

## Repetitive Loss Area Analysis

### Marin County, CA

December 2022

# DRAFT

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## 1. Executive Summary

The purpose of this report is to help homeowners to reduce their flood risk by providing a broad understanding of the problems and identifying potential solutions. It is one component of Marin County's overall floodplain management program. Due to the number of properties in Marin that meet the National Flood Insurance Program's (NFIP's) definition of Repetitive Loss (RL) properties, a Repetitive Loss Area Analysis (RLAA) is required for the County to participate in the NFIP's Community Rating System (CRS) program.

This Repetitive Loss Area Analysis (RLAA) followed a five-step process.

**Step 1:** Advise all property owners in the repetitive flood loss areas that the analysis will be conducted and request their input on the hazard and recommended actions.

**Step 2:** Conduct site visit and collect basic data on the analysis area and each building in the identified study area within the neighborhood to determine the causes of the repetitive flood damage.

**Step 3:** Contact agencies or organizations that may have plans that could affect the cause or impacts of the flooding.

**Step 4:** Review alternative mitigation approaches and determine whether any property protection measures or drainage improvements area are feasible.

**Step 5:** Document the findings

FEMA defines Repetitive Loss Properties (RLPs) as: **“any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978.”**<sup>1</sup>

As of August 2019, there are 81 Repetitive Loss Properties (RLPs) across Marin County. The majority, 75 properties, are in unincorporated areas of the county; six properties are located within incorporated portions of Marin. According to FEMA's payment records, the total payment for building losses for these RL claims from January 1978 to August 2019 was about \$3,484,000 and the total payment for content losses was about \$706,000, bringing the grand total to \$4,190,000. This represents a 21% increase in total losses over the 5-year period. The average payment per claim is estimated at \$17,560; a 12.4% increase over the 2015 average.

The 2019 expansion of the Marin County RL Analysis to incorporated areas is responsible for an increment of the increased loss totals. Incorporated areas within the County accounted for a 2% increase in the building payment, and a 27% increase in payments for contents. The combined payments for incorporated parcels make up 6% of the total payments reported since

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<sup>1</sup>Excluded from this definition are: Buildings entirely in, on, or over water into which boats are floated.

1978. This accounts for 29% of the increase in total payments since the 2015 analysis.

A total of twenty-seven (27) RL areas (RLAs) were delineated in 2019. 22 RLAs are in unincorporated areas of Marin County; 5 new RLAs are delineated in incorporated areas (cities/towns). The determination of RLAs considered repetitive loss and single loss properties, topography, structure/foundation type, stormwater infrastructure, community boundary limits, and causes of flooding. Major causes of flooding in the RL areas included coastal flooding due to high tide and heavy wind in the bayfront and coastal areas, creek overbank flows due to heavy rainfall in the areas near streams, interior flooding due to high tailwater and/or inadequate interior drainage systems in the areas protected by levees. Localized storm water flooding occurred due to storm drain backup flooding and hillslope drainage.

Step 5 in Section 3 of this report documents findings of the flooding problems and provides recommendations which include implementing recommended flood hazard mitigation measures, obtaining funding assistance for these measures, and annually updating this report.

## 2. Introduction

### 2.1. Repetitive Loss Analysis Definitions

The following definitions are used throughout this report and in the assessment and funding for protection measures for communities and residences.

#### **100-Year Flood (1% Annual Chance Flood)**

A flood event that has a 1% chance of being equaled or exceeded in any given year.

#### **100-Year Flood Elevation or Base Flood Elevation (BFE)**

The water elevation produced by the 100-year flood.

#### **100-Year Floodplain**

The area that would be inundated by the 100-year flood.

#### **CRS (Community Rating System)**

A voluntary program designed to reward a community for doing more than meeting the NFIP minimum requirements to reduce flood damages.

#### **FEMA (Federal Emergency Management Agency)**

The Federal agency responsible for implementing the National Flood Insurance Program.

#### **FIRM (Flood Insurance Rate Map)**

A series of maps provided by FEMA that designate areas of a community according to various levels of flood risk.

#### **NFIP (National Flood Insurance Program)**

The program enabling property owners in participating communities to purchase insurance protection from the Federal government against losses from flooding.

#### **Repetitive Loss (RLP) Property**

A Repetitive Loss (RL) property is **any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978.**

#### **Repetitive Loss (RLA) Area**

The properties on the repetitive loss list prepared by FEMA and all nearby properties that

are subject to same or similar flooding conditions.

### **RLAA (Repetitive Loss Area Analysis)**

An approach that identifies repetitive loss areas, evaluates mitigation approaches, and determines the most appropriate alternatives to reduce future losses in repetitive flooded areas.

## **2.2.National Flood Insurance Program (NFIP) Background**

The National Flood Insurance Program (NFIP) is tasked with paying claims while trying to keep the price of flood insurance affordable. It has particular claims associated with repetitive flood loss properties, which was estimated to cost \$200 million per year in flood insurance claim payments. Repetitive flood loss properties represent only 1.4% of all flood insurance policies, yet historically they have accounted for nearly 25% of claim payments. Mitigating these repeatedly flooded properties will reduce the overall costs to the NFIP, the communities in which they are located, and the individual homeowners.

The NFIP is based on a cooperative agreement between the Federal Emergency Management Agency (FEMA) and local units of government. FEMA agrees to underwrite flood insurance policies within a community and the community agrees to regulate development in the floodplain. Participation in the NFIP is voluntary, but communities have incentive to join because Federally-backed flood insurance is not available in non-participating communities and a non-participating community will not receive Federal aid for damage to insurable buildings in the floodplain.

The three basic components of the NFIP are floodplain mapping, flood insurance, and floodplain management regulations. Floodplain mapping is provided by FEMA on a series of maps called Flood Insurance Rate Maps (FIRMs), which designate areas of a community according to various levels of flood risk. Regardless of its risk level, any building in an NFIP participating community can be covered by a flood insurance policy, even buildings not located in a mapped floodplain. A flood insurance policy is only mandated for Federally-backed mortgages on buildings in the floodplain. In Marin County, any new buildings constructed in a floodplain, and any improvements or repair of existing buildings in a floodplain, are subject to the Floodplain Management regulations (Chapter 23.09) of the Marin County Code of Ordinances.

Marin County joined the NFIP in 1982 and recently applied for entry into the FEMA's Community Rating System (CRS) program. This analysis is prepared as part of Marin County's CRS program effort. The analysis follows FEMA guidelines to determine why an area has repeated flood losses and what alternative flood protection measures would help break the cycle of repetitive flooding.



