske, BCDC.

ECOSYSTEM SERVICES OF MENLO PARK/EAST PALO ALTO BAYLANDS PCA

Habitats

Depressional Wetlands	248 acres
Lagoon	496 acres
Tidal Flat	744 acres
Tidal Marsh	310 acres
Grasslands	248 acres
Playa	682 acres
Ridgway's Rail	248 acres
Brown Pelican	62 acres
Snowy Plover	1,301 acres

Stormwater

Annual Runoff Retention	301.8 million gallons
Groundwater Recharge	63.7 million gallons
Flood Water Retention	72.2 million gallons

Recreation

Approximate Visitation Rates	42 photo user days (PUD)

Carbon Storage

Percent soil organic matter x acres	9,507

Figure 10k. Ecosystem Services of this PCA. Statistics on habitats, recreation, carbon storage and stormwater retention in this PCA. *Data by the ART Bay Area Natural Capital Project (2019).*

Note: This PCA spans the boundaries of the Belmont-Redwood OLU and San Francisquito OLU.

OTHER IMPORTANT NATURAL AREAS ASSESSED

During the ART Bay Area Regional Working Group meetings, regional working group members reviewed Local Assessment findings and requested that other assets that were connected to and/or critical to the continued functioning of the assets being assessed be included in these descriptions. The following descriptions include assets that were included at the request of our working group members to ensure critical assets located near the regional systems assessed were incorporated to the extent feasible into vulnerability assessment results.

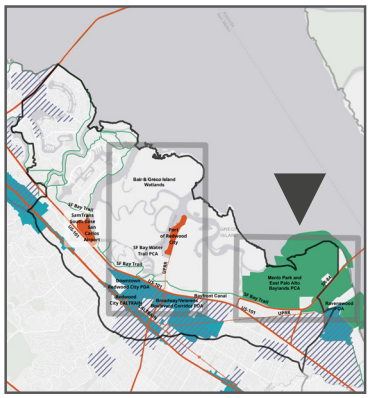
Bair and Greco Island Wetlands • Bair Island is a marsh area covering 3,000 acres and includes three islands: Inner, Middle and Outer and is part of the larger Don Edwards San Francisco Bay National Wildlife Refuge. Bair Island is surrounded by Steinberger Slough to its south and Redwood Creek to the its southeast. The Middle and Outer islands are also home to the Bair Island Ecological Reserve. Bair Island encompasses an array of estuarine habitats, including a naturally formed shell beach on Outer Bair, and tidal wetland and aquatic habitats on all three islands. Bair Island provides critical habitat for a variety of species, such as harbor seals, and serves as an important stopover for birds on the Pacific Flyway. Greco Island, which lies southeast of Bair Islands is also a wetland area and part of the Don Edwards San Francisco Bay National Wildlife Refuge. It is surrounded by Redwood Creek to its west and Westpoint Slough along its south. Like Bair Islands, Greco Island provides important habitat for critical habitat for marsh-dependent species, including the endangered California Ridgway's Rail and salt marsh harvest mouse. It is also a place for harbor seals to haul out in the Bay. The wetlands are exposed to permanent flooding at 12" TWL.

Bayfront Canal • The Bayfront Canal is a stormwater channel that has experienced frequent flooding for over sixty years, which occurs when high tides coincide with high creeks flows from storm events, which are combined flooding issues and prevent the canal from draining into the San Francisco Bay. The County of San Mateo is currently collaborating with Redwood City, Menlo Park, Atherton, State Coastal Conservancy, US Fish and Wildlife Service, Cargill and others to help identify flood management strategies. Without adaptation solutions, flooding from the Bayfront Canal may exacerbate current flooding issues in Redwood City and other communities in the area. These efforts are ongoing. It is exposed to flooding by 24" TWL.

Cargill Salt Works • The Saltworks property has been creating salt since 1901 and is only one of two remaining salt works in the United States. It is comprised of a series of various evaporation ponds, which contain seasonal wetlands that provide habitat for over 70 species of birds, including migratory waterbirds as well as the endangered Western Snowy Plover. It is exposed to flooding at 24" TWL.

View of the Cargill salt ponds looking towards Redwood City. Photo by BCDC.

Focus Area A:
Menlo Park/East Palo Alto Baylands & Dumbarton Touchdown



Location

This Focus Area includes the areas surrounding the SR-84 Dumbarton Bridge touchdown, stretching along the shoreline from the Don Edwards San Francisco Bay National Wildlife Refuge SF2 ponds to the Bedwell Bayfront Park and including the Don Edwards San Francisco Bay National Wildlife Refuge Ravenswood Ponds. (Figure 11k).

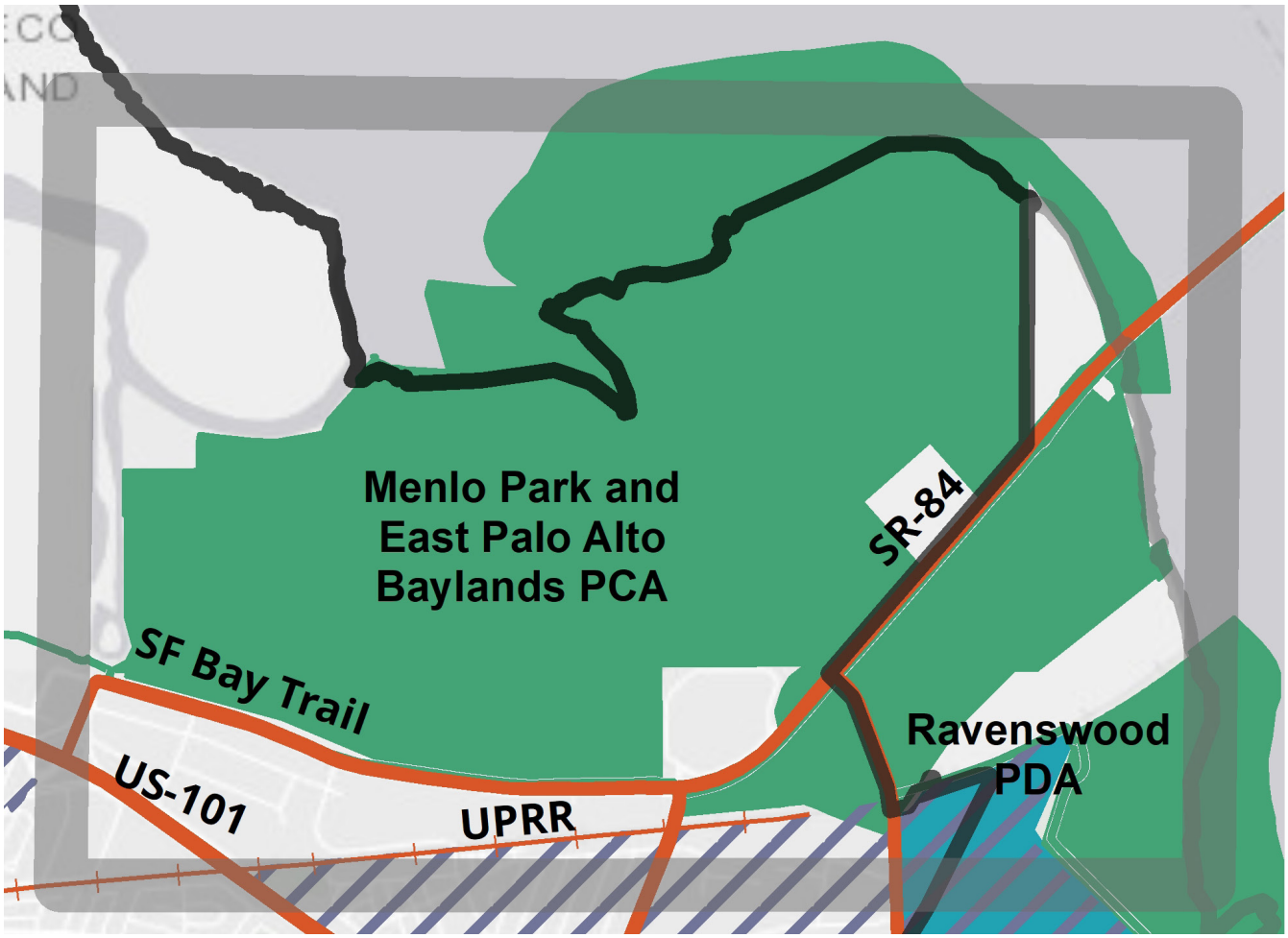


Figure 11k. Top: Identification of where Focus Area is within OLU. Bottom: Map of Focus Area containing regional systems. Individual assets assessed in this Focus Area are labeled on the map and listed on the following page.

