

# PRELIMINARY INVESTIGATION AND RECOMMENDATIONS FEMA REQUIREMENTS AND SEA LEVEL RISE

## FOR BIOMARIN

999 3<sup>RD</sup> Street, San Rafael  
Marin County, California

Prepared by:  
**CSW/Stuber-Stroeh Engineering Group, Inc.**  
45 Leveroni Court  
Novato, California 94949  
(415) 883-9850

CSW | ST2 File No.:  
5.692.28.1



**CSW | ST2**

# **PRELIMINARY INVESTIGATION AND RECOMMENDATIONS FEMA REQUIREMENTS AND SEA LEVEL RISE July 26, 2018**

## **TABLE OF CONTENTS**

---

- A. Introduction
- B. Investigation
- C. Impacts
- D. Planning / Recommendations

### **Appendices**

Appendix I	Vicinity Map
Appendix II	FEMA FIRMette
Appendix III	OCOF Results for Sea Level Rise and Wave Model Combinations Interactive Map Screenshots
Appendix IV	OCOF Results for Sea Level Rise and Wave Model Combinations Sea Level Rise and Scenario Report
Appendix V	Tables: Site Specific Sea Level Rise Projections and Potential Impacts
Appendix VI	NOAA Datum Diagram for Point San Quentin
Appendix VII	Sheet V1 – Topographic Map
Appendix VIII	Sheet C4 – Preliminary Grading Plan - DRAFT

Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

A. Introduction

Looking to the future, BioMarin is proposing to expand their campus within the downtown area of San Rafael, CA. This Preliminary Investigation presents the results of research to determine potential impacts that might be result from flooding according to the Federal Emergency Management Agency (FEMA) and the projected range of sea level rise to this property.

The property to undergo re-development for this expansion is located at 999 3<sup>rd</sup> Street, San Rafael, CA. The property is bounded by 3<sup>rd</sup> Street to the north, 2<sup>nd</sup> Street to the south, Lindero Street to the east and Brooks Street to the west. The property has been developed and in its current condition is paved with asphalt and concrete as part of the site remediation completed by Pacific Gas and Electric Company's site closure efforts.

The water level in the surrounding municipal storm drain system and the site has the potential to be affected by flooding due to storm overflows from San Rafael Creek, from encroaching tide waters and the combination of storm overflows and encroaching tide waters.

The FEMA Flood Insurance Rate Map for the project location indicates that the site is in Zone AH with inundation to Elevation 11 feet NAVD88. Areas of flooding shown in the FIRM are typically impacted by insufficient capacity of the surrounding storm and creek systems to convey peak flows generated by the 1 percent annual chance (100-year storm) event.

The primary driver of the water level with respect to sea level rise is the water level of San Rafael Bay and just beyond San Rafael Bay, the San Francisco Bay. San Rafael Bay is located approximately 1.9 miles to the east of the project site. Current mean higher high water elevations in the bay are around 5.8 NAVD88<sup>1</sup>. With elevations along the curb of the streets bounding the property ranging from 8.0 NAVD88 at the southeast corner of the property to 10.0 NAVD88 at the northwest corner, the project site is in a relatively low-elevation area near sea level. Even without the occurrence of a storm, the capacity of the surrounding storm drain systems may already be partially or fully filled with water due to high-tide events.

The most recent Federal Emergency Management Agency (FEMA) maps account for sources of flooding due to wave surge from San Rafael Bay and San Francisco Bay but do not include sea level rise projections. To investigate flooding due to sea level rise, an alternative source of information was used and is discussed in the next section.

B. Investigation

FEMA

According to the Flood Insurance Study for Marin County, Volume 1<sup>2</sup>

- “The floods in Marin County are normally of short duration, lasting only 3 or 4 days. Floods may develop within 24 hours after the beginning of a flood-producing storm and will normally

---

<sup>1</sup> National Oceanic Atmospheric Administration

<sup>2</sup> Flood Insurance Study, Volume 1 of 3, FEMA Flood Insurance Study No. 06041CV001D

Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

recede within 1 day after the end of the storm. Tributaries rise rapidly, so that flooding begins a few hours after the occurrence of heavy rainfall. Sheetflow flooding is caused by inadequate channel capacity and poor drainage in areas close to streams.”

- “Storm centers from the southwest produce the type of storm pattern most commonly responsible for the majority of the serious coastal flooding. The strong winds and high tides that create storm surges are also accompanied by heavy rains. In some instances, high tides back up riverflows, which causes flooding at the river mouths.”
- “In general most of the City of San Rafael is designated as either shaded or unshaded Zone X on the FIRMs. The limited capacity of the storm drainage system will subject a large portion of downtown City of San Rafael to shallow sheet flow during the 1-percent annual chance flood as floodwaters in excess of the storm drain capacity flow down the streets.”
- “The shallow flooding zones (Zone AH) adjacent to San Rafael Creek were caused by overflows from the channel near D Street which flow west along the channel. The ponding areas were caused by the constricted section between A and B Streets and by the channel levees near the Southern Pacific Railroad. The channel levees cause the water to pond up to elevation 11 before it can spill back into the channel near Lincoln Avenue.”

The project site is located in the shallow flooding zone mentioned in the last bullet point above. The FIRM shows the site to be in the Zone AH with elevation 11, close to San Rafael Creek and “upstream” of the location where the floodwaters spill back into the channel near Lincoln Avenue. See Appendix II for an annotated version of the FIRM (FIRMette) discussing the relationship of the site to the described features of the flooding.

It is important to note that the flood conditions in the FEMA report represent current conditions. Some areas of San Rafael are subject to inundation due to wave action brought about by wind conditions over Bay waters. But the flooding in the FIRMs does not account for sea level rise. Future FEMA studies, reports and mapping may be updated as the impacts of sea level rise progress and possibly the rate of rise becomes predictable with greater accuracy.

### Sea Level Rise

Since the purpose of the investigation is to provide BioMarin with parameters to determine future flooding risk as a result of sea level rise, we have created a range of outcomes using a number of assumptions which are presented in the following discussion. As outlined in the Marin Shoreline Sea Level Rise Vulnerability Assessment by Marin County dated June 2017, sea level rise projections for the San Francisco, California region are as follows in Table 1, below:

Table 1: Sea Level Rise Projections for San Francisco, CA Region

Time Period	Time Range	Projected Range of Height of Sea Level Rise	
By 2030	Near Term	4.1 - 30.0 cm	1.6 - 11.8 inches
By 2050	Medium Term	11.9 - 61.0 cm	4.7 - 24.0 inches
By 2100	Long Term	42.2 - 167.1 cm	16.6 - 65.8 inches



Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

Inundation maps reflecting sea level rise projections can be found from sources including, but not limited to, the U.S. Geological Survey's Coastal Storm Modeling System (CoSMoS), Marin County's MarinMap Map Viewer and the San Francisco Bay Conservation and Development Commission (BCDC) Adapting to Rising Tides (ART) Program.

CoSMoS was used in this investigation because it is the model of reference for the County of Marin, as described in the County of Marin's "Marin BayWAVE" Project Sea Level Rise Model Comparison Memo dated December 2015. The CoSMoS model can be viewed through the Our Coast Our Future (OCOF) website which is available via link through the Marin Bay Waterfront Adaptation Vulnerability Evaluation (BayWAVE) program. Note, throughout this report documents available through the CoSMoS model are commonly titled with the OCOF name and the term "CoSMoS model" is interchangeable with the term "OCOF model".

One of the advantages of the OCOF model is the ability to overlay the varying heights of sea level rise with wave events such as the King Tide and 20-year and 100-year Storm Surge events. The King Tides are exceptionally high tides which occur occasionally throughout the year and currently impact roads and properties in Marin County and throughout the San Francisco Bay Area. As sea level rises, the extent of impact of the King Tides will increase. In the OCOF model the 20- and 100-year storm events are storm-driven wind events producing wave surges, which travel across the bay toward the shore and are driven by wind- and atmospheric pressure conditions. The 100-year storm event in the OCOF model is different from the 100-year storm event flooding in the FEMA FIRMs. The flooding shown in the FEMA maps is caused by peak runoff from the surrounding watershed travelling downstream toward the Bay.

Thus, a limitation of the OCOF inundation maps listed above is that flooding due to runoff generated by precipitation events are not included in the OCOF model simulations. Therefore, flooding due to high flow in streams and storm drain systems is not included. This means that in some scenarios, even though properties may appear "dry" for the displayed combination of events, flooding could still occur due to insufficient capacity of streams and storm drain systems to convey storm flows. Large amounts of runoff in the surrounding storm drain systems will also impact the ability of the surrounding systems to drain as sea level rises and wave inundation increases.

Sea Level Rise depths are measured above Mean Higher High Water (MHHW). According to the National Oceanic Atmospheric Administration (NOAA), MHHW at Point San Quentin is 5.61 feet based on the North American Vertical Datum of 1988 (NAVD88).

Point San Quentin is approximately 1.9 miles south of the location where San Rafael Creek discharges into San Rafael Bay. For the purpose of this investigation, it is assumed that MHHW for San Rafael Creek at San Rafael Bay is the same as MHHW for the Point San Quentin at the southern tip of San Rafael Bay.

For this investigation, within CoSMoS, screenshots of the area were printed for the combinations presented in Table 2, below:

Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

Table 2: Combinations of CoSMoS Results included in Appendix II

Sea Level Rise Height		Present Day MHHW Elevation	Future MHHW Elevation (Baseline)	Wave Event (Tide or Storm Surge Severity)	Timing Near Term (by 2030), Medium Term (by 2050), or Long Term (by 2100)
centimeters	inches	Feet, NAVD88	Feet, NAVD88		
25	9.8	5.6	6.4	King Tide	Near to Medium
25	9.8	5.6	6.4	20 Year	Near to Medium
25	9.8	5.6	6.4	100 Year	Near to Medium
50	19.7	5.6	7.2	King Tide	Medium to Long
50	19.7	5.6	7.2	20 Year	Medium to Long
50	19.7	5.6	7.2	100 Year	Medium to Long
75	29.5	5.6	8.1	King Tide	Long
75	29.5	5.6	8.1	20 Year	Long
75	29.5	5.6	8.1	100 Year	Long
100	39.4	5.6	8.9	King Tide	Long
100	39.4	5.6	8.9	20 Year	Long
100	39.4	5.6	8.9	100 Year	Long
125	49.2	5.6	9.7	King Tide	Long
125	49.2	5.6	9.7	20 Year	Long
125	49.2	5.6	9.7	100 Year	Long
150	59.1	5.6	10.5	King Tide	Long
150	59.1	5.6	10.5	20 Year	Long
150	59.1	5.6	10.5	100 Year	Long

### C. Impacts

#### FEMA

Based on the FEMA FIRM, flooding is anticipated at the project site for the 100-year storm event. This flooding is due to the peak flow of runoff from the surrounding watershed and incapacity of the municipal storm system to convey stormwater to the Bay. The site and surrounding areas are expected to be flooded to an elevation of 11 NAVD88. During this storm event, the ground surface and infrastructure of the site and surrounding neighborhoods are anticipated to be inundated if left at current elevations.

#### Sea Level Rise

Impacts at ground level due to sea level rise at 999 3<sup>rd</sup> Street and surrounding neighborhood in San Rafael are anticipated to begin appearing in the near- to medium terms, or within the next 12 to 32 years. Impacts within the surrounding municipal storm drain systems may already be occurring.

A table of potential impacts according to Sea Level Rise scenario for the project site is available within Appendix V of this Report.

Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

D. Planning / Recommendations

As is evident from the preceding report, improvements to 999 3<sup>rd</sup> Street in San Rafael should be constructed with the expectation that area-wide flooding will occur in the lifespan of the project.

At a minimum, according to the City of San Rafael Municipal Code, the proposed development shall either have to “be elevated to the base flood elevation shown on the FEMA FIRM plus predicted 30 years settlement or together with attendant utility and sanitary facilities provide the following:

- a. Be flood proofed below the elevation recommended under Section 18.50.010 C.1 so that the structure is watertight with walls substantially impermeable to the passage of water;
- b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and
- c. Be certified by a registered professional engineer or architect that the standards of this section (18.50.010 C.2) are satisfied. Such certification shall be provided to the floodplain administrator.”<sup>3</sup>

In our opinion, the elevation of the first floor of the buildings at 999 Third Street should be set at a minimum elevation of 13.0 NAVD88. While future sea level rise might suggest higher elevations, given the fact that the entire area between 999 Third and the San Rafael Creek channel, including the Bio Marin Campus at Lindero and Lincoln, is lower than elevation 13, the likely hood of an area wide protection plan to implemented in the future is high.

Setting the first floor elevation of the buildings to 13.0 NAVD88 satisfies the municipal code requirement to be at or above the FEMA base flood elevation and provides 2 feet of additional height above the base flood elevation to protect the building in anticipation of “30-years settlement” and to protect the building within the Near-Term (within the next 12 years) and Medium-Term (within the next 32 years) time ranges of sea level rise.