### **2.3. Community Rating System**

The CRS is a voluntary program designed to reward a community for doing more than meeting the NFIP minimum requirements to reduce flood damages. Communities can be rewarded for activities such as reducing flood damage to existing buildings, managing development in areas not shown in the floodplain on the Flood Insurance Rate Maps (FIRMs), protecting new buildings from floods greater than the 100-year flood, helping insurance agents obtain flood data, and helping people obtain flood insurance. The reward for these activities comes in the form of reduced premiums for flood insurance policy holders. Once a community has been accepted into the CRS, the community's floodplain management activities are rated according to the scoring system described in the CRS Coordinator's Manual (FEMA, 2017). CRS communities are rated on a scale of 1-10. A Class 10 ( $\leq 499$  credit points) community receives no reduction in flood insurance premiums, but every class below 10 receives an additional 5% premium reduction. Class 1 requires the most credit points ( $\geq 4,500$ ) and provides a 45% premium reduction.

Federal programs such as the Community Rating System (CRS) encourage communities to identify and mitigate the causes of repetitive losses. The first step is to map repetitive loss areas, which are contiguous areas that include one or more properties on FEMA's list of repetitive loss properties and all nearby properties with exposure to the same or similar flooding conditions. FEMA considers listed repetitive loss properties to be indicative of an overall repetitive loss problem that may affect other nearby properties. Designation of repetitive loss areas around listed repetitive loss properties allows an evaluation of actual or potential flooding problems at properties that may not have flood insurance or may have had only a single previous claim. This ensures that all properties with the same exposure to a flood risk are addressed equally.

### **2.4. Repetitive Loss Properties, Repetitive Loss Area, and Repetitive Loss Area Analysis**

Repetitive loss (RL) properties are those properties for which two or more claims of more than \$1,000 have been paid by the NFIP within any rolling 10-year period since 1978 (e.g., two claims during the periods 1978–1987, 1979–1988, etc.). A repetitive loss area is an area that contains the properties on the repetitive loss list obtained from FEMA and all nearby properties that are subject to the same or similar flooding conditions<sup>2</sup>. A repetitive loss area analysis (RLAA) is an approach that identifies repetitive loss areas, evaluates mitigation

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<sup>2</sup> Each RL area must include at least one of the properties on the FEMA's RL list. In addition, all the "historical" claim properties (even single claim) must be included in the RL area maps if they are caused by the same flooding source and mechanism as the RL properties. It is important to note that the only reason a property appears on FEMA's list is because the structure had flood insurance and received two or more claims of at least \$1,000 during any given 10-year period. These properties are merely representative of the community's overall repetitive flooding problem. Other structures near the ones listed by FEMA may have been uninsured during the floods, may have had single flood insurance claims, or may have had multiple claims under different policies that the system did not recognize as being the same repetitively flooded address. From a community perspective, it is not fair to single out those properties that happen to be on FEMA's list. All properties with the same exposure to repeated flood damage should be included in the RL area and addressed.

approaches, and determines the most appropriate alternatives to reduce future losses.

## **2.5. Historical Claims of Repetitive Loss Properties in Marin County**

The 2014 RL list provided by FEMA identified 78 properties which satisfied the RLA criteria. Examination of the list found that there were four (4) duplicates for four RL properties and six (6) properties were not within unincorporated Marin County.<sup>3</sup> The number of RL properties in unincorporated Marin County was revised to 72. This classified the County as a Category C repetitive loss community based on FEMA's classifications of A, B, and C.<sup>4</sup>

The 2019 analysis utilizes loss data from claims between January 1978 and August 2019. Marin County expands the analysis to consider both incorporated and unincorporated areas. The analysis identifies 81 RL properties countywide. The 2019 RL analysis utilized the same procedure for data review and synthesis as the 2014 analysis. In unincorporated Marin County, 75 RL parcels were identified, three less than identified in 2014. An additional six (6) parcels were identified in incorporated areas, bringing to 2019 total of RL parcels to 81. Table 1.1 summarizes historical repetitive loss claims from January 1978 to August 2019. Table 2.1 provides a summary of the dates of historical claims. Because much of the county is subject to tidal influence via San Francisco Bay or the ocean coast, the majority of claims occur when significant rainfall events are compounded by high tide conditions.

According to FEMA's payment records, the total payment for building losses for these RL claims from January 1978 to August 2019 was about \$3,484,000 and the total payment for content losses was about \$706,000, bringing the grand total to \$4,190,000. This represents a 21% increase in losses over the 5-year period from 2014 -2019. The average payment per claim is estimated at \$17,560; a 12.4% increase over the 2015 average of \$15,600.

In order for a community with 10 or more RL properties to participate in the CRS program, special conditions have to be met. One condition requires the County to adopt either a Floodplain Management Plan or a Repetitive Loss Area Analysis prior to its entry into the CRS program.

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<sup>3</sup> An updated RL list was prepared after review of FEMA's list. The review examined the FEMA's list for accuracy (including address spelling) to determine whether the properties were actually in the limits of unincorporated Marin County, and to determine whether the insured buildings on the RL list had been removed, retrofitted, or otherwise protected from the cause of repetitive flooding. The result of the review was recorded on a Repetitive Loss Update Worksheet (AW-501).

<sup>4</sup> Category A: A community with no repetitive loss properties or unmitigated repetitive loss properties.  
Category B: A community with at least one, but fewer than 10 unmitigated repetitive loss properties.  
Category C: A community with 10 or more unmitigated repetitive loss properties.

**Table 2.1: Marin County Historical Repetitive Loss Claims and Properties**

<b>Number of Claims</b>	<b>RL Properties with the Number of Claims (Unincorporated)</b>	<b>RL Properties with the Number of Claims (Incorporated)</b>	<b>Total Number of Claims</b>
2	37	3	80
3	14	0	42
4	16	0	64
5	3	0	15
6	3	0	18
7	2	0	14
8	0	0	0
9	3	0	27
<b>Total</b>	<b>78</b>	<b>3</b>	<b>260</b>

