

SAUSALITO

Municipality Profile: Sausalito

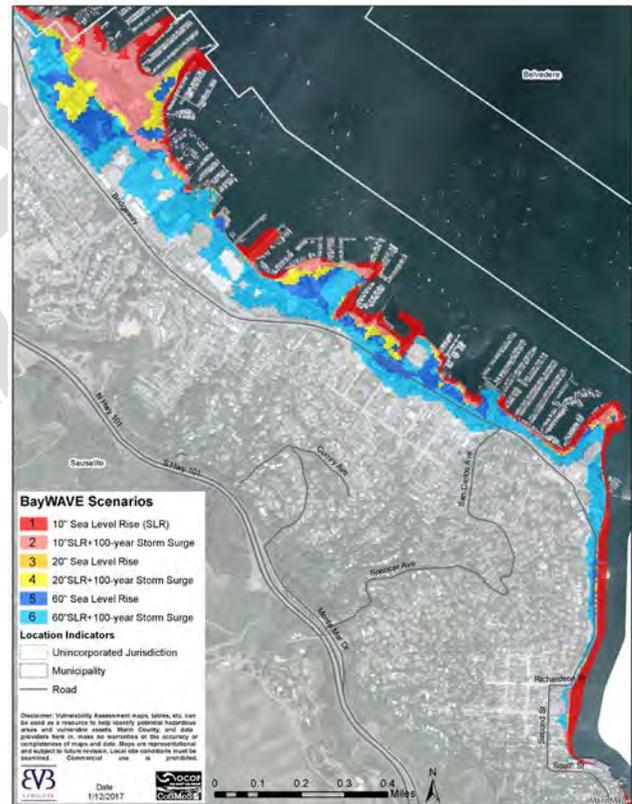
Sausalito, the southernmost community on the Marin shoreline, is situated just across the Golden Gate Bridge from San Francisco, along Richardson's Bay. In the near-term, twenty-six acres could be exposed to sea level rise. In the long-term, 84 acres could be exposed to sea level rise; and 150 acres could be exposed with an additional 100-year storm surge. The following assets in the low lying areas primarily east of Bridgeway may be vulnerable to storm surges and sea level rise:

IMPACTS AT-A-GLANCE: SCENARIO 6

150 acres	7,000+ people
265 living units	18 commercial parcels
3.5 miles of roads	
Extreme event impacts already occur	Property Owners City of Sausalito SMCS Southern Marin Fire District GG's Sausalito Ferry
\$400 million in assessed property value, \$61,000 in single-family home market value ¹	

- Northerly access to Sausalito could be blocked in the Waldo Point community. Shifting highway access to the narrow windy hillside roads.
- The Marinship area in northern Sausalito is built on fill and is vulnerable to subsidence and flooding. This is the primary employment area.
- Shoreline homes in Old Town could be impacted by erosion, storm surges, and high tides.
- Bridgeway leading to Old Town is vulnerable in the long-term. The main wastewater force main leading to Sausalito Marin City Sanitary District treatment plant is under this roadway.
- Swede's and Tiffany beaches, and all other shoreline parks, could be vulnerable in the near-term.
- The Golden Gate Ferry's Sausalito Ferry landing is vulnerable in the near-term.
- The fire rescue boat in a vulnerable marina could also be impacted in times of need.
- Several shoreline restaurants, hotels, and business could be vulnerable to flooding in the near-term.
- Inflow and infiltration of tide waters into underground pipes could increasingly burden the wastewater treatment facilities.
- Several small shoreline parks and festival areas at Spinnaker Point could flood, degrading public facilities and impeding public use.
- Several residents live in boats in marinas and unauthorized boats out in Richardson's Bay that are especially vulnerable during storms and could be vulnerable to damage at the marina's that host them.
- Tens of historic sites could be vulnerable across the BayWAVE scenarios.

Map 46. Sausalito BayWAVE Scenarios



¹ 2016 dollars

SAUSALITO

Vulnerable Assets

Land

Sausalito is primarily built out and land locked by Richardson’s Bay and the Marin Headlands. Most of the development is elevated on a hillside, however, the narrow strip of low-lying land near the shoreline is where most of the city’s employment, tourist, cultural, bay access, and maritime assets are located.

Acres

Because of Sausalito’s hilly nature, very little acreage could be flooded relative to the total area of the city, and to other communities in the study area. In near-term scenario 1, ten inches of sea level rise could flood 26 acres during average high tide several times a month. These 25 acres are dispersed along the shoreline and account for two percent of all acreage in Sausalito. An additional 100-year storm surge could double the acreage, though the added area would face temporary flooding only. In medium-term scenario 3, ten more acres and one additional percentage of the community could be exposed. With a storm surge these numbers could rise to 65 acres for five percent of the community. In long-term scenario 5, size percent of the community or 84 acres could expect tidal exposure. These and another 65 acres could face 100-year storm surge flooding as well.

Parcels

Land is divided into parcels for ownership and development purposes. Parcels are assigned land uses and tend to stay true to that designation, though many sites could feature multiple uses, such as commercial with housing included. Examining parcels can provide a window into how many land uses and human activities may be vulnerable.

The parcels that could flood tidally in the near-term are in the Marinship neighborhood, and extend all along the shoreline to Old Town Sausalito. Several of the parcels along the shoreline already extend into water by design. In the near-term 40 parcels could face tidal flooding. A 100-year storm surge at this sea level could temporarily flood another 20 or so parcels, and flood the first 40 parcels even more.

Table 48. Sausalito Exposed Acres

Scenarios	Acres		
	#	%	
Near-term	1	26	2
	2	52	4
Medium-term	3	35	3
	4	65	5
Long-term	5	84	6
	6	149	11

Source: Marin Map, CoSMoS

Table 49. Sausalito Vulnerable Parcels

Scenarios	Parcels		
	#	%	
Near-term	1	40	1
	2	61	2
Medium-term	3	48	1
	4	68	2
Long-term	5	88	3
	6	358	11

Source: Marin Map, CoSMoS

In the medium-term, 8 or so more parcels in Marinship and along the shoreline could flood in each scenario. In long-term scenario 5, around three percent of parcels in Sausalito could face tidal inundation, and an additional 100-year storm surge on top of five feet of sea level rise could flood another 8 percent of Sausalito parcels. Overall, 11 percent of parcels could face storm surge flooding.

Vulnerable parcels account for nearly ten percent of all commercial parcels, though less than one percent of percent of residential parcels in the community. Note, however, a few of the marinas along the Bay allow people to live on their boats in slips. While these are not residential parcels, these are residential spaces that could be highly vulnerable during storm surges especially. Commercial buildings include a grocery store, offices, restaurants, and professional practices. Industrial operations are generally related to boating and craftsmanship.

