Community Profile: Tiburon

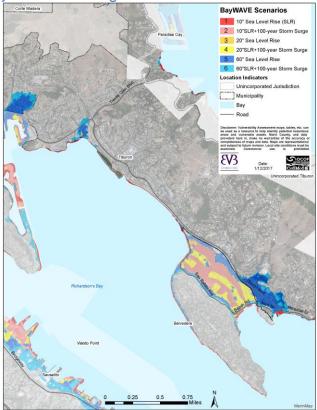
Tiburon is located along an extensive peninsula projecting into Richardson's and San Pablo Bays. The peninsula is generally steep with several areas of reinforced shoreline. However, the low-lying downtown Blackie's Pasture, and Cove areas could be vulnerable. Increased sea level rise and storm surges could significantly compromise this shoreline community in the following ways:

- Highly valued Main Street shoreline shops and restaurants could be vulnerable in the near-term.
- Homes along the interface of the bluffs and shoreline could be vulnerable to increased erosion and bluff collapse during storms.
- The Tiburon and Angel Island ferries may face complications with loading during extreme high tides, and may experience compromised American Disabilities Act (ADA) access.
- Vehicular access along Tiburon Blvd. could be compromised at the Cove Shopping Center and in downtown in the long-term.
- The Tiburon Fire Department, library, post office, and municipal facilities may be vulnerable to tidal flooding in the long-term.
- The Bay Trail and hotels downtown are compromised in the near-term.
- Corinthian Yacht Club facilities could be vulnerable to storm damage and flooding in the medium- to long-terms.
- The Cove Shopping Center is vulnerable in the long-term to sea level rise, though could suffer sooner from combinations of higher tides and stormwater
- If US 101 is compromised, so is service and goods delivery to Tiburon businesses.
- Access to Tiburon from Corte Madera could also flood in the medium-term.
- Homes high in the hills could become isolated and cut off from necessities and the ability to leave the community, as alternative access routes are not available at this time.
- Several historic sites downtown and the old shipping terminal could flood with saltwater as early as the near-term.

IMPACTS AT-A-GLANCE

341 living units 8,500+ people 135 acres exposed 2.4 miles of roads 36 commercial parcels Storm and tidal impacts already occur **Town of Tiburon** Over \$400 million in **Property Owners** assessed value; nearly **Caltrans** \$600 million in single-family market family 186 **Marin DPW Ferry Services**

Map 70. Tiburon Sea Level Rise and 100year Storm Surge Scenarios



Source: MarinMap, CoSMoS. Credit: BVB Consulting LLC

¹⁸⁶ 2016 dollars



View of Corinthian Marina and Tiburon Ferry facilities from Shoreline Park. Credit: BVB Consulting LLC

Vulnerable Assets

Tiburon's most vulnerable assets are concentrated on the face of the peninsula, downtown, and the Cove. These areas feature housing and a number of business, civic, recreation, historic and visitor serving uses. These areas tend to draw millions of visitors a year and provide a significant amount of economic and cultural value to the community and Marin County.

Land

Low-lying land on Tiburon's steep peninsula are concentrated in small areas that ae highly developed and treasured. Bluff top parcels could expect negative impacts from storm surges that could cause the bluffs to collapse. Note that because significant amounts of development are in the uplands, the exposed land area is relatively small compared to the total area of Tiburon. Examining the exposed acreage and the vulnerable land uses on the exposed land provides a glimpse of what is at stake if actions to prepare for sea level rise are no taken.

Acres

In near- and medium-term scenarios 1, 2, 3, and 4, about fifty acres could be vulnerable. By the long-term, 106 acres could be vulnerable to sea level rise and 135 acres could be vulnerable with an additional 100-year storm surge. Despite the numeric jump, these figures account for less than one percent of Tiburon's land area.

Parcels

<u>Table 76</u> shows how many parcels are in the exposed area of the community under the six BayWAVE scenarios. About 45 to 50 parcels could be vulnerable in the near- and medium-terms. IN the long-term, this number triples to 150 vulnerable parcels. An additional 100-year storm surge at five feet of sea level rise could triple this figure again, to and 450 flooded parcels.