**Table 2.2 Dates of Historical Claims for Multiple RL Properties in Marin County<sup>5</sup>**

Event Date	Number of Claims	Notes
<b>Total Claims</b>	<b>220</b>	<b>Years: 1978-2019</b>
1978/01/16-19	3	No Data
1979/01/10-11	2	No Data
1980/02/15-18	6	Extreme heavy rain
1982/01/04	26	Extreme heavy rain (resulted in a 150 to 200-year flood in Ross Valley)
1982/11/29-30	4	Heavy consecutive rains drove flooding regionally and state wide
1982/12/29	2	No Data
1983/01/27 1983/01/27	36	Extreme high tide and heavy wind (recorded highest tide (8.88 ft NAVD88) at the San Francisco Bay Presidio Tide Gage over the 150-year period of record)
1983/02/25	3	
1983/03/01	9	High tide (7.72 ft NAVD88) combined with heavy rain (about 2 inches
1983/03/13	2	
1983/12/03	20	Extreme high tide and heavy wind (recorded second highest tide (8.77 ft NAVD88) at the San Francisco Bay Presidio Tide Gage over the 150-year period of record)
1986/02/14-19	12	Heavy rain (5.7 inches rainfall in 24 hours recorded at Phoenix Lake)
1993/01/06-20	7	Heavy Rainfall (5" + /day) for two consecutive days
1995/01/08-19	10	Very wet month (33.77 inches rainfall for January recorded at Phoenix
1995/03/09-10	3	No Data
1995/12/12-18	3	No Data
1997/01/01	6	Extreme high tide and heavy wind (recorded third highest tide (8.49 ft., NAVD88) at the San Francisco Bay Presidio Tide Gage over the 150-year period of record
1998/02/03-06	14	Consecutive heavy rainfall (3-5") over several days created local and area wide flooding along Novato Creek, Corte Madera Creek
2001/01/10	2	No Data
2001/12/01	2	No Data

<sup>5</sup> <https://www.ncdc.noaa.gov/stormevents>

<b>Table 2.2 Dates of Historical Claims for Multiple RL Properties<sup>6</sup></b>		
2002/12/15-16	5	Heavy and consecutive rainfall events accumulated saturated soils and rising stages in small and large stream regionally, diving both local and area-wide flooding.
2003/12/24-29	2	No Data
2004/12/27	2	No Data
2005/01/07	2	No Data
2005/12/18	2	No Data
2005/12/30-31	20	Extreme heavy rain (resulted in 100-year flood in Ross Valley)
2006/01/03	2	No Data
2008/01/04	5	Flooding rains, high winds, record high surf and strong onshore wind caused coastal flooding. Ocean water was driven onto streets in Stinson Beach and Bolinas.
2014/02/09	3	No Data
2014/12/12	5	Coastal flooding driven by astronomically high tide and strong onshore winds, combined with ongoing heavy rainfall.
2016-2019	0	No Claims though significant storms occurred in: 2017: Roadway flooding NB 101 at Lucky Dr Offramp. 2018: Roadway flooding at San Clemente Drive and Bon Aire Rd, CM., Almonte Blvd and SR 1, Marin City., and SR-1 and Fallon Road, Fallon. 2018 King tide flooding reported at low lying locations including Hwy 101 near Hwy 1 at Marin City 2019/01: Scattered flooding of houses around Sleepy Hollow, Ross Valley, San Anselmo, and Fairfax due to clogged drains along the Corte Madera Cr.; and Flooding at Hwy 1 at Sir Francis Drake Blvd, and in low lying portions of Pt. Reyes Petaluma Rd.; and Flooding at Hwy 101 at Lucky Drive.
<b>Total Claims</b>	<b>220</b>	

<sup>6</sup> <https://www.ncdc.noaa.gov/stormevents>

## 2.6. Five Step Process of Completing a Repetitive Loss Area Analysis

The process of completing a RLAA plan is one that incorporates a number of stakeholders – local officials, government agencies, and residents, civil and social organizations – into the analysis. Doing so serves the purpose of not just of creating a suitable plan for Community Rating System (CRS) credit points where applicable, but also of making stakeholders more aware of the shared problems repetitive flooding causes in their neighborhoods. This collaborative effort is also intended to encourage residents and officials to participate in realistic mitigation measures that may reduce or even eliminate future repetitive flooding problems.

To achieve the above purposes, FEMA 2013 CRS Coordinator’s Manual specifies the following 5 steps for preparation of a RLAA:

**Step 1:** Advise all property owners in the repetitive flood loss areas that the analysis will be conducted and request their input on the hazard and recommended actions.

**Step 2:** Conduct site visit and collect basic data on the analysis area and each building in the identified study area within the neighborhood to determine the causes of the repetitive damage.

**Step 3:** Contact agencies or organizations that may have plans that could affect the cause or impacts of the flooding.

**Step 4:** Review alternative mitigation approaches and determine whether any property protection measures or drainage improvements area are feasible.

**Step 5:** Document the findings in a report. The report should include a summary of the process that was followed and how property owners were involved in the process; a problem statement with a map of the affected area; a list or table showing basic information for each building in the affected area; the alternative approaches that were reviewed; and a list of action items identifying the responsible party, when the action should be completed, and how it will be funded.

### 3. Delineation of Repetitive Loss Areas

To support the delineation of RL areas, all historical single claims were also obtained from FEMA. The following approach was taken to delineate the RL areas:

1. Generate a Marin County wide base map depicting topography, parcels, creeks and wetlands.
2. Plot the 2015 list of Repetitive Loss Parcels (RLPs) on the map.
3. Plot the 2019 updated list of RLPs on the map
4. Plot nearby properties that have received at least one flood insurance claim. The flooding dates were checked to see if they coincided with the flooding dates for the properties on the repetitive loss list.
5. Overlay a topographic GIS layer to identify areas that are lower in elevation than areas without repetitive claims.
6. Overlay county and municipal data identify stormwater pumps, large pipes, culverts, levees and other mapped stormwater infrastructure.
7. Draw lines around those areas with similarly situated properties, i.e., subject to flooding and lower-lying than the surrounding properties.
8. Conduct a site visit to confirm the boundaries.
9. After the repetitive loss areas are identified, prepare a list of the addresses of all improved<sup>7</sup> parcels in those areas for an outreach program.

Twenty-one (21) RL areas were delineated for unincorporated Marin County, and five (5) RL areas were added for incorporated areas. Figures 3.1a-d present the location of RLAs across larger county areas. Appendix A provides mapping for each of the 26 RLAs and summarizes the causes of flooding and recommended mitigation measures. To comply with the Privacy Act, the RL properties and single claim properties are not shown on these figures. Table 3.1 shows the number of properties, number of RL properties within each RL area, and the causes of flooding.

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<sup>7</sup> An improved parcel is one with an insurable building on it. For CRS purposes, an insurable building is a walled and roofed structure, principally above ground and affixed to a permanent site, including a manufactured (mobile) home on a foundation.

