Our Coast, Our Future

Applications for Marin County

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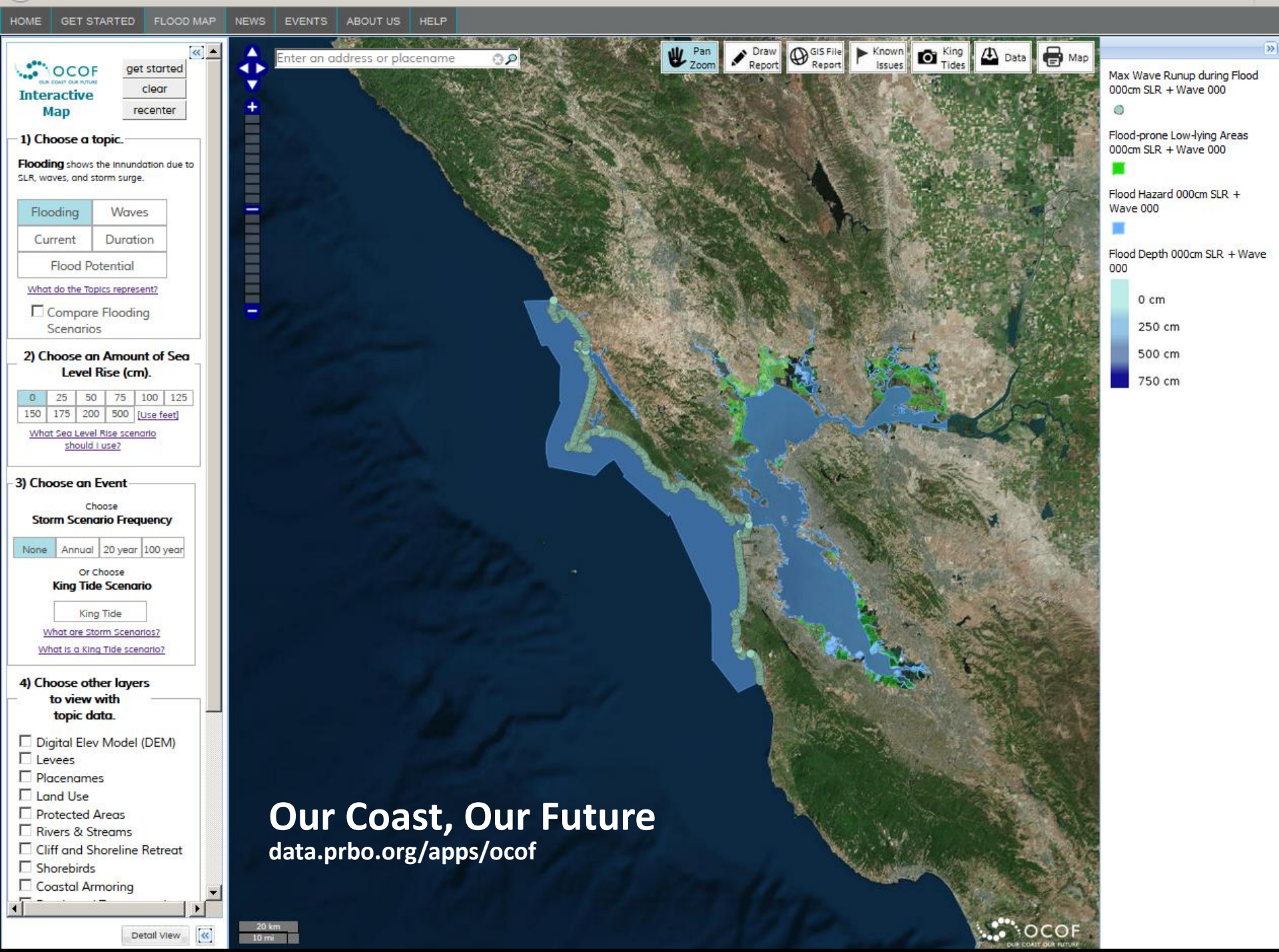
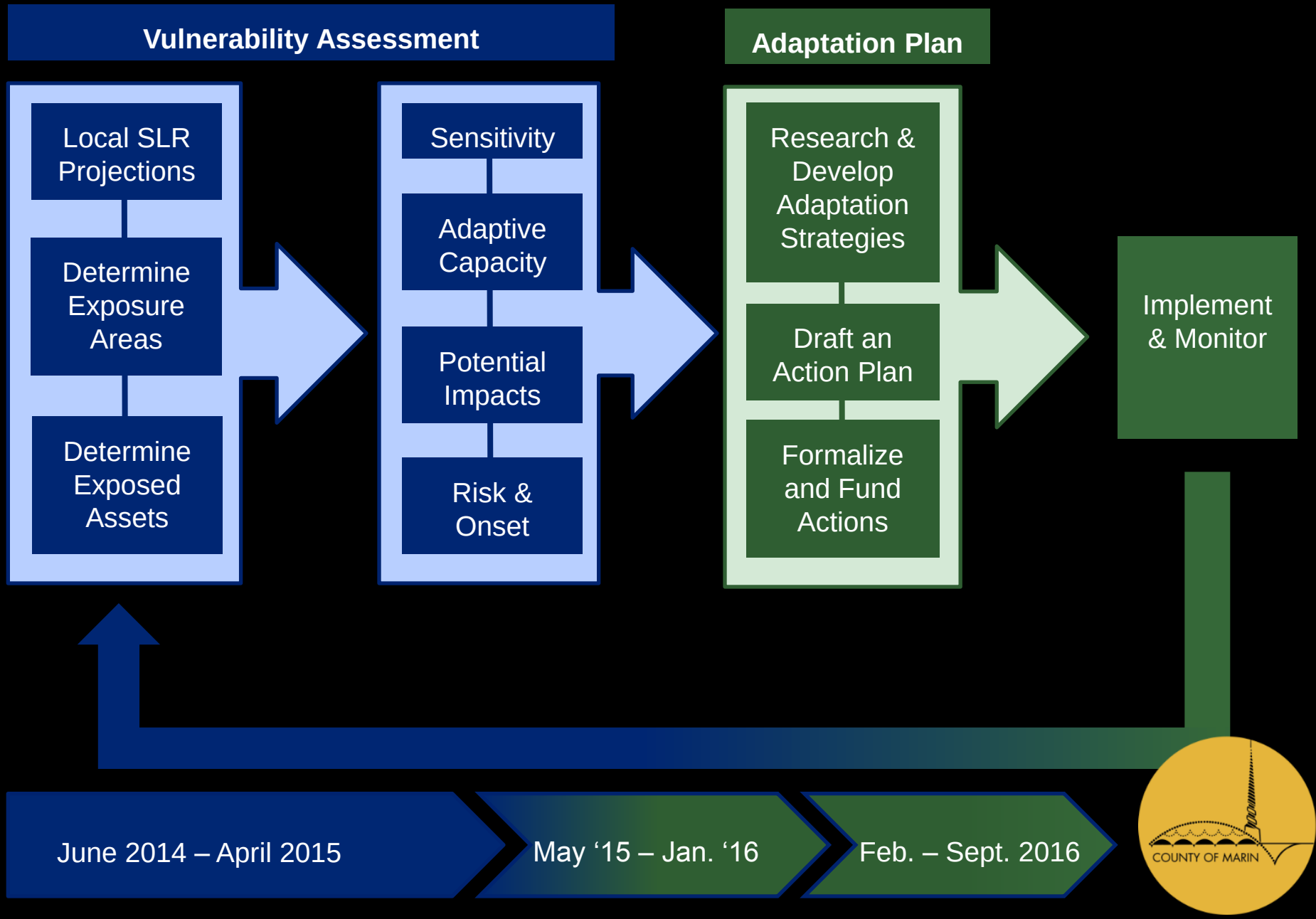
Marin County CDA
7-14-16