Table 75. Tiburon Exposed Acreage

Scenarios		Acres		
		#	%	
Near-term	1	48	0.3	
Near-term	2	47	0.3	
Medium-term	3	48	0.3	
Medium-term	4	49	0.3	
Long-term	5	106	0.6	
Long-term	6	135	0.8	

Source: MarinMap, CoSMoS

Table 76. Tiburon Vulnerable Parcels at MHHW

Scenarios		Parcels		
		#	%	
Noor tour	1	46	1	
Near-term		46	1	
Medium-term	3	47	1	
wearum-term	4	49	1	
Lang taum	5	145	4	
Long-term	6	442	12	

Source: MarinMap, CoSMoS

Table 77. Tiburon Vulnerable Residential and Commercial Parcels

	Scenario						
Land Use	1		3		5		
	#	%	#	%	#	%	
Residential	34	1	34	1	88	3	
Commercial	4	7	5	9	36	64	

Source: MarinMap, CoSMoS.



The Tiburon waterfront is vulnerable in the near-term. Source: Marin County CDA.

When taking a closer look at land use, a striking 65 percent of commercial properties could be vulnerable to long-term levels of sea level rise. In this scenario, tidal flooding could extend down Tiburon Boulevard. Additional stormwater from the hillsides would only exacerbate his flooding during storms. Reductions in service or loss due to building or inventory damage could have significant economic and employment repercussions for Tiburon. In earlier scenarios, roughly ten percent of commercial parcels could face tidal flooding at MHHW. While less than three percent of residential parcels in Tiburon could face tidal flooding, several downtown commercial buildings likely feature second story apartments.

Buildings

Many of Tiburon's Vulnerable parcels host buildings for commercial, residential, and public service activities. Compared to other communities in the study area, Tiburon has fewer buildings that could be vulnerable to sea level rise due to the bluff side development pattern. Nevertheless, these buildings provide much of Tiburon's historic and charming character.

Table 78. Tiburon Vulnerable Parcels by Land Use

	Scenarios						
Londillon	1		3		5		
Land Use	Near-term		Mediu	Medium-term		Long-term	
	#	Ac.	#	Ac.	#	Ac.	
Commercial Improved	4	1	5	1	32	18	
Commercial Unimproved					4	1	
Residential	34	10	42	10	87	19	
Multi-Family Improved	12	3	12	3	12	3	
Multi-Family Unimproved	2	0.5	2	0.5	4	0.5	
Single Family Improved	13	6	13	6	62	15	
Single Family Unimproved	7	0.5	7	0.6	7	0.6	
Tax Exempt	8	18	8	18	20	36	

Source: MarinMap, CoSMoS

Table 79. Tiburon Vulnerable Buildings

Scenarios		Buildings		
		#	%	
Near-term	1	26	1	
Near-term	2	42	1	
Medium-term	3	42	1	
	4	44	1	
Long-term	5	153	4	
	6	261	7	

Source: MarinMap, CoSMoS

<u>Table 79</u> shows how many buildings could be impacted under the six BayWAVE scenarios. The analysis shows that 20 to 50 buildings in the nearand medium-terms, and 150 buildings in the long-term are vulnerable to tidal flooding at MHHW. When a 100-year storm surge also occurs, 260 parcels would flood temporarily. The difference in scenario 6 parcel and building figures may be attributed to the nature of bluff side development, where the parcels could be impacted at the water's edge with the building safely elevated above and/or back from the edge.

In the downtown area, several of the buildings impacted first are restaurants that feed locals and

visitors, later the condos and other office facilities and housing just beyond the Tiburon Blvd. and Main Street intersection. Heading north along Tiburon Blvd. are several buildings, including CVS, Town Hall, Library, and other Tiburon offices that could expect tidal flooding in the long-term. Some of these buildings are newer construction and elevated with floating foundations designed to maintain stability of soggy soils. Because of this, these buildings may be able to withstand seasonal flooding; however, parking and access points could be compromised then and when tidal waters reach the area.

Housing is primarily impacted along the bluff edge around the peninsula. These properties may have docks and other structural components on the water that would be adjusted or lost first. Another batch of homes could suffer tidal impacts just east to the Cove Shopping Center in the long-term. The shopping center, which could expect over one foot of water in the medium-term and over 3 feet of water in the long-term, and the adjacent stretch of Tiburon Blvd. already face seasonal stormwater flooding. The site is equipped with a high capacity pump station to prevent flooding here. Additional tidal forces against the stormwater flow could burden the pump station and may result in more severe stormwater back-ups during high tides.

<u>Table 80</u> divides the vulnerable buildings by how much water could fill the property, whether it is one, two, or ten feet of tidal waters at MHHW. In scenario 1, a few buildings downtown are flooded with seven to nine feet of water. In scenario 3, a few are flooded at low levels of flooding, and the buildings impacted in scenario 1 flood with deeper waters. In the long-term, scenario 5, nearly 100 buildings could be under three feet of flood waters, with a few buildings vulnerable to between three and six feet of flooding. The same buildings measured in scenario 1 remain under deep water at MHHW.