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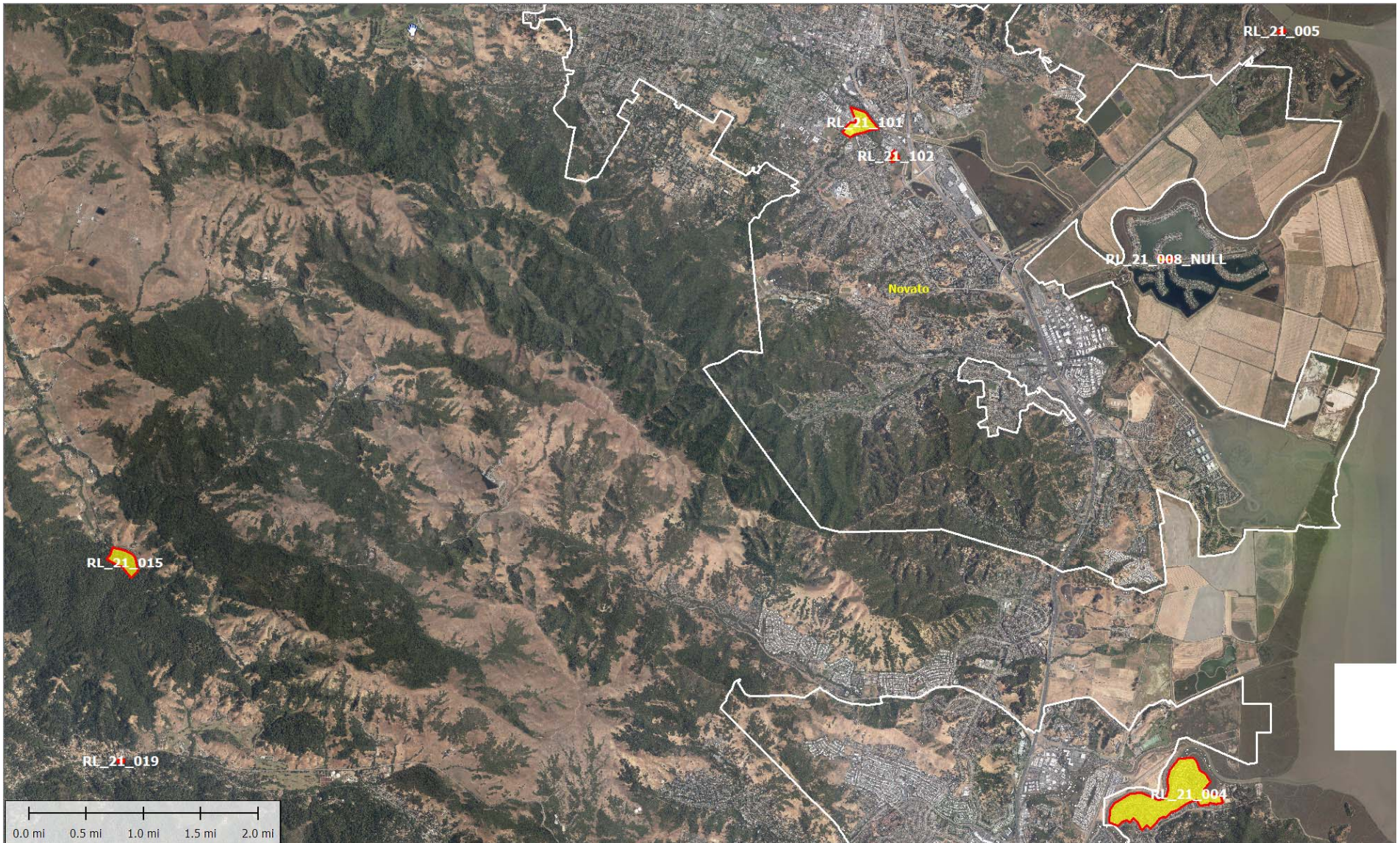