Baylands. Map data ©2019 by Google.

Why shared stories of vulnerability?

This Focus Area was selected because it contains a variety of regional systems, including numerous transportation routes, a PDA, multiple PCAs, and the Belle Haven and East Palo Alto communities. Due to overlap and dependencies among these regional systems in this area, the vulnerabilities of these systems to flooding and sea level rise are discussed together in shared stories of the shoreline, overtopping, and exposure to flooding as water levels rise. The goal of communicating shared vulnerabilities and consequences is to encourage multi-benefit solutions through collaborations and coordination.

Figure 11k. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN THIS FOCUS AREA LISTED BELOW:

TRANSPORTATION

- SR-84
- US-101
- Union Pacific Railroad (UPRR)

VULNERABLE COMMUNITIES

- East Palo Alto Community
- Belle Haven Community

PRIORITY DEVELOPMENT AREAS (PDAs)

- Ravenswood PDA

PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- Menlo Park/ East Palo Alto Baylands PCA

Shoreline today and into the future

SHORELINE TYPE STORY

What is the shoreline made up of now?

The shoreline in this Focus Area is predominately wetlands at the Menlo Park/East Palo Alto Baylands PCA, which includes the areas of Ravenswood Slough, and Don Edwards San Francisco Bay National Wildlife Refuge's Ravenswood Ponds.

SHORELINE DEVELOPMENT STORY

How will the shoreline change in the future?

This area is actively undergoing significant planning and/or development activities, particularly in areas near the Dumbarton Bridge Touchdown and within the Menlo Park/East Palo Alto Baylands PCA. These include activities that have recently been permitted by BCDC or are ongoing discussions in progress at the time of this publication. These major potential shoreline changes include:

- **SB1 East Palo Alto and Dumbarton Bridge Resiliency Project** (Consultant work on alternative adaptation strategies to address flooding impacts at the Dumbarton Bridge touchdown and East Palo Alto community, ongoing at the time of publication)
- **SR-84/US-101 Interchange** (Plans to address flooding at the SR-84/US-101 interchange with the Bayfront Canal and Watershed Resilience project to provide a managed detention basin for floodwaters to alleviate creek flooding for communities in Redwood City and Menlo Park, ongoing at time of publication)
- **South Bay Salt Pond Restoration Project** (Habitat restoration and flood management features in the Don Edwards San Francisco Bay National Wildlife Refuge's Ravenswood Ponds (located between Bedwell Bayfront Park and the SR-84 Dumbarton Bridge touchdown and along Bayshore Highway, ongoing at time of publication).
- **SAFER Bay** project is ongoing and plans to implement levee enhancements and tidal marsh restoration along the San Francisco Bay from Menlo Park to East Palo Alto to reduce current Bay flooding that occurs to existing residential homes and businesses (ongoing at time of publication).

Top photo: View from Menlo Park looking northeast to the Bay. Photo by SF Baykeeper, Robb Most, and LightHawk. Bottom photo: Port of Redwood City. Photo by SF Baykeeper, Cole Burchiel, and LightHawk.

Current and future flooding risk

OVERTOPPING STORY

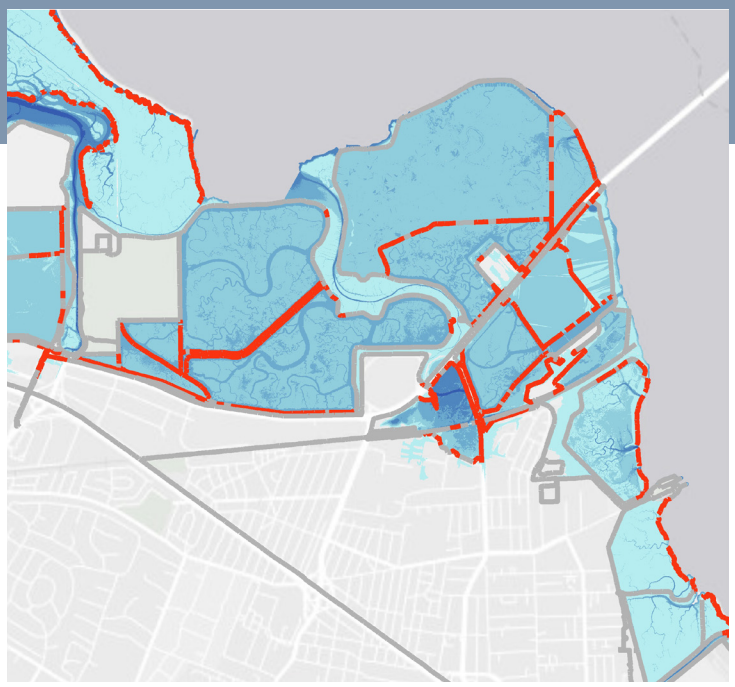
Where is water coming over the shoreline?

Water enters the shoreline at the wetlands in the Menlo Park/East Palo Alto Baylands PCA at 12" TWL, overtopping berms at a parcel within the PCA just north of the SR-84 Dumbarton Bridge owned by the City of San Jose. Overtopping of a floodwall at the SR-84 Dumbarton Bridge touchdown also occurs at 12" TWL, as well as along embankments along local roads leading to a PG&E substation within the PCA. By 24" TWL, significant overtopping occurs from berms within the wetlands of the PCA both north of the Dumbarton Bridge and south in the wetlands of Ravenswood Open Space Preserve (Figure 12k). Overtopping also occurs over an engineered levee and transportation structure at 24" TWL at the SR-84/US-101 interchange at Marsh Ave. At 36" TWL, overtopping occurs across multiple sections of SR-84, and also across the Union Pacific Railroad, which is not designed as a flood control levee.

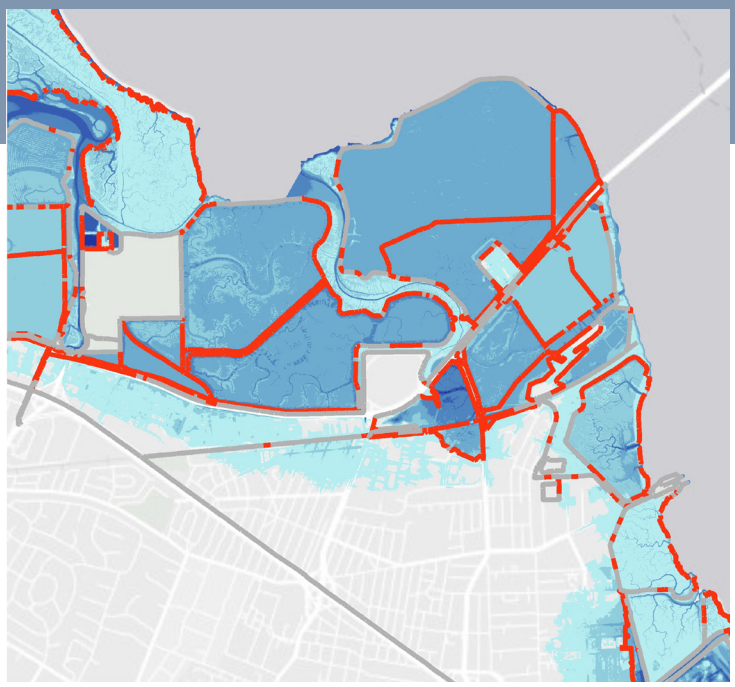
FLOODING EXPOSURE STORY

Where does flooding occur?