Marin County
Bodega Bay
Cotati
Boyes Hot Springs
Napa
El Verano
Sonoma
Fallon
Temelec
Dillon Beach
Schellville
Tomales
Petaluma
Hamlet
Nicks Cove
Lakeville
Marshall
Burdell
Sears Point
Olompali
Novato
San Pablo Bay National Wildlife Refuge
Inverness
Point Reyes Station
Indian Tree Preserve
Point Reyes National Seashore
San Pablo Bay
Olema
Tocaloma
Lucas Valley-Marinwood
Jewell
San Geronimo
Drakes Bay
Woodacre
Santa Venetia
Five Brooks
Fairfax
Bayview-Montalvin
San Rafael
San Anselmo
San Pablo
Corte Madera
Richmond
Larkspur
El Cerrito
Bolinas
Mill Valley
Bolinas Bay
Stinson Beach
Albany
Tamalpais-Homestead Valley
Berkeley
Muir Beach
Sausalito
Golden Gate National Recreation Area
Emeryville
Oakland
San Francisco
Richmond District
Gulf of the Farallones Marine Sanctuary
Farallon Islands


Marin County, California


HOME
GET STARTED
FLOOD MAP
NEWS
EVENTS
ABOUT US
HELP
OCOF
Interactive Map
get started
clear
recenter
1) Choose a topic.
Flooding shows the inundation due to SLR, waves, and storm surge.
Flooding
Waves
Current
Duration
Flood Potential
What do the Topics represent?
Compare Flooding Scenarios
2) Choose an Amount of Sea Level Rise (cm).
0
25
50
75
100
125
150
175
200
500
[Use feet]
What Sea Level Rise scenario should I use?
3) Choose an Event
Choose
Storm Scenario Frequency
None
Annual
20 year
100 year
Or Choose
King Tide Scenario
King Tide
What are Storm Scenarios?
What is a King Tide scenario?
4) Choose other layers to view with topic data.
Digital Elev Model (DEM)
Levees
Placenames
Land Use
Protected Areas
Rivers & Streams
Cliff and Shoreline Retreat
Shorebirds
Coastal Armoring
Detail View
Enter an address or placename
Pan Zoom
Draw Report
GIS File Report
Known Issues
King Tides
Data
Map
Max Wave Runup during Flood 000cm SLR + Wave 000
Flood-prone Low-lying Areas 000cm SLR + Wave 000
Flood Hazard 000cm SLR + Wave 000
Flood Depth 000cm SLR + Wave 000
0 cm
250 cm
500 cm
750 cm
Our Coast, Our Future
data.prbo.org/apps/ocof
20 km
10 mi
OCOF

C-SMART Process



Data Layers

- **Flood Hazard**
- **Flood Depth (tif)**
- **Flood Duration**
- **Low-lying areas**
- **Maximum Inundation**
- **Minimum Inundation**
- **Maximum Wave Height**
- **Maximum Wave Runup**
- **Velocities**