Figure 3.1a: Central Marin County 2019 Repetitive Loss Areas



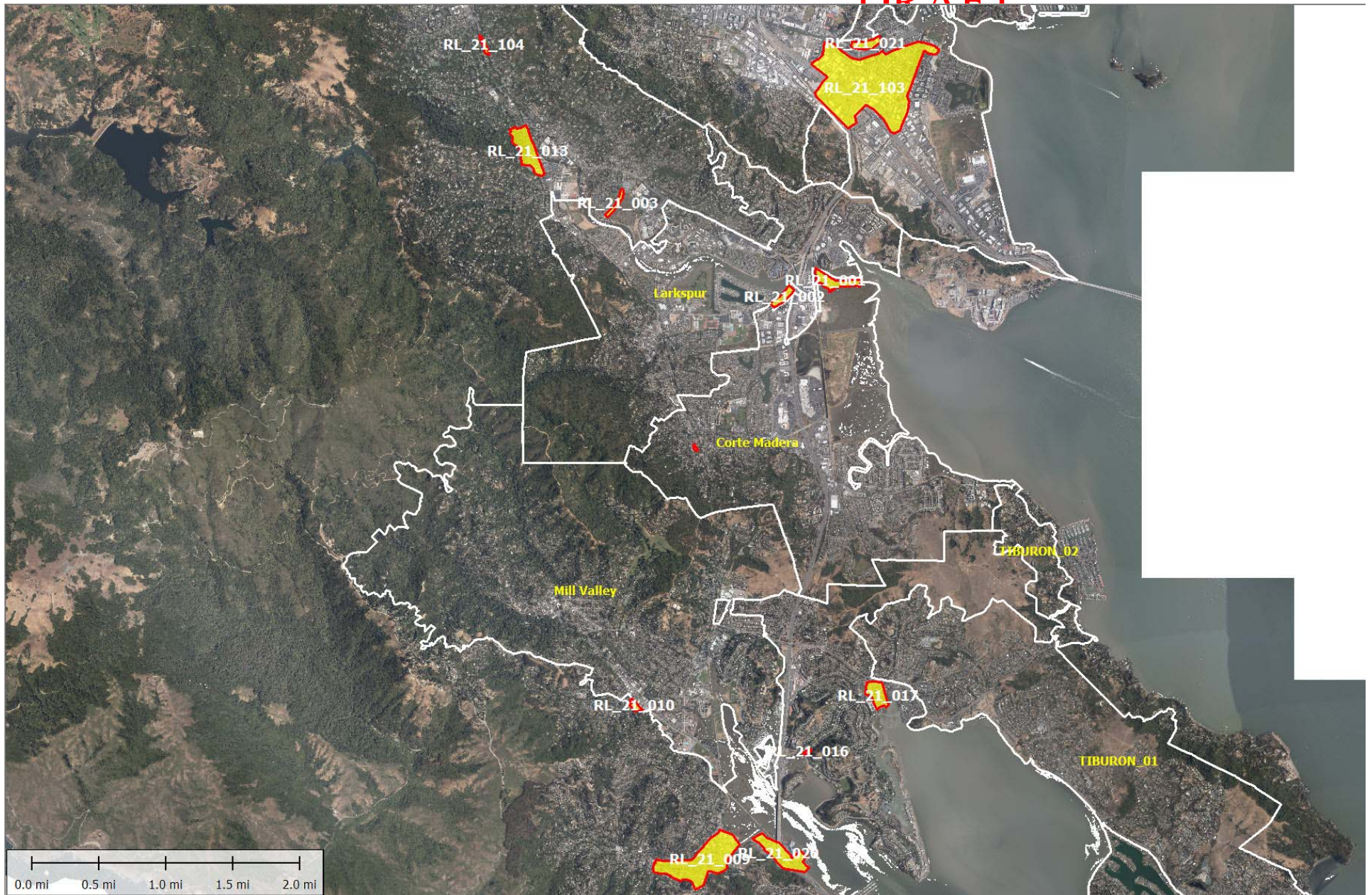


Figure 3.1b: Southern Marin County 2019 Repetitive Loss Areas

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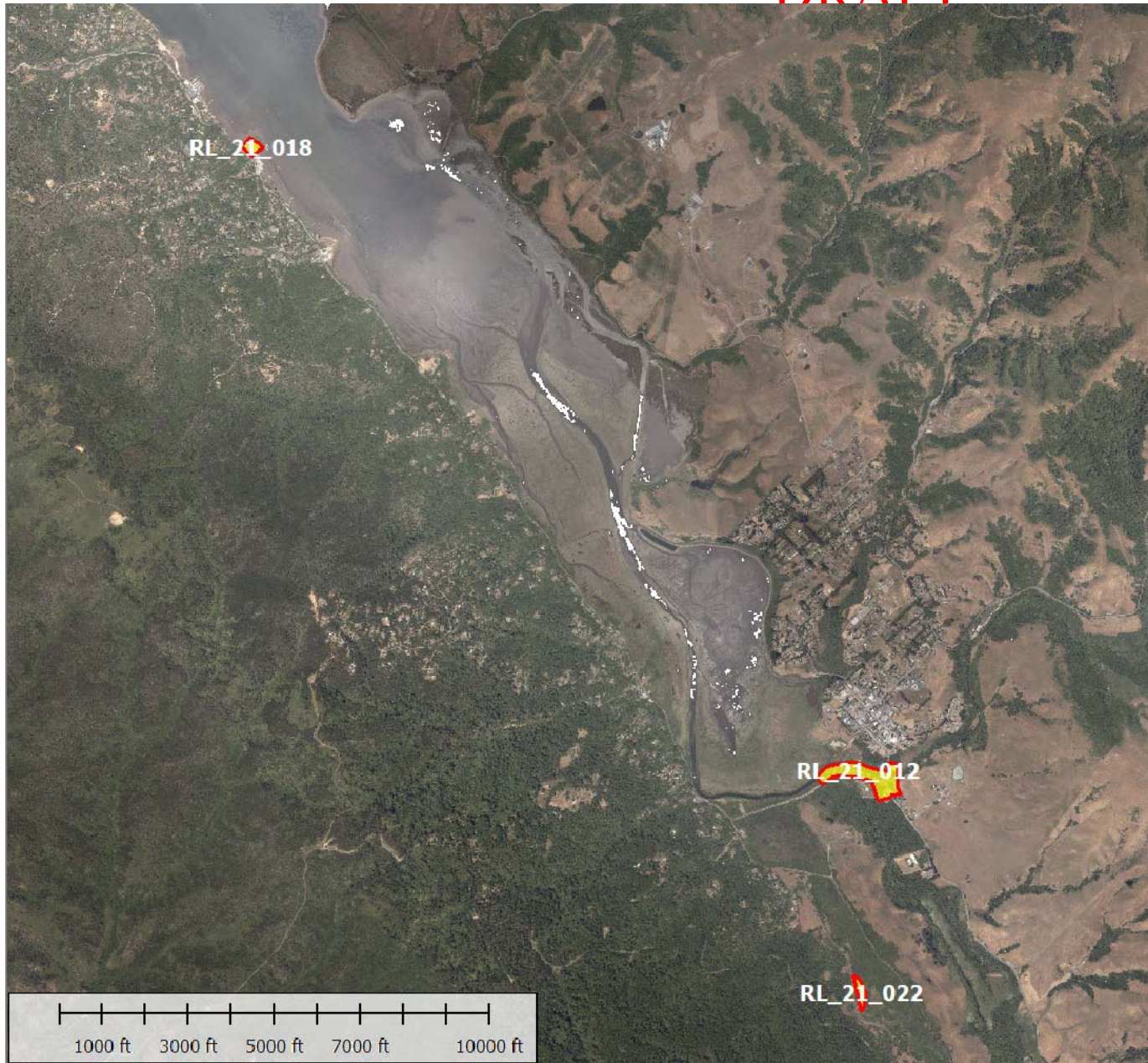


Figure 3.1c: Tomales Bay, Marin County 2019 Repetitive Loss Areas

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Figure 3.1d: Coastal Marin County 2019 Repetitive Loss Areas

**Table 3.1 Property Count and Causes of Flooding in Repetitive Loss Areas**

<b>RL Area</b>	<b>City</b>	<b>RLA Properties</b>	<b>2019 RL Properties</b>	<b>Causes of Flooding</b>
RL-01	Greenbrae	53	2	Corte Madera Creek estuary tidal flooding.
RL-02	Greenbrae	16	2	<ul style="list-style-type: none"> <li>• Corte Madera Creek estuary tidal flooding;</li> <li>• Corte Madera Creek overbank flow flooding.</li> </ul>
RL-03	Kentfield	20	1	<ul style="list-style-type: none"> <li>• Creekside Marsh/ McAllister Creek tidal and overbank flooding; Local storm drain flooding due to high tailwater or inadequate hydraulic capacity.</li> </ul>
RL-04	San Rafael: Santa Venetia	570	20	Interior flooding due to high tailwater and/or inadequate interior drainage system.
RL-05	Novato: Petaluma River Estuary	15	1	Petaluma River estuary tidal flooding.
RL-06	Stinson Beach	240	15	<ul style="list-style-type: none"> <li>• Easkoot Creek overbank flow flooding;</li> <li>• Coastal flooding.</li> </ul>
RL-07	Stinson Beach	123	2	Coastal flooding.
RL-08	Novato: Bel Marin Keys	0	0	Local storm drainage backup flooding due to high tailwater or inadequate hydraulic capacity.
RL-09	Mill Valley: Coyote Creek	258	8	<ul style="list-style-type: none"> <li>• Richardson Bay tidal flooding</li> <li>• Coyote Creek overbank flow flooding</li> <li>• Local storm drainage backup flooding due to high tailwater or inadequate hydraulic capacity.</li> </ul>
RL-10	Mill Valley: Reed Creek	15	2	Reed Creek overbank flow flooding.
RL-11	Fairfax: Upper Watershed	3	1	Local flooding due to inadequate local storm drains.
RL-12	Point Reyes Station	20	2	Lagunitas Creek overbank flow flooding.
RL-13	Kentfield	90	3	<ul style="list-style-type: none"> <li>• Corte Madera Creek estuary tidal flooding</li> <li>• Corte Madera Creek breakout flow upstream and Murphy Creek overbank flow flooding.</li> </ul>
RL-14	Muir Beach	9	2	Redwood Creek overbank flow flooding.
RL-15	Nicasio	9	1	<ul style="list-style-type: none"> <li>• Overbank flow flooding from an unnamed creek</li> <li>• Local storm drainage backup flooding due to high tailwater or inadequate hydraulic capacity.</li> </ul>
RL-16	Mill Valley: Strawberry	4	1	Local storm drainage backup flooding due to high tailwater (high tide) or inadequate hydraulic capacity.
RL-17	Mill Valley: Strawberry	43	2	Local storm drainage backup flooding due to high tailwater (high tide) or inadequate hydraulic capacity.
RL-18	Inverness	7	1	<ul style="list-style-type: none"> <li>• Tomales Bay flooding</li> <li>• Overbank flow flooding from an unnamed creek.</li> </ul>
RL-19	Forest Knolls	3	1	San Geronimo Creek overbank flow flooding.
RL-20	Mill Valley /Manzanita	10	1	Tidal Flooding, Richardson Bay