The Menlo Park/East Palo Alto Baylands PCA is exposed to flooding at 12" TWL in the wetlands around Ravenswood Point. At 24" TWL, the westbound side the Dumbarton Bridge touchdown is inundated, along with a one-mile section of the eastbound side, north and south access roads, public access parking and a nearby bicycle path. Flooding also occurs at the SR-84/US-101 interchange at Marsh Road between 24" and 36" TWL. At 24" TWL, major and minor streets in the East Palo Alto community and Ravenswood PDA, including SR-109 (University Avenue) are exposed. At 36" TWL, overtopping of the Union Pacific Railroad occurs, leading to inland flooding of the Belle Haven community. Higher TWLs in this area increases flooding extent across residential and commercial land uses, along with local transportation routes (Table 7k).



24" TWL



36" TWL

OVERTOPPING AND FLOODING

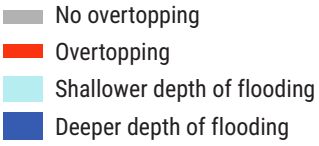


Figure 12k. Two total water levels selected that demonstrate first overtopping and/or significant flooding thresholds. Visit the Bay Shoreline Flood Explorer (explorer.adaptingtorisingtides.org) to see more TWLs.

FIRST FLOODING OF REGIONAL SYSTEMS ASSESSED

Regional Systems Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Menlo Park/EPA Baylands PCA										
San Francisco Bay Trail PCA										
SR-84 Dumbarton Bridge Touchdown										
US-101										
East Palo Alto Community										
Ravenswood PDA										
UPRR										
Belle Haven Community										

Table 7k. First exposure of regional systems. Individual assets within the four regional systems in this area are shown and colored bars represent when each asset is first exposed to flooding impacts.

Shared vulnerabilities to flooding

SHARED VULNERABILITY STORIES

Vulnerability assessments were conducted on individual assets and then shared vulnerabilities were identified for regional systems within each focus area. The vulnerability statements below reflect shared stories of vulnerability. Our goal is to emphasize the interconnections among and across local systems, and encourage shared multi-benefits adaptation solutions.

1. Tidal Marshes and Recreation

The Ravenswood Ponds are in the process of being restored to tidal wetlands and are currently providing critical marsh habitat for federally listed endangered species and important recreational opportunities. Marshes require space and sediment in order to keep up with the rising water levels of the Bay, but these marshes are constrained by development behind them, including the SR-84, the Facebook campus, commercial areas, and other infrastructure. Additionally, sea level rise is likely to change the composition of habitat types in the marsh, impacting marsh-dependent species. Sea level rise will also impact the recreational opportunities available to residents of Belle Haven and surrounding communities if the single access road to visit the Bedwell Bayfront Park via Marsh Road is flooded. A complex arrangement of owners and managers of the marshes exacerbates these vulnerabilities.

2. Complex Ownership

Residents of the Belle Haven community are vulnerable to sea level rise impacts if overtopping of the Union Pacific Railroad, which serves as ad-hoc flooding protection, leads to flooding of homes and community services in the community. The Union Pacific Railroad is privately owned and there is lack of information about the quality or condition of the rail. The community is dependent on the actions of a variety of diverse, uncoordinated owners and managers who make decisions about the land between the shoreline and the community, including the Menlo Park East Palo Alto Baylands PCA, which has a complex array of owners and managers, the SR-84, and Union Pacific Railroad. Additionally, this area is currently experiencing high growth due to the increase in technology companies in the area and community members are already experiencing ongoing displacement and are at risk of further displacement

Dumbarton Bridge touchdown. Photo by SF Baykeeper, Cole Burchiel, and LightHawk.

3. Regional Connector

The westbound approach to the SR-84 Dumbarton Bridge Touchdown and carries thousands of commuters to employment centers across the region and is exposed to sea level rise. Many technology companies use the Dumbarton Bridge to transport their employees across the Bay and flooding impacts will disrupt these economic centers for the region as there are limited redundant bridge crossings in the region. The SR-84 Dumbarton Bridge Touchdown is also located adjacent to utility infrastructure including the Ravenswood Substation, which is at high risk of liquefaction. Flooding impacts will be worsened in the event of a major earthquake in areas where liquefaction occurs. The Bridge Touchdown is also adjacent to the Don Edwards San Francisco Bay National Wildlife Refuge, whose vulnerability is exacerbated by a complex array of owners, managers, and permit requirements at the shoreline.

Shared consequences to flooding

SHARED CONSEQUENCE STORIES

This section translates shared vulnerability statements into stories of shared consequences. The ART program considers consequences through frames of sustainability: Society and Equity, the Economy and the Environment.

Society and Equity • This Focus Area includes two communities considered to have among the highest social vulnerability in the region. Early impacts to these communities, at 24" TWL for residential households in East Palo Alto and at 36" TWL for the Belle Haven community is likely to have a disproportionately larger impact on these communities as they possess characteristics that may make it more difficult to respond to, or plan for, flood events. The large percentage of residents that have a disability, are severely housing cost burdened, and are under 5 present unique challenges in their ability to adapt to flooding impacts or re-locate in the event of permanent inundation. Also, in both of these communities, flooding impacts begin early and become significant and severe by 108" TWL.

The Bay Trail, a publicly accessible commuter and recreation route, has segments exposed to flooding as early as 12" TWL. Because the Bay Trail functions as an interconnected system, disruptions at any segments can limit and disrupt its use for commuters and visitors who may use the route to access employment centers from across the Peninsula as well as from East Palo Alto to Redwood City, or other job or recreation areas in the region. The Bay Trail also serves to connect users to other recreation areas in the Menlo Park/East Palo Alto PCA, such as the Bedwell Bayfront Park and flooding of the single access point to the park at Marsh Road from 24" – 36" TWL renders this free recreational area inaccessible, even though the park itself is elevated not exposed to flooding at this TWL.

Homes near the San Francisco Bay Trail in East Palo Alto. Photo by BCDC.

Economy • The first major economic impacts from flooding in this Focus Area may come from disruptions to the access roads leading to the Ravenswood Substation at 12" TWL, located within the Menlo Park/East Palo Alto Baylands PCA and again when the substation itself becomes flooded at 24" TWL. Loss of power to residential communities and local businesses could have large economic consequences for people working in the area, particularly because the Ravenswood PDA is planned for significant growth in employment opportunities.

Flooding at the SR-84 Dumbarton Bridge and also at the SR-84/US-101 interchange is also likely to have major economic consequences as these routes carry thousands of people every day across the bridge to employment centers in Redwood City, Menlo Park, Foster City and elsewhere along the peninsula. The lack of redundancy to cross the Bay also makes these impacts more severe to commuters who will have to take longer routes, likely leading to traffic congestions and increased vehicle miles traveled, which will increase greenhouse gas emissions. Additionally, the Ravenswood PDA is slated for future housing and increased economic growth and job opportunity, and flooding to this area will affect the ability of the PDA to function and meet the needs of its residents.

Environment • Tidal wetlands in the Menlo Park/East Palo Alto Baylands PCA are home to some of the largest intact wetlands and tidal marsh ecosystems in the San Francisco Bay and serves to protect communities inland from storms and high tide events. As water levels rise, tidal marshes within this PCA as well as the ecosystem services they provide including habitat for wildlife and endangered species, recreation, flood protection, wave height reduction, and stormwater retention and other services are likely to be lost without space or sediment for the wetlands to migrate to higher (inland) elevation, or without interventions (e.g. sediment augmentation) that allow existing marsh elevations to keep up with rising water levels. Loss of wetlands leads to loss the ecosystem services they provide to residents nearby and across the region.

FITTING INTO REGIONAL STORY

How are local areas contributing to Regional Hot Spots?

The regional scale analysis of ART Bay Area identified clusters of highest consequences around the region, called "Regional Hot Spots." These areas include places that contain the top five highest consequences in the region for 1) any transportation asset and 2) either a PDA or PCA, and 3) the presence of a vulnerable community block group at any given water level.

Datasets were identified for each regional system to provide a measure of consequence to quantify impacts in the event of flooding. A full list of consequences used for each regional system can be found in Chapter 2.1 Regional Hot Spots.

Regional Hot Spot at 36" TWL

Figure 13k. East Palo Alto Hot Spot: From 36" TWL to 108" TWL, this Focus Area contains clusters of assets that have among the highest consequences of flooding in the region.