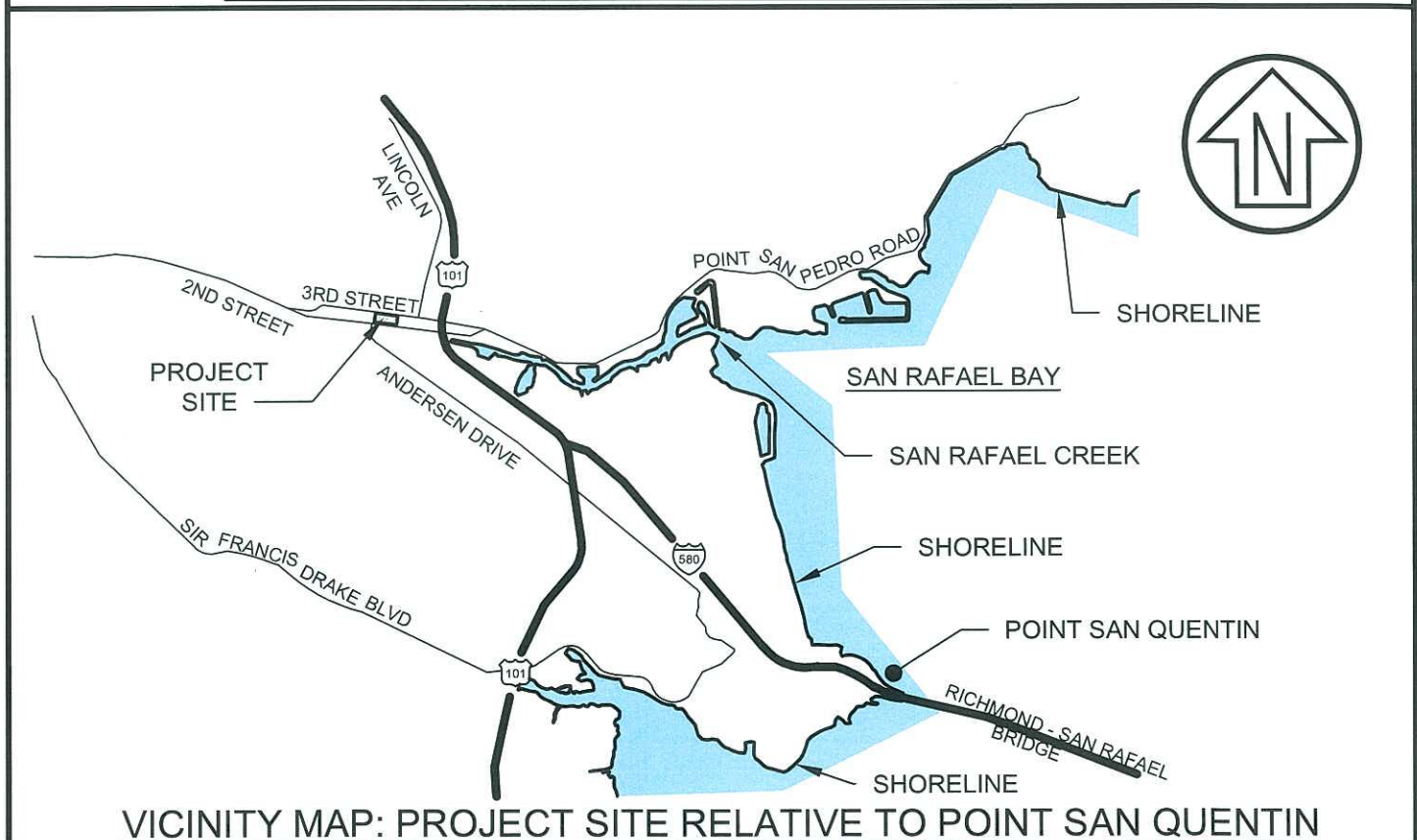
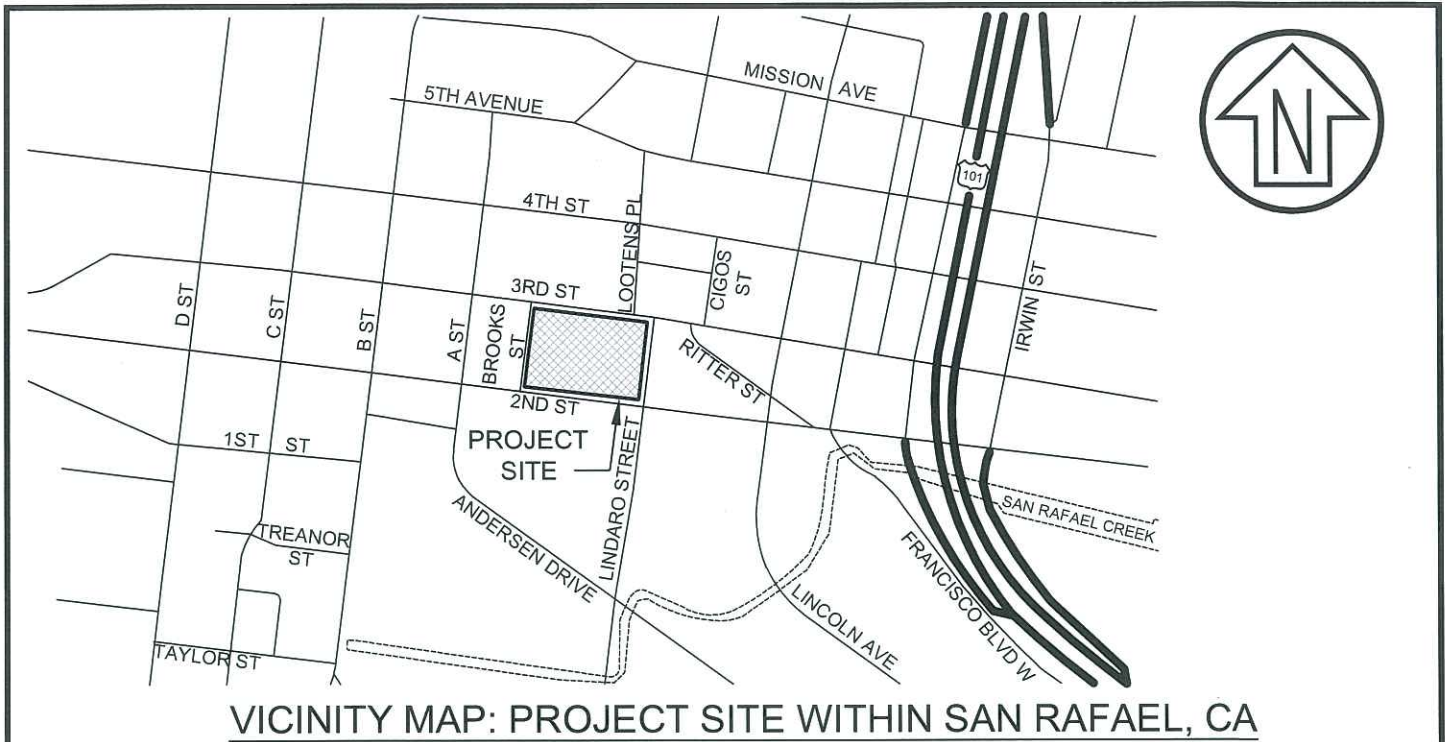
---

<sup>3</sup> City of San Rafael Municipal Code Section 18.50.010 – Standards of Construction

Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

## **APPENDIX I**

### **Vicinity Map**



**CSW | ST2**

**CSW/Stuber-Stroeh Engineering Group, Inc.**

Civil & Structural Engineers | Surveying & Mapping | Environmental Planning  
Land Planning | Construction Management

45 Leveroni Court  
Novato, CA 94949

tel: 415.883.9850  
fax: 415.883.9835

<http://www.cswst2.com>

© 2013

Rev. X

Job No. 569228.1

Date: 07/25/2018

Scale: AS SHOWN

**BIOMARIN  
VICINITY MAPS**

999 3RD SHEET

SAN RAFAEL

MARIN COUNTY

CALIFORNIA

Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

## **APPENDIX II**

**FEMA FIRMette**







# National Flood Hazard Layer FIRMette



37°58'33.19"N

FEMA FIRMETTE annotated with excerpts from the "Flood Insurance Study for Marin County, California and Incorporated Areas" FEMA FIS No. 06041CV001D, 8/15/2017.

In general, most of the City of San Rafael is designated as either shaded or unshaded Zone X on the FIRMs. The limited capacity of the storm drainage system will subject a large portion of downtown City of San Rafael to shallow sheet flow during the 1-percent annual chance flood as floodwaters in excess of the storm drain capacity flow down the streets. (Marin County FIS, FEMA, 2017.)



0 250 500 1,000 1,500 2,000 Feet 1:6,000

USGS The National Map: Orthoimagery. Data refreshed October 2017. 37°58'4.83"N

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

Without Base Flood Elevation (BFE)  
Zone A, V, A99

With BFE or Depth  
Zone AE, AO, AH, VE, AR

Regulatory Floodway

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile  
Zone X

Future Conditions 1% Annual Chance Flood Hazard  
Zone X

Area with Reduced Flood Risk due to Levee. See Notes.  
Zone X

Area with Flood Risk due to Levee  
Zone D

Area of Minimal Flood Hazard  
Zone X

Effective LOMRs

Area of Undetermined Flood Hazard  
Zone D

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped

NO SCREEN

Effective LOMRs

Area of Minimal Flood Hazard

Area of Undetermined Flood Hazard

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped

NO SCREEN

Effective LOMRs

Area of Minimal Flood Hazard

Area of Undetermined Flood Hazard

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/23/2018 at 5:02:57 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



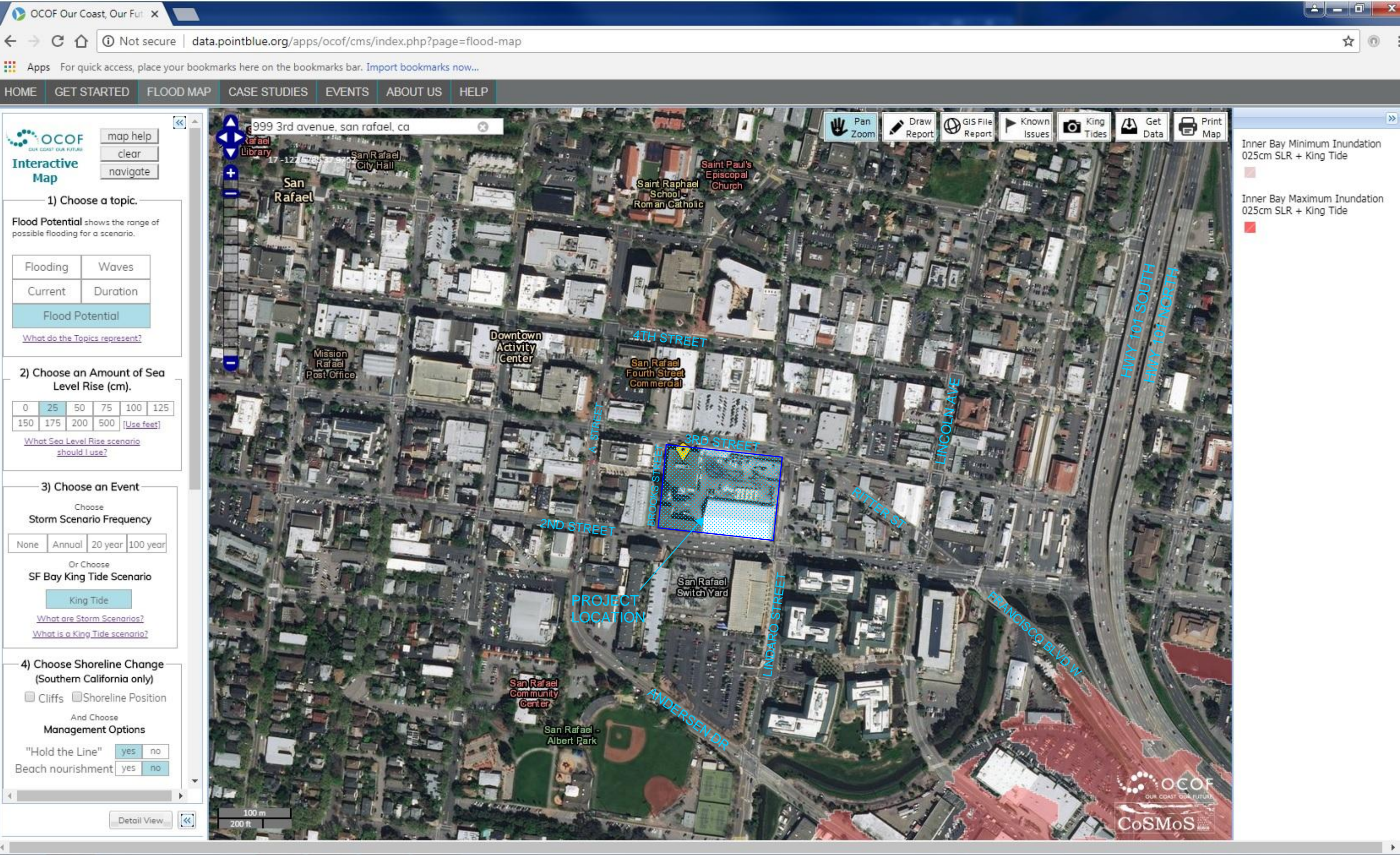
Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

### **APPENDIX III**

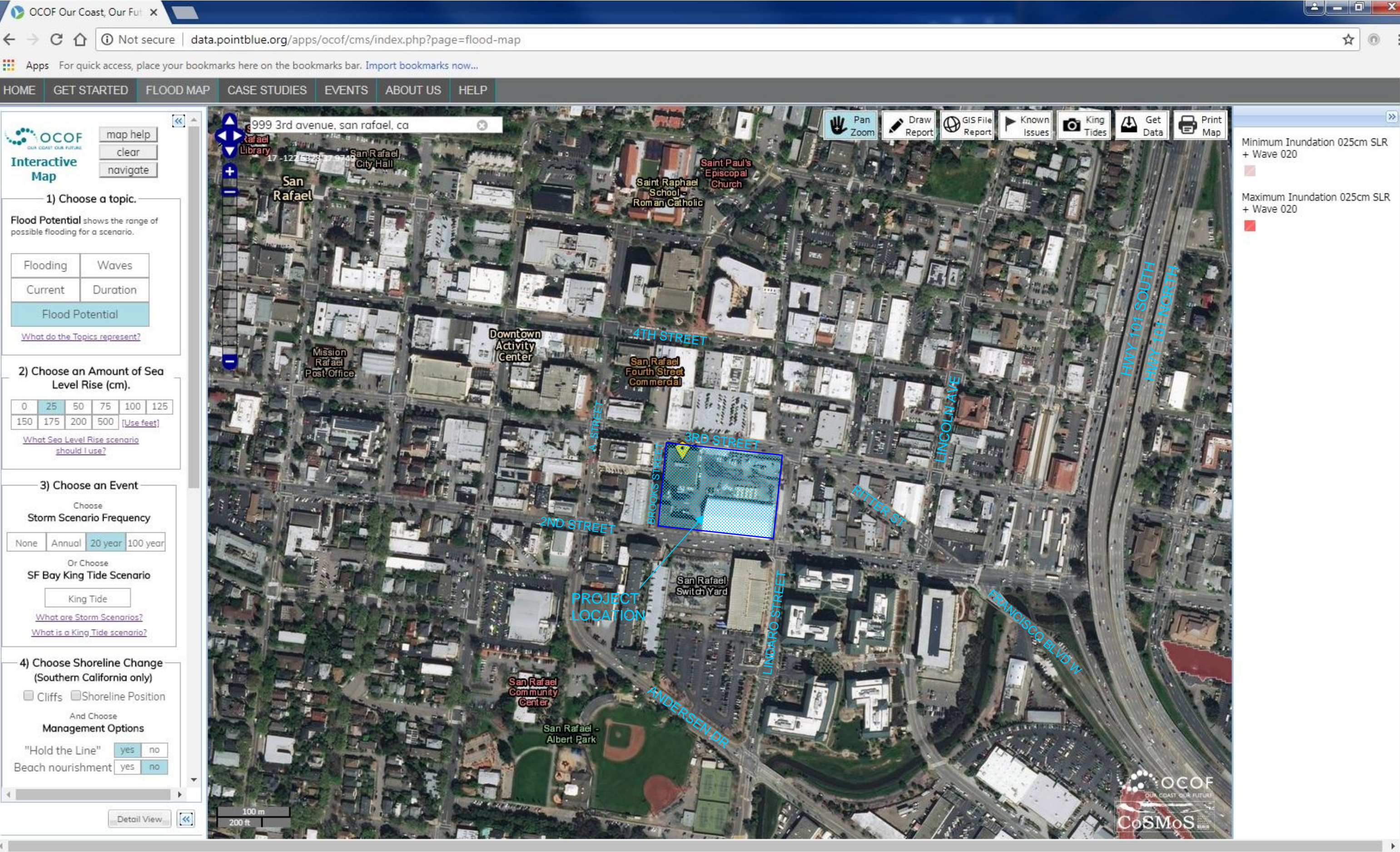
**OCOF Results for Sea Level Rise and Wave Model Combinations**