<u>Table 81</u> outlines cost estimates for damage to buildings and their contents under scenario 6, the worst case storm surge scenario analyzed in this assessment. The analysis uses the FEMA damage tagging levels of yellow for minor damage of \$5,000 and no more than \$17,000 per building, orange for moderate damage of more than \$17,000, and red for destroyed structures. Nearly \$200 million of damage could occur if all vulnerable buildings in scenario 6 were to be destroyed in the long-term. This figure assumes all of the vulnerable buildings in scenario 6 experience one of the three damage levels,

destroyed. Reality would likely reflect a mix of damage levels.

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.

Table 80. Tiburon Vulnerable Buildings Average Flood Depth* Estimates at MHHW

Flood Depth		Scenario				
(feet)		1	3	5		
0.1-1	#		1	22		
1.1-2	#		0	34		
2.1-3	#		1	37		
3.1-4	#			18		
4.1-5	#			4		
5.1-6	#			1		
6.1-7	#		1	1		
7.1-8	#	5	2	1		
8.1-9	#		2	1		
9.1- 10	#	1	2	2		
10.1+	#			1		

Source: MarinMap, CoSMoS

Table 81. Tiburon Vulnerable Buildings FEMA Hazus Damage Estimates for Longterm Scenario 6

Buildings in Scenario 6	261
Yellow Tag-Minor Damage \$5,000 minimum	\$1,305,000
Orange Tag: Moderate Damage \$17,001 minimum	\$4,437,261
Red Tag-Destroyed Assessed structural value	\$187,457,062

Source: MarinMap, CoSMoS

^{*} Flood depth data is not available for all exposed areas and assets.

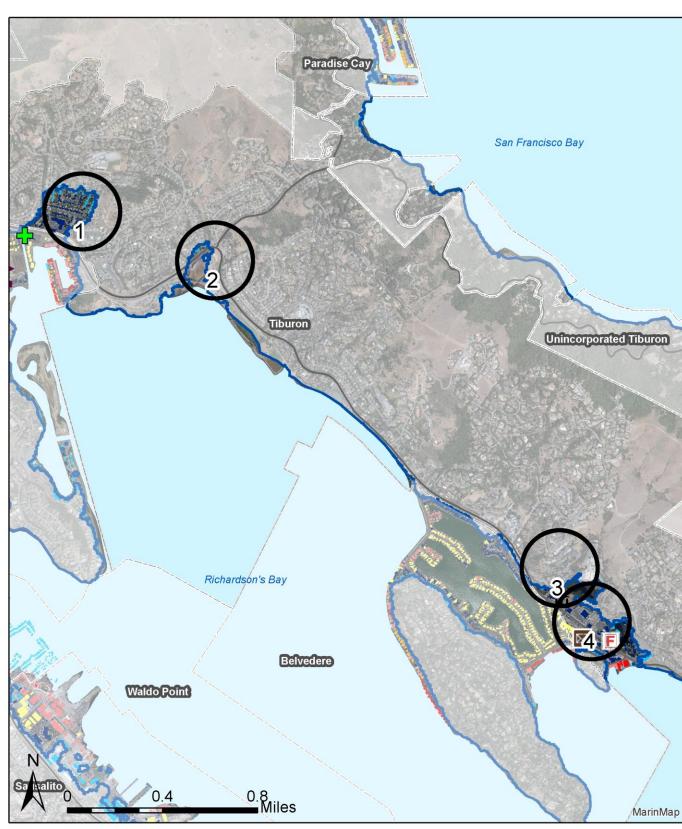
Map 71. Tiburon Vulnerable Buildings **Vulnerable Assets** Post Office $\widehat{\mathbf{m}}$ City Hall **Emergency Shelter** Fire Station **Vulnerable Buildings** Scen. 1: 10" Sea Level Rise (SLR) Scen. 2: 10" SLR+Storm Surge Scen. 3: 20" Sea Level Rise Scen. 4: 20"SLR+Storm Surge Scen 5: 60" Sea Level Rise Scen. 6: 60"SLR+Storm Surge **Location Indicators** Unincorporated Municipality Road

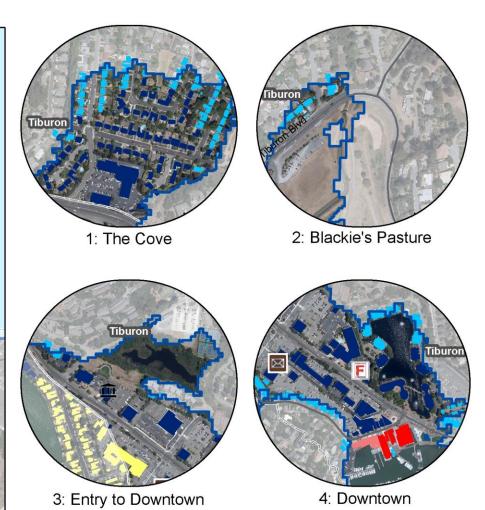
Inland Extent: Sea Level @ 60"+100-year Storm

Bay

Marin County







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.