The East Palo Alto/Menlo Park Baylands and Dumbarton Bridge Touchdown is part of the East Palo Alto Regional Hot Spot, meaning it contains a cluster of assets that have among the highest consequences of flooding in the region. To the west is the Redwood City Hot Spot, discussed in the next Focus Area section.

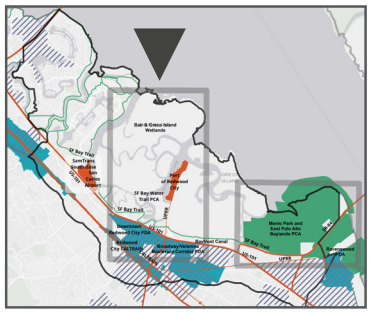
It becomes a Regional Hot Spot starting at 36" TWL and continues to 108" TWL (Figure 13k).

The East Palo Alto cluster is driven by depressional wetlands, lagoons, and snowy plover habitat in the Menlo Park and East Palo Alto Baylands PCA, a Regional Bicycle Segment network, and socially vulnerable and contaminated block groups.

Chapter 4 Regional Adaptation provides adaptation responses for regional issues.

Local access roads near the SR-84 Dumbarton Bridge touchdown. A temporary barrier exists to provide short-term flood protection. Photo by BCDC.

Focus Area B:
Redwood City Downtown & US-101



Location

This Focus Area includes the shorelines and areas surrounding the Port of Redwood City, Bair Island wetlands and sloughs, and Redwood Creek including the communities and economic centers of and around Downtown Redwood City. It is approximately 5.8 square miles (Figure 14k).

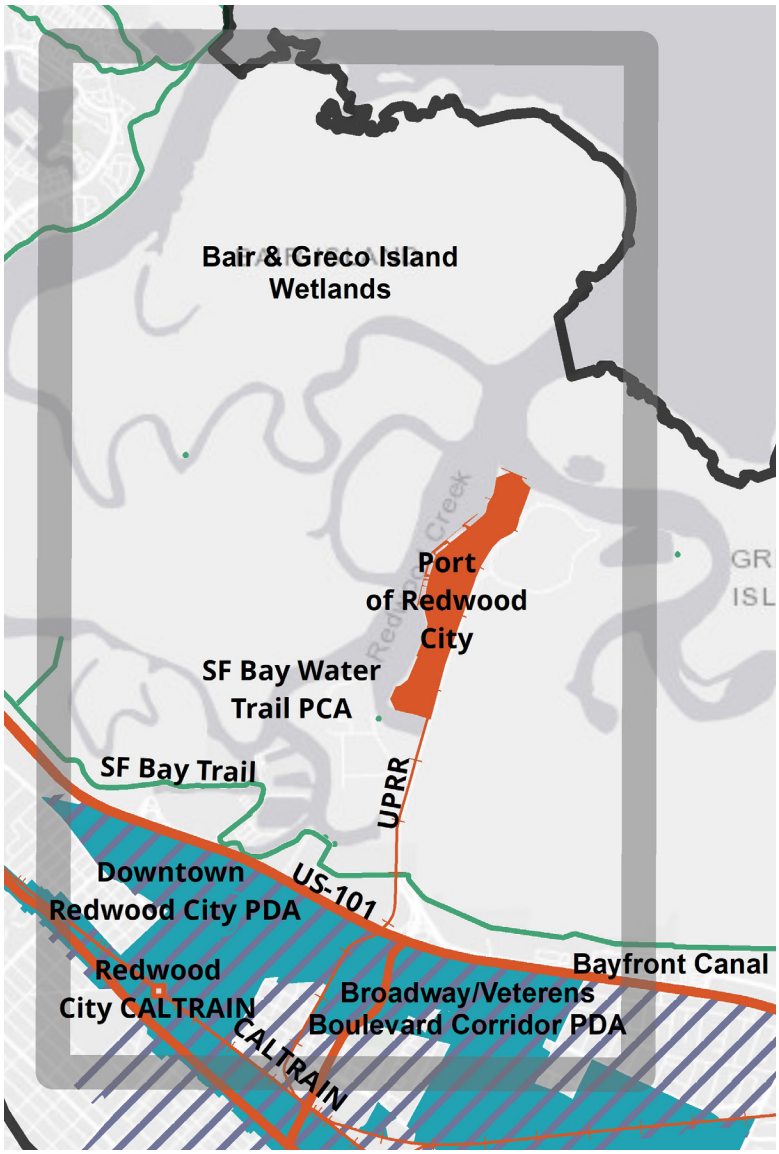
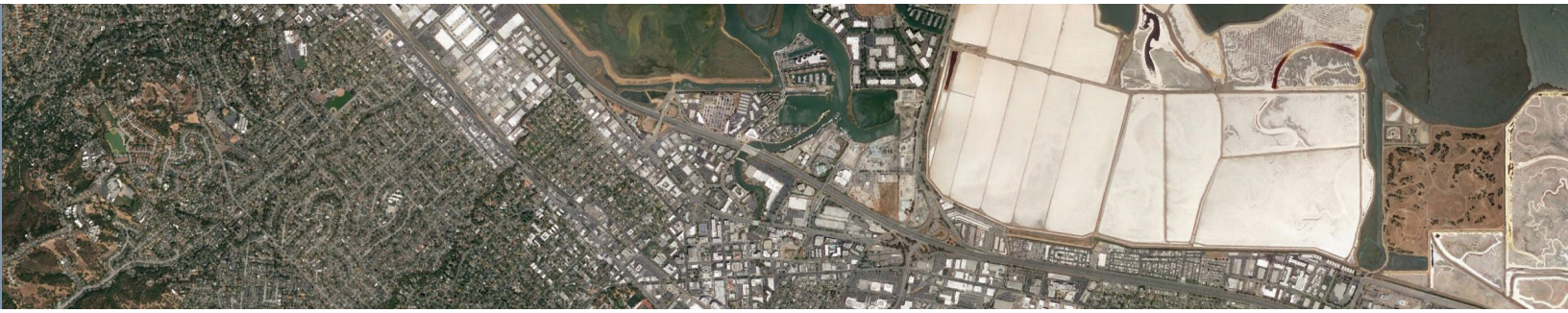


Figure 14k. Top: Identification of where Focus Area is within OLU. Bottom: Map of Focus Area containing regional systems. Individual assets assessed in this Focus Area are labeled on the map and listed on the following page.



I-580 and US-101 interchange. Map data ©2019 by Google.

Why shared stories of vulnerability?

This Focus Area was selected because it contains a variety of regional systems, including the Port and numerous transportation routes, two PDAs, multiple PCAs, and the Redwood City/North Fair Oaks Community. Due to overlap and dependencies among these regional systems in this area, the vulnerabilities of these systems to flooding and sea level rise are discussed together in shared stories of the shoreline, overtopping, and exposure to flooding as water levels rise. The goal of communicating shared vulnerabilities and consequences is to encourage multi-benefit solutions through collaborations and coordination.

Figure 14k. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN THIS FOCUS AREA LISTED BELOW:

TRANSPORTATION

- Port of Redwood City
- Union Pacific Rail
- US-101
- Redwood Caltrain Station

VULNERABLE COMMUNITIES

- Redwood City/ North Fair Oaks Community

PRIORITY DEVELOPMENT AREAS (PDAs)

- Broadway/ Veterans Blvd Corridor PDA
- Downtown Redwood City PDA

PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA
- San Francisco Water Trail (3 sites) PCA

Shoreline today and into the future

SHORELINE TYPE STORY

What is the shoreline made up of now?

The shoreline in this Focus Area is primarily wetlands at the Don Edwards San Francisco Bay National Wildlife Refuge Bair and Greco Islands, Cargill salt ponds, and embankments along Redwood Creek. The shoreline is owned/managed by numerous entities, including the Port of Redwood City, City of Redwood City, and landowners of wildlife areas and salt ponds including the US Fish and Wildlife Service and Cargill.

SHORELINE DEVELOPMENT STORY

How will the shoreline change in the future?

This area is actively undergoing significant planning and/or development activities. There are a number of activities that have recently been permitted by BCDC or have ongoing permit applications in progress.