**Interactive Map Screenshots**

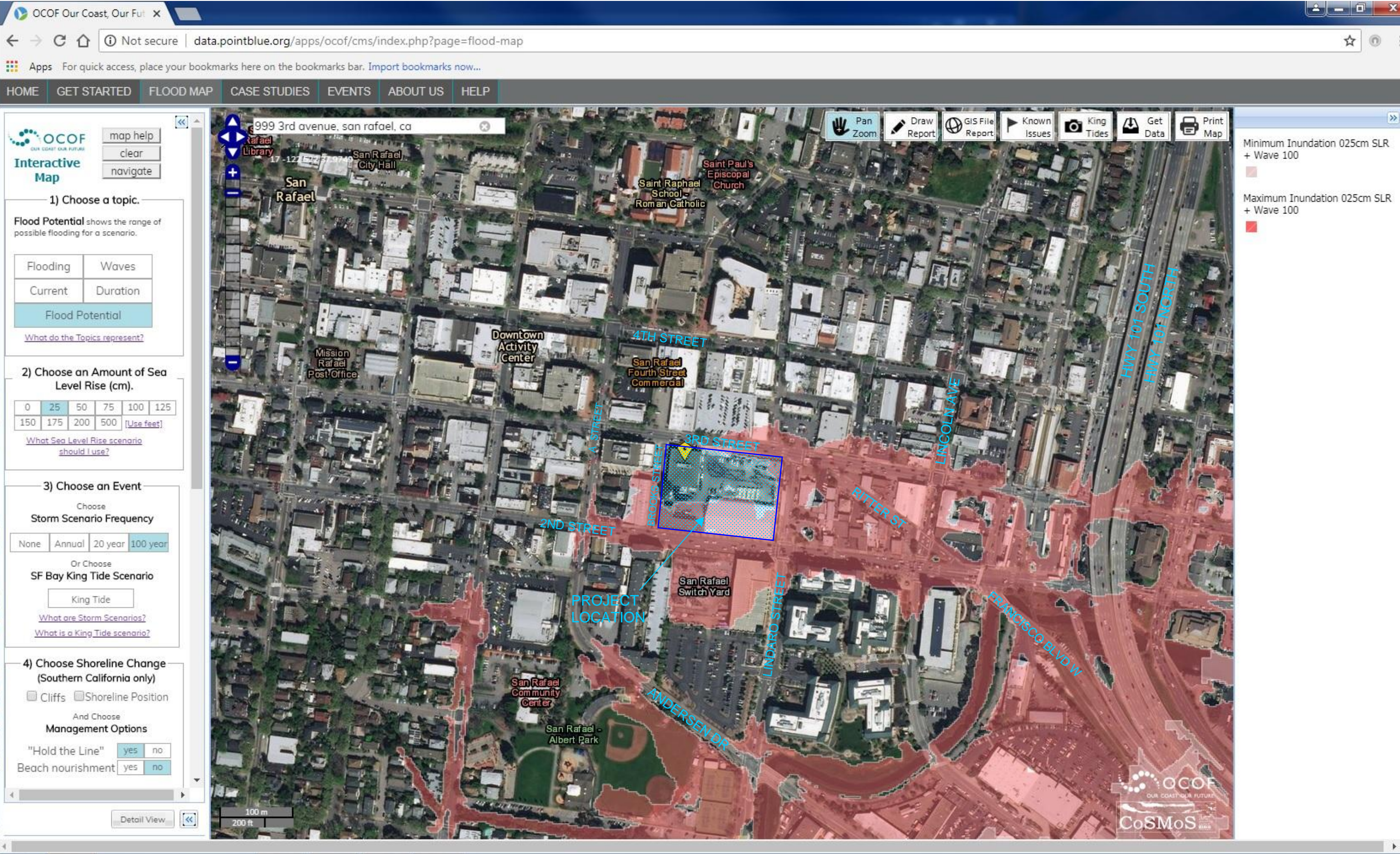
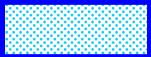




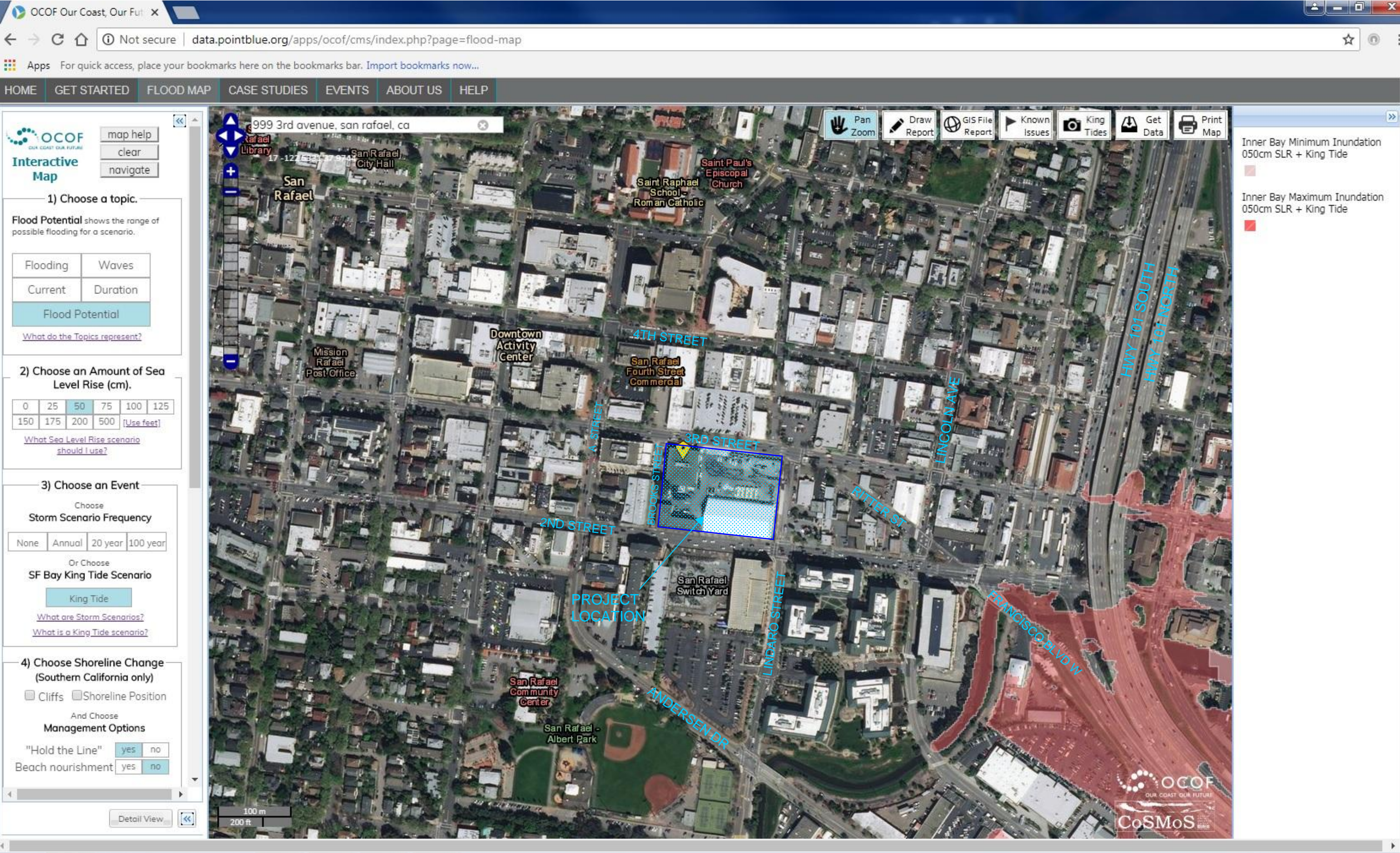
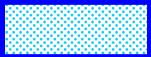




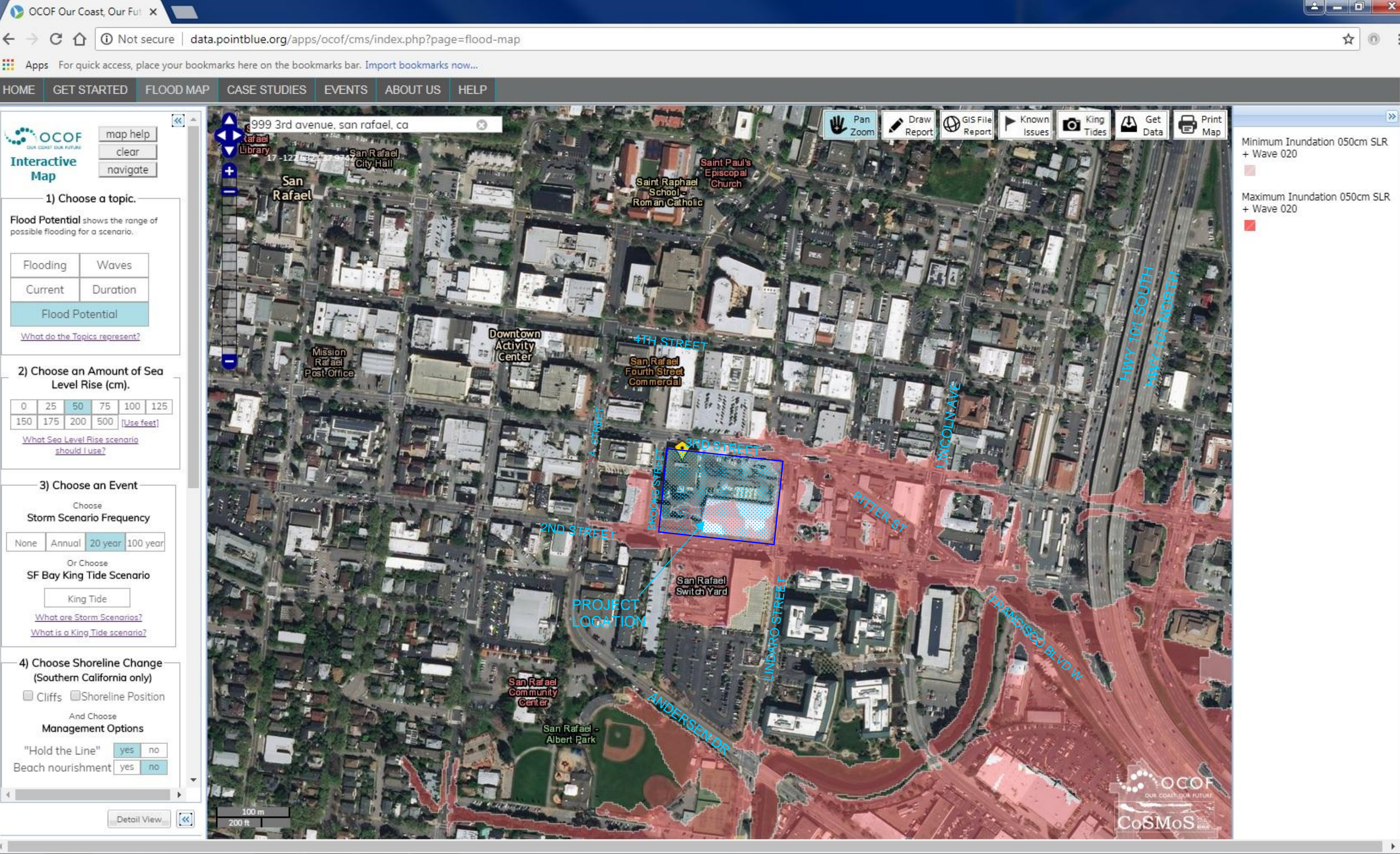
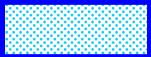