More concerning is that Sausalito could lose 41 percent of industrial parcels to tidal flooding and an additional 20 percent to 100-year storm surge flooding in the long-term. Twenty to 30 percent of

SAUSALITO

industrial parcels could suffer 100-year storm surge impacts before this time. This, while only a few parcels is a significant contribution to the city's employment base. Note that while several places along the shoreline have armoring, they may not be adequate to hold back the potential flood waters. The only historic landfill site in Sausalito is Dunphy Park. The park could become completely covered with high tide waters at a sea level rise of 60 inches.

Buildings

The Sausalito Bayfront is highly developed with industrial and maritime oriented businesses, facilities, and residences. Buildings in the Marinship neighborhood are likely to flood as are, bay front homes on pilings in Old Town. The properties could be susceptible to undercutting from strong wave activity during storms, and from consistently higher high tides. In addition, Marinship and a few other sites along the shore were filled prior to construction and are prone to subsidence. The flooded buildings account for a small percentage of the building in the community.

In the near-term, 21 buildings could be compromised to flooding, however, a 100-year storm surge at this increased sea level could flood nearly 115 buildings with bay water. In the medium-term scenario 3 and 4, 67, and 133 buildings respectively could experience flooding. In the long-term, five percent, or about 150 buildings could be subject of tidal flooding on a monthly basis, while an additional five percent could experience storm surge flooding. While, these numbers are relatively low compared to many communities in the study area, the Sausalito shoreline is one of the biggest destinations in the county and its loss would have significant impacts on the economy and culture of Marin County residents and visitors. In fact, several of the vulnerable buildings are part of Sausalito's Historic Downtown and are irreplaceable. To learn more about historic resources see the Cultural Resources Profile.

Table 53 divides potentially vulnerable buildings by the amount of water they could be flooded with at MHHW. For example, this table shows how many buildings flooded in scenario 1 could flood with one, two, or ten feet of water at the average highest high tide. A 100-year storm surge combined with these sea levels could add one to three feet of water on top of these levels.

Table 50. Sausalito Vulnerable Residential and Commercial Parcels

Land Use	Scenarios					
	1		3		5	
	Near-term		Medium-term		Long-term	
	#	%	#	%	#	%
Residential	9	0	11	0	12	0
Commercial	4	2	6	3	18	10
Industrial	3	21	8	30	41	62

Source: Marin Map, CoSMoS

Table 51. Sausalito Vulnerable Land Uses

Land Use	Scenarios					
	1		3		5	
	Near-term		Medium-term		Long-term	
	#	Ac.	#	Ac.	#	Ac.
Commercial Improved	3	0.6	5	3	16	14
Commercial Unimproved					2	0.12
Industrial Improved	2	1	5	2	24	17
Industrial Unimproved					4	1
Single-family Attached					3	0.03
Single Family Residential Improved	6	0.4	8	1	9	1
Tax Exempt	25	7	26	7	30	11

Source: Marin Map, CoSMoS

Table 52. Sausalito Vulnerable Buildings

Scenarios	Buildings		
		#	%
Near-term	1	21	1
	2	113	4
Medium-term	3	67	2
	4	133	4
Long-term	5	154	5
	6	299	10

Source: Marin Map, CoSMoS

SAUSALITO

In scenario 1, about ten buildings are could face three feet or shallower depths, and ten could be vulnerable to waters over three feet, with most vulnerable to over six feet to seven feet. In the medium-term, several buildings are expected to flood with up to two feet of water, with ten more that could be flooded with three feet of water. About twice as many buildings could be vulnerable to over three feet of water than in the near-term. In the long-term, over fifty buildings could be vulnerable to less than or equal to 3 feet of water, and seventy buildings could be vulnerable to more than three feet of water. Across all of the scenarios, a small percentage of the buildings stock could face tidal flooding; however, these buildings are a significant portion of the city’s commercial and industrial base.

The maps on the following pages illustrate vulnerable buildings by scenario. The areas in the call out circles enable the reader the see areas that are difficult to see on the large scale map. The circles do not indicate that these areas are more vulnerable than others along the shoreline.



The Spinnaker. Sausalito. Credit: E. Snow

Table 53. Number of Sausalito Vulnerable Buildings by Flood* Level at MHHW

Flood Depth (feet)	Scenarios		
	1	3	5
	Near-term	Medium-term	Long-term
0.1-1		2	3
1.1-2	2	19	20
2.1-3	6	9	32
3.1-4	2	5	22
4.1-5		3	32

Flood Depth (feet)	Scenarios		
	1	3	5
	Near-term	Medium-term	Long-term
5.1-6	1	3	6
6.1-7	6	8	7
7.1- 8	2	4	3
8.1-9	2	2	5
9.1- 10		0	3
10.1+		4	9

* Flood depth data is not available for every vulnerable building. Buildings that already exist beyond the mean sea level are not included.

Source: Marin Map, CoSMoS

Table 54 Table 54 estimates damage costs using FEMA tagging designations for buildings and their contents. This analysis assumes every vulnerable building experiences the same level of damage under scenario 6 conditions. At minor levels of damage, up to \$5 million² in damages could occur. If all of the buildings impacted under scenario 6 were to become unusable, over \$200 million in assessed structural value could be lost.³

The maps on the following pages illustrate vulnerable buildings by scenario. The areas in the call out circles enable the reader the see areas that are difficult to see on the large scale map. The circles do not indicate that these areas are more vulnerable than others along the shoreline.



The Spinnaker. Sausalito. Credit: E. Snow

² 2016 dollars
³ 2016 dollars

SAUSALITO

Table 53. Number of Sausalito Vulnerable Buildings by Flood* Level at MHHW

Flood Depth (feet)	Scenarios		
	1	3	5
	Near-term	Medium-term	Long-term
0.1-1		2	3
1.1-2	2	19	20
2.1-3	6	9	32
3.1-4	2	5	22
4.1-5		3	32
5.1-6	1	3	6
6.1-7	6	8	7
7.1- 8	2	4	3
8.1-9	2	2	5
9.1- 10		0	3
10.1+		4	9

* Flood depth data is not available for every vulnerable building. Buildings that already exist beyond the mean sea level are not included.

Source: Marin Map, CoSMoS

Table 54. Sausalito Vulnerable Buildings FEMA Hazus Storm Damage Estimates in Long-term Scenario 6

Buildings in Scenario 6	299
Yellow Tag-Minor Damage \$5,000 minimum	\$1,495,000
Orange Tag- Moderate Damage \$17,001 minimum	\$5,083,299
Red Tag-Destroyed Assessed structural value	\$228,617,482