Transportation

The first road that could be impacted is Brunini Way in scenario 2. Additional roads downtown and west of Tiburon Boulevard may avoid impacts until after medium-term scenarios 3 and 4. Tiburon Boulevard could expect 100-year storm surge impacts in scenario 6 at Main Street, Paradise Drive, and the Cove. Tiburon Boulevard is the main access road to Tiburon. Paradise Drive offers a windy alternative; however, Paradise Drive faces its own flooding issues in Corte Madera. In addition to roads, the Bay Trail could expect flooding downtown and erosion along its course.

Roads could erode and deteriorate faster if they are repeatedly exposed to salt water. Vehicles can also be destroyed by salt water exposure. Temporary closures to the road and bicycle network could have significant impacts on commuting to and from the peninsula to US Highway 101, completing daily routines, recreational opportunities, and emergency vehicle access. Disruptions in the road network would disrupt Golden Gate Transit Route 8 service along Tiburon Boulevard and at the following stops:

- Tiburon Blvd. and Mar West St.,
- Tiburon Blvd. and Main St., and
- Tiburon Blvd. and Beach Rd.

If public transportation gets cut off because roads are inundated, people who travel through or to the area for work would be cut off. Similarly, people with mobility or health constraints will be affected.

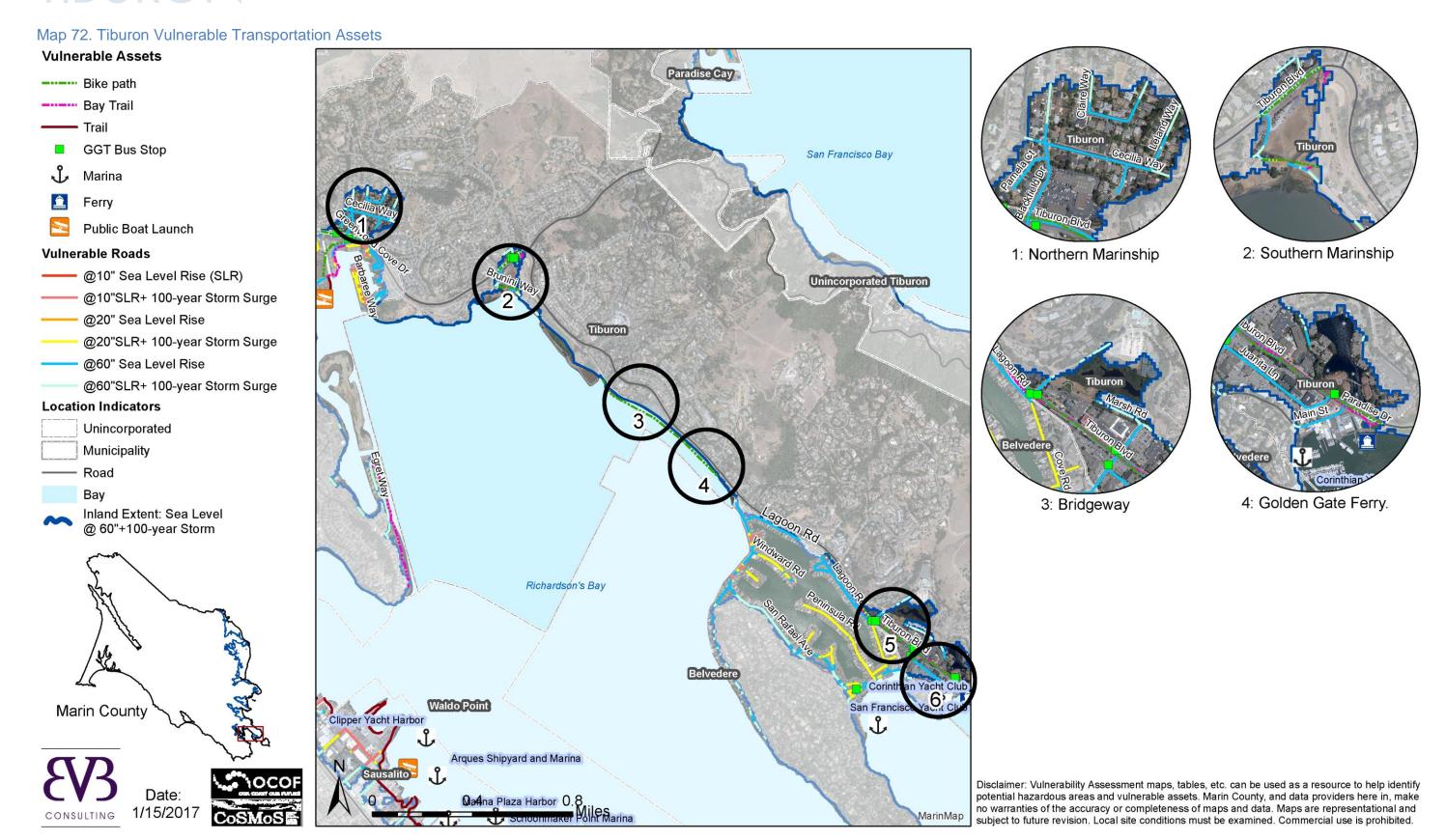
Tiburon also features a robust boating center with the Corinthian Yacht Club, the Blue and Gold commuter ferry to San Francisco, and the Angel Island Ferry. These sites can typically adjust to higher tides, though they made need to be elevated. If the adjacent land severely floods, access to these water transportation features may not be available. This could significantly impact commuting to San Francisco via ferry, and travel to Angel Island. In addition, several private docks could be vulnerable in their current elevations. These facilities are anticipated to tolerate higher tides; however, storms are known to damage piers, docs, and other marina structures.