<b>Table 3.1 Property Count and Causes of Flooding in RL Areas (Continued)</b>				
RL-21	San Rafael N. San Pedro Rd Lowrie Yacht Harbor	15	1	<ul style="list-style-type: none"> <li>• Tidal Flooding, San Rafael Canal</li> <li>• Stormwater contributions</li> </ul>
RL-22	Bear Valley Cr. Floodplain inundation	1	1	<ul style="list-style-type: none"> <li>• Bear valley Creek overbank flooding</li> <li>• Private parcel drainage realignment</li> </ul>
RL-101	So. Novato @ Nave Gardens	84	1	Novato creek tidal backwater, overbank flooding Arroyo Avichi Creek/Novato Creek/Warner Creek
RL – 102	So. Novato @ Baccaglio Basin/Scottsdale Pond	11	1	<ul style="list-style-type: none"> <li>• Novato street and overbank Creek drainage</li> <li>• Conveyance from Baccaglio Basin</li> <li>• Backwater from Novato Creek and Scottsdale Pond</li> </ul>
RL-103	San Rafael, San Rafael Canal @ Hwy 101 ramp	698	1	<ul style="list-style-type: none"> <li>• Coastal Flooding</li> <li>• Highway Drainage</li> <li>• Upslope drainage</li> </ul>
RL-104	Corte Madera Creek Floodplain US of Ross Cr. Confluence	11	1	Upslope street drainage via Sir Francis Drake Blvd.
RL- 105	Corte Madera Hills Grove Ave @ Corte Madera Ave and Montecito Drive	5	1	Residential drainage and structure improvements - private.
<b>Total</b>		<b>2,336</b>	<b>75</b>	

### **3.1.Repetitive Loss Area Analysis**

#### **3.1.1. Advise All Property Owners**

The first step in FEMA’s five-step process is to notify the residents in the RL areas about Marin County’s ongoing work. The County sends a letter annually to property owners within repetitive loss areas. In 2023, the mailing list and letter are being distributed to residents and owners of parcels within the updated RLAs. The notification letter advises recipients that their parcel falls within a RLA, and encourages them to obtain and/or maintain flood insurance, and take action to reduce the risk of danger and damages. This includes review of the current RLA Report, (this 2022 document), and requests response to a brief County survey soliciting information regarding the extent and type of flooding experienced on their parcel and comment on the 2022 RLA report. The letter and survey, provided in Attachment A,

#### **3.1.2. Collect Data**

The second step in the process is the collection of data that pertains to the RL areas; both as a whole and specifically about the causes of the repetitive flooding. These six primary sources of data and information are summarized below:

- County Plans and Codes;
- Community Plans and Codes;
- Watershed Program Flood Studies;
- Flood Hazard Mapping and Flood Insurance Data;
- Drainage and public infrastructure data;
- Site Visit Data Collection.

#### **1.1.1.1 Marin County Plans and Codes**

The following Marin County plans and codes were reviewed:

- Marin County Code of Ordinances, 2022 Update
- Marin Countywide Plan, 2015 Update
- Marin County Local Hazard Mitigation Plan, 2018 Update
- Marin County Local Coastal Plan, 2021 Updates
- Marin County 2023 Safety Element Update which includes updated for flood and sea level rise risks is in production as of this writing.

**Marin County Code of Ordinances: Chapter 23.09 of the code addresses floodplain management. It sets the following standards for construction in all areas of special flood hazards:**

**23.09.031 - General provisions.**

(A) Lands to Which This Chapter Applies. This chapter shall apply to all areas of special flood hazards within the jurisdiction of the county.

(B) Basis for Establishing the Areas of Special Flood Hazard. The areas of special flood hazard, identified by the Federal Emergency Management Agency or Federal Insurance Administration in a scientific and engineering report entitled "Flood Insurance Study for Marin County, California, unincorporated areas" dated November 19, 1986, and accompanying flood insurance rate maps and flood boundary and floodway maps, and all subsequent amendments to and/or revisions of any of these, are adopted by reference and declared to be a part of this chapter, as well as amendments thereto. This flood insurance study is on file at the Marin County department of public works. This flood insurance study is the minimum area of applicability of these rules and may be supplemented by studies for other areas which allow implementation of these rules and which are recommended to the board of supervisors by the floodplain administrator.

**23.09.034 Standards of construction.**

In all areas of special flood hazards, the following standards are required:

- (a) Anchoring.
  - (1) All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.
  - (2) All manufactured homes shall meet the anchoring standards of this chapter.
- (b) Construction Materials and Methods.
  - (1) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
  - (2) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.
  - (3) All new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
  - (4) Require within Zones AM, AO or VO, adequate drainage paths around structures on slopes to guide floodwaters around and away from proposed structures.
- (c) Elevation and Floodproofing.
  - (1) New construction and substantial improvement of any structure shall have the lowest floor, including basement, elevated to or above the base flood elevation. Nonresidential structures may meet the standards in subparagraph (3) of subsection (c) of this section. Upon completion of the structure, the elevation of the lowest floor, including basement, shall be certified by a registered

civil engineer, or licensed land surveyor. Such certification shall be provided to the floodplain administrator.