Source: Marin Map, CoSMoS; 2016 dollars

SAUSALITO

Map 47. Sausalito Vulnerable Buildings

Vulnerable Assets

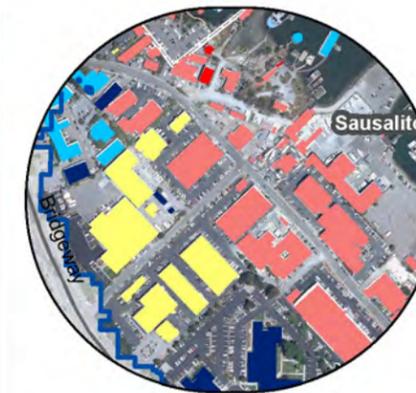
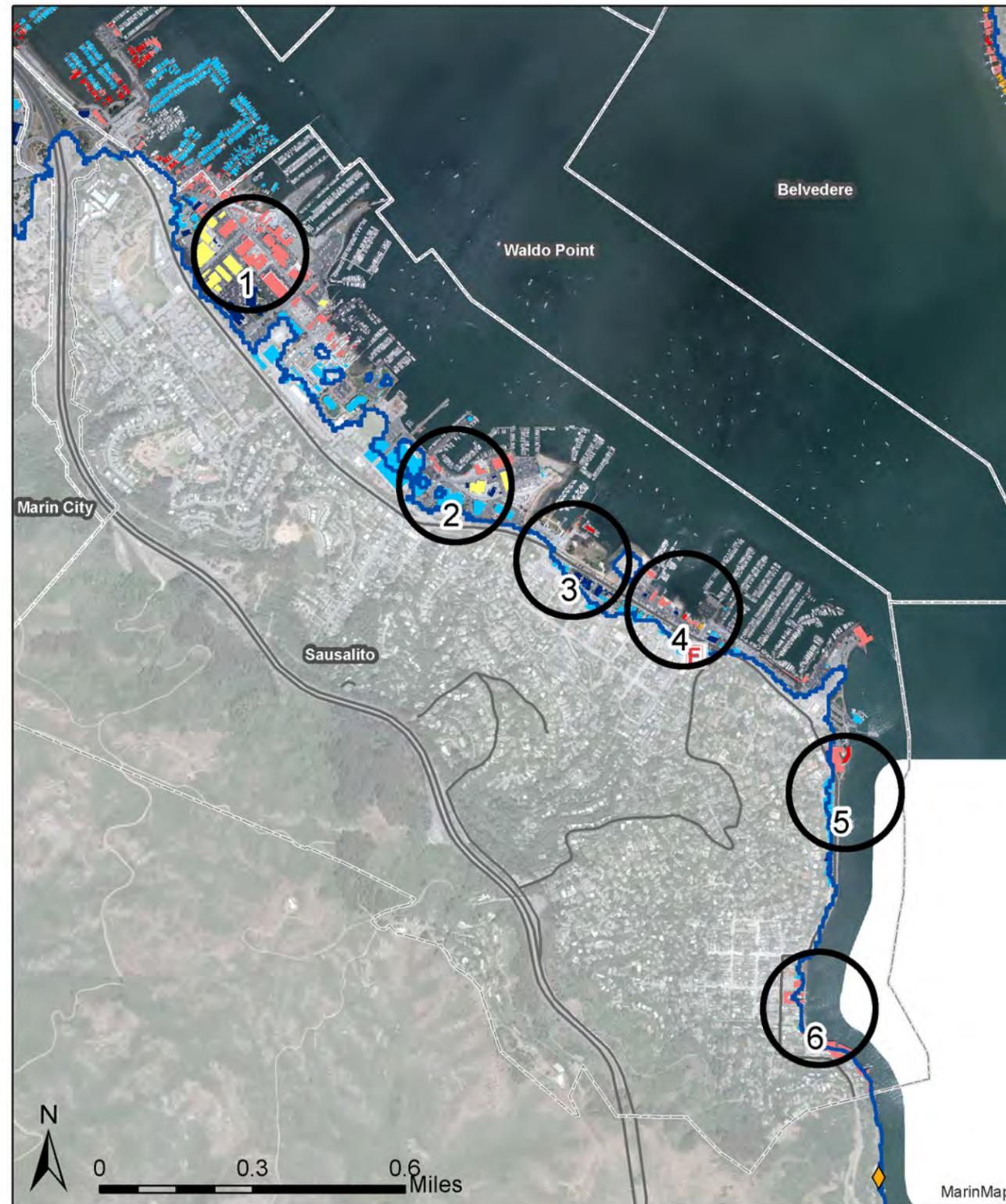
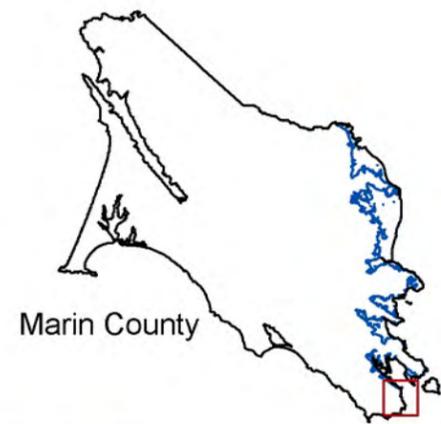
- Fire Station
- District Office

Vulnerable Buildings

- Scen. 1: 10" Sea Level Rise (SLR)
- Scen. 2: 10" SLR+Storm Surge
- Scen. 3: 20" Sea Level Rise
- Scen. 4: 20"SLR+Storm Surge
- Scen. 5: 60" Sea Level Rise
- Scen. 6: 60"SLR+Storm Surge

Location Indicators

- Unincorporated
- Municipality
- Road
- Inland Extent: Sea Level @ 60"+100-year Storm



1: Marinship



2: Libertyship Way



3: Dunphy Park



4: Southern Marin Fire Department



5: Bridgeway



6: Old Town

Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.



Date: 1/15/2017



SAUSALITO

Transportation

In the near-term with a storm surge, scenario 2, several streets in the Marinship area could flood more frequently than they already do causing reduced access to jobs and businesses there. In this time period with a 100-year storm, about one half of a mile could flood temporarily. By the medium-term, streets near Dunphy Park could become vulnerable. By this time, about 1.14 road miles could expect tidal impacts. With a 100-year storms surge coincidence, nearly one mile could experience bay surge flooding. In the long-term, Bridgeway could be vulnerable in the low lying areas downtown and along the southern shoreline. In addition, Johnson Street, where the Fire Station No. 1 is located, and Litho Street could be vulnerable. Overall, these roads miles add up to nearly one and one half of a mile. An additional two miles of road, and several other roads in the downtown area could be flooded by 60 inches with the 100-year storm surge.

Golden Gate Transit routes 2, 4, 10, 17, 22, 70, 80, 91, and 92 could be impeded by tidal and storms surge flooding along the vulnerable roadways. Floodwaters could reach the following stops:

- Bridgeway and Napa St.,
- Bridgeway and Pine St.,
- Bridgeway and Napa St.,
- Bridgeway and Turney St., and
- Bridgeway and Ensign St.

In addition to roads, the Sausalito/Mill Valley Path and Bay Trail could be vulnerable to sea level rise in the Marinship and downtown areas. While these pathways could likely withstand low levels of irregular flooding, frequent flooding could prevent travel by foot, bike, or other non-motorized vehicles. This could have significant impacts on commuting and safe public access to recreational opportunities in the area.