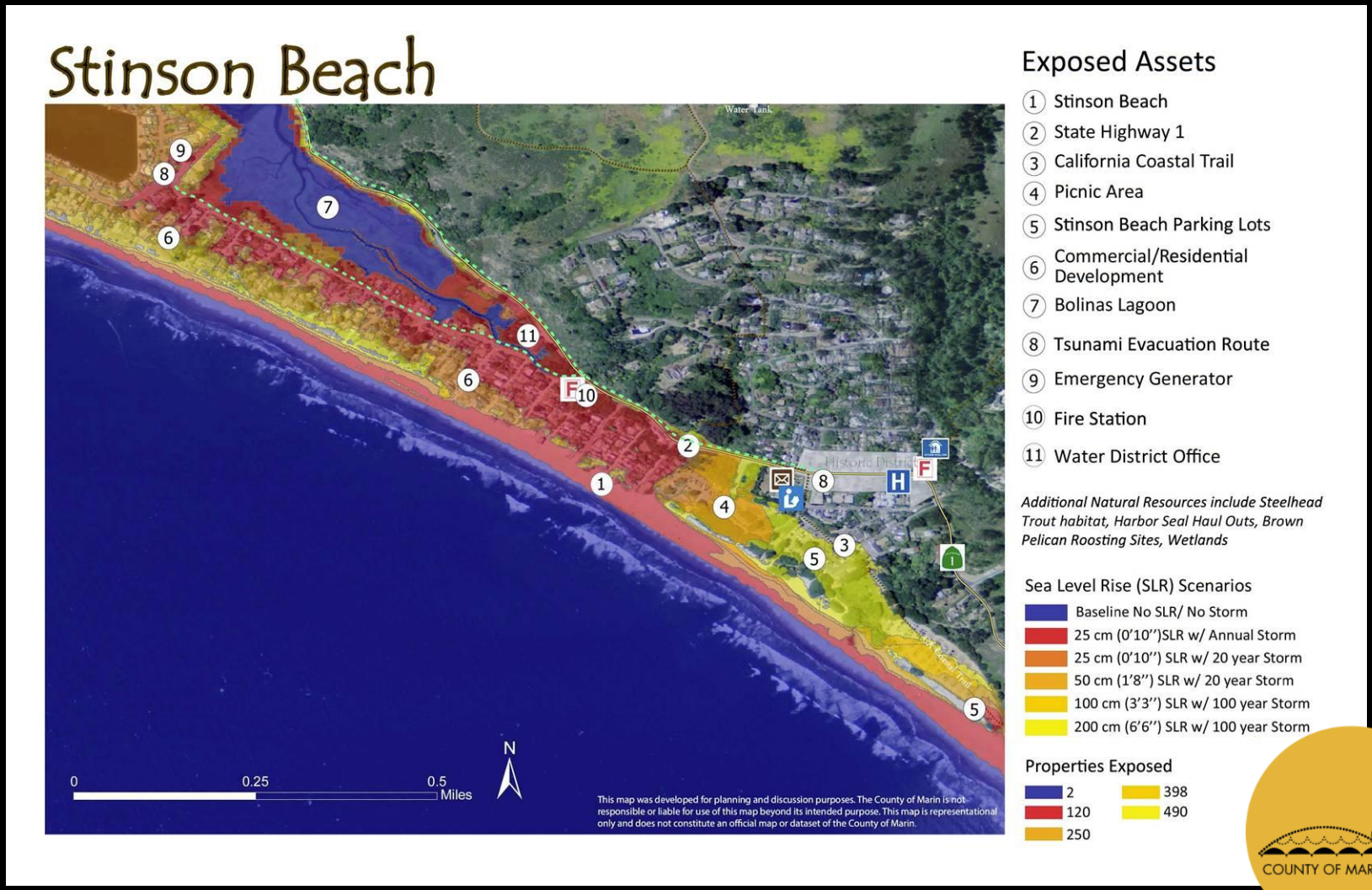
40 different SLR scenarios

	No storm	Annual storm	20-year storm	100-year storm
0cm SLR				
25cm SLR		*	*	
50cm SLR			*	
75cm SLR				
100cm SLR				*
125cm SLR				
150cm SLR				
175cm SLR				
200cm SLR				*
500cm SLR				

* Marin County selected SLR scenarios

Step 1 – Exposure

Potential changes in water level from sea level rise and storm events and geomorphic change, and the built and natural assets that could be impacted.



ASSET MAPPING

Mapping people; livelihoods; environmental services and resources; infrastructure; and economic, social, & cultural assets

- Agricultural land
- Protected areas
- Public beaches and parks
- Dunes
- River & streams
- Wetland areas
- Habitat areas
- Oyster beds
- Sandspits
- Shorebirds
- Roads and transportation
- Trails
- Buildings
- Residential development
- Commercial buildings
- Schools
- Elderly/mobility limited facilities
- Hotels/Motels
- Harbors and marinas
- Fishing, aquaculture facilities
- Utilities & services
- Septic leach fields
- Water Supply wells
- Archeological/ Paleontological
- Historic sites