<u>Table 82</u> lists Tiburon transportation routes by when they are exposed to salt water at MHHW. The maps on the following pages illustrate vulnerable transportation features. 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.

Table 82. Tiburon Vulnerable Transportation Assets

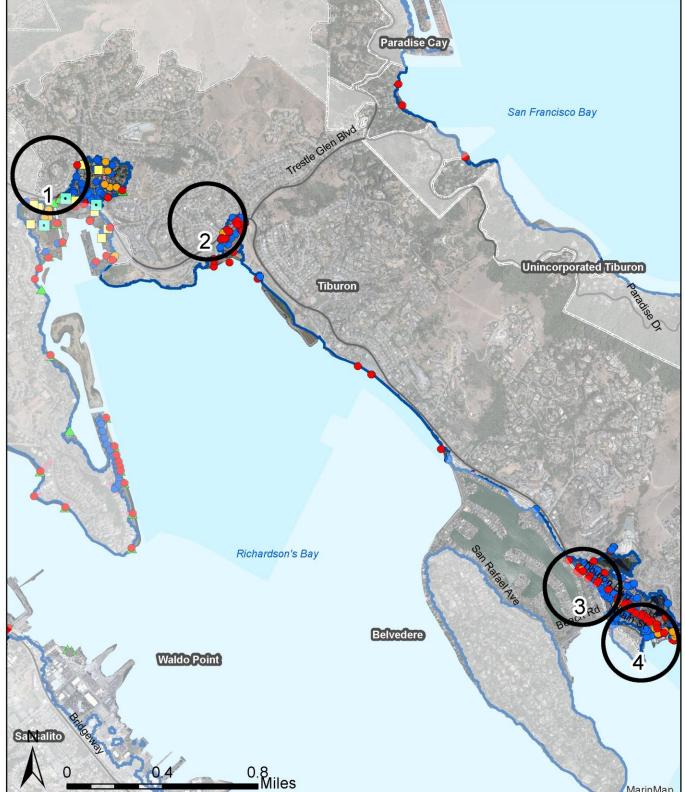
Near	-term	Med	dium-term	Long-t	erm
Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
None	0.01 miles	None	0.02 miles	1.5 miles	2.5 miles
	Brunini Wy ^L		Road from scenario 2	Road from scenarios 2 & 4 Beach Rd L Blackfield Dr L Blackies' Pasture Rd L Cecilia Wy L Claire Wy L Harriet Way L Juanita Ln L Lagoon Vista L Leland Wy L Main St L Mar West St L Marsh Rd L Pamela Ct L Paradise Dr L, M	Roads in scenarios 2, 4, & 5 Tiburon Blvd ^C Jefferson Dr ^L Washington Ct ^L