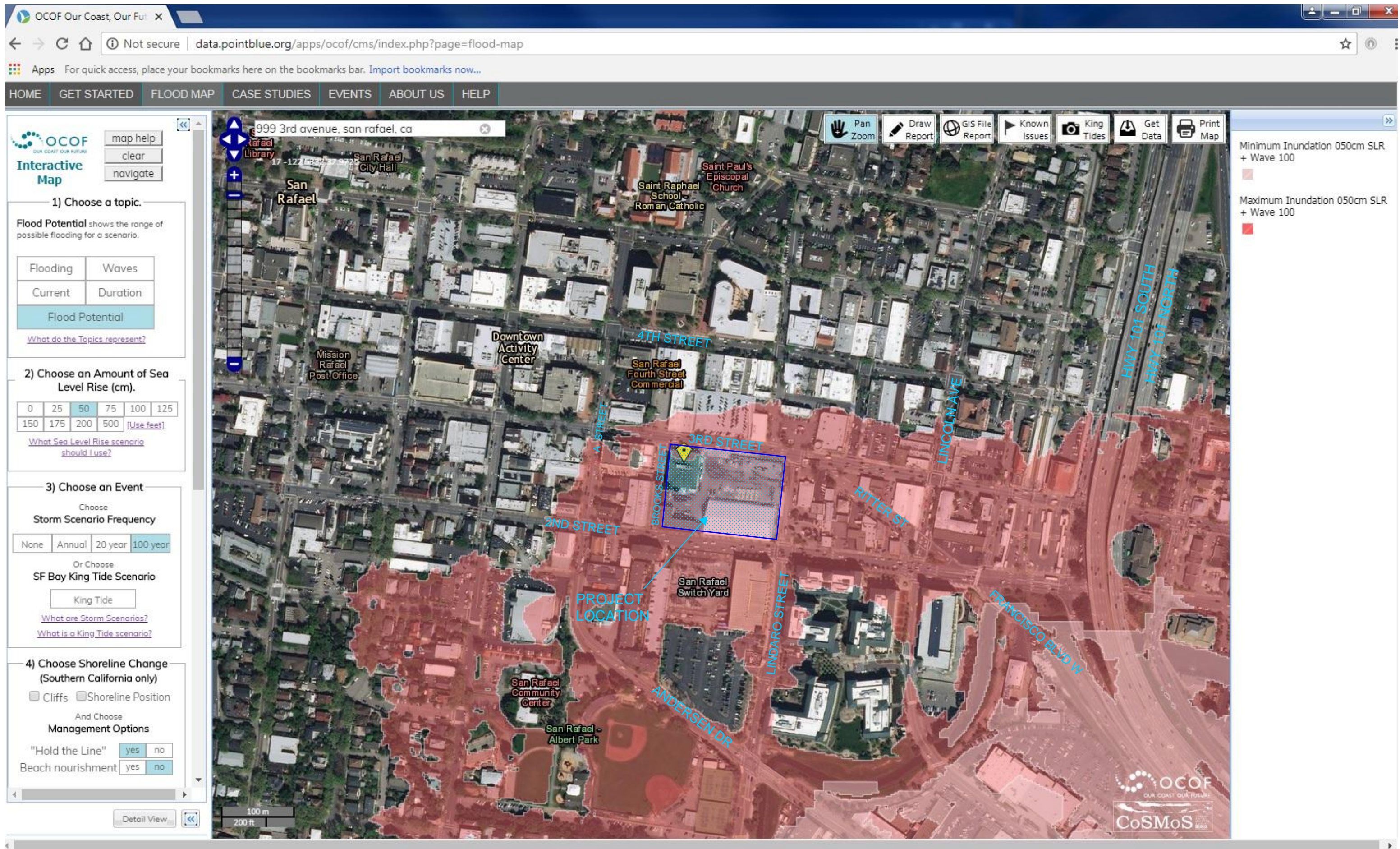




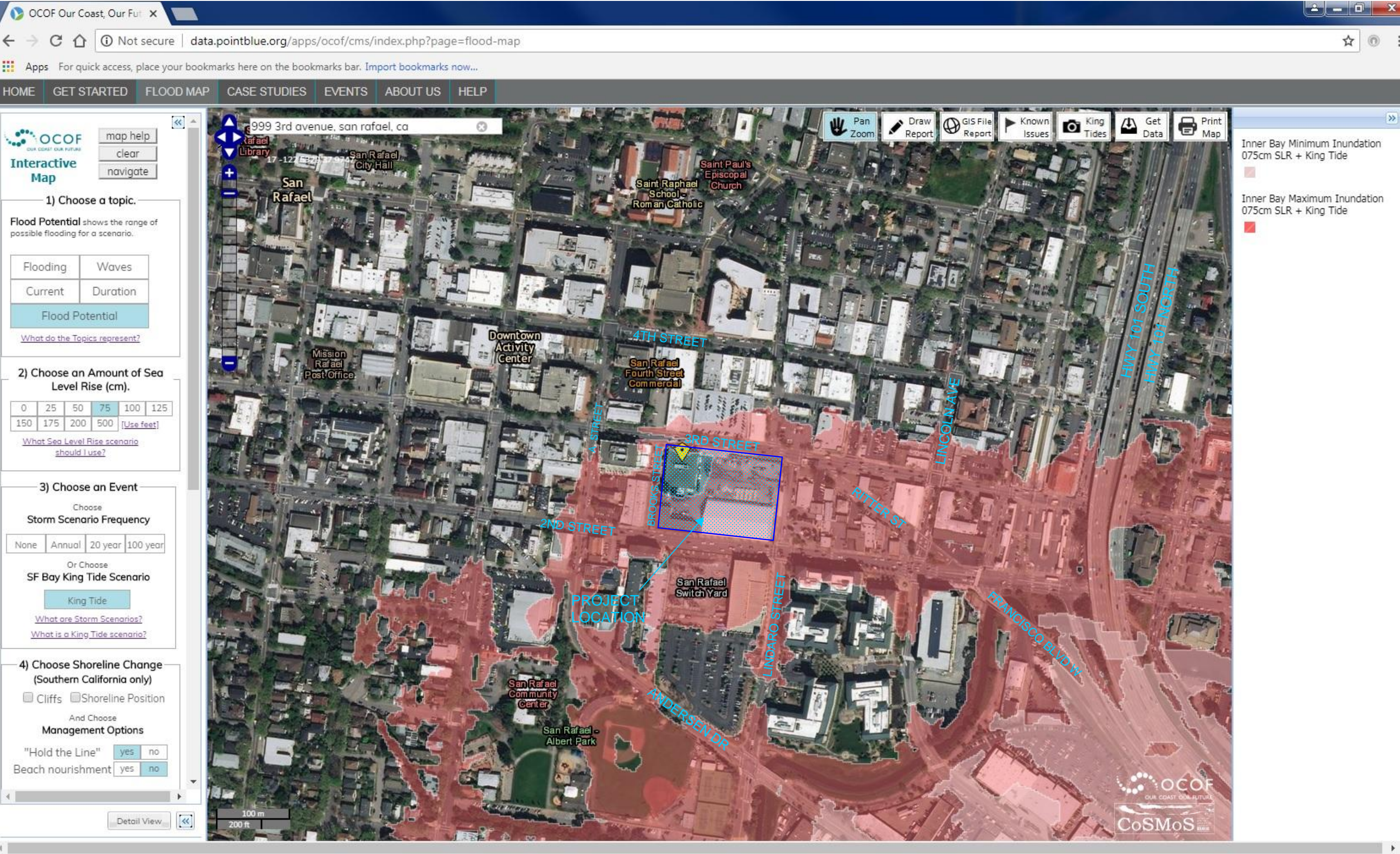




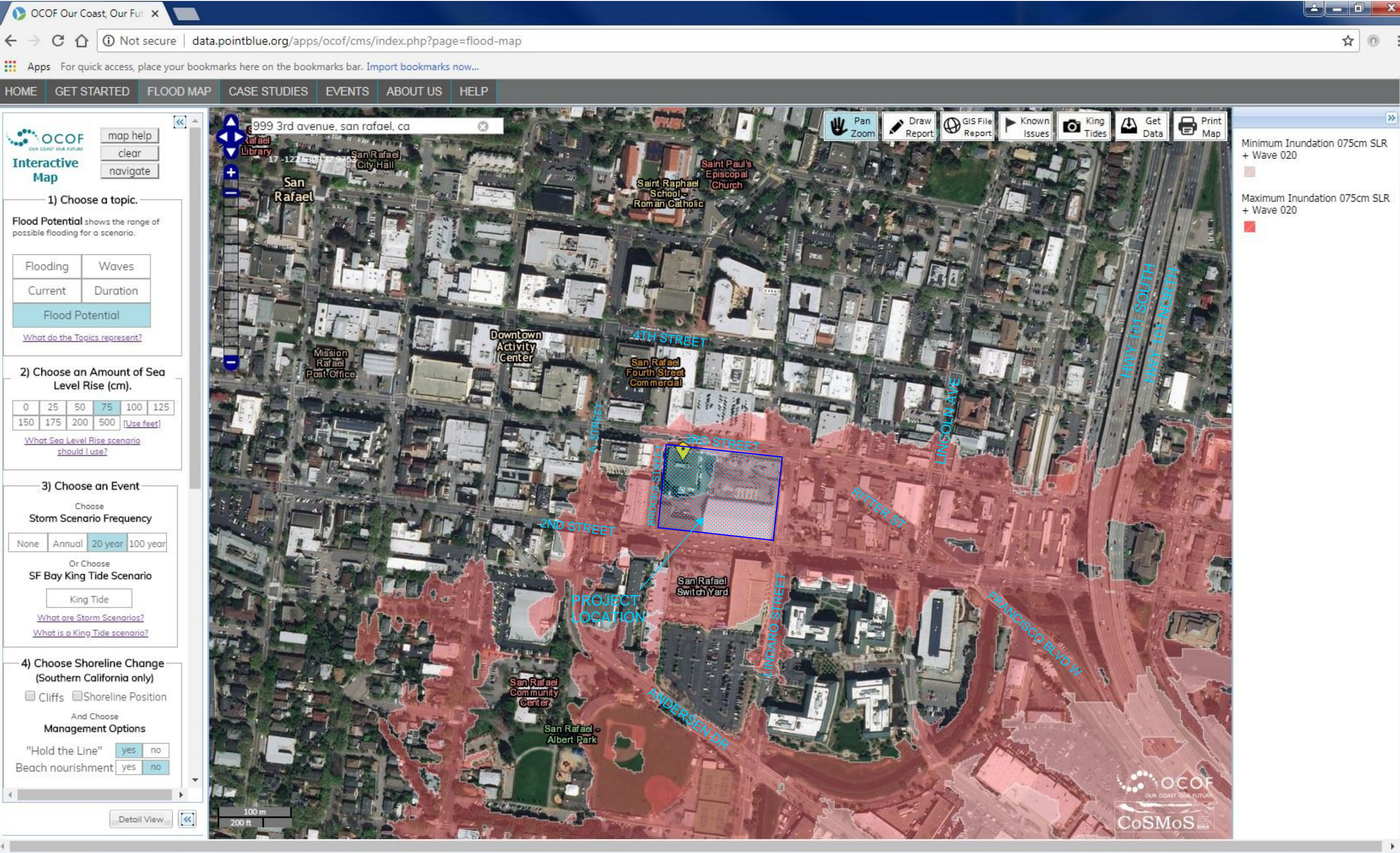




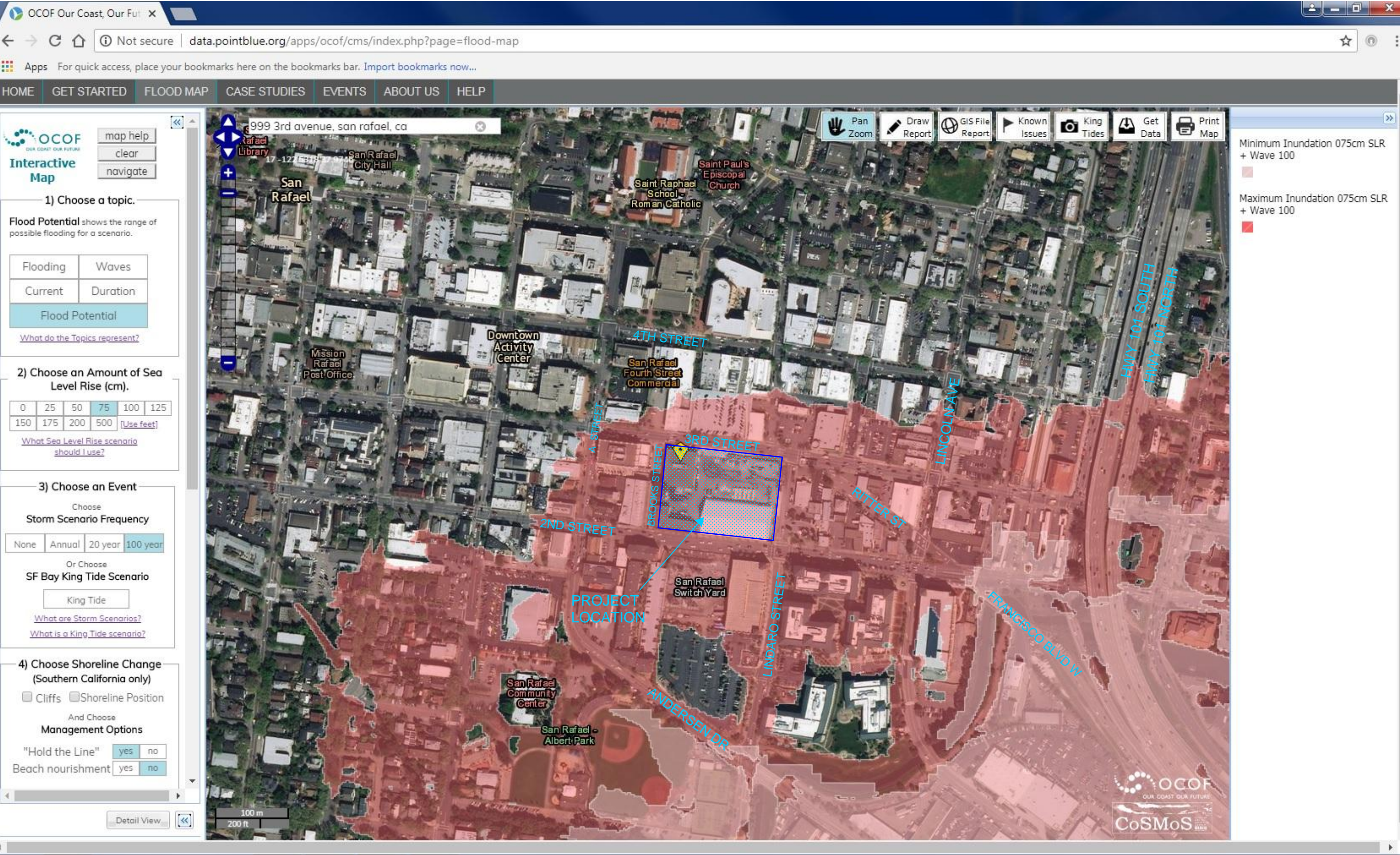
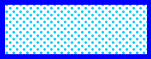