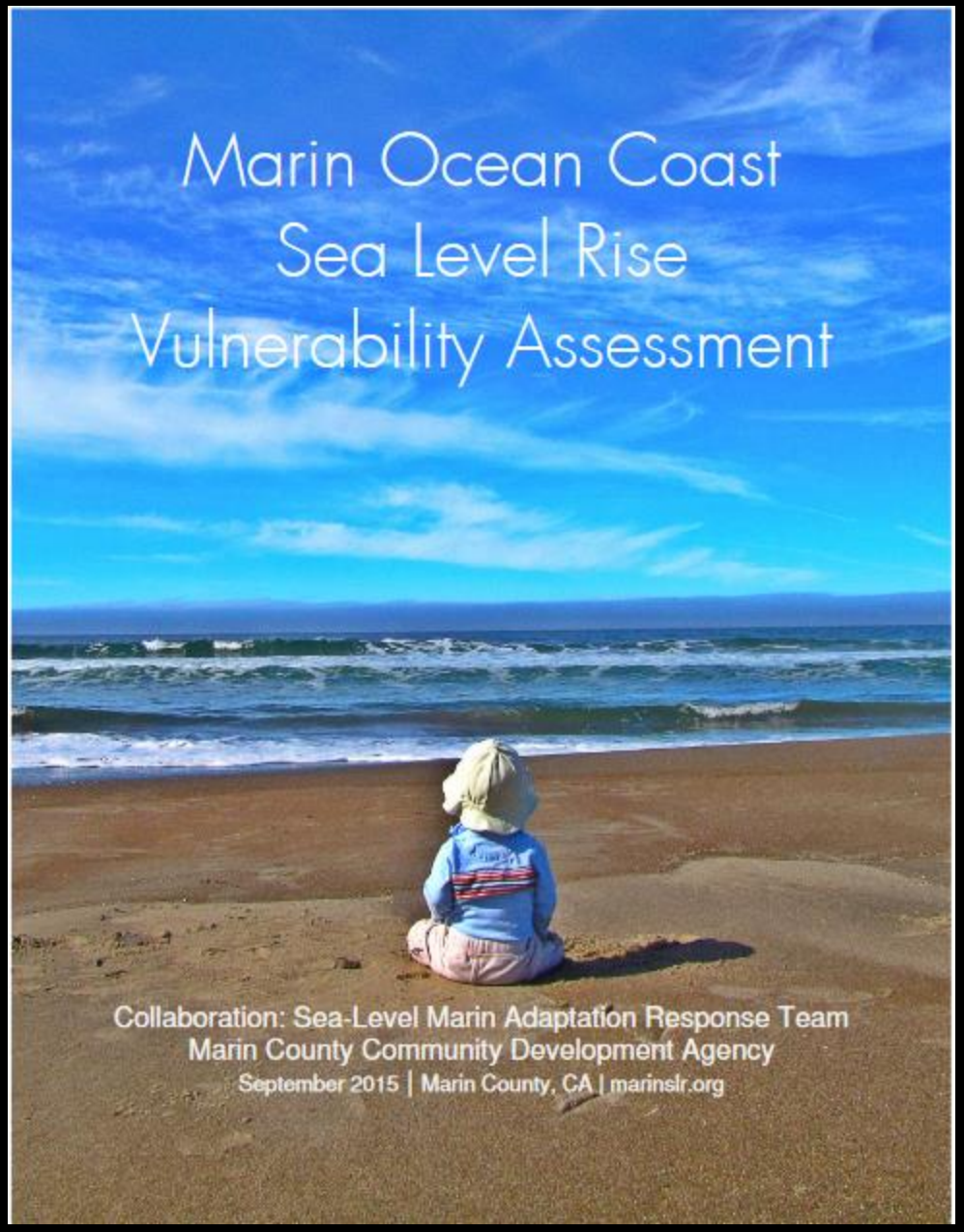
COUNTY OF MARIN

Community Profiles

Muir Beach • Stinson Beach • Bolinas • Inverness • Point Reyes Station • Eastshore • Dillon Beach

Asset Profiles

Parcels & Buildings • Transportation • Utilities • Working Lands • Recreation • Emergency Services • Historic and Archaeological



Exposure Tables

Table 7. Exposed Parcels & Buildings by Scenario

	Parcels		Buildings	
	#	%	#	%
Scenario 1	824	16%	372	8%
Scenario 2	1,046	20%	588	10%
Scenario 3	1,085	21%	680	11%
Scenario 4	1,150	21%	853	14%
Scenario 5	1,298	25%	1,076	18%

Source: Marin Map, OCOF

Table 16. Miles of Exposed Road Segments

	Shoreline Hwy	Sir Francis Drake Blvd.	Local & Private
Scenario 1	0.68 (2%)	0.02 (0.1%)	1.77 (> 1%)
Scenario 2	1.24 (4%)	0.02 (0.1%)	3.08 (1%)
Scenario 3	1.79 (5%)	0.15 (1%)	3.30 (2%)
Scenario 4	2.30 (7%)	0.53 (4%)	4.82 (2%)
Scenario 5	6.70 (19%)	2.35 (17%)	10.4 (3.5%)

Source: Marin Map

Table 8. Exposed Parcels by Community and Land Use

	Scenario 1				Scenario 3				Scenario 5			
	Residential		Commercial		Residential		Commercial		Residential		Commercial	
	#	%	#	%	#	%	#	%	#	%	#	%
Stinson Beach	295	36%	6	21%	556	68%	6	21%	566	69%	6	21%
Bolinas	27	2%	1	7%	53	5%	4	27%	94	8%	13	87%
Inverness	38	3%	7	37%	72	6%	8	42%	108	9%	10	53%
Pt. Reyes Station	9	2%	3	8%	11	3%	3	8%	30	8%	4	11%
East Shore	66	49%	9	90%	105	78%	9	90%	114	84%	10	100%
Dillon Beach	0	0%	1	4%	1	0%	1	4%	6	1%	3	10%
TOTAL	435	10%	27	20%	798	19%	31	23%	918	22%	46	33%

Source: Marin Map Parcel Layer Land Use Description 2014

Flood Depth Tables

STINSON BEACH

Table 37. Stinson Beach Building Permanent and Temporary Flood Depths
(Total number and the portion (%) of the buildings exposed in that scenario)