- (2) New construction and substantial improvement of any structure in Zone AG or VO shall have the lowest floor, including basement, elevated above the highest adjacent grade and at least as high as the depth number specified in feet on the FIRM or at least two feet if no depth number is specified. Nonresidential structures may meet the standards in subparagraph (3) of subsection (c) of this section. Prior to occupancy of the structure, a registered civil engineer or licensed land surveyor shall certify that the elevation of the structure meets this standard and shall provide such certification to the floodplain administrator.
- (3) Nonresidential construction shall either be elevated in conformance with subdivisions (1) or (2) of subsection (c) of this section, or, together with attendant utility and sanitary facilities:
  - (a) Be floodproofed so that below the base flood level 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;
  - (c) Be certified by a registered civil engineer or architect that the standards of this subsection are satisfied. Such certifications, shall be provided to the floodplain administrator.
- (4) Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered civil engineer or architect or meet or exceed the following minimum criteria:
  - (A) Either a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves or other coverings or devices, provided that they permit the automatic entry and exit of floodwaters; or
  - (B) Be certified to comply with a local floodproofing standard approved by the Federal Insurance Administration.
- (5) Manufactured homes shall also meet the standards in Section 23.09.037.

(Ord. 3293 § 8, 1999)

### **23.09.036 Standards for subdivisions.**

- (a) All preliminary subdivision proposals shall identify the flood hazard area and the elevation of the base flood.
- (b) All final subdivision plans will provide the elevation of proposed structures and pads. If the site is filled above the base flood, the final pad elevation shall be certified by a registered civil engineer or licensed land surveyor and provided to the floodplain administrator.
- (c) All subdivision proposals shall be consistent with the need to minimize flood damage.
- (d) All subdivision proposals shall have all utilities and facilities under the control of the county located and constructed to minimize flood damage.
- (e) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage.

(Ord. 3293 § 10, 1999)



**23.09.037 Standards for manufactured homes.**

All new and replacement manufactured homes and additions to manufactured homes shall:

- (a) Be elevated so that the lowest floor is at or above the base flood elevation; and
- (b) Be securely anchored to a permanent foundation system to resist flotation, collapse or lateral movement.

(Ord. 3293 § 11, 1999)

**Marin Countywide Plan:**

Section 2.6 of the Countywide Plan (2007, 2015 update) addresses Environmental Hazards and Safety. The policies and programs in this section of the Countywide Plan are intended to provide equitable hazard planning that minimizes harm to people and property due to environmental hazards from geologic seismicity, flooding, fire, and climate change. Goals of the plan include Equitable Community Safety Planning (EHS-1); Disaster Mitigation, Preparedness, Response and Recovery (EHS-2); Safety from Geologic and Seismic Hazards (EHS-3) [an important element as Marin County is bisected by the San Andreas fault]; Safety from Flooding (EHS-4); Safety from Wildfire (EHS-5); and Resilience to Climate Change (EHS-6), including drought, extreme heat, severe storms, and sea level rise impacts.

Flooding in Marin County can originate from urban storm runoff, high flows on rivers and creeks, high tide inundation and/or drainage backwater or high surf. Areas near streams may be flooded after heavy rainfall, while high tides combined with heavy rains can cause flooding in low-lying inland, bayfront and coastal areas. Dam failure and subsequent flooding can also result from earthquake activity. To achieve the goal of safety from flooding and inundation, this section sets policies and implements the programs summarized in Table 3.2. The County maintains an Emergency Operations Plan to guide agency and public natural disaster preparedness and on the ground response.



MARIN COUNTYWIDE PLAN

***Why is this important?***

With increases in sea level due to global warming, flooding is predicted to increase in the future. Locating development in flood-prone areas can expose structures to damage and create risks for inhabitants in the immediate and surrounding areas.

**Environment:** Prohibiting development in the floodplain helps preserve valuable habitat, vital groundwater recharge capacity, and other natural systems.

**Economy:** Significant flooding with associated economic impacts has occurred in portions of Corte Madera, Larkspur, Greenbrae, Ross, San Anselmo, San Rafael, and Novato over the last 30 years. Flooding has also occurred in Mill Valley, Fairfax, and Muir Beach. Extensive property damage could be expected in inundated valleys, especially those downstream from major dam/reservoir complexes. Protecting property from future flooding risks contributes to economic stability.

The most recent countywide plan update incorporates added language regarding sea level rise, floodplain protection and economic benefits.

**Table 3.2 Marin Countywide Plan Policies:**

<b>EH-3.1</b>	<b>Follow a Regulatory Approach.</b> Utilize regulations instead of flood control projects whenever possible to minimize losses in areas where flooding is inevitable.
<b>EH-3.2</b>	<b>Retain Natural Conditions.</b> Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.
<b>EH-3.3</b>	<b>Monitor Environmental Change.</b> Consider cumulative impacts to hydrological conditions, including alterations in drainage patterns and the potential for a rise in sea level, when processing development applications in watersheds with flooding or inundation potential.
<b>EH-3.4</b>	<b>Consider Flood Inundation.</b> Consider flood inundation resulting from upstream dam failures when assessing flood hazards for environmental review and implementing associated programs within the County.

**Implementation Programs:**

The Marin County countywide plan promotes 16 Flood Hazard Mitigation programs to reduce public and community risk of flooding loss Table 3.3.