These major potential shoreline changes include:

- **US-101 Caltrans lanes expansion** (Ongoing at time of publication)
- **Bayfront Canal and Atherton Channel Flood Management and Restoration Project**[27] (Ongoing at time of publication)

Top photo: Port of Redwood in the distance. Photo by SF Baykeeper, Cole Burchiel, and LightHawk. Bottom photo: View of Cargill Salt ponds. Photo by BCDC.

Current and future flooding risk

OVERTOPPING STORY

Where is water coming over the shoreline?

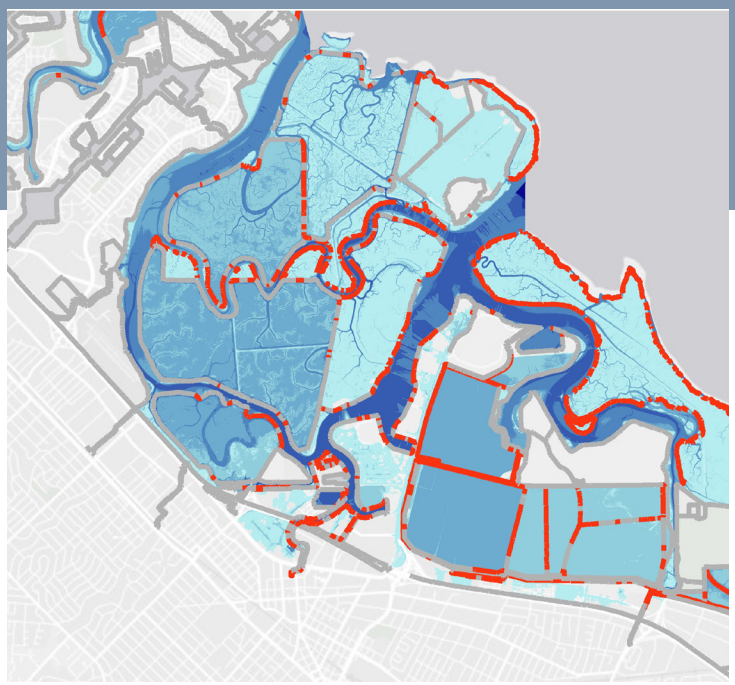
Water begins entering this Focus Area at 12" TWL from Redwood Creek at the Port of Redwood City, from channels near Bair Island/ Smith Slough over berms, and over wetland areas on bayside sections of Bair and Greco Islands. At 24" TWL, significant overtopping occurs in Redwood City over creek embankments at Redwood Creek. Berms around the former salt ponds are overtopped at 24" TWL as well as most of the shoreline embankments at the Port of Redwood City. By 36" TWL, significant flooding occurs due to overtopping of embankments at Redwood Creek (Figure 15k).

FLOODING EXPOSURE STORY

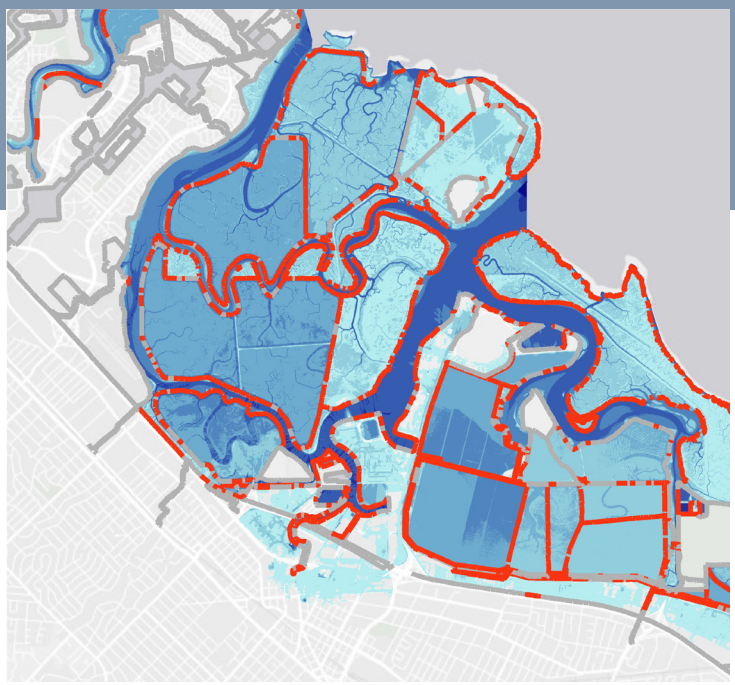
Where does flooding occur?

This Focus Area is exposed to flooding starting at 12" TWL with flooding at the Port of Redwood City and commercial areas just south of Bair Island (Table 8k). At 24" TWL, large sections of commercial areas are exposed, including areas containing numerous car dealerships. Commercial areas south of the US-101 are also exposed at 24" TWL, impacting additional car dealerships and government buildings in Redwood City, among other commercial businesses. At 24" TWL flooding also impacts the Broadway/Veterans Boulevard Corridor PDA, Bay Trail and the Redwood City vulnerable community.

By 36" TWL significant portions of Downtown Redwood City PDA and Redwood City Vulnerable Community are exposed, including the Downtown areas with commercial, mixed-use and residential housing. Kaiser Permanente Hospital facilities and Stanford medical facilities are also impacted at 36" TWL. Other areas exposed include City and County government offices, such as the Police Station and Redwood City Woman's Correctional Facility, among others. From 48" TWL onward, significant portions of Redwood City are exposed, increasing through 108" TWL.



24" TWL



36" TWL

OVERTOPPING AND FLOODING

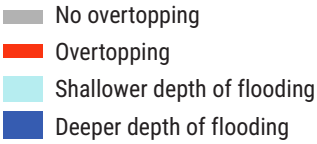


Figure 15k. Two total water levels selected that demonstrate first overtopping and/or significant flooding thresholds. Visit the Bay Shoreline Flood Explorer (explorer.adaptingtorisingtides.org) to see more TWLs.

FIRST FLOODING OF REGIONAL SYSTEMS ASSESSED

Regional Systems Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
Port of Redwood City										
US-101										
Blair and Greco Islands										
Bayfront Canal										
UPRR										
Water Trail Sites										
San Francisco Bay Trail PCA										
Redwood City/North Fair Oaks Community										
Broadway/Veterans Boulevard PDA										
Downtown Redwood City PDA										
Redwood Caltrain Station										

Table 8k. First exposure of regional systems. Individual assets within the four regional systems in this area are shown and colored bars represent when each asset is first exposed to flooding impacts.

Shared vulnerabilities to flooding

SHARED VULNERABILITY STORIES

Vulnerability assessments were conducted on individual assets and then shared vulnerabilities were identified for regional systems within each focus area. The vulnerability statements below reflect shared stories of vulnerability. Our goal is to emphasize the interconnections among and across local systems, and encourage shared multi-benefits adaptation solutions.

1. Commuter Transportation Connector

This Focus Area contains a number of critical transit connections, including the Redwood Caltrain Station, which serves as a transfer station that provides critical connections to commuters and passengers to access other parts of the peninsula via Caltrain routes or connections to other public transit. Portions of the Redwood Caltrain station and the track that serve it are exposed to sea level rise, which will disrupt the rail service. A lack of redundancy of Caltrain transfer stations on the peninsula and the connected network of rail lines make these assets especially vulnerable to flooding and lead to high consequences for the region.

This area also includes the US-101, which is at risk of flooding and is a main transportation artery on the peninsula. The US-101 carries thousands of vehicles and truck traffic daily and is a designated emergency route. This area is protected by Bair and Greco Island wetland habitats, which serves as the first line of bayshore defense for communities, businesses, and emergency and medical services behind it.

US-101 running through Redwood City.
Map data © 2019 by Google

2. Critical Emergency Services Hub

Within this Focus Area there are a variety of critical emergency government services and medical centers that serve as a hub for emergency operations for both Redwood City and San Mateo County. These facilities are within naturally low-lying areas and many emergency response facilities, including hospitals, fire stations, and police stations contain salt-water sensitive equipment. Since Redwood City is the seat of San Mateo County, there is a lack of redundancy for these county emergency services. There are also numerous utilities infrastructure at risk of sea level rise, including electrical substations, which would disrupt power services to communities and emergency government and medical services. Flooding impacts to these facilities and/or utilities that provide critical power will limit the ability of government emergency and medical response and impact communities and businesses in the area, disproportionately impacting vulnerable community members in Redwood City. This area is protected by Bair and Greco Island wetland habitats, which serves as a first line of bayshore defense for communities, businesses, and emergency and medical services behind it.