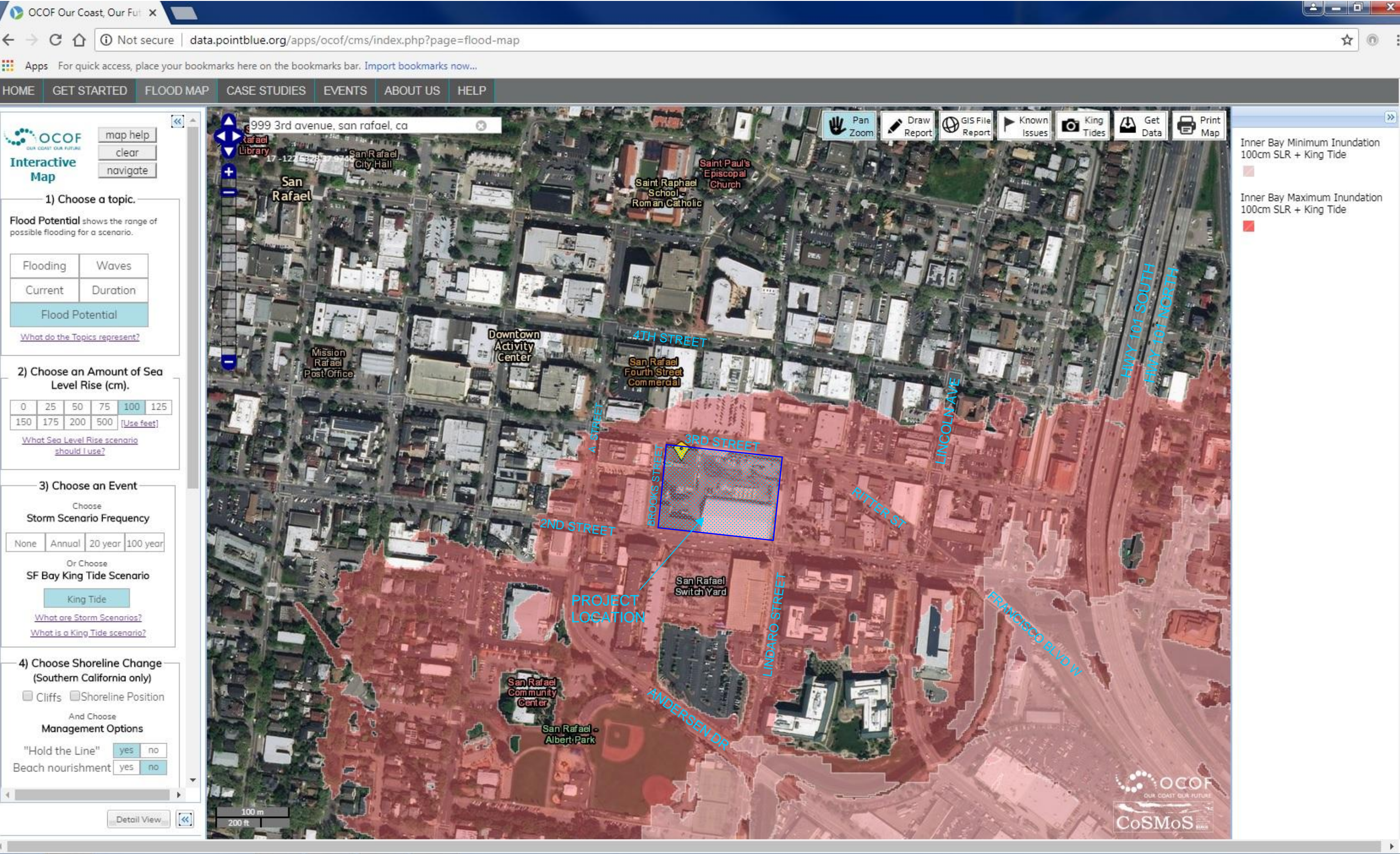




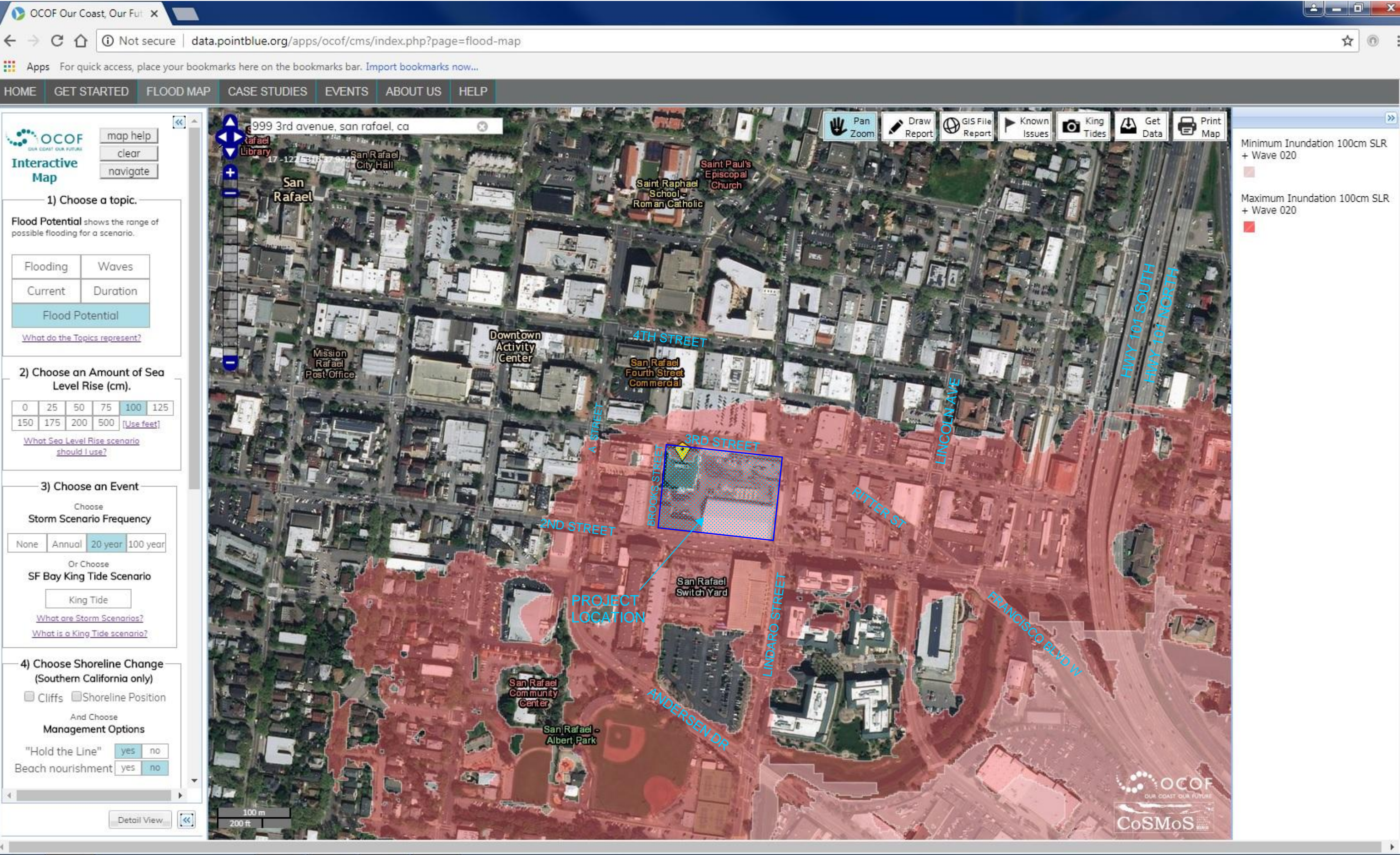




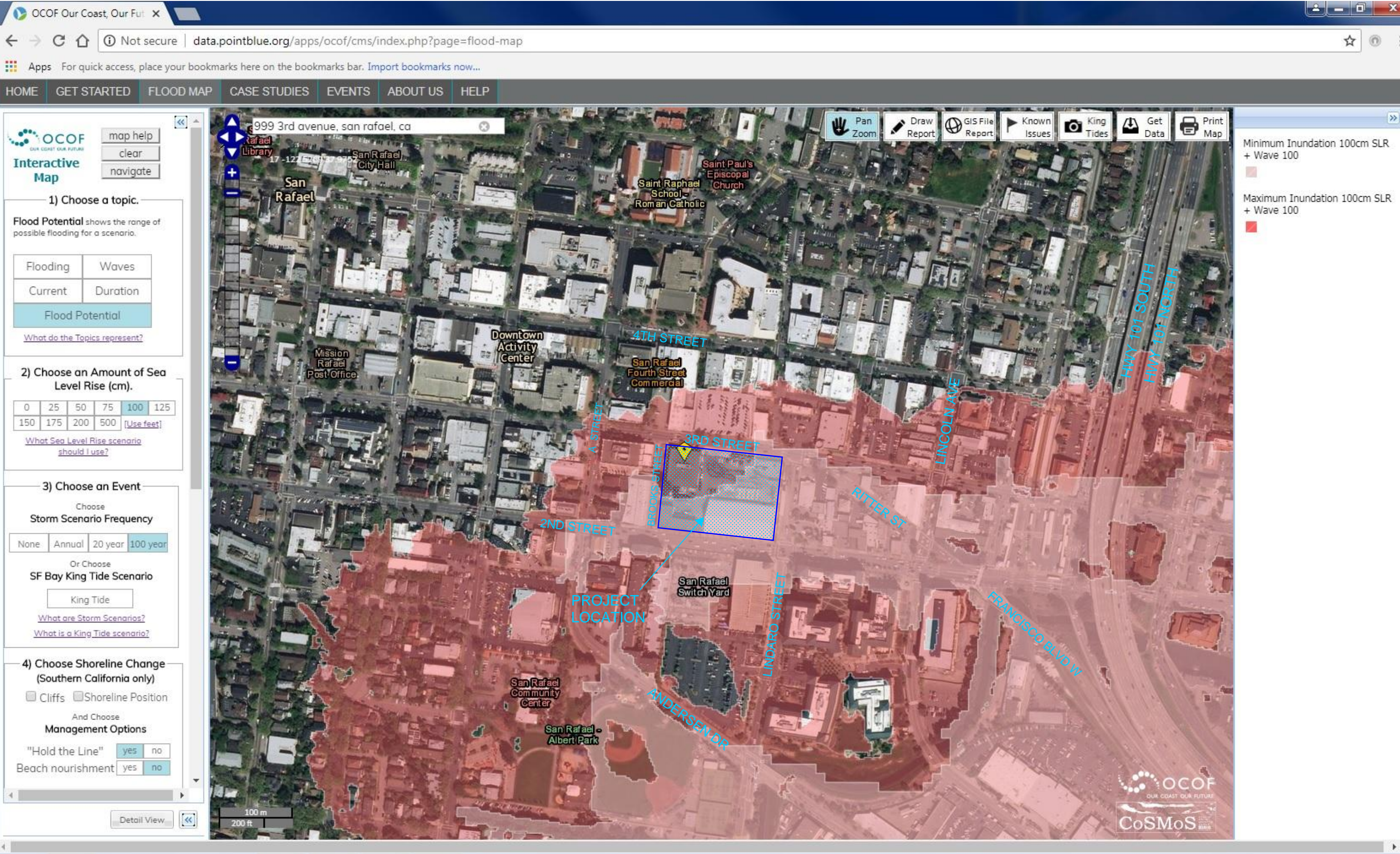




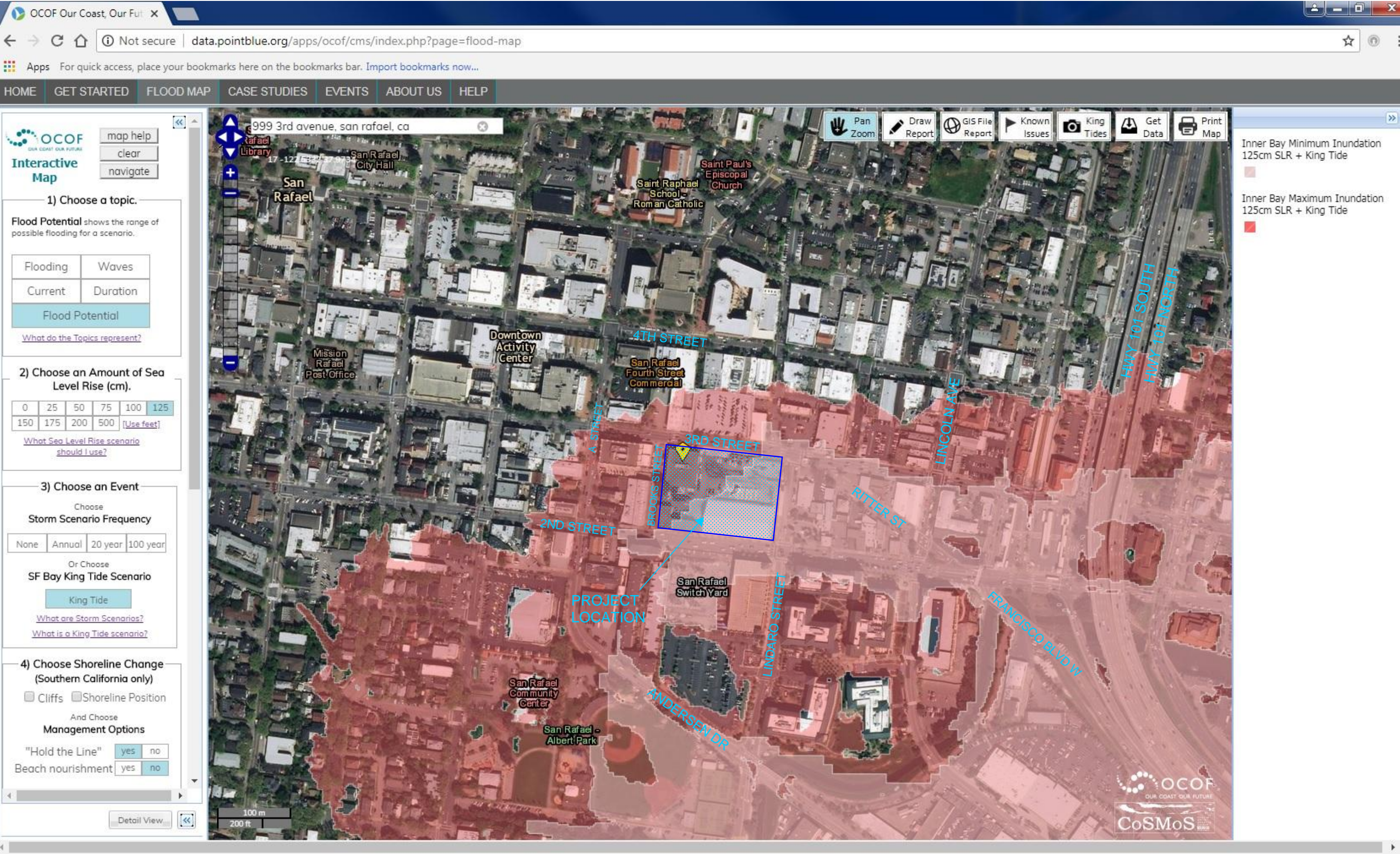




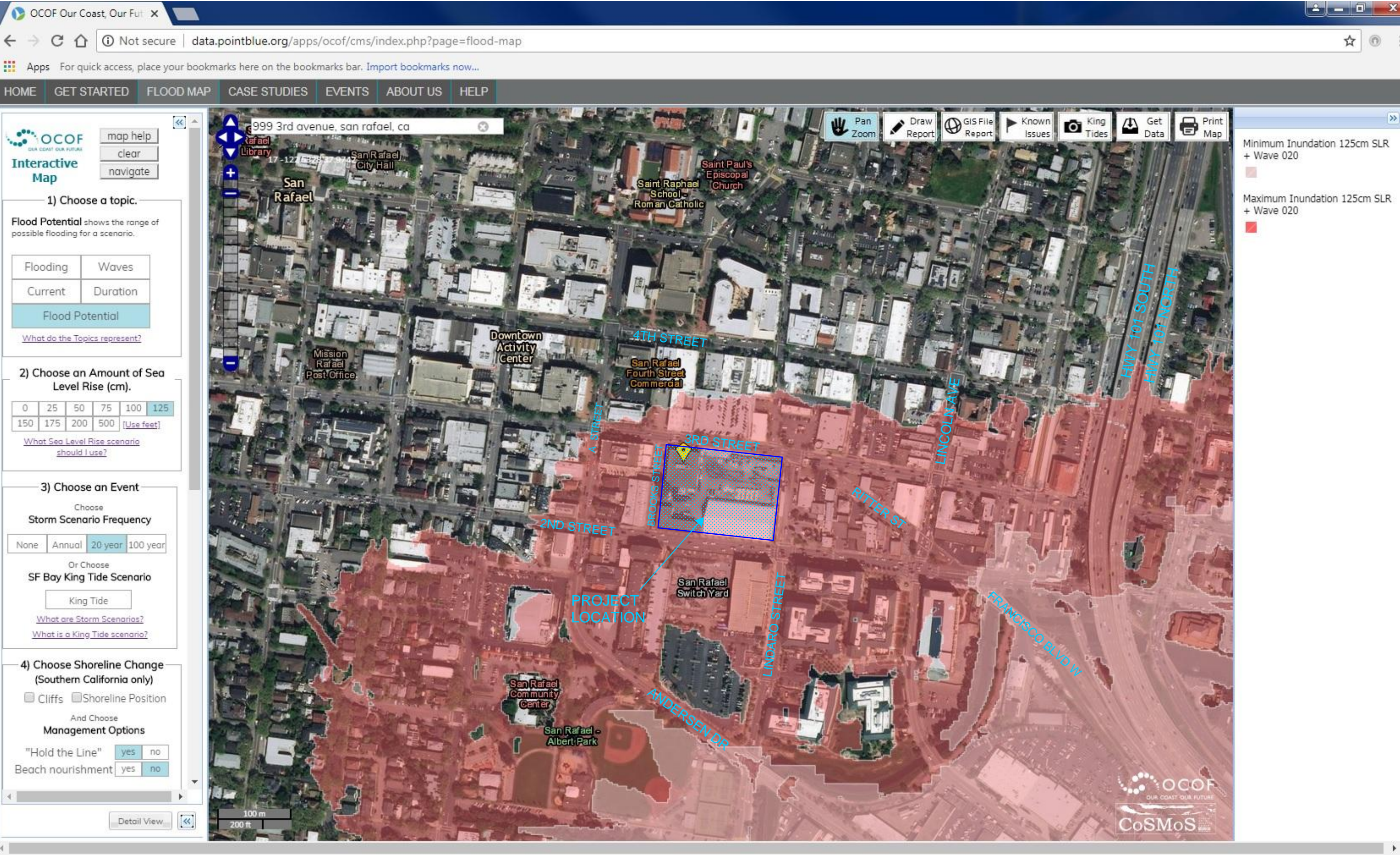




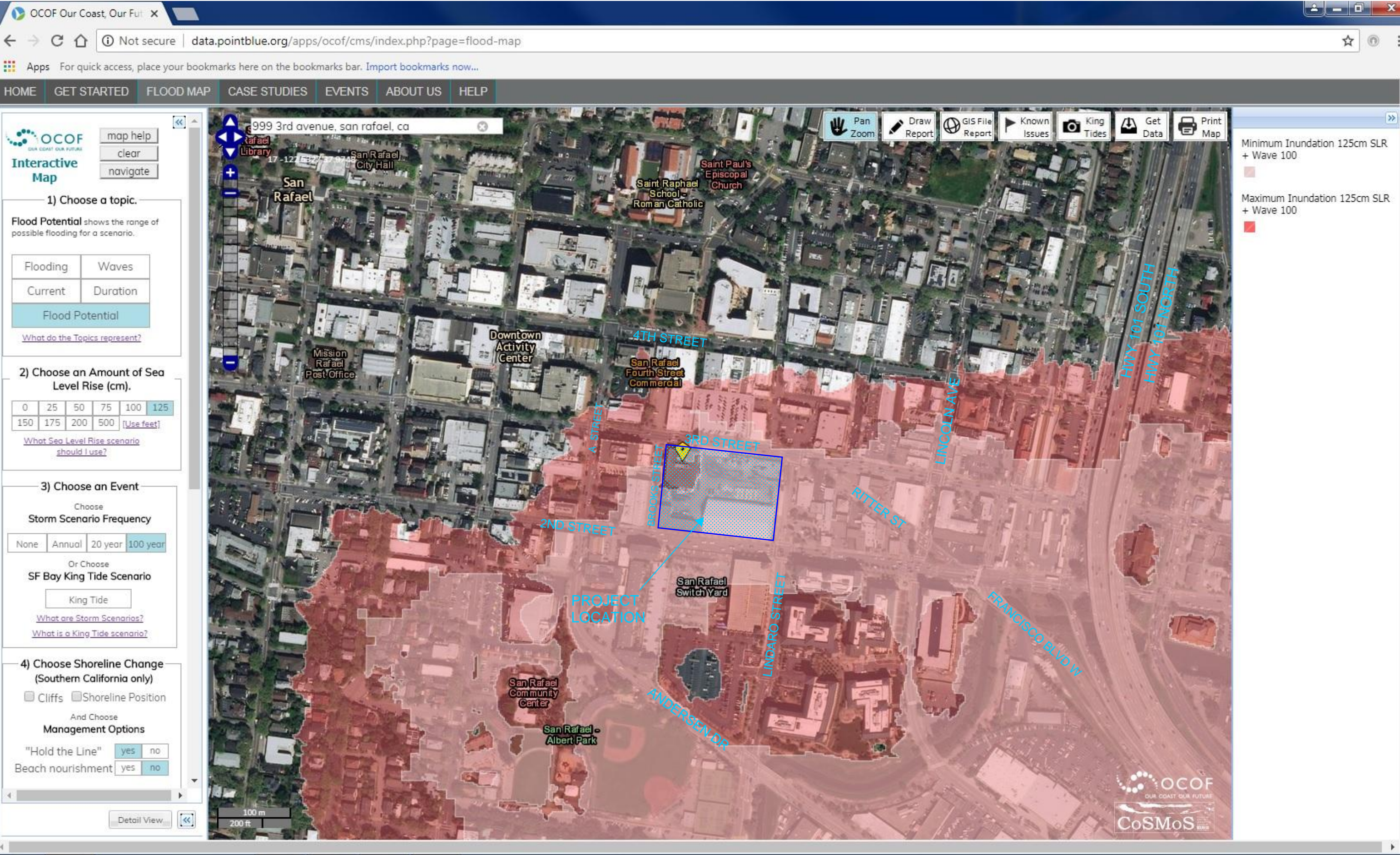




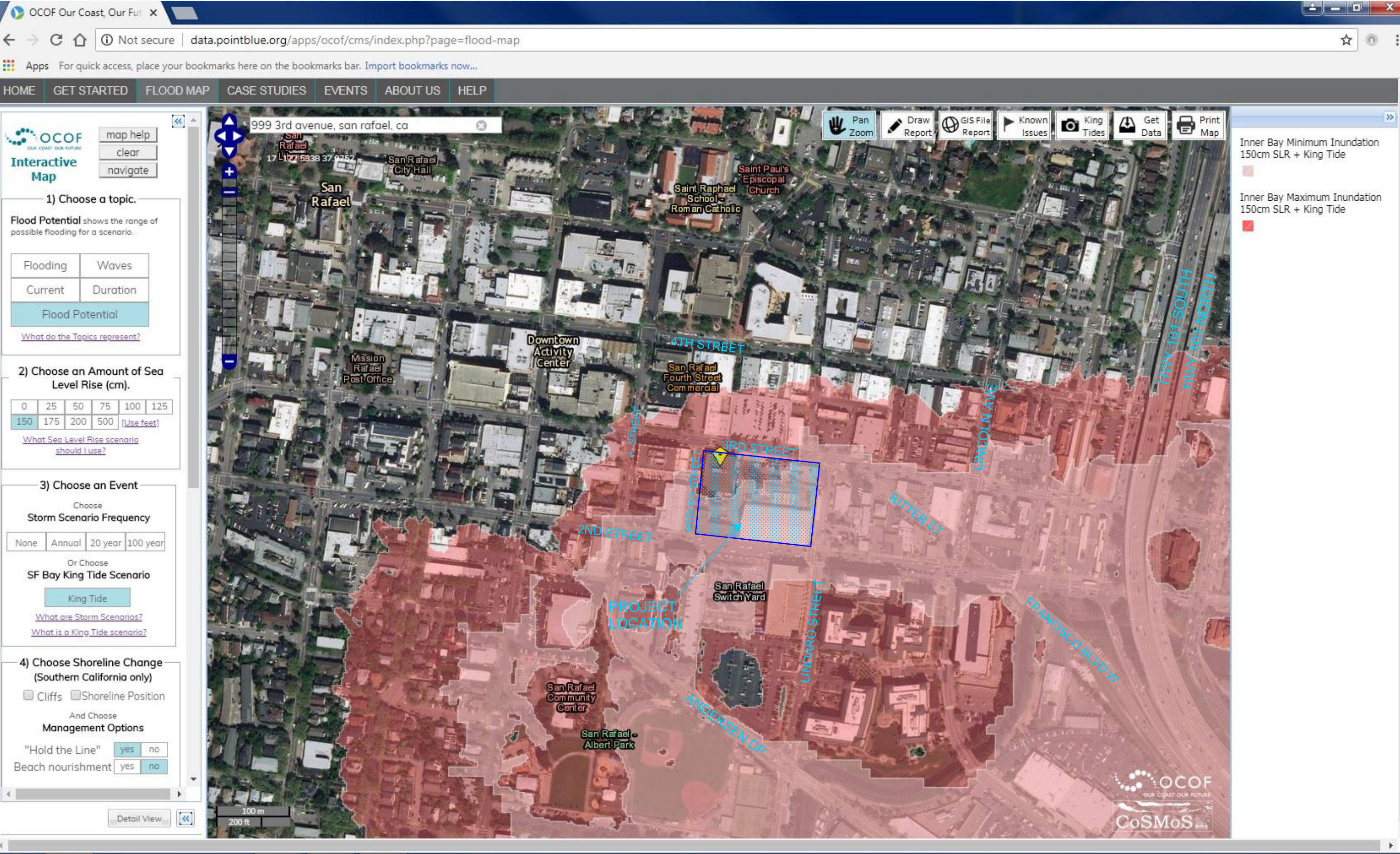




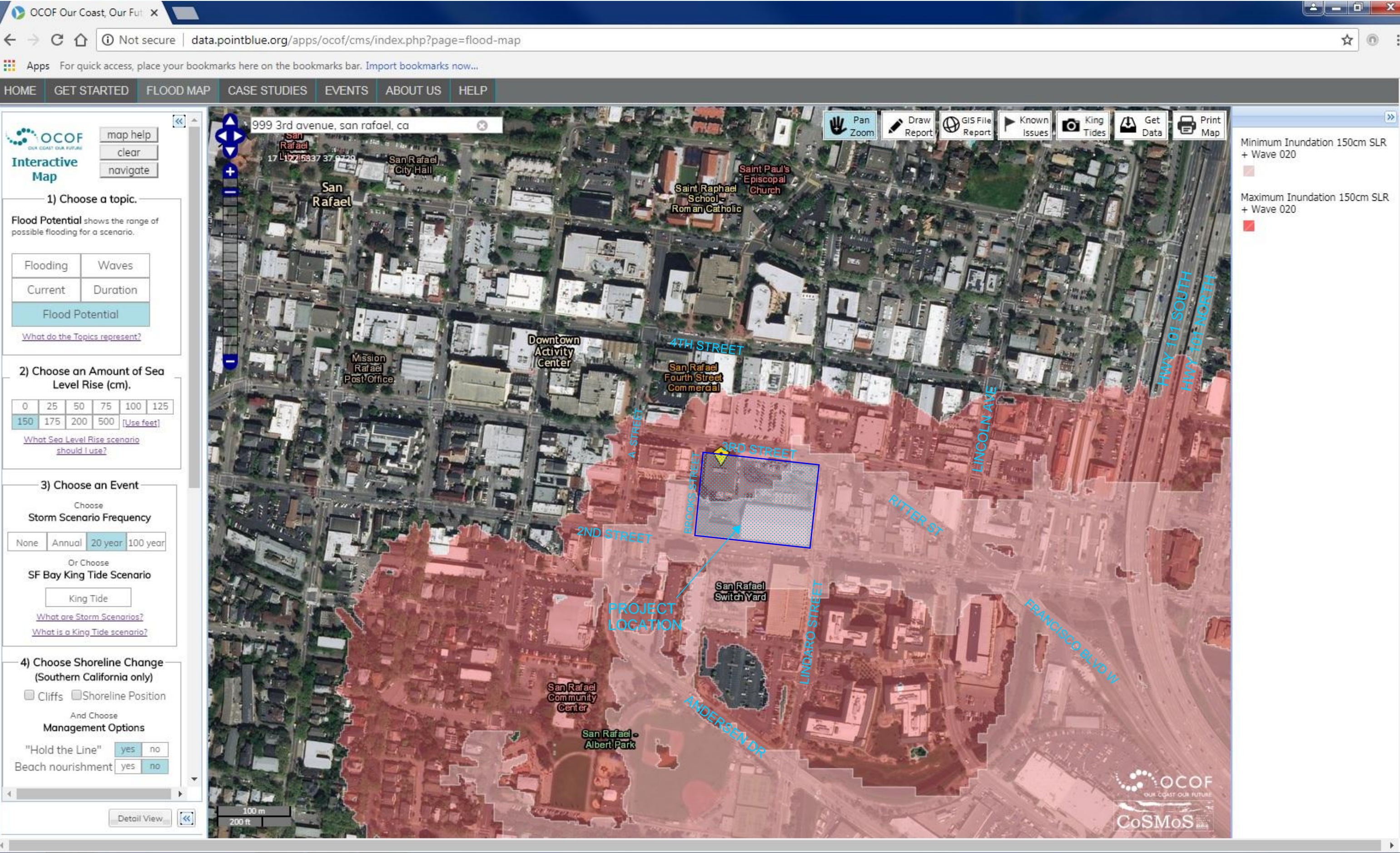
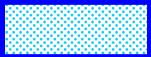