Finally, though likely able to adjust in the near- and medium terms, several marinas, boat launches, boat slips, and other boating facilities could be flooded out during storms and eventually, tidal waters. During storms, the boats themselves could also be damaged. A significant vulnerable water transportation facility is the GGF Sausalito Ferry to and from San Francisco. The GGF Sausalito Ferry operates on a float system, and could likely withstand sea level impacts into the latter half of the century. However, the land the dock connects to and

the parking lot could be flooded with deep water at MHHW in the near-term. Impacts to this facility would affect commuting and tourism. The following marine facilities are in the exposed area:

- Sausalito Shipyard and Marina, including residents,
- Cass Gidley Marina (public),
- Five Star Yacht,
- Liberty Ship Marina,
- Marina Plaza Harbor,
- Pelican Yacht Harbor,
- Bridgeway Marina,
- Sausalito Yacht Harbor, and
- Schoonmaker Point Marina.



Boats in Marina. Sausalito. Credit: City of Sausalito Photo Gallery.



Sausalito Yacht Club. Credit: E. Snow

SAUSALITO

Table 55. Sausalito Transportation Routes Vulnerable to Sea Level Rise and a 100-year Storm Surge

Near -Term		Medium -Term		Long -Term	
Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
None	0.5 miles	0.14 miles	0.8 miles	1.4 miles	3.5 miles
	Anchor Street ^P Coloma St ^L Gate 5 Rd ^{L,P} Harbor Dr ^L Heath Wy ^L Liberty Ship Wy ^P Spinnaker Dr ^P Varda Landing Rd ^P		Roads in scenario 2 Humboldt Ave ^{L,P} Turney St ^L	Roads in scenarios 1-4 Bridgeway ^L Johnson St ^L Litho St ^L Locust St ^L N Bridge Blvd ^L Napa St ^L Road 3 ^P	Roads in scenarios 1-5 Bay St ^P Bee St ^L Caledonia St ^L El Portal St ^L Ensign St ^L Marina Plaza ^P Marinship Wy ^{L,P} Napa St ^L Pine St ^L Princess St ^L Richardson St ^L San Carlos Ave ^L Tracy Wy ^L Wateree St ^P

M = Marin County; C = State of California; L = Local Municipality; P = Private. Source: Marin Map, CoSMoS

The maps on the following pages illustrate vulnerable transportation features. The areas in the call out circles enable the reader to see areas that are difficult to see on the large scale map. The circles do not indicate that these areas are more vulnerable than others along the shoreline.

SAUSALITO

Map 48. Sausalito Vulnerable Transportation Assets

Vulnerable Assets

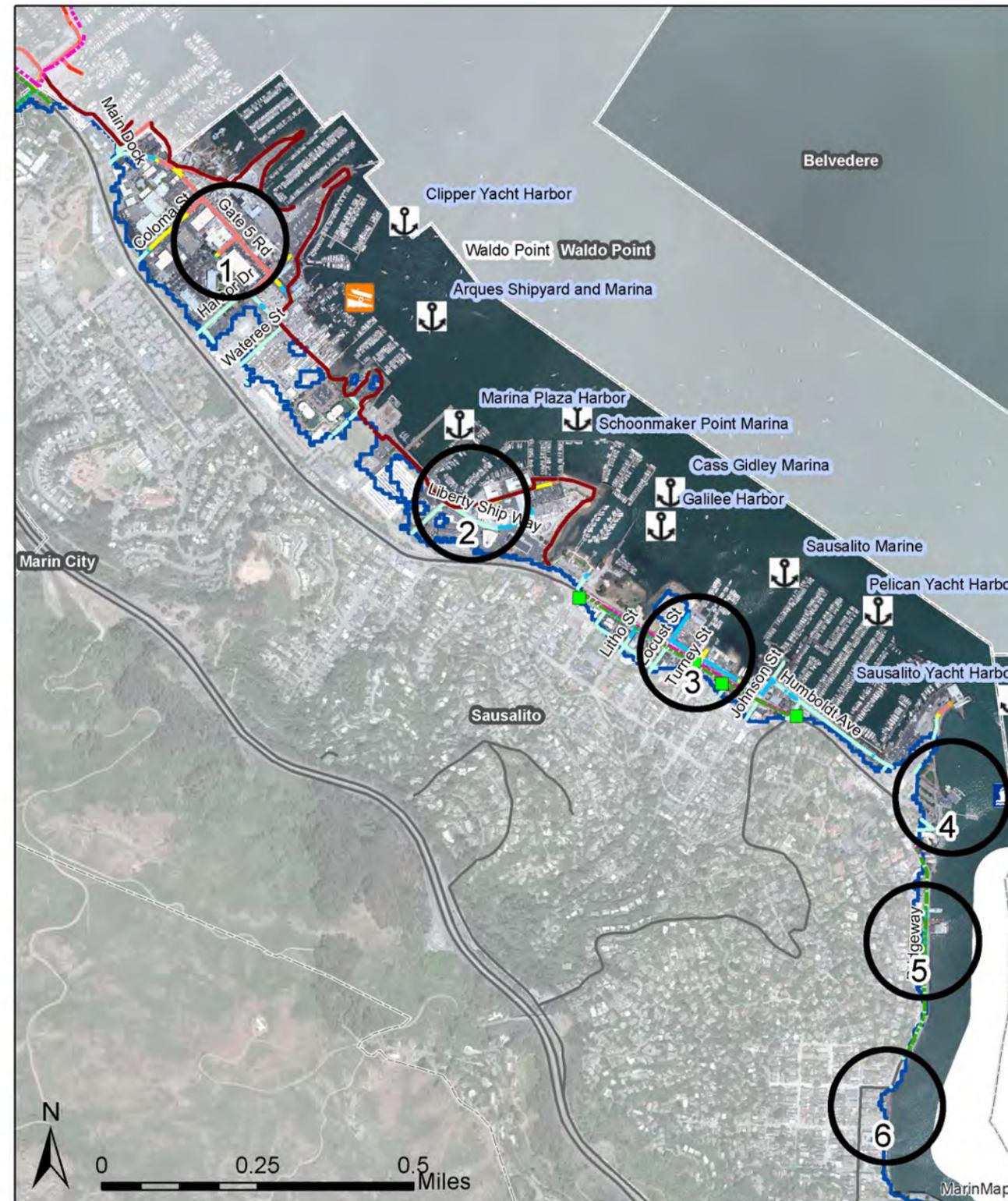
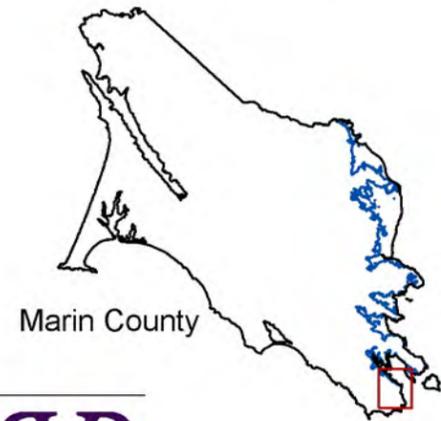
- Bike path
- Bay Trail
- Trail
- GGT Bus Stop
- Marina
- Ferry
- Boat Launch

Vulnerable Roads

- @10" Sea Level Rise (SLR)
- @10"SLR+ 100-year Storm Surge
- @20" Sea Level Rise
- @20"SLR+ 100-year Storm Surge
- @60" Sea Level Rise
- @60"SLR+ 100-year Storm Surge

Location Indicators

- Unincorporated
- Municipality
- Road
- Inland Extent: Sea Level @ 60"+100-year Storm



1: Northern Marinship



2: Southern Marinship



3: Bridgeway



4: Golden Gate Ferry



5: Bridgeway



6: Old Town

Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.