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Buildings Exposed	#	223	430	466	591	660
Temporary Inundation	#	207	414	401	427	110
	%	93%	96%	86%	73%	17%
0 - 1.5 feet	#	106	184	186	114	32
	%	97%	99%	99%	93%	80%
1.5 - 3 feet	#	61	119	120	87	35
	%	92%	98%	91%	91%	56%
3 - 4.5 feet	#	35	57	61	72	22
	%	81%	97%	90%	78%	49%
4.5 - 6 feet	#	5	46	27	59	14
	%	100%	94%	84%	70%	12%
6 - 7.5 feet	#		8	7	61	4
	%		53%	18%	62%	5%
7.5 - 9 feet	#			0	25	2
	%			0%	42%	2%
9 - 10.5 feet	#				8	0
	%				22%	0%
10.5 - 12 feet	#				1	0
	%				100%	0%
12 - 13.5 feet	#					0
	%					0%
Permanent Inundation	#	16	16	65	164	549
	%	7%	4%	14%	27%	83%
0 - 1.5 feet	#	3	1	1	8	8
	%	3%	1%	1%	7%	20%
1.5 - 3 feet	#	5	3	12	9	27
	%	8%	2%	9%	9%	44%
3 - 4.5 feet	#	8	2	7	20	23
	%	19%	3%	10%	22%	51%
	#	0	3	5	25	105

Flood Depth Tables

BOLINAS

Table 45. Bolinas Vulnerable Assets

Asset (not exhaustive)	Tidal & Extreme Event Flooding Depth Estimates Underlined values indicate tidal flooding at mean higher high water (MHHW) based on one geographic point located at the landward limit of the first scenario where it overlaps the asset. Values not underlined represent extreme event flooding. A maximum value is provided for groups of buildings. Roads received a high, used for ranking, and low value along the line segment.					Vulnerability TF: Temp. Flooding during extreme events; I: Inundated at MHHW; E: Erosion; WT: Water Table; SI: Saltwater Intrusion; WS: Wave Surge; HW: High Wind, HS: Habitat Shift
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	
Tsunami Evacuation Route	2'4"	1'8"	2'5"	4'2"	7'9"	TF, I, WS, E
Downtown Buildings	1'8"+1'5"	1'8"+2'2"	2'7"+2'	4'5"+2'1'	7'9"+1'7"	I, WT, WS, TF
Wharf Road	6" - 2'1"	3" - 2'4"	2" - 2'9"	1" - 5'4"	10" - 7'4"	I, TF
Agate Beach	2'1"	1'11"	2'8"	4'8"	9'3"	I
Shoreline Hwy	0"- 1'8"	0" - 2'3"	0" - 3'1"	0.4" - 4'10"	0.4" - 8'6"	I, TF
Historic District		3'10"	4'8"	6'4"	10'	I, E
Bluff Top Buildings	X	X	X	X	X	E
Sewage Lift Station			3'3"	5'	8'7"	TF, I
Olema-Bolinas Road			2'8"	4" - 4'4"	2" - 7'11"	I, TF
Bolinas Super Market			8"	2'6"	6'1"	I, E, SI
Bolinas Library				1'8"	5'3"	I, TF
Bo-Gas Station				1'7"	5'3"	I
Gospel Flats				1'7"	5'3"	I, WT, SI, TF
Community Center Emergency Shelter				1'7"	5'2"	I, E
Community Land Trust Housing				1'2"	4'10"	I
Church: Calvary Presbyterian					5'10"	I, TF
Bob Stewart Trail					4'8"	I, TF
Bolinas People's Store					3'	I, TF

Future Hazardous Conditions

Table 12. Buildings Potentially Facing Hazardous Conditions

	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	#	%	#	%	#	%	#	%	#	%
East Shore	43	13%	59	18%	61	18%	56	17%	125	38%
Stinson	27	2%	48	4%	89	8%	239	21%	582	51%
Bolinas	3	<1%	6	<1%	15	1%	25	1%	98	5%
Inverness	4	<1%	4	<1%	4	<1%	14	1%	36	2%
Pt. Reyes Station									36	4%

Source: Marin Map, OCOF

Table 40. Stinson Beach Buidings Potentially Facing Hazardous Conditions (feet, inches)

Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		
#	%	#	%	#	%	#	%	#	%	Value*
27	2%	48	4%	89	8%	239	21%	582	51%	$217,439,909