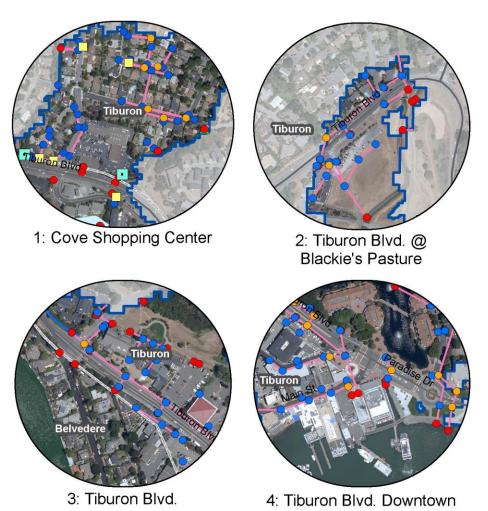
M = Marin County; C = State of California; L = Local Municipality; P = Private. Source: MarinMap, CoSMoS



Map 73. Tiburon Vulnerable Stormwater Management Assets

Vulnerable Assets Catch Basin Manhole Structures Pipe Inlet/Outlet **Pump Station** Channel Stormwater Pipe **Location Indicators** Unincorporated Municipality Road Bay Inland Extent: Sea Level @ 60"+100-year Storm





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Marin County

consulting 2/15/2017



Pump station and overflow pond at the Cove Shopping Center. Credit: Marin County DPW

Utilities

Tiburon will likely face utility issues common in other shoreline communities in the study area, including:

- Underground pipes face compounding pressure forces from water and the road,
- Road erosion and collapse with underlain pipes,
- 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.

The smaller of two treatment plants in Sanitary District No. 5, the Paradise Cove Plant, would be impacted at scenario 6, 5 feet of sea level rise, plus 100-year storm surge. The main issues are worsening erosion and flooding at this site, saltwater intrusion for sewer lines along Tiburon Boulevard that run along the beach, a manhole at Beach Road and Tiburon Boulevard that already floods, and pump station electrical panels.

The primary treatment facility off Tiburon Boulevard could anticipate some flooding during storm surges in the parking lot. This flooding may also create access issues for employees and cause wear and tear on facility vehicles and equipment.

A majority of the pipes are original, and are planned for replacement, including the force main for Belvedere. All sewage is pumped from smaller pump stations to one main pump station and the 50-year old connecting pipe needs repair. 187

The maps on the previous pages illustrate vulnerable utility features. 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.

Natural Resources

The Tiburon Peninsula provides ample bird habitat, fishing, and other open water habitats. Small marshes also support wetland species. These habitats are very narrow and may already be drowned out at existing high tides. As sea level rises, these habitats could become dominated by standing water. Eelgrass is also a critical tidal habitat, typically in slightly deeper, saltier waters, associated with rocky ground. Eelgrass was observed off Tiburon Point off the high bluff extending into the San Francisco Bay. Eelgrass beds are recognized by both federal and state agencies as sensitive and highly valuable habitat for a suite of species. They are managed under the Magnuson-Stevens Fishery Conservation Management Act. Eelgrass beds are listed as a Habitat Area of Particular Concern because they are susceptible to degradation, especially ecologically important, and/or located in an environmentally stressed area. As mean low tide rises closer to the bluff edge, these essential plants would be stressed by inadequate sunlight.

The longfin smelt is the only listed species recorded in this area. The smelt is list as threated on the California species list and a candidate for the federal list. The San Pablo Song sparrow is unique to the area and lives in potentially vulnerable habitat. In addition, the Tiburon Mariposa Lily at Ring Mountain could also be vulnerable to increased salinity.