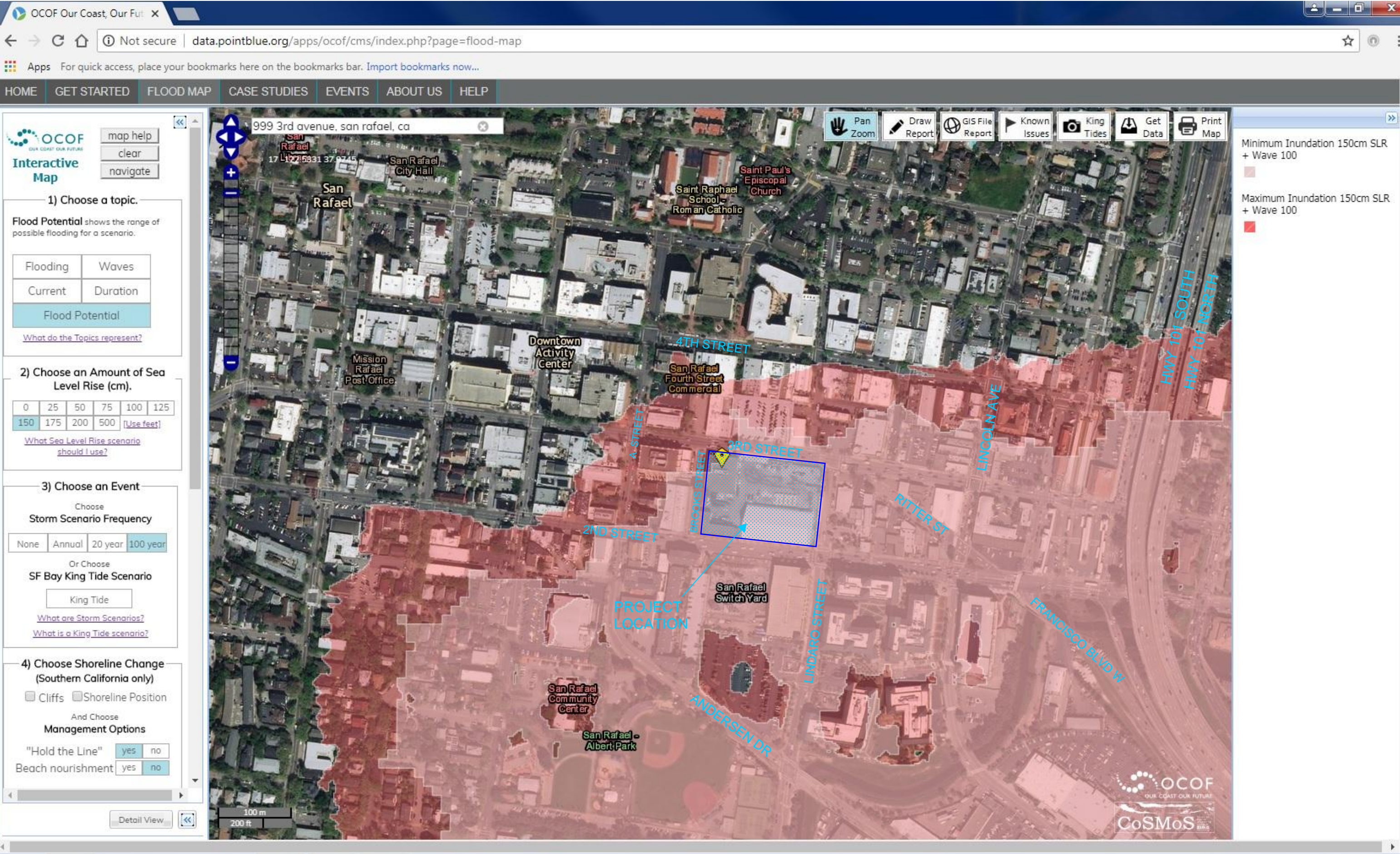














Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

## **APPENDIX IV**

### **OCOF Results for Sea Level Rise and Wave Model Combinations**

#### **Sea Level Rise and Scenario Report**

This is the sea level rise and storm scenario report for the area you selected. This report was designed to provide information to help you identify vulnerabilities to sea level rise and storm surges.