3. Specialized Bulk Cargo

The Port of Redwood City is a natural deep-water port and supports the transfer of specialized bulk and construction material that is used to build housing and other structures across the peninsula. The Port depends on the Union Pacific Rail to move and transport goods, as well as access to the US-101 for truck traffic. The Port and Union Pacific Rail are vulnerable if the Port's terminals and supporting utilities infrastructure are exposed to sea level rise. A complex arrangement of ownership and operations presents a challenge to sufficiently understanding vulnerabilities of the Port and Union Pacific Rail. There is a lack of redundancy of Seaports in the San Francisco Bay Area, and limited opportunity to accommodate the Port's specialized cargo services.

Shared consequences to flooding

SHARED CONSEQUENCE STORIES

This section translates shared vulnerability statements into stories of shared consequences. The ART program considers consequences through frames of sustainability: Society and Equity, the Economy and the Environment.

Society and Equity • Flooding to residential households in the Broadway/ Veterans Boulevard PDA, Downtown Redwood City PDA and Redwood City vulnerable communities will impact thousands of people and these impacts occur at lower total water levels relative to the region. The current flooding issues at the Bayfront Canal will only exacerbate flooding in this area. Residents of the Redwood City community have many socially vulnerable characteristics that may limit their ability to respond to and prepare for flooding, leading to disproportionate impacts on community members.

The Broadway/ Veterans Boulevard PDA and Downtown Redwood City PDA are home to the County seat of San Mateo and numerous County and City government facilities. It is a hub for government and emergency response facilities, including San Mateo's current development of a new Emergency Operations Center within the Downtown Redwood City PDA. Additionally, the area contains numerous schools, youth education programs, homeless shelters and mental health facilities, mobile home parks, and fire and police stations, which serve the community. There is also a large presence of medical facilities in the area, including Kaiser Permanente Hospital and Stanford Medical Campus. Impacts to flooding in this region are likely to affect not only local emergency services but also emergency services for the region as San Mateo County is moving its base of emergency operations to Redwood City.

Economy • This area includes some main areas of economic activity, including being home to some of the region's largest employers, including the Kaiser Permanente Hospital, a new Stanford Campus, and the Port of Redwood City. The dependence of others in the region on the Port of Redwood City to import specialized bulk and construction materials for transport to other areas of the peninsula could impact the region more broadly. Additionally, planned increase in commercial development of the Broadway/Veterans Blvd. PDA for more light-industrial and incubator uses could increase economic costs associated with flooding in this area.

Disruption to major transportation routes in this area, including the US-101 and Redwood Train Station, will also have larger economic consequences as Redwood City is a key transportation hub and connector for commuters across the Peninsula and region.

Environment • This area contains some of the largest contiguous wetlands in the San Francisco Bay at the Don Edwards San Francisco Bay National Wildlife Refuge Bair and Greco Islands and loss of these habitats would impair the ability of these ecosystems to provide critical ecosystem services such as habitat for wildlife and endangered species, recreation, flood protection, wave height reduction, and stormwater retention and other services are likely to be lost without space or sediment for the wetlands to migrate to higher (inland) elevation, or without interventions (e.g. sediment augmentation) that allow existing marsh elevations to keep up with rising water levels.

Much of these wetland areas have had significant investments already and have been restored from being formally diked areas to now being open to tidal action. The long length of the wetland shoreline in this area has provided both opportunities for large-scale multi-benefit restoration and adaptation options, as well as challenges. South San Francisco Bay wetlands are among the most resilient to sea level rise because of high sediment availability. Also, Bair Island provides the full suite of estuarine wetland-associated habitats, ranging from shallow subtidal to wetland to upland transition zone to upland.

Additionally, Redwood Creek, where the majority of inland flooding impacts arise from, is a long tidally influenced creek, and shoreline solutions must be sure not to disrupt the ecological processes of the creek. The loss of the wetlands as nature-based flood protection would increase the height and cost of structural shoreline protection such as levees. Marshes provide habitat for threatened and endangered species. Storm event flooding makes these species more vulnerable to predation and can reduce reproductive success if nests are flooded. The presence of numerous contaminated sites also poses a risk to both these wetlands ecosystems and surrounding communities.

FITTING INTO REGIONAL STORY

How are local areas contributing to Regional Hot Spots?

The regional scale analysis of ART Bay Area identified clusters of highest consequences around the region, called "Regional Hot Spots." These areas include places that contain the top five highest consequences in the region for 1) any transportation asset and 2) either a PDA or PCA, and 3) the presence of a vulnerable community block group at any given water level.

Datasets were identified for each regional system to provide a measure of consequence to quantify impacts in the event of flooding. A full list of consequences used for each regional system can be found in Chapter 2.1 Regional Hot Spots.

Regional Hot Spot at 24" TWL

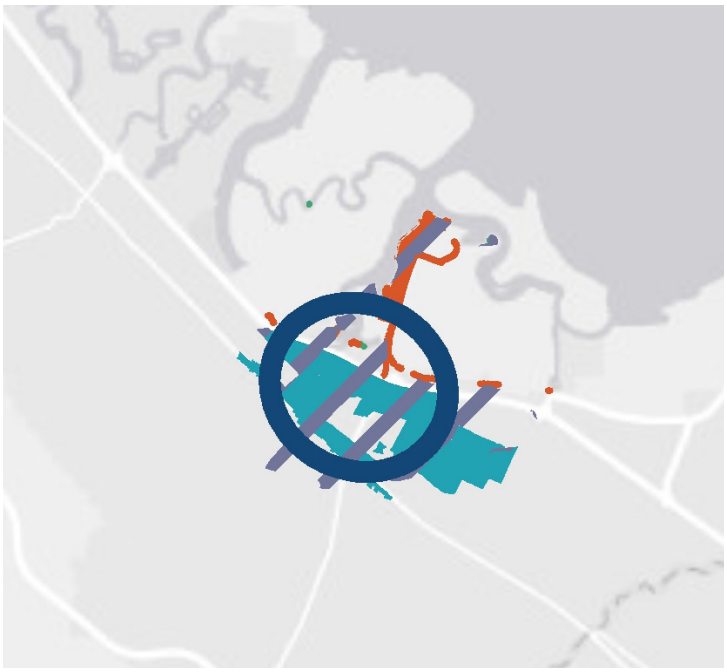


Figure 16k. Redwood City Hot Spot: From 24" TWL to 108" TWL, this Focus Area contains clusters of assets that have among the highest consequences of flooding in the region.

The Redwood City area is a Regional Hot Spot, meaning it contains a cluster of assets that have among the highest consequences of flooding in the region.

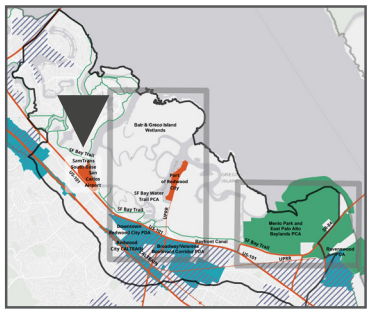
It becomes a Regional Hot Spot starting at 24" TWL and continues to 108" TWL (Figure 16k).

The Redwood City cluster is driven by the Broadway/Veterans Corridor PDA (2010 and 2040 job spaces, and job spaces growth), Union Pacific freight rail, and both social and contamination vulnerability.

Chapter 4 Regional Adaptation provides adaptation responses for regional issues.

Flooding during King Tides in Redwood City. Photo courtesy of California King Tides Project.

Area of Impact C:
San Carlos Airport and SamTrans Maintenance Facility



Location

This Area of Impact lies just east of Bair Island on the edge of Steinberger Slough, with Pulgas Creek to its south, and US-101 to its west. It is approximately 0.5 square miles (Figure 17k).