Date: 1/15/2017



SAUSALITO

Utilities

Individual buildings that flood could face on site electrical, potable water, stormwater, and wastewater issues. If these sites, especially those closest to the shoreline, become regularly inundated, services could be permanently cut off.

These properties could also become sources of excess water into the pump stations for flood control and the waste treatment system. This could place a burden on the equipment, chemical use, and energy conservation.

Potential Sausalito Marin City Sanitary District (SMCSD) vulnerabilities impacting all residents in Sausalito are:

- The Main Street pump station and pipeline. The pipeline collects and transports 95 percent of the effluent brought to the treatment plant and borders the shoreline under a vulnerable portion of Bridgeway.
- The Locust Street pump station could become burdened with tidal water infiltration.
- The Anchor Street pump station could become burdened.
- The pump station, 500 block of Bridgeway could become burdened, and controls across the street near the Trident Restaurant could be flooded.
- The Drake pump station could become burdened with tidal water infiltration.
- The Gate 5 Road pump stations could become increasingly burdened by tidal water infiltration and could also be vulnerable to subsidence.
- The access hatches along effluent pipes extending into Richardson's Bay could be overtopped frequently preventing employee access.
- The below grade electrical motors at the treatment plant could be flooded in the long-term at high tides with a 100-year storm surge.

In addition, Sausalito is vulnerable to issues common to all of the communities such as:

- Underground pipes face compounding pressure forces from water and the road,
- Road erosion and collapse with underlain pipes,
- Increasing saltwater inflow and infiltration causing inefficiencies in wastewater treatment,
- Continuously subsiding soils or fill, and

- Escalating activity, capacity demands, energy consumption, and wear and tear on pump stations in stormwater and wastewater systems,
- Aging individual site connections for water, sewer, and electrical, and
- Flood waters interrupting access for employees to reach work sites.

Available PG&E data did not reveal any major gas and electric assets that could be vulnerable in the study area. The same may be true for potable water infrastructure. Digitized geographic stormwater data was not available at the time of this assessment. Wastewater data is provided on [Map 49](#).

Working Lands

Fishing habitats and facilities could be impacted. See Transportation section for a list and map of marinas and boat launches in Sausalito.

Natural Resources

Beaches are among the most vulnerable habitats, susceptible to higher tides, flooding, erosion, and sand shift.⁴ Swede's and Tiffany beaches are very narrow with minimal habitat value and no opportunity to migrate landward. Beaches and rocky areas are home to many seabirds and several unique fish species swim just off shore.

A 2008 study found that Richardson's Bay supports extensive beds of eelgrass.⁵ Eelgrass was observed in the open water immediately northeast of Dunphy Park and Cass Gidley Marina and within the Richardson Bay Navigation Channel.⁶ Eelgrass beds are among the most productive aquatic ecosystems known. Eelgrass beds are recognized by both federal and state agencies as sensitive and essential habitat for Pacific salmon and groundfish.⁷

⁴Hutto, S.V., K.D. Higgason, J.M. Kershner, W.A. Reynier, D.S. Gregg. 2015. Climate Change Vulnerability Assessment for the North-central California Shoreline and Ocean. Marine Sanctuaries Conservation Series ONMS-15-02. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD.

⁵Merkel & Associates, Inc. May 2008. Baseline Eelgrass Study, San Francisco Bay, California. Prepared for Marin Baylands Advocates/Audubon Society, May 5, 2008

⁶These features are not mapped. Their absence does not indicate a lack of vulnerability, rather a lack of digitized data.

⁷NOAA Fisheries West Coast Region. 2014. The Importance of Eelgrass. Updated fall 2014.

SAUSALITO

Eelgrass beds are much larger and closer to shore than the mapped habitats on Map 52.

The longfin smelt is the only listed species recorded in this area. The smelt is listed as threatened on the California list and a candidate on the federal list. The largest longfin smelt population occurs in the San Francisco Estuary and Sacramento-San Joaquin Delta. This species occupies bay waters throughout summer and moves into lower reaches of rivers in fall to spawn. Other important fish species sensitive to changes in environmental conditions that could occur in Richardson's Bay are:

- Chinook salmon
- Delta smelt:
- Green sturgeon
- Pacific herring, and
- Steelhead.

Listed bird species that could be found in or moving through the Sausalito shoreline are the Ridgway's rail and the Western snowy plover. The Ridgway's rail is one of the largest rails in North America. The Ridgway's rail is very secretive and occurs primarily in salt and brackish marshes with pickleweed and cordgrass. Richardson's Bay is known to support a small number of Ridgway's rails.⁸ The Western snowy plover is a small shorebird that nests on and near the shores of the San Francisco Bay and may forage in Richardson's Bay. Other unique and valuable bird species common in the area are:

- California brown pelican,
- California least tern,
- Double-crested cormorant,
- San Francisco common yellowthroat, and
- San Pablo (Samuels) song sparrow.

Additional migratory birds are reported and some may occur within the project site on a regular basis or on occasion (e.g., Allen's hummingbird, marbled godwit, Nuttall's woodpecker, western grebe).

And while not listed as threatened or endangered, a unique and valuable species that travels through the

San Francisco Bay is the Southern sea otter, also known as the California sea otter. These mammals are, among the smallest of marine mammals and may live for 15-20 years in the wild. Insects, such as the Monarch butterfly, could also see impacts to their habitats that directly impact their success at survival. To learn more about these species, see the Natural Resources Profile.

Finally, numerous special status plants with habitats that are expected to be vulnerable to sea level rise are:

- Franciscan thistle
- Hairless popcornflower.
- Marin western flax.
- Oregon polemonium.
- Point Reyes salty bird's-beak.
- Tiburon buckwheat.
- Tiburon paintbrush.
- White-rayed pentachaeta.⁹

Recreation

Based on the CoSMoS model results, beaches and shoreline parks could disappear in the near to medium-terms. A few shoreline hotels, restaurants, and other guest serving facilities could also face higher tides. Turney Street Boat Ramp, the only public boat launch on Richardson's Bay, and other private marinas could also become compromised more frequently during high tides, especially by long-term scenario 5. Nearly all of the shoreline trails, including the Bay Trail and bicycle trails could also flood out and require increased maintenance from repeated saltwater exposure.