*Improvement Assessed Value Marin County Assessor 2014. Source: Marin Map

Beach Erosion

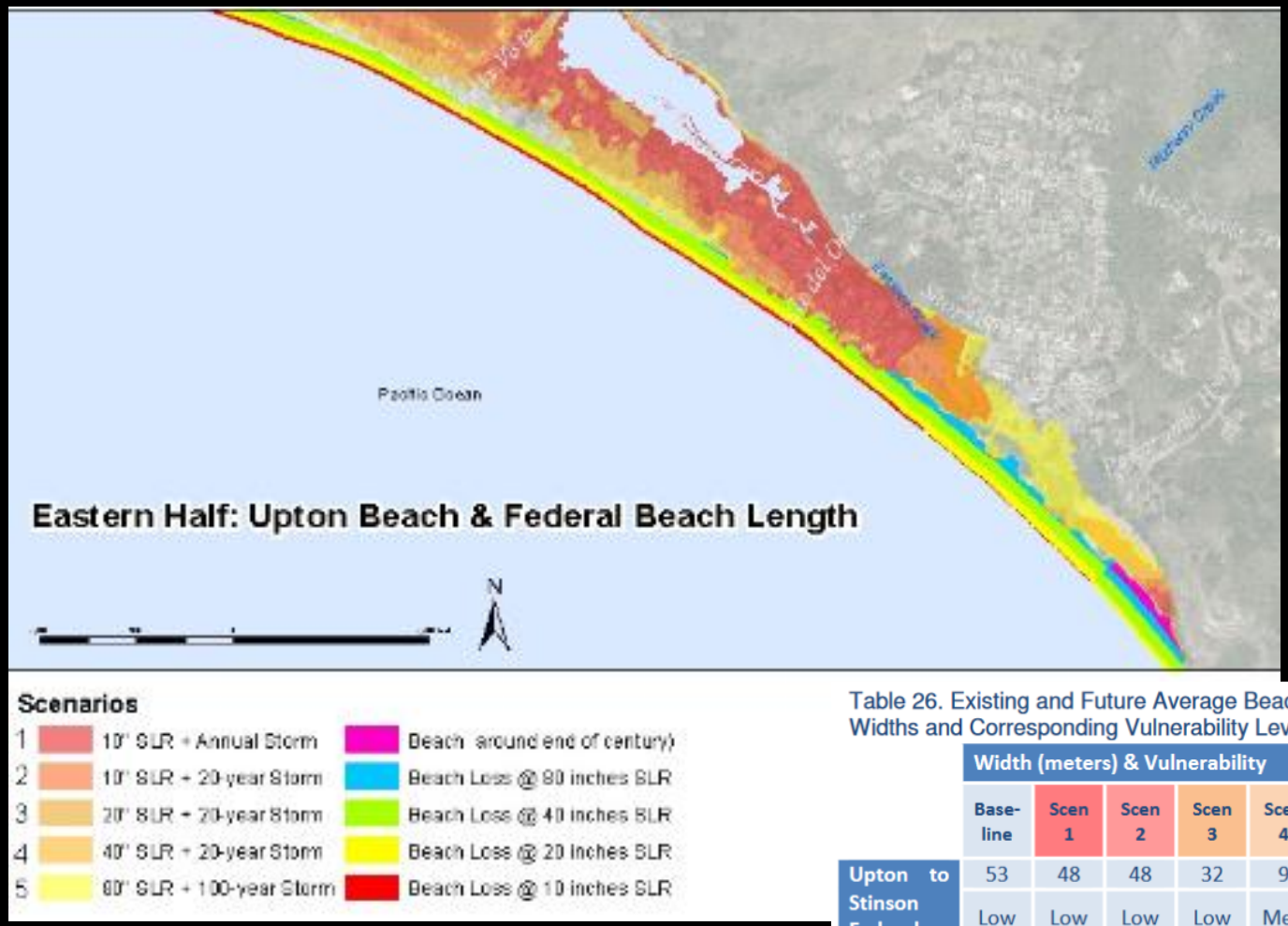
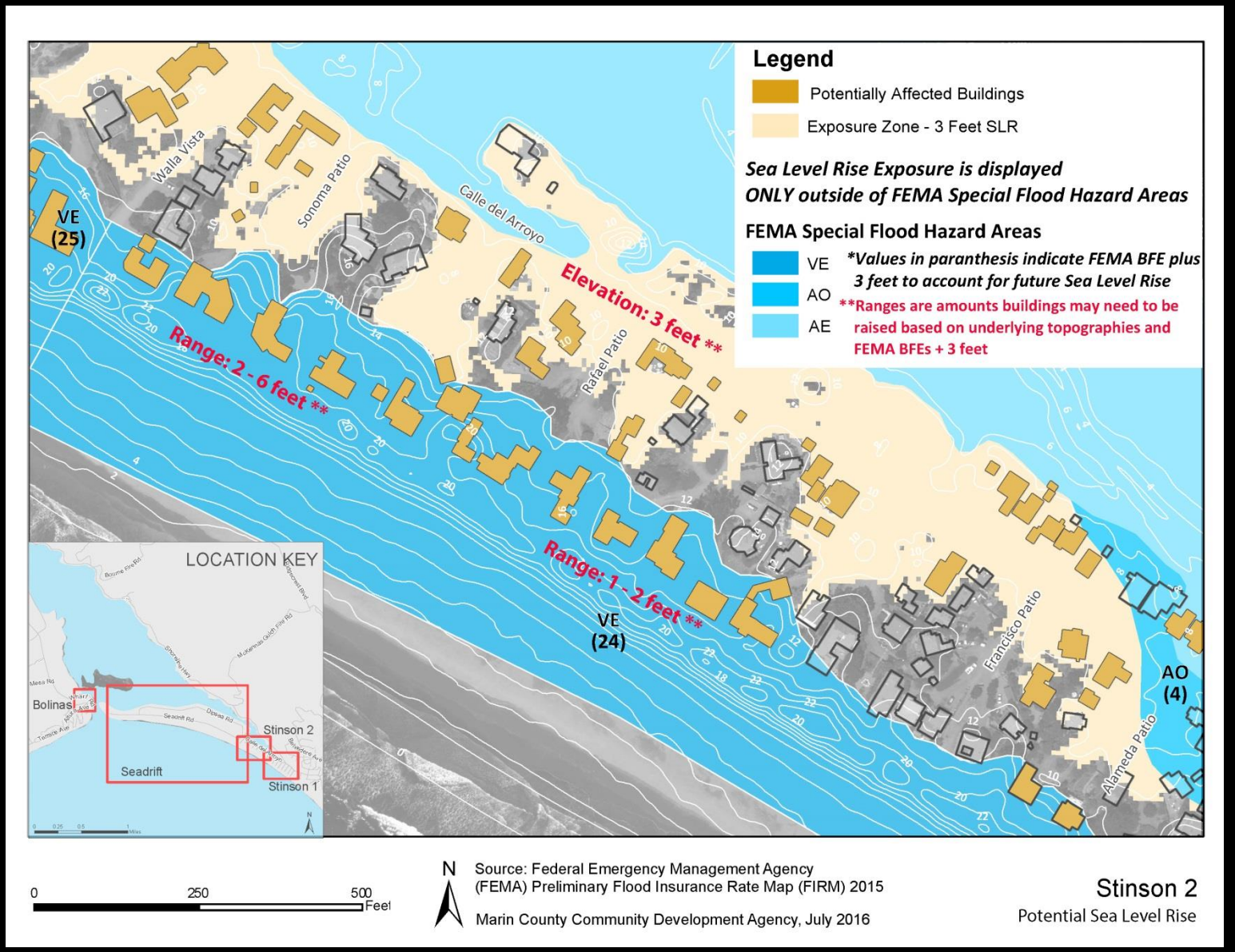