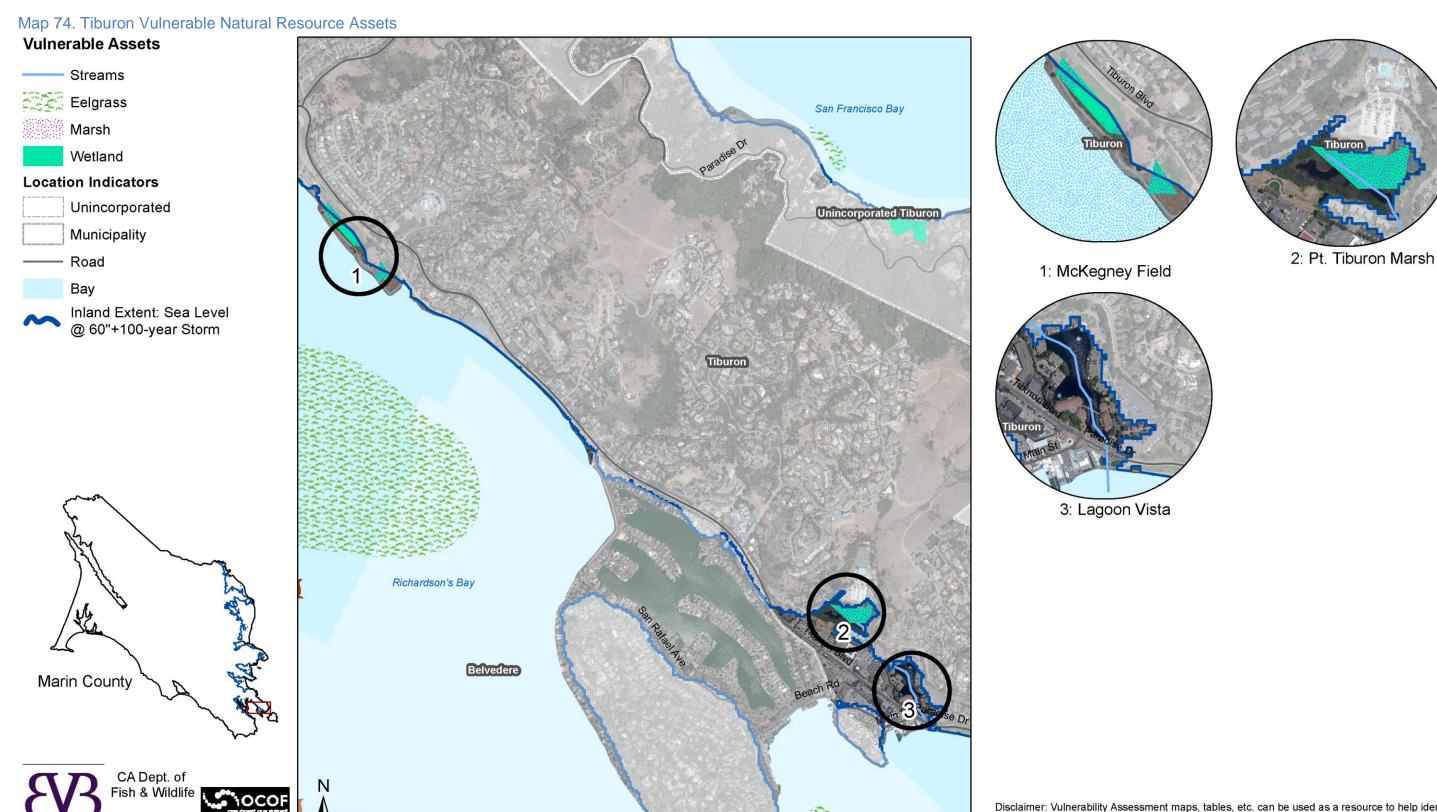
Recreation

Tiburon is a destination for visitors via ferry, boat, bike, and car. The shoreline view of San Francisco, water bordering restaurants, and a walkable downtown, draw tourists from around the world to this small community. The main concern is reduced functionality of vulnerable transportation assets,

¹⁸⁷ Sea Level Rise Interview. Jan. 20, 2016. Sanitary District No. 5. Tony Rubio. Interviewed by C. Choo, Marin County Public Works.

including the Bay Trail and ferry service to San Francisco and Angel Island State Park. In addition, restaurants, hotels, and other visitor serving facilities on the shoreline could be vulnerable in the nearterm. Potentially vulnerable hotels are the Water's Edge Hotel and the Lodge at Tiburon.

The maps on the following pages illustrate vulnerable natural resource, recreation, emergency and historic features. 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.



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MarinMap

1/24/2017

0.4 Miles

Map 75. Tiburon Vulnerable Emergency Assets **Vulnerable Assets** 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. F Fire Station 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 San Francisco Bay 0.2 —Miles 0.1