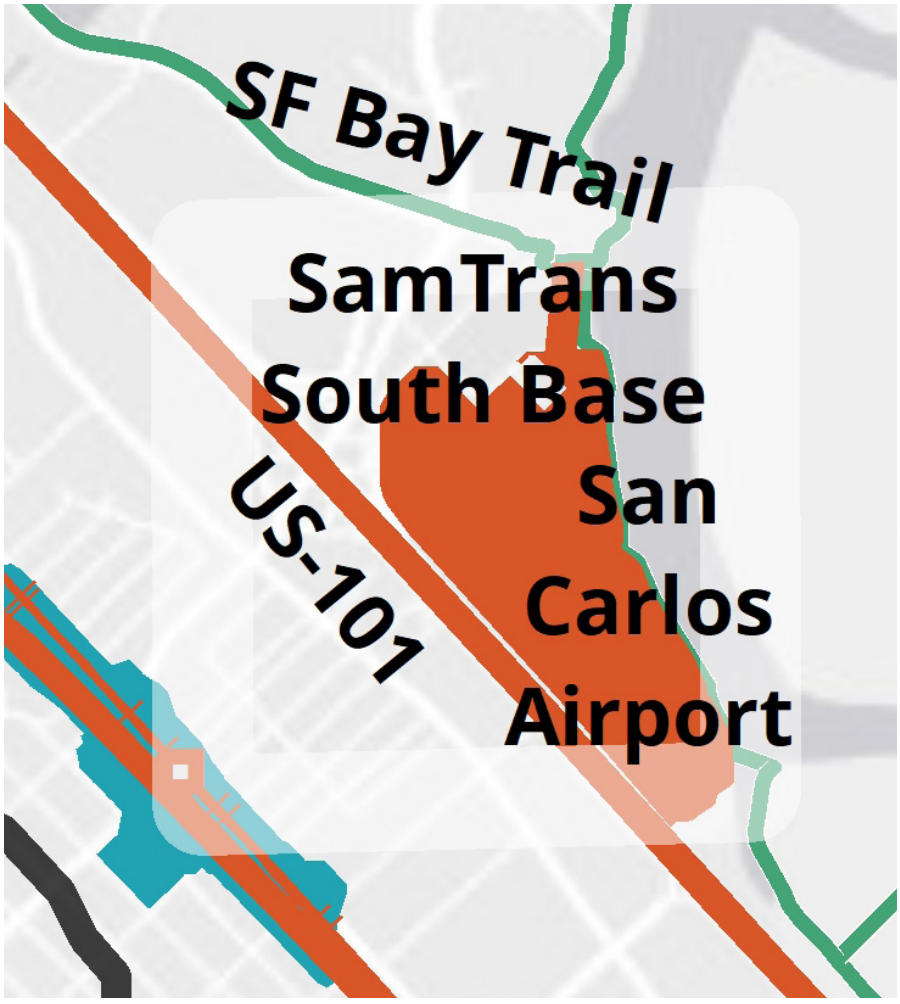
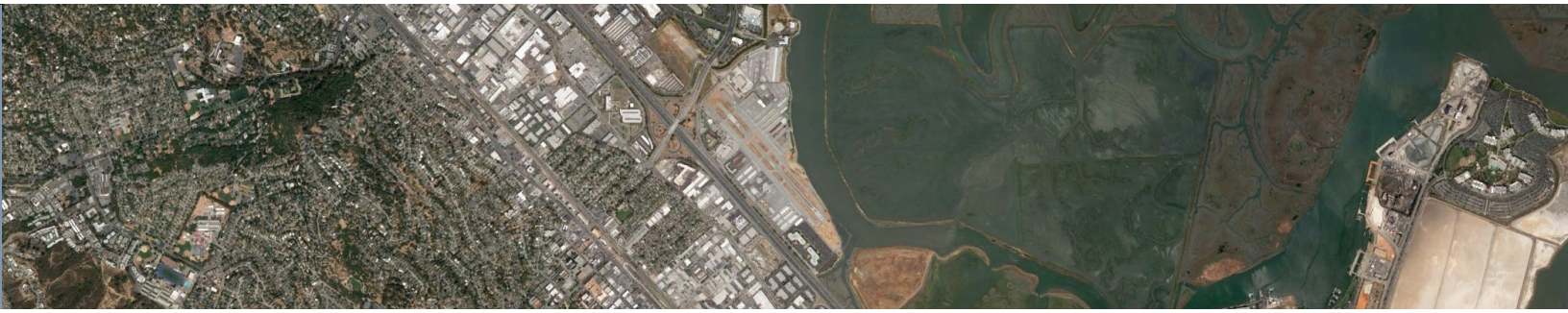


Figure 17k. Top: Identification of where Area of Impact is within OLU. Bottom: Map of Area of Impact containing regional systems. Individual assets assessed in this Area of Impact are labeled on the map and listed on the following page.



San Carlos Airport. Map data ©2019 by Google.

Why shared stories of vulnerability?

This Area of Impact was selected because it contains many transportation assets, including the San Carlos Airport, SamTrans Maintenance Facility and US-101. Due to overlap and dependencies among these regional systems in this area, the vulnerabilities of these systems to flooding and sea level rise are discussed together in shared stories of the shoreline, overtopping, and exposure to flooding as water levels rise. The goal of communicating shared vulnerabilities and consequences is to encourage multi-benefit solutions through collaborations and coordination.

Figure 17k. MAP OF REGIONAL SYSTEMS AND LIST OF INDIVIDUAL ASSETS ASSESSED WITHIN THIS AREA OF IMPACT LISTED BELOW:

TRANSPORTATION

- San Carlos Airport
- Samtrans Maintenance Facility
- US-101

VULNERABLE COMMUNITIES

- N/A

PRIORITY DEVELOPMENT AREAS (PDAs)

- N/A

PRIORITY CONSERVATION AREAS (PCAs)

- San Francisco Bay Trail PCA

Shoreline today and into the future

SHORELINE TYPE STORY

What is the shoreline made up of now?

The shoreline in this Area of Impact is an engineered levee that serves as the first line of defense. It also includes wetlands and embankments.

SHORELINE DEVELOPMENT STORY

How will the shoreline change in the future?

There are no known significant plans in this area to address flooding risk or change the shoreline or flood pathways.

Current and future flooding risk

OVERTOPPING STORY

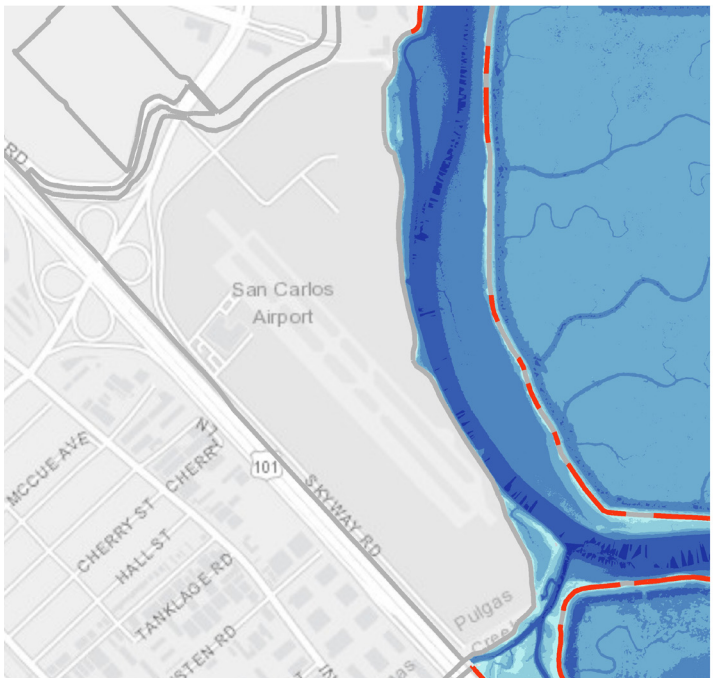
Where is water coming over the shoreline?

Overtopping occurs at 48" TWL along the entire length of engineered levee from the Bayside at Steinberger Slough, and along the entire length of the embankments north of the San Carlos Airport as well as across transportation structure to the west of the airport at 48" TWL (Figure 18k).