## Area and Elevation Information

Area is the size of selected polygon, in square meters, acres and hectares, and Elevation is the average, minimum and maximum elevation from the Digital Elevation Model (DEM) within the polygon.

Area:	23,460.44 m <sup>2</sup>	Elevation:	Mean: 2.87 meters
	5.80 ac		Minimum: 2.24 meters
	2.35 ha		Maximum: 3.58 meters

## Projected Percent Area Flooded for the Selected Area

Values indicate the percentage of the selected area flooded for the Storm and Sea Level Rise Scenario combination. Areas of open water are excluded from these percentages.





Storm Scenario	100 yr Storm	0	0	0	0	70%	92%	93%	93%	93%	100%
	20 yr Storm	0	0	0	0	0	0	70%	92%	93%	100%
	Annual Storm	0	0	0	0	0	0	76%	94%	94%	100%
	No Storm	0	0	0	0	0	0	75%	94%	94%	100%
		none	25 cm	50 cm	75 cm	100 cm	125 cm	150 cm	175 cm	200 cm	500 cm
Sea Level Rise Scenario											

 under 25% flooded
  25-50% flooded
  50-75% flooded
  over 75% flooded

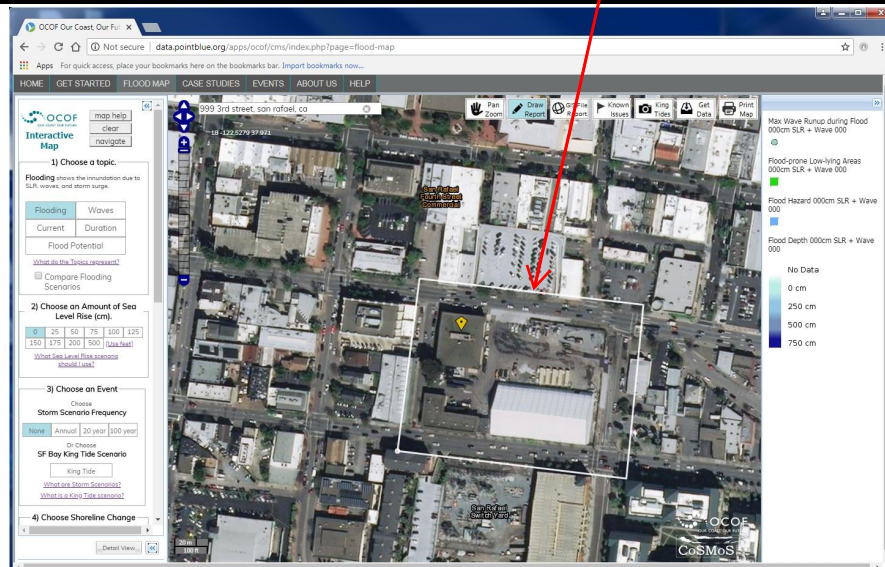
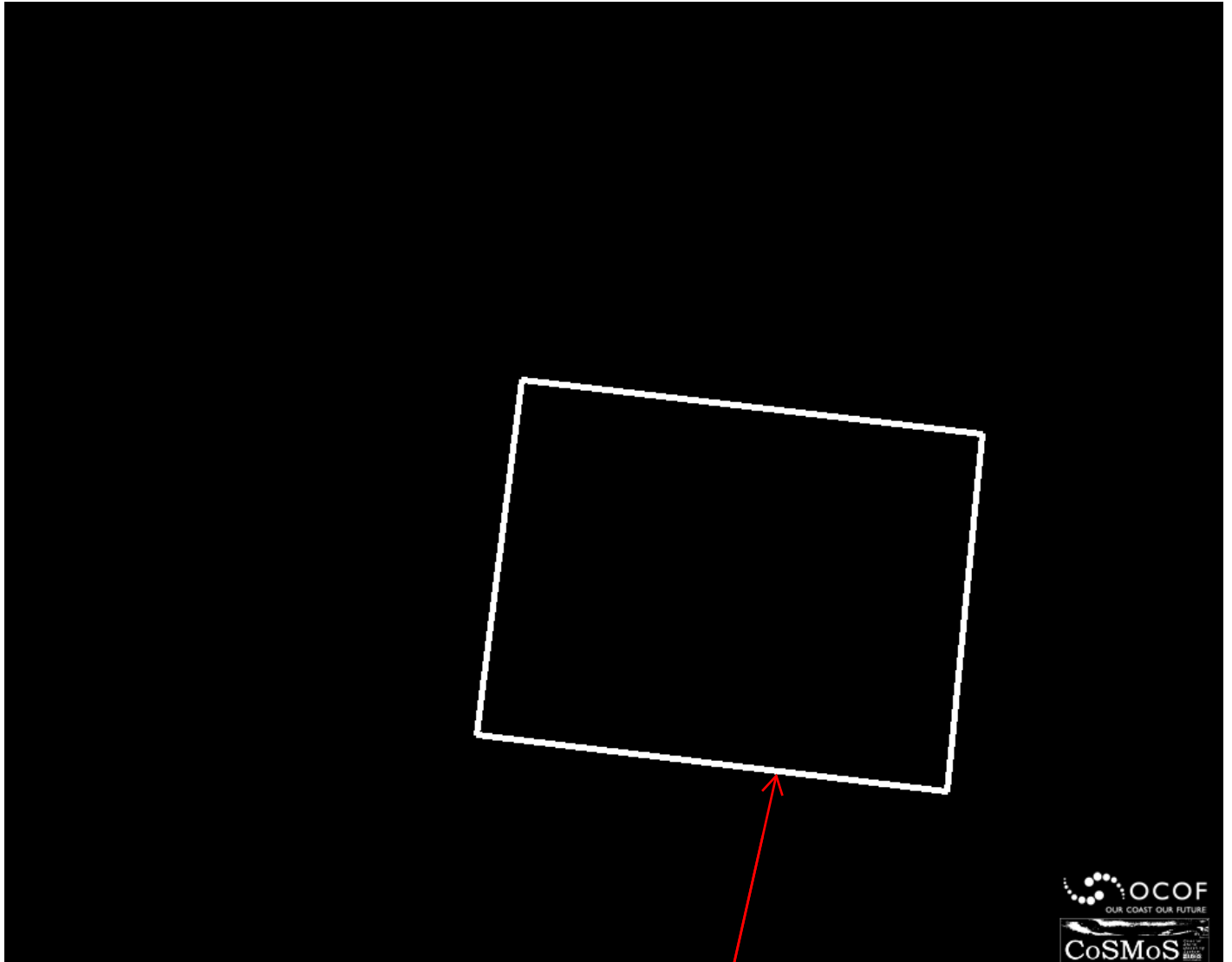
## Projected Average Flood Depth for the Selected Area

Values indicate the average flood depth (in feet and centimeters) over the Mean Higher High Water (MHHW) within the selected area for each Storm and Sea Level Rise Scenario combination. Values include modeling uncertainty bracket of +/- 40 cm.

Storm Scenario	100 yr Storm	none	none	none	none	25 - 105 cm 0.8 - 3.4 ft	45 - 125 cm 1.5 - 4.1 ft	70 - 150 cm 2.3 - 4.9 ft	95 - 175 cm 3.1 - 5.7 ft	120 - 200 cm 3.9 - 6.6 ft	430 - 510 cm 14.1 - 16.7 ft
	20 yr Storm	none	none	none	none	none	none	30 - 110 cm 1 - 3.6 ft	55 - 135 cm 1.8 - 4.4 ft	80 - 160 cm 2.6 - 5.2 ft	355 - 435 cm 11.6 - 14.3 ft
	Annual Storm	none	none	none	none	none	none	35 - 115 cm 1.1 - 3.8 ft	55 - 135 cm 1.8 - 4.4 ft	80 - 160 cm 2.6 - 5.2 ft	375 - 455 cm 12.3 - 14.9 ft
	No Storm	none	none	none	none	none	none	30 - 110 cm 1 - 3.6 ft	55 - 135 cm 1.8 - 4.4 ft	75 - 155 cm 2.5 - 5.1 ft	360 - 440 cm 11.8 - 14.4 ft
		none	25 cm	50 cm	75 cm	100 cm	125 cm	150 cm	175 cm	200 cm	500 cm
Sea Level Rise Scenario											

 average less than 1 ft
  1 to 3 ft
  3 to 5 ft
  over 5 ft

## Map of Area



Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

## **APPENDIX V**

**Table: Site Specific Sea Level Rise Projections and Potential Impacts**

Appendix V – Table: 999 3<sup>rd</sup> Street, San Rafael: Near-, Medium- and Long Term Impacts

Sea Level Rise Height		Present Day MHHW	Future MHHW	Storm Surge Severity	Wave Height above MHHW	Max Flood Elevation	Proposed Lowest Finished Floor	Lowest Adjacent Existing Grade	Level of Inundation in OCOF Interactive Map Flood Probability Layers	Timing Near Term (by 2030), Medium Term (by 2050), or Long Term (by 2100)	Impacts								
cm	inches	Elevation in Feet based on NAVD88	Elevation in Feet based on NAVD88		feet	Elevation in Feet based on NAVD88	Elevation in Feet based on NAVD88	Elevation in Feet based on NAVD88			Area of Interest								
											Finished Floor (13 NAVD88)	Foundation	Pavement/ Parking (assumes lowest elevation at driveway entries of 8.5+/-NAVD88)	Electrical Service	Storm Drain	Sanitary Sewer	Potable Water	Gas Service	Adjacent City Roads
25	9.8	5.6	6.4	No Storm	None	6.4	13.0	8.0	-	Near to Medium					X				
25	9.8	5.6	6.4	20 Year	None	6.4	13.0	8.0	None	Near to Medium					X				
25	9.8	5.6	6.4	100 Year	None	6.4	13.0	8.0	Flooding in southern portion of site. Flooding in streets adjacent to the site on all sides.	Near to Medium					X	X	X	X	X
50	19.7	5.6	7.2	No Storm	None	7.2	13.0	8.0	-	Medium to Long					X	X	X	X	
50	19.7	5.6	7.2	20 Year	None	7.2	13.0	8.0	Flooding in southern portion of site. Flooding in streets adjacent to the site on all sides.	Medium to Long					X	X	X	X	X
50	19.7	5.6	7.2	100 Year	None	7.2	13.0	8.0	Flooding throughout site.	Medium to Long					X	X	X	X	X
75	29.5	5.6	8.1	No Storm	None	8.1	13.0	8.0	-	Long					X	X	X	X	X
75	29.5	5.6	8.1	20 Year	None	8.1	13.0	8.0	Flooding throughout site.	Long					X	X	X	X	X
75	29.5	5.6	8.1	100 Year	None	8.1	13.0	8.0	Flooding throughout site.	Long					X	X	X	X	X
100	39.4	5.6	8.9	No Storm	None	8.9	13.0	8.0	-	Long			X	X	X	X	X	X	X
100	39.4	5.6	8.9	20 Year	None	8.9	13.0	8.0	Flooding throughout site.	Long			X	X	X	X	X	X	X
100	39.4	5.6	8.9	100 Year	0.8-3.4	9.7-12.3	13.0	8.0	Flooding throughout site.	Long		X	X	X	X	X	X	X	X
125	49.2	5.6	9.7	No Storm	None	9.7	13.0	8.0	-	Long			X	X	X	X	X	X	X
125	49.2	5.6	9.7	20 Year	None	9.7	13.0	8.0	Flooding throughout site.	Long			X	X	X	X	X	X	X
125	49.2	5.6	9.7	100 Year	1.5-4.1	11.2-13.8	13.0	8.0	Flooding throughout site.	Long	X	X	X	X	X	X	X	X	X
150	59.1	5.6	10.5	No Storm	1.0-3.6	11.5-14.1	13.0	8.0	-	Long	X	X	X	X	X	X	X	X	X
150	59.1	5.6	10.5	20 Year	1.0-3.6	11.5-14.1	13.0	8.0	Flooding throughout site.	Long	X	X	X	X	X	X	X	X	X
150	59.1	5.6	10.5	100 Year	2.3-4.9	12.8-15.4	13.0	8.0	Flooding throughout site.	Long	X	X	X	X	X	X	X	X	X