Table 26. Existing and Future Average Beach Widths and Corresponding Vulnerability Levels

	Width (meters) & Vulnerability					
	Base-line	Scen 1	Scen 2	Scen 3	Scen 4	Scen 5
Upton to Stinson Federal	53	48	48	32	9	2
	Low	Low	Low	Low	Med	High
Stinson (Seadrift)	38	29	29	14	0	0
	Low	Low	Low	Med	High	High
Bolinas	38	29	29	14	0	0
	Low	Low	Low	Med	High	High
Inverness/ East Shore	Beaches along are narrower than 10 meters.					
	High					

Source: ESA, 2015, OCOF

LCP Applications



BayWAVE – model and scenario identification

AT-A-GLANCE

Considerations	**NOAA**	**OCOF**
Storm Surge	No	Yes
Flood Depth	No	Yes
Wave Height	No	Yes
Velocity	No	Yes
Address Lookup	No	Yes
DEM	5 meter	2 meter
Datum	Variable datum at MHHW for water elevation[2]	Variable datum at MHHW for water elevation[3]
Website minimum zoom-in scale	1''=1000'	1''=200'
Uncertainty Mapping	Via Confidence Mapping feature	Via Flood Potential feature
Used by other jurisdictions?	Contra Costa County, Alameda County, Santa Clara County, East Bay Regional Park District, Humboldt County, EPA Region 10, CA Department of Parks and Recreation, City of Benicia, CA Office of Planning and Research, Richardson Bay Shoreline Study[4]	San Mateo County[5], West Marin County, Southern California

Challenges

Flood Depth • Sea Level Rise • Water Elevation • Topography • NAVD88 • BFEs • Water Levels (MLLW and MHHW)

marinslr.org

Photo Credit: Dianne Arrigoni

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COUNTY OF MARIN