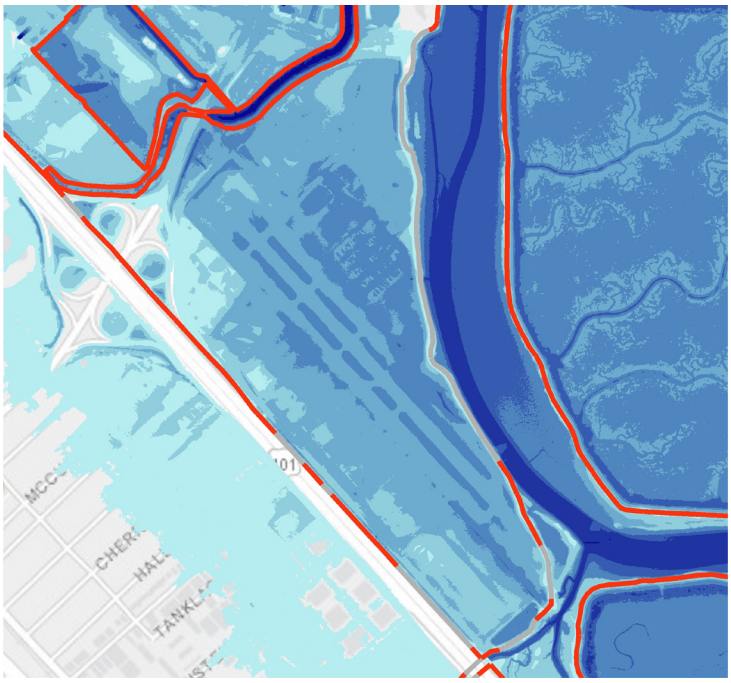
FLOODING EXPOSURE STORY

Where does flooding occur?

This area become fully flooded at a threshold of 48" TWL, impacting the entire San Carlos Airport, SamTrans Maintenance Facility, and US-101 in this Area of Impact (Table 9k).



36" TWL



48" TWL

OVERTOPPING AND FLOODING

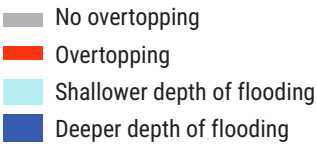


Figure 18k. Two total water levels selected that demonstrate first overtopping and/or significant flooding thresholds. Visit the Bay Shoreline Flood Explorer (explorer.adaptingtorisingtides.org) to see more TWLs.

FIRST FLOODING OF REGIONAL SYSTEMS ASSESSED

Regional Systems Impacted	12"	24"	36"	48"	52"	66"	77"	84"	96"	108"
San Carlos Airport										
SamTrans Maintenance Facility										
US-101										
San Francisco Bay Trail PCA										

Table 9k. First exposure of regional systems. Individual assets within the four regional systems in this area are shown and colored bars represent when each asset is first exposed to flooding impacts.

Shared vulnerabilities to flooding

SHARED VULNERABILITY STORIES

Vulnerability assessments were conducted on individual assets and then shared vulnerabilities were identified for regional systems within each focus area. The vulnerability statements below reflect shared stories of vulnerability. Our goal is to emphasize the interconnections among and across local systems, and encourage shared multi-benefits adaptation solutions.

1. Regional Transportation Connector

The San Carlos Airport serves as the reliever airport to the San Francisco International Airport, serving as the primary airport in the event of an emergency disruption at SFO, and also provides emergency response functions to the region. Flooding impacts both the runways as well as salt-sensitive equipment. This area also includes the SamTrans maintenance facilities, which support the network of buses and public transit that serve thousands of commuters and residents in San Mateo County. Flooding will cause disruptions to the facility's bus storage, fueling and maintenance centers. There is a lack of redundancy of airports that can serve as a reliever to SFO in the region, and the SamTrans facility is also limited in redundancy as it is one of only two in the county.

San Carlos Airport during King Tides in January 2020. Photo by SF Baykeeper, Cole Burchiel, and LightHawk.

SHARED CONSEQUENCE STORIES

This section translates shared vulnerability statements into stories of shared consequences. The ART program considers consequences through frames of sustainability: Society and Equity, the Economy and the Environment.

Society and Equity • The San Carlos Airport and SamTrans South Base Maintenance Facility provide important transportation services and options for residents living nearby. Additionally, the San Carlos Airport's role as a reliver airport to SFO in the case of an emergency makes it important to not only the local area but the Peninsula and region. Flooding impacts to the US-101, a designated emergency route will also lead to significant consequences if it cannot be used in the event of a major earthquake or other emergency. Impacts to the Bay Trail in this area limit the ability of people to use this for commuting and recreation to view the wetlands of Bair Island and other natural areas.

Economy • Disruptions to the SamTrans South Base Maintenance Facility will likely effect bus riders in the City of San Mateo and City of San Carlos and may have serious consequences to the local economy if commuters are unable to access their homes or places of work. Flooding of the San Carlos Airport could also major economic consequences if its use as a reliever airport to SFO is impacted and people cannot access domestic or international flights for work.

Environment • Flooding impacts to San Carlos Airport and SamTrans South Base Maintenance Facility could lead to mobilization of fuel and other hazardous contaminates that could impact endangered species residing in the Bair Island wetlands, as well as impair ecosystem functioning.

Endnotes

1 Caltrans, "2016 Vehicle Volumes (AADT)."
2 Caltrans, "2016 Truck Volumes (AADTT)."
3 "Lifeline Routes."
4 Caltrans, "2016 Vehicle Volumes (AADT)."
5 Caltrans, "2016 Truck Volumes (AADTT)."
6 "Lifeline Routes."
7 Caltrans, "2016 Vehicle Volumes (AADT)."
8 Caltrans, "2016 Truck Volumes (AADTT)."
9 Caltrains, "Annual Passenger Counts," 2018, http://www.caltrain.com/Assets/_Marketing/pdf/2018+Annual+Passenger+Coun ts.pdf?v=2.
10 Caltrains.
11 Badawi and Associates, "Port of Redwood City: Basic Financial Statements and Independent Auditors Report," 2018, https://docs.wixstatic.com/ugd/a04078_5f90f6aa08aa474ba67772d5e75104bc.pdf.
12 Port of Redwood City, "FAQ | Redwood City Port," RedwoodCityPort, accessed September 4, 2019, https://www.redwoodcityport.com/faq.
13 San Mateo County, "Asset Vulnerability Report: San Carlos Airport," 2018, https://seachangesmc.org/wp-content/uploads/2018/03/Final_AVP_16_SanCarlosAirport_JN_MP.pdf.
14 "Menlo Park General Plan: Land Use Existing Conditions Report" (City of Menlo Park, January 2015), https://www.menlopark.org/DocumentCenter/View/6295/1_LandUse_ExCond_PublicReviewDraft.
15 Kevin Kelly, "Menlo Park: Gentrification Worries Grow in Belle Haven as Housing and Jobs Increase," The Mercury News, June 29, 2016, https://www.mercurynews.com/2016/06/29/menlo-park-gentrification-worries-grow-in-belle-haven-as-housing-and-jobs-increase/.
16 Logan Rockefeller Harris and Sydney Cespedes, "East Palo Alto: An Island of Affordability in a Sea of Wealth," June 2015.
17 City of East Palo Alto, "East Palo Alto General Plan 2035 - Chapter 10: Safety and Noise Element," n.d.
18 City of East Palo Alto.
19 City of East Palo Alto.
20 "MTC Open Data Layer Library: Priority Development Areas (Current)."
21 "Ravenswood / 4 Corners TOD Specific Plan" (City of East Palo Alto, February 22, 2013).
22 "Ravenswood / 4 Corners TOD Specific Plan."
23 "Ravenswood / 4 Corners TOD Specific Plan."
24 "San Francisco Bay Area Water Trail."
25 "San Francisco Bay Trail – A 500-Mile Trail Around the Bay."
26 U.S. Fish and Wildlife Service, "Don Edwards San Francisco Bay National Wildlife Refuge Final Comprehensive Conservation Plan."
27 "Bayfront Canal and Atherton Channel Flood Management & Restoration Project," accessed September 11, 2019, https://bayfrontwatershed.org/.