Key: X Impact due to rising sea water levels



Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

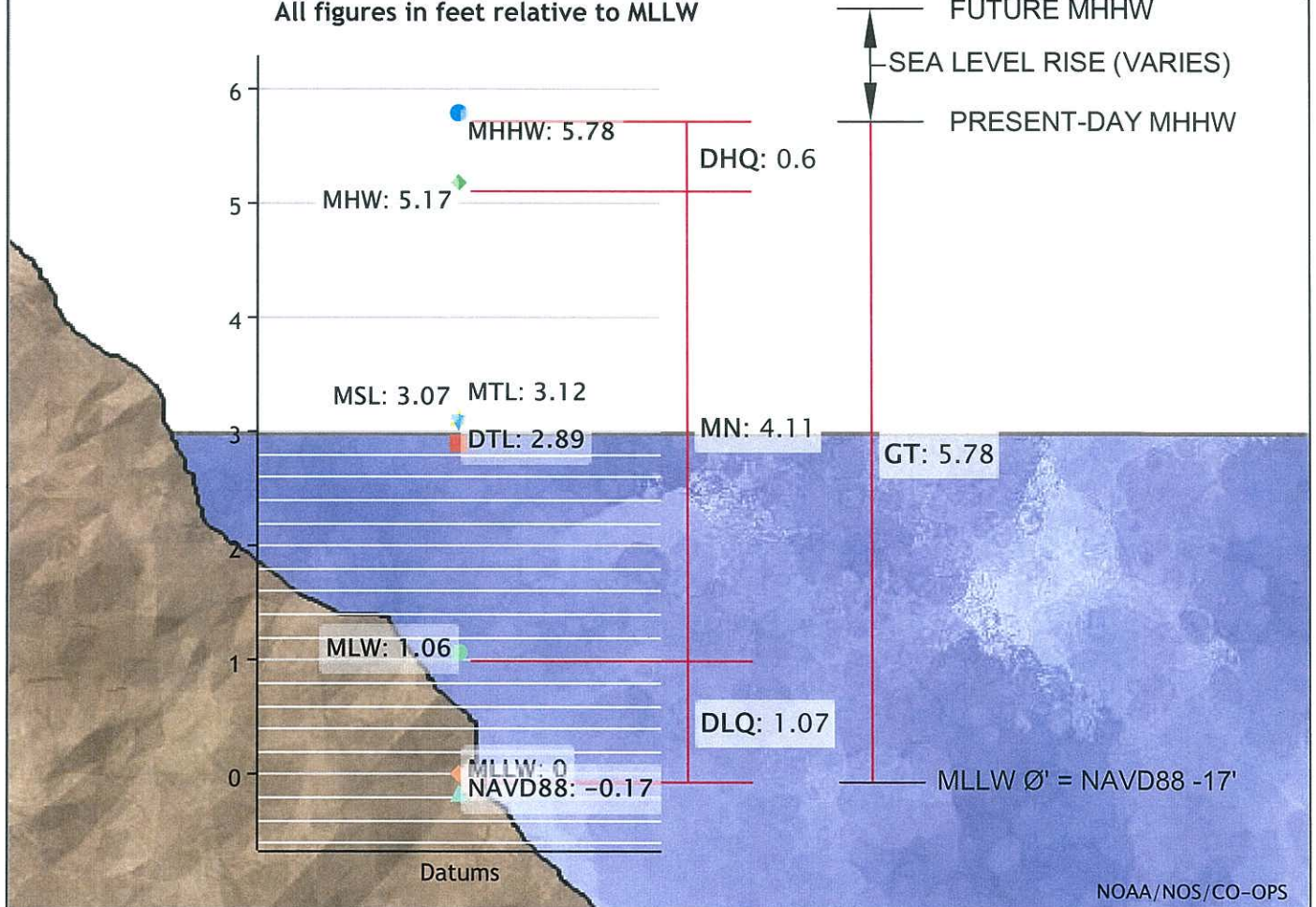
## **APPENDIX VI**

### **NOAA Datum Diagram – Point San Quentin**



# Datums for 9414873, POINT SAN QUENTIN, SAN FRANCISCO BAY

All figures in feet relative to MLLW



## ABBREVIATIONS:

NAVD88	NORTH AMERICAN VERTICAL DATUM OF 1988
MHHW	MEAN HIGHER HIGH WATER
MLLW	MEAN LOWER LOW WATER
MSL	MEAN SEA LEVEL

**CSW ST2**

**CSW/Stuber-Stroeh Engineering Group, Inc.**

Civil & Structural Engineers | Surveying & Mapping | Environmental Planning  
Land Planning | Construction Management

45 Leveroni Court  
Novato, CA 94949

tel: 415.883.9850  
fax: 415.883.9835

<http://www.cswst2.com>

© 2017

Rev. X

Job No. 569228.1

Date: 07/25/2018

Scale: AS SHOWN

**BIOMARIN**  
**TIDAL DATUMS & SEA LEVEL RISE**

999 3RD STREET

SAN RAFAEL

MARIN COUNTY

CALIFORNIA

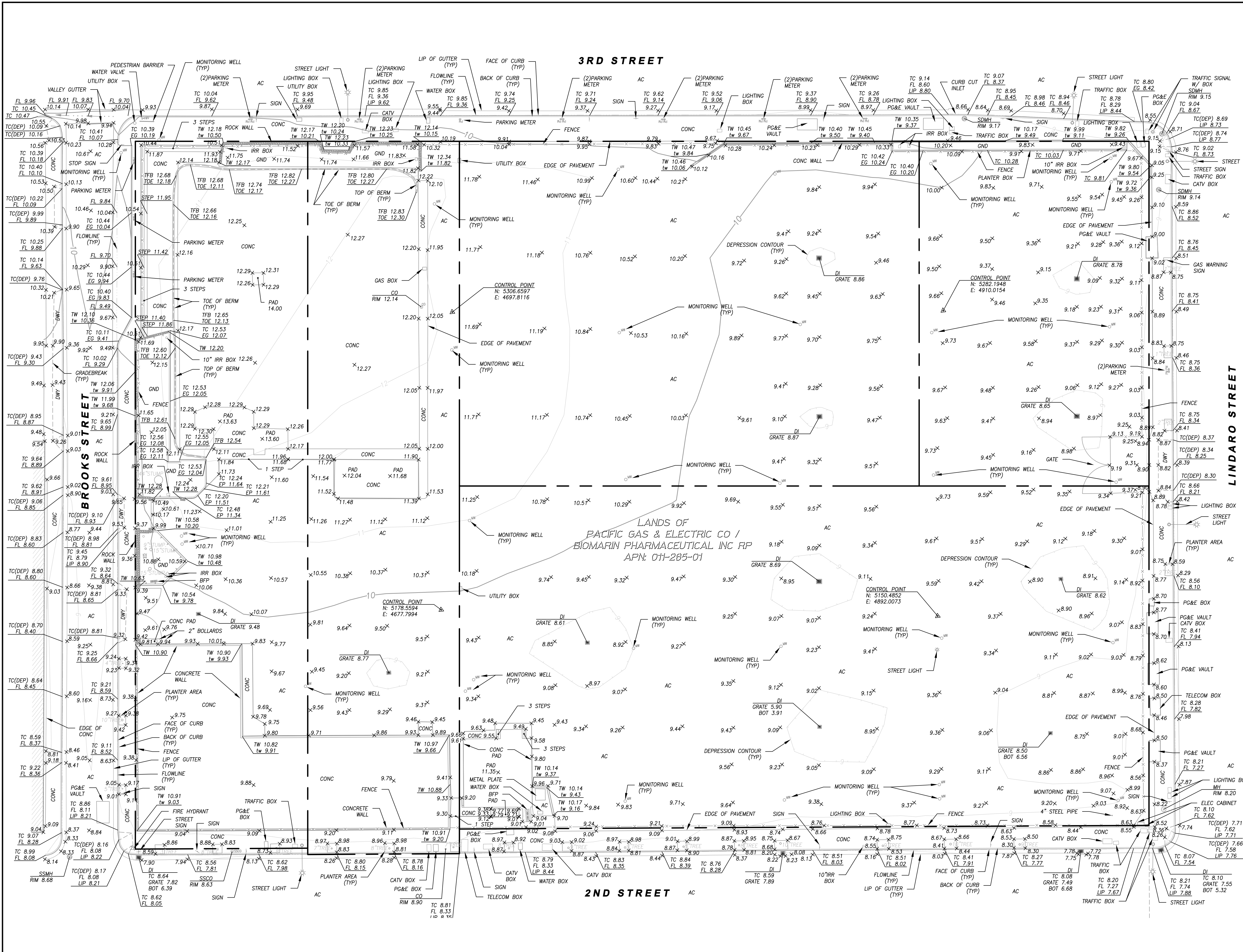


Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

## **APPENDIX VII**

### **Topographic Map**





- NOTES**
- DISTANCES SHOWN ARE IN FEET AND DECIMALS THEREOF.
  - BOUNDARY SHOWN HEREON IS BASED ON THAT CERTAIN RECORD OF SURVEY ENTITLED "RECORD OF SURVEY THE LANDS OF BIOMARIN PHARMACEUTICAL, INC" RECORDED IN BOOK 2016 OF MAPS, PAGE 131, MARIN COUNTY RECORDS..
  - VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 BASED ON CORPSCON CONVERSION FROM NGVD29, A COPY OF WHICH IS ON FILE AT THE OFFICE OF CSW/S2.
  - TOPOGRAPHY SHOWN WAS PERFORMED BY FIELD SURVEY IN APRIL OF 2018.
  - OBSERVED SURFACE UTILITIES WERE COLLECTED. BURIED UTILITIES MAY EXIST THAT ARE NOT SHOWN HEREON.

**ABBREVIATIONS**

AC	ASPHALTIC CONCRETE	GV	GAS VALVE
BFP	BACK FLOW PREVENTER	HYD	HYDRANT
BOT	BOTTOM	ICV	IRRIGATION CONTROL VALVE
CATV	CABLE TELEVISION	IRR	IRRIGATION
CL	CENTER LINE	N	NORTHING
CO	CLEANOUT	PA	PLANTER AREA
CONC	CONCRETE	PG&E	PACIFIC GAS & ELECTRIC
DEP	DEPRESSED	PNL	PANEL
DI	DRAIN INLET	PP	POWER POLE
DWY	DRIVEWAY	SD	STORM DRAIN
E	EASTING	SL	STREET LIGHT
EB	EDGE OF BOX	SS	SANITARY SEWER
EG	EXISTING GRADE	SSCO	SANITARY SEWER CLEANOUT
EL	ELEVATION	TSC	TOP OF CURB
ELEC	ELECTRICAL	TELECOM	TELECOMMUNICATIONS
EOC	EDGE OF CONCRETE	TYP	TYPICAL
EP	EDGE OF PAVEMENT	TW	TOP OF WALL
FH	FIRE HYDRANT	tw	TOE OF WALL
FL	FLOW LINE	W	WATER
G	GROUND	WV	WATER VALVE

**LEGEND**

	BOUNDARY
	BUILDING
	CONTOUR MAJOR (5' INTERVAL)
	CONTOUR MINOR (1' INTERVAL)
	FENCE
	GRADE BREAK LINE
	RETAINING WALL
	TOE OF BANK
	TOP OF BANK

**PRELIMINARY**



Rev	Date	Description	Designed	Drawn	Checked
-	4/27/18	SUBMIT TO CLIENT		JBD	AGC

**CSW | ST2**

**CSW/Stuber-Stroeh Engineering Group, Inc.**  
Civil & Structural Engineers | Surveying & Mapping | Environmental Planning  
Land Planning | Construction Management

45 Leveroni Court  
Novato, CA 94949

tel: 415.883.9850  
fax: 415.883.9835

http://www.cswst2.com

© 2018

City	San Rafael
County	Marin
State	California

999 3RD STREET  
TOPOGRAPHIC MAP  
BIOMARIN

Prepared Under the Direction of:

Sheet  
**V1**

Scale: 1"=10'  
Date: 4/27/2018  
Project Number: 5.692.28  
Plan File:

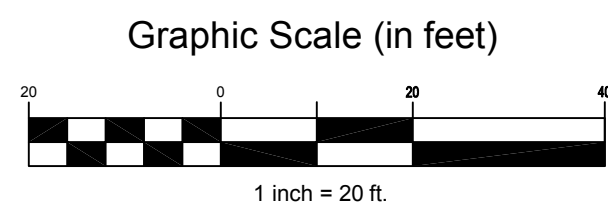
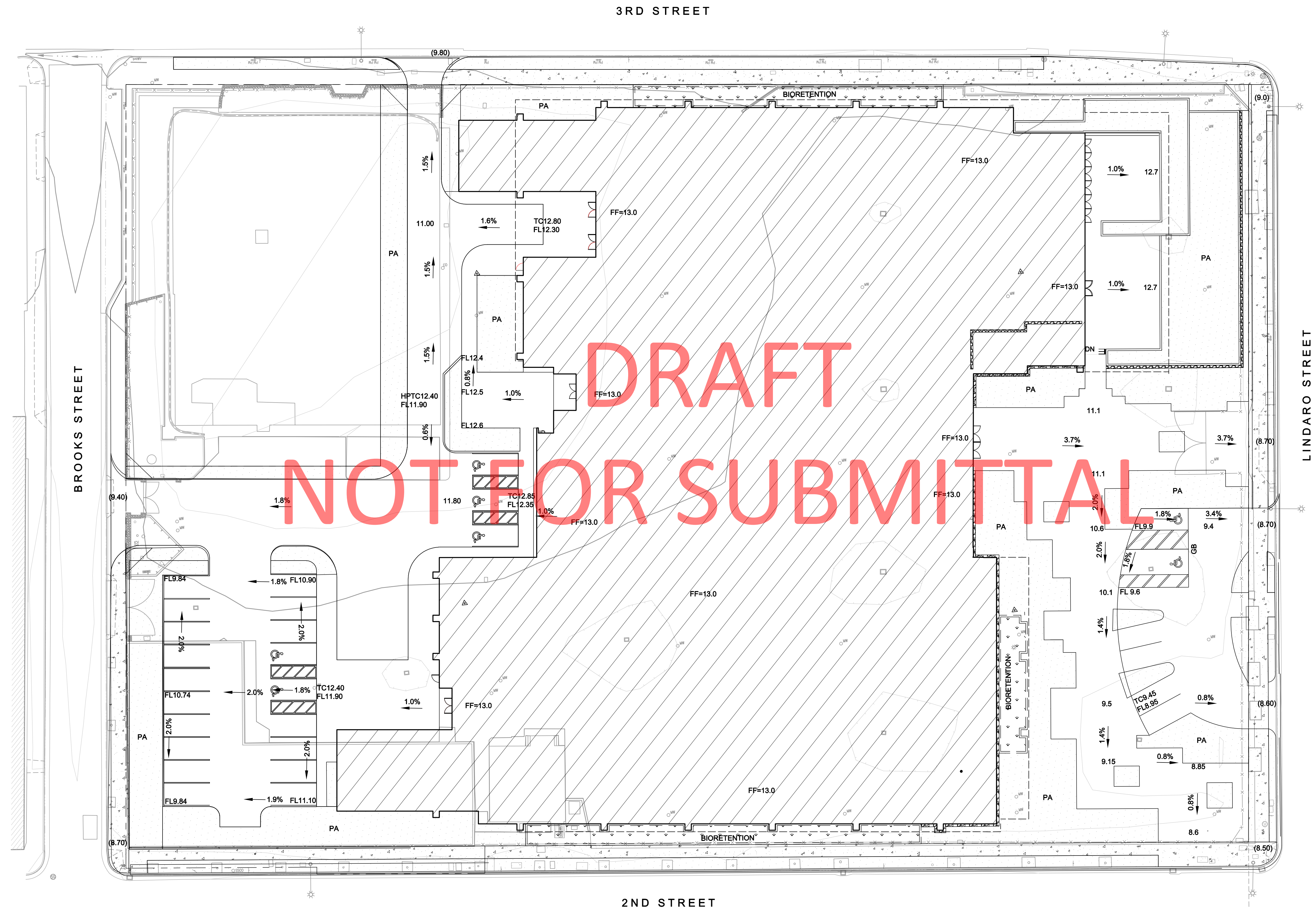


Preliminary Investigation  
And Recommendations  
FEMA Requirements and Sea Level Rise  
July 26, 2018

## **APPENDIX VIII**

### **Preliminary Grading Plan - DRAFT**





**1** OVERALL GROUND LEVEL  
SCALE: 1" = 20'-0"