Emergency Services

Access for emergency services to the Marinship area and other shoreline areas east of Bridgeway are the primary concern for police, fire, and ambulatory services. The Southern Marin Fire Rescue boat Liberty could also be vulnerable during severe storms and impacted by disrupted marina function. This would also be true for Sausalito Police Department's two boats, Marine 1, berthed at Schoonmaker Marina, and Marine 2, berthed at the US Army Corps of Engineer's dock. Fire Station 1

http://www.westcoast.fisheries.noaa.gov/stories/2014/04_1107_2014_eelgrass_mitigation.html . Accessed 1/18/17

⁸ Wood, J., L. Salas, N. Nur, M. Elrod, J. McBroom. 2013. Distribution and population trends for the Endangered California Clapper Rail. State of the Estuary Conference, 26 October 2013, Oakland, CA.

⁹ Prunuske Chatham, Inc. March 2016. Draft Biological Resources Assessment: Dunphy Park Improvement Project Sausalito, Marin County.

SAUSALITO

and the Sausalito Police Department station could expect 100-year storm surge impacts by the end of the century, and access issues east of Bridgeway sooner. Finally, according to local asset managers, the Army Corps of Engineers facility off Bridgeway and Liberty Ship Way also serves as an emergency shelter. The large facility hosts the Bay Model Visitors Center and serves as the Navigation Branch for the M/V Raccoon and M/V John A.B. Dillard, Jr. at its dock in Sausalito.¹⁰

The maps on the following pages illustrate vulnerable utility, natural resource, recreation, emergency and historic features. The areas in the call out circles enable the reader to see areas that are difficult to see on the large scale map. The circles do not indicate that these areas are more vulnerable than others along the shoreline.



In the long-term flooding could impact Bridgeway and historic buildings lining its west side. Credit: Marin CDA

¹⁰ J. Goldman. Dec. 20, 2016. Personal Communication. B. Van Belleghem

SAUSALITO

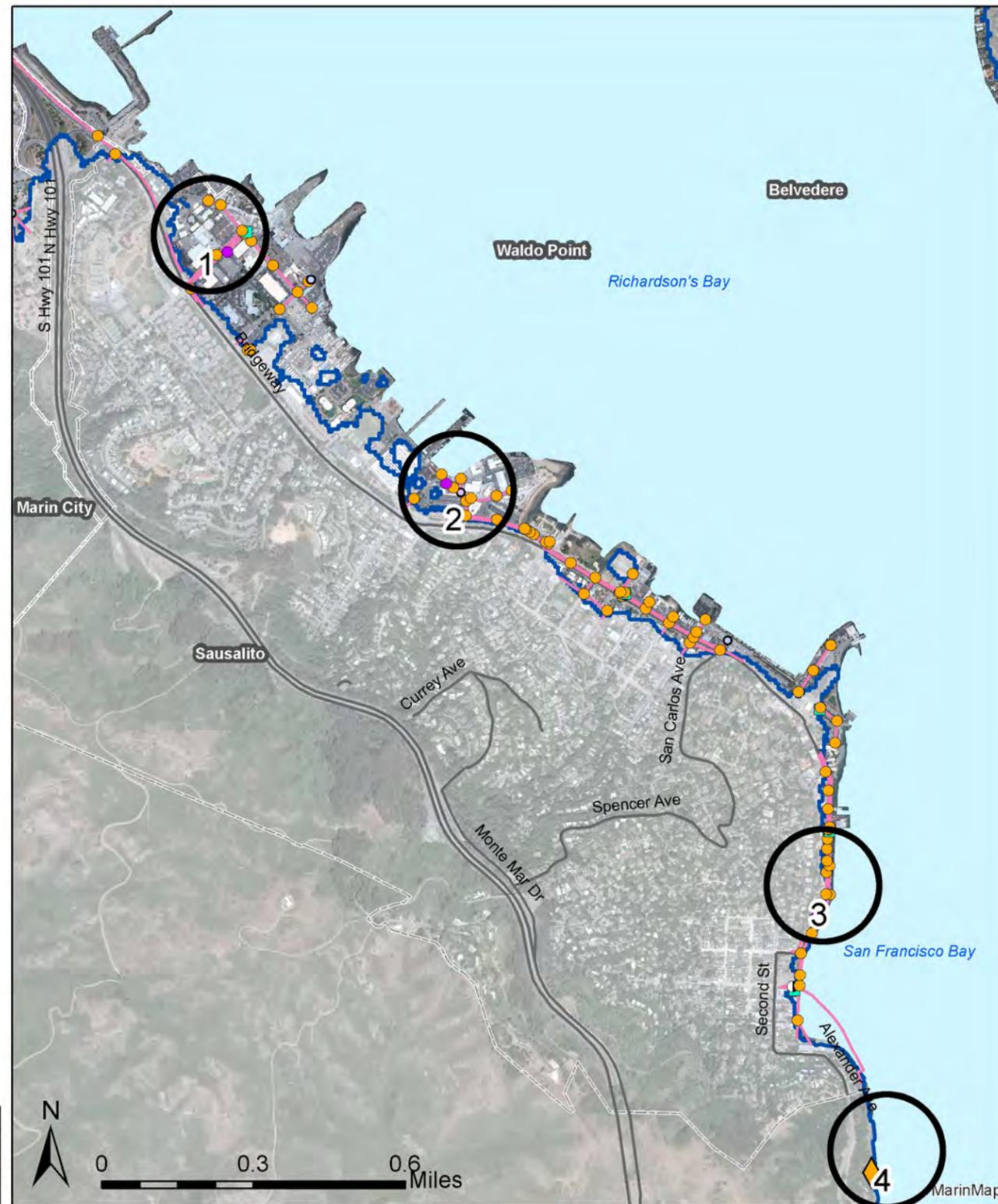
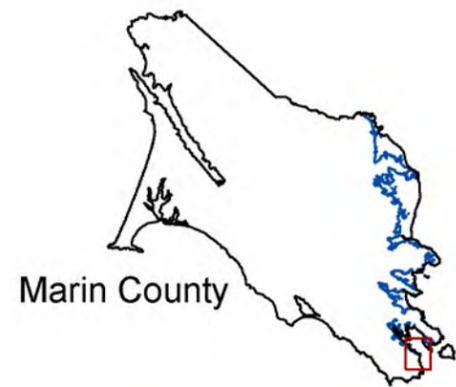
Map 49. Sausalito Vulnerable Wastewater Assets

Vulnerable Assets

-
- Pump Station
- BT
- GV
- LH
- Manhole
- RC
- Residential Lateral
- Pipe
- ◆ Treatment Plant

Location Indicators

- Unincorporated
- Municipality
- Road
- Bay
- ~ Inland Extent: Sea Level @ 60"+100-year Storm Surge



1: Marinship



2: Liberty Ship Way



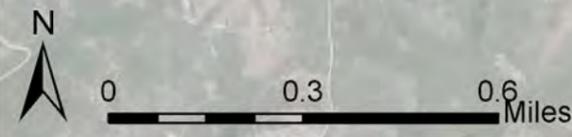
3: Bridgeway



4: Sausalito Marin City Wastewater Treatment Plant



Date: 2/9/2017



Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.