CONSULTING 2/14/2017

MarinMap

Map 76. Tiburon Vulnerable Cultural Resource Assets

Vulnerable Historic Buildings

@10" Sea Level Rise

@10"+ Storm Surge

@20" Sea Level Rise

@20"+ Storm Surge

@60" Sea Level Rise

@60"+ Storm Surge

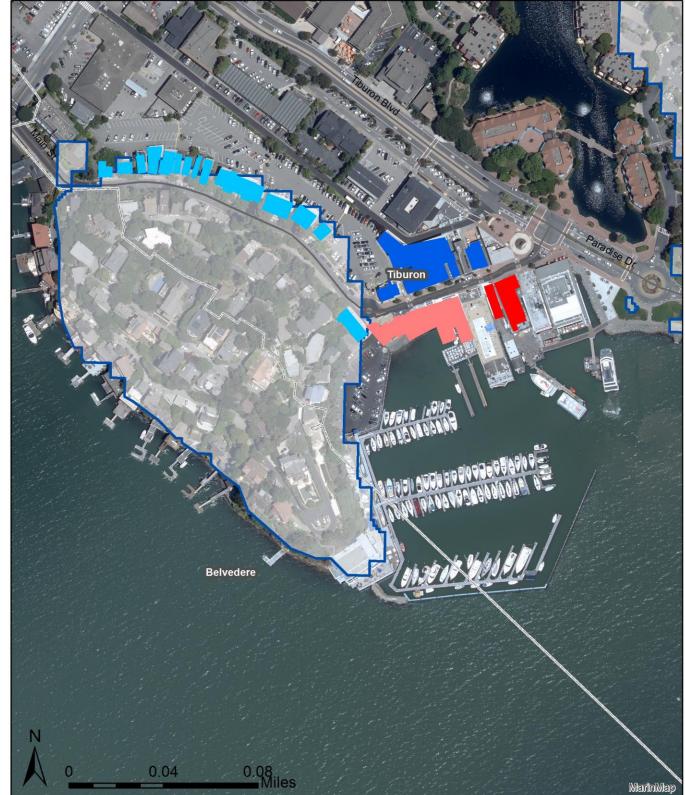
Location Indicators

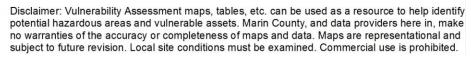
Municipality

- Major Road

Marin County

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





Date: 2/17/2017



Tiburon's Main Street buildings date back to the early 1900s. Credit: Marin County CDA



Southern terminus of the Northwestern Pacific Railroad, Tiburon. Credit: San Francisco and North Pacific Railroad Station House-Depot National Register of Historic Places

Emergency Services

The Tiburon Fire Department could tidally flood in the long-term and experience restricted access throughout and out of downtown Tiburon. If Tiburon Boulevard is compromised, service up to the bluff may take longer. Service to the Cove area could be hindered by flooding on Tiburon Boulevard and within the Cove neighborhood itself.

Cultural Resources

Vulnerable historic buildings in Tiburon are the Peter Donahue Building on the National Register of Historic Places¹⁸⁸ and several others on the Local Historic Inventory for Downtown Tiburon. Vulnerable historic sites include over 20 buildings built in the 1920s along upper and lower Main Street. Then and now, commercial uses provide commuters and visitors using the Tiburon Ferry Terminal. Several lower Main Street sites could be subject to tidal inundation in the near-term. Upper Main Street sites

¹⁸⁸ Arnett, V.M. 1994. National Register of Historic Places Form-San Francisco and North Pacific Railroad Station House & Depot. are subject to storm surge flooding in the long-term. Just beyond the downtown, the San Francisco and North Pacific Railroad Station House-Depot, or the Peter Donahue Building, could be vulnerable to the 100-year storm surge in long-term scenario 6. Overall, these buildings could be vulnerable to over eight feet of tidal and storm surge flooding.

<u>Table 83</u> lists example vulnerable assets in Tiburon by onset and flood depth. A 100-year storm surge would add an additional 1 to 3 feet of water to these properties. Note also, above average high tides, such as king tides, could impact more properties than accounted for in this analysis.

Table 83. Example Tiburon Vulnerable Assets by Onset and Flooding at MHHW

Account by Chiece	Scenarios				
Asset	Near- term	Medium -term	Long- term		
	1	3	5		
Waterfront	9'2"	9'11"	12'9"		
Pt. Tiburon Shoreline Park	8'	8'8"	11'6"		
Ferry facilities	4'	5'	12'9"		
Corinthian Yacht Club	4'	4'3"	11'		
Richardson Bay Lineal Park	0-3'	1"-3'7"	1"-15'		
Blackie's Pasture	0-9"	5'4"	12'9"		
Cypress Garden Park	7"	1'4"	4'4"		
Tiburon Blvd. shopping		4"-2'	1'-5'4"		
Cove Shopping Center		1'8"	3'11"		
Post office		1'6"	3'11"		
Tiburon Fire Department		1'	2'6"		
Town Hall		1'	2'2"		
Town Library		1'	2'2"		
Tiburon Blvd.			9"-5'		
Zelinsky Park			4'10"		
Pt. Tiburon Marsh			4'4"		
Bay Trail			6"-3'		
Main Street			4"-2'5"		
Bel Aire Park			2'4"		

Source: MarinMap, CoSMoS