SAUSALITO

Map 50. Sausalito Vulnerable Natural Resource Assets

Vulnerable Assets

 Eelgrass

 Streams

Location Indicators

 Unincorporated

 Municipality

 Road

 Bay

 Inland Extent: Sea Level @ 60"+100-year Storm



1: Glen Creek



CA Dept. of Fish & Wildlife

Date: 1/24/2017



0 0.3 0.6 Miles

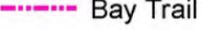
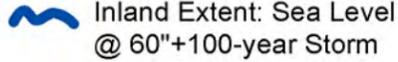
MarinMap

Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.

SAUSALITO

Map 51. Sausalito Vulnerable Recreation Assets

Vulnerable Assets

-  Ferry
 -  Public Boat Launch
 -  Marina
 -  Bay Trail
 -  Trail
 -  Bikeway
 -  Park
- ## Location Indicators
-  Unincorporated
 -  Municipality
 -  Road
 -  Bay
 -  Inland Extent: Sea Level @ 60"+100-year Storm



1: Marina Plaza Harbor & Bay Model Visitor's Center



2: Shoonmaker Beach



3: Dunphy Park



4: Tiffany & Swedes Beach

Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.

SAUSALITO

Map 52. Sausalito Vulnerable Emergency Service Assets

Vulnerable Assets

 Fire Station

 Marina

Vulnerable Arterials & Highways

 @ Scen. 1: 10" Sea Level Rise (SLR)

 @ Scen. 2: 10"SLR+Storm Surge

 @ Scen. 3: 20"SLR

 @ Scen. 4: 20"SLR+Storm Surge

 @ Scen. 5: 60"SLR

 @ Scen. 6: 60"SLR+Storm Surge

Location Indicators

 Unincorporated

 Municipality

 Road

 Bay

 Inland Extent: Sea Level @ 60"+100-year Storm



Marin County



Date: 2/15/2017



SAUSALITO

Map 53. Sausalito Vulnerable Cultural Resource Assets

Vulnerable Historic Buildings

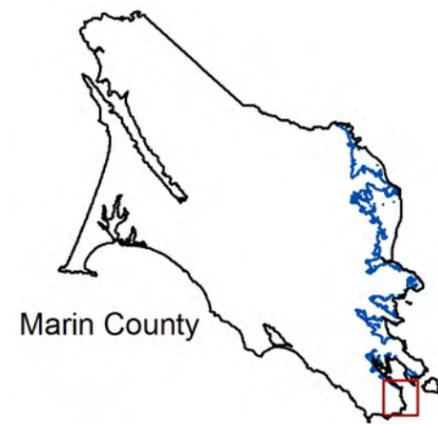
- Scen. 1: 10" Sea Level Rise (SLR)
- Scen. 2: 10" SLR+Storm Surge
- Scen. 3: 20" Sea Level Rise
- Scen. 4: 20" SLR+Storm Surge
- Scen. 5: 60" Sea Level Rise
- Scen. 6: 60" SLR+Storm Surge

Location Indicators

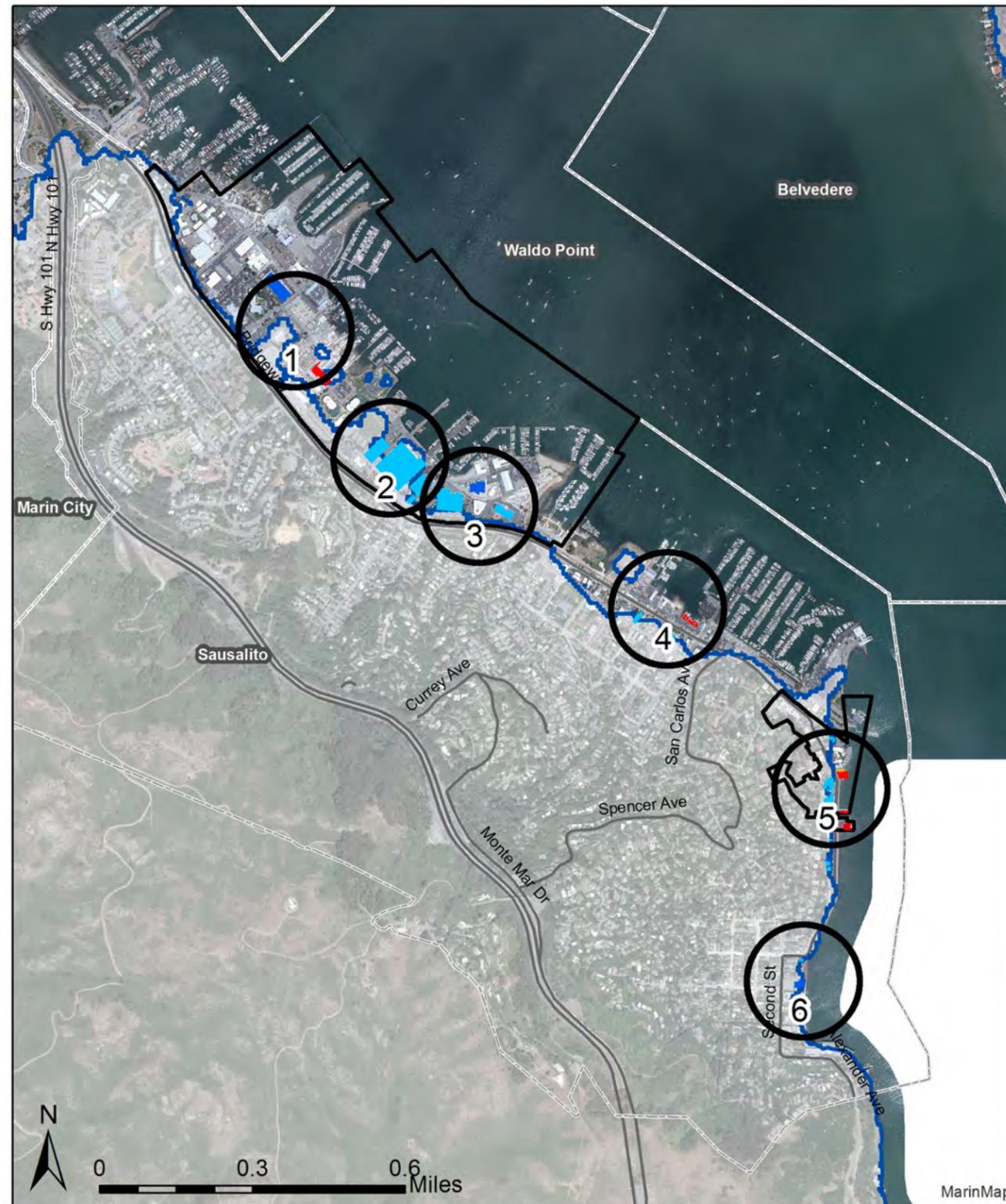
- Municipality
- Major Road
- ~ Inland Extent: Sea Level @ 60"+100-year Storm

Source: Marin Map, CoSMoS, City of Sausalito, Historic Resource Inventory Listing, Marinship Historic Context Statement.

Archaeological resources may be present.



Date:
2/17/2017



1: Northern Marinship



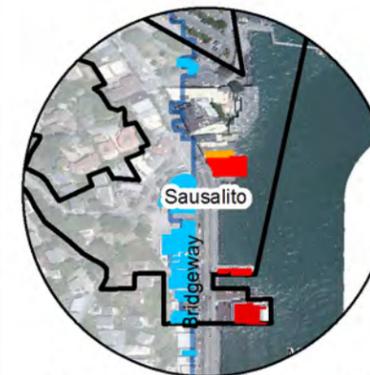
2: Central Marinship



3: Southern Marinship



4: Ark Row District



5: Downtown Historic District



6: Old Town

Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.

SAUSALITO

Cultural Resources

Vulnerable Resources: 26 National register district contributing sites, 17 noteworthy structures, 2 landmark buildings

Scenarios: All

Flood Depths: 09'04"+100-year storm surge

Primary Building Materials: Wood, concrete, brick, stucco, concrete

Both water and land access routes to Sausalito's historic properties could be vulnerable in the near-term. The historic GGF Sausalito Ferry landing could face inundation in the near-term. In the long-term, parts of Bridgeway could be tidally flooded, and impacts could worsen with storms.

A handful of private properties, including two major districts (Downtown Historic District and Ark Row District) on the city's Historic Resources Inventory could also be vulnerable across the BayWAVE scenarios. Sausalito's Ark Row District includes seven noteworthy properties that could be flooded with more than six feet of tidewaters in the near-term, and nine feet in the long-term. An additional ten other properties could be vulnerable in the long-term, including the original firehouse, with eight of the ten only subject to storms. Additionally, two of Sausalito's landmark buildings, Castle by the Sea and Ice House, could be vulnerable to a 100-year storm surge in scenario 6.

Marinship

Vulnerable Resources: 10 potential historic resources

Scenarios: All

Flood Depths: 2'1" - 2'8"+100-year storm surge; flood depth data limited

Primary Building Materials: Concrete, wood, stucco, steel

The former Marinship yard, an approximately 210-acre site, was one of six Emergency Shipyards in the San Francisco Bay Area established during World War II. Marinship was built on bay fill, and some areas, such as Heath Way, have experienced approximately five feet of subsidence since 1943 based on photographic records.¹¹ In 2010, the Marinship Historic Context Statement inventoried and recorded every major World War II era building and structure. The effort concluded:

- Marinship retains a higher degree of architectural integrity than any of the other Bay Area World War II emergency shipyards,
- Eight surviving buildings could form a California Register eligible district in the southernmost portion of the district,
- Two sites are individually eligible for the National Register of Historic Place, and
- Four sites are individually eligible for the California Register of Historic Places.

These sites were never nominated for national or state historic registers, and therefore have no formal historic status. However, these resources can be considered potential historic resources.

In the near term, shipways that are part of Building 23, the Marinship Shipways and Offices, could be vulnerable to the increased 10 inches of sea level rise. More detailed analysis would be necessary to fully evaluate integrity impacts that may occur.

In the long-term, two buildings, the Marinship Maintenance Garage and the Marinship Mold Loft and Yard Office, could be vulnerable to tidal flooding at depths deeper than two feet. Both buildings were erected in 1942 with cinderblock construction and could be vulnerable to standing water. The Mold Loft could be eligible for the California Register, and the Maintenance garage could support a California register-eligible district.

Seven other properties could be vulnerable to the 100-year storm surge by the long-term scenario including Building 29, the Marinship Warehouse. This building now serves as the Bay Model Visitors Center which houses the U.S. Army Corps of Engineers Bay Model, a working hydraulic scale model of the SF Bay-Delta, completed in 1957.¹² The model is no longer used for research, but open to the public for educational purposes.

Downtown Historic District

The Downtown Historic District is a National Register of Historic Places and on the City of Sausalito Historic Resources Inventory Listing. Overall, there are 26 National Register District contributing sites,

¹¹ Robin Petravic (Heath Ceramics), personal communications. July 2016.

¹² U.S. Army Corps of Engineers Bay Model. Last updated August 18, 2016. en.wikipedia.org/wiki/U.S._Army_Corps_of_Engineers_Bay_Model

SAUSALITO

that could experience over nine feet of sea level rise flooding and additional storm surge flooding in the long-term.

Sausalito was an important hub for rail, car and ferry traffic before the Golden Gate Bridge was constructed. During World War II, the city developed rapidly as a shipbuilding center. The Downtown Historic District centers on a ferry terminal with service to/from San Francisco, and is an important area for commerce, and as a popular visitor destination. The district is a National Park Service Certified Historic District.¹³

Sea level rise is projected to inundate parts of Sausalito's historic district in the near-term, with storms expanding the vulnerable area and exacerbating impacts. By the long-term scenario with a 100-year storm surge, 26 National Register District contributing sites could be vulnerable. Further analysis could determine specific vulnerability to each building based on location, flood depth, height above grade, materials, etc.

Table 56 lists example vulnerable assets in Sausalito by onset and flood depth at MHHW. Maps throughout the profile illustrate the developed and natural assets vulnerable to sea level rise and the 100-year storm surge. A 100-year storm surge could add an additional 1 to 3 feet of water to these properties. Note also, above average high tides could impact more properties than accounted for in this analysis.

Archaeological Resources

Archaeological resources may be present in the exposure zones.

Table 56. Example Sausalito Vulnerable Assets by Onset and Flooding at MHHW

Asset	Scenarios		
	1 Near-term	3 Medium-term	5 Long-term
Sausalito Ferry Facilities	No data		
Swedes Beach	Flooded at existing high tides		
Tiffany Beach	Flooded at existing high tides		7'
Marinship Neighborhood	0-13'	4"-14'2"	11"-36'
Marina Plaza Harbor	5'7"	8'6"	21'9"
Dunphy Park	5'1"	5'8"	13'8"
Shops and restaurants	3'6"	4'6"	11'6"
Sausalito Yacht Harbor	4"	1'	3'
Mill Valley/Sausalito Pathway		0-8'5"	1"-11'8"
Schoonmaker Beach		7'2"	10'1"
Schoonmaker Point Marina		3'3"	8'2"
Clipper Yacht Harbor		2'5"	6'3"
Gate 5 Road		0-2'2"	10"-4'10"
Cass Gidley Marina		2'	3'2"
Turney Street Boat Ramp			8'8"
Yee Tock Chee Park			2'11"
Bay Trail			7"-2'3"
Bridgeway			7"-2'

Source: Marin Map, OCOF, Asset Manager Interviews

¹³ Office of Historic Places, accessed July 14, 2016. http://ohp.parks.ca.gov/?page_id=27283