**Table 3.3: Marin Countywide Plan Flood Hazard Mitigation Programs**

<p><b>EH-3.a</b></p>	<p><b>Regulate Development in Flood and Inundation Areas.</b> Continue to require all improvements in Bayfront, Floodplain, Tidelands, and Coastal High Hazard Zones to be designed to be more resistant to damage from flooding, tsunamis, seiches, and related water-borne debris, and to be located so that buildings and features such as docks, decking, floats, and vessels would be more resistant to damage.</p>
<p><b>EH-3.b</b></p>	<p><b>Update Maps.</b> Annually review those areas covered by the Countywide Plan that are subject to flooding, identified by floodplain mapping prepared by the Federal Emergency Management Agency (FEMA) or Department of Water Resources, and other General Plan maps accordingly. Periodically review and overlay County zoning maps to show flood, tsunami, and inundation hazard areas along the San Francisco Bay, San Pablo Bay, Tomales Bay, and the Pacific Ocean, the Bayfront Conservation Zone, and the Coastal Zone.</p>
<p><b>EH-3.c</b></p>	<p><b>Revise Regulations.</b> Consider expanding the F-1 and F-2 Floodway Districts to include areas of the unincorporated county that lie within primary and secondary floodways, and/or establishing an ordinance that will ensure that land use activities in flood hazard areas will be allowed only in compliance with federal standards.</p>
<p><b>EH-3.d</b></p>	<p><b>Alert Property Owners.</b> Notify owners of property in areas with inundation or flooding potential regarding those hazards when they seek development review or other related County services.</p>
<p><b>EH-3.e</b></p>	<p><b>Restrict Development in Flood Prone Areas.</b> Continue to regulate development in Special Flood Hazard areas by applying the County’s Floodplain Management Ordinance, Federal Emergency Management Agency regulations, and environmental review pursuant to the California Environmental Quality Act (CEQA).</p>
<p><b>EH-3.f</b></p>	<p><b>Require Hydrologic Studies.</b> Continue to require submission of detailed hydrologic and geologic studies for any proposed development that could increase sedimentation of a watercourse or alter natural drainage patterns. Amend the Development Code to include findings to continue to regulate development in flood prone areas to ensure public health and safety and to preserve the hydraulic and geomorphic integrity of the stream system and associated habitat.</p>
<p><b>EH-3.g</b></p>	<p><b>Locate Critical Facilities Safely.</b> Amend the Development Code to prohibit placement of public safety structures within tsunami inundation or flood-prone areas.</p>
<p><b>EH-3.h</b></p>	<p><b>Retain Ponding Areas.</b> Maintain publicly controlled flood ponding areas in a natural state for flood control, and continue to promote compatible uses in ponding areas, such as agriculture, open space, and recreation.</p>
<p><b>EH-3.i</b></p>	<p><b>Update Dam Inundation Maps.</b> Update and make public inundation maps for dam/reservoir complexes where downstream valleys are inhabited and the risk of loss of life and extensive property damage is significant.</p>
<p><b>EH-3.j</b></p>	<p><b>Review and Inspect Dams.</b> Maintain permit authority over and continue to oversee construction of dams too small to be regulated by the State or federal government.</p>

EH-3.k	Anticipate Climate Change Impacts, Including Sea Level Rise. Recent predictions of sea level rise for the San Francisco Bay region by BCDC and USGS based on climate models and hydrodynamic modeling of the San Francisco Bay Estuary Institute indicate 16 inches of rise by mid-century and 55 inches by 2100. Cooperate with the U.S. Geological Survey, the San Francisco Bay Conservation and Development Commission, the California Landscape Cooperative’s Climate Commons project and other monitoring agencies to track bay and ocean levels and share baseline topographic and resource data obtained by the County in implementing its own projects to enhance hydrodynamic and ecosystem modeling efforts and assessment of regional climate change impacts. Use official estimates for mean sea level rise and topographic data for environmental review. Environmental review for development applications and County infrastructure shall incorporate official mid-century sea level rise estimates, and require adaptive strategies for end-of-century sea level rise for any such project with expected life times beyond 2050.
EH-3.l	Limit Seawall Barriers. Limit repair, replacement, or construction of coastal sea walls and erosion barriers consistent with Local Coastal Program requirements, and as demonstrated to be necessary to protect persons and properties from rising sea level.
EH-3.m	Maintain Flood Controls. Continue to implement adopted flood control programs, including limitations on land use activities in flood hazard areas and through repair and maintenance of necessary flood control structures.
EH-3.n	Plan for Climate Change Impacts, Including Sea Level Rise. Consider sea level rise in future countywide and community plan efforts. Apply for membership in the National Flood Insurance Program’s (NFIP) Community Rating System (CRS), and as appropriate through revisions to the
EH-3.o	Seek Levee Assistance. Pursue funding for levee reconstruction in those areas threatened by sea level rise, including but not limited to Santa Venetia.
EH-3.p	Assess the Cumulative Impacts of Development in Watersheds on Flood Prone Areas. Consider the effects of upstream development, including impervious surfaces, alteration of drainage patterns, reduction of vegetation, increased sedimentation, and others, on the potential for flooding in low-lying areas. Consider watershed studies to gather detailed information.
EH-3.q	Develop Watershed Management and Monitoring Plans. Develop watershed- specific, integrated watershed management and monitoring plans that include development guidelines, natural flood mitigation measures, biomechanical technologies, and the enhancement of hydrological and ecological processes. The guiding principles of the watershed plans shall equally consider habitat and species protection and monitoring as well as the protection of human life and property.

**Marin County Long Range Countywide Planning Initiatives:**


In addition to the countywide planning requirements detailed above, Marin County actively pursues long range planning, assessment and mitigation efforts in collaboration with public, state and Federal partners. Many overlapping elements of these initiatives are underway in an effort to prepare for the escalating flood and fire risks attributable to climate change. Marin County is made of entirely of small coastal watersheds, with most communities occupying valley floors subject to flash flooding. Concurrently, it’s unique location straddling, the Pacific Ocean and San Francisco Bay, make it subject to river and coastal flooding over a high percentage of County lands. While these natural resources provide a unique and valued habitat for all Marin County denizens, it elevates the flood hazards for many Marin County landowners and businesses.

These planning initiatives serve as a foundation for public flood awareness, preparation and safety. These studies, plans and programs also garner community support for infrastructure improvement initiatives, and adaption plans.

**Long Range Planning Initiatives**


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Community Development Agency f t



**Marin County Multi-Jurisdictional Local Hazard Mitigation Plan**

Find information about the 2018 Marin County Multi-Jurisdictional Local Hazard Mitigation Plan and the current update process.




**Sea Level Rise**

Find information about Marin County's "Collaboration: Sea-level Marin Adaptation Response Team" (C-SMART)



**Local Coastal Program**

Find information about the proposed Local Coastal Program Amendments



**Stream Conservation Area Ordinance**

Find information about the Stream Conservation Area (SCA) policies of the Marin Countywide Plan.

**Marin County Multi-Jurisdictional Local Hazard Mitigation Plan:** This plan is the product of an ongoing planning process undertaken by the County of Marin to meet the requirements of the Disaster Mitigation Act of 2000 (DMA) - (Public Law 106-3900). This work is required to maintain eligibility for certain FEMA Hazard Mitigation and disaster loss reduction programs. It describes strategies for sustaining and building on existing disaster mitigation activities to maximize safety of lives, preservation of property, and protection of the environment during times of disaster.

Section 2 of the plan (Hazard Mitigation) states that the County of Marin participates in ongoing mitigation actions and proposed activities for flood prevention. Storm drainage projects to protect vulnerable properties are a primary mitigation activity in Marin County. The need for coastal county and private land protection efforts is rapidly rising for County lands bordering both the Pacific Ocean, and San Francisco and San Pablo Bays.

## **Sea Level Rise Adaption Planning (BayWAVE and C-SMART)**

Rising seas threaten Marin County's Bay shoreline and ocean coast-- with some areas already experiencing flooding during high tides and storms. Two ongoing County planning programs coordinate with one another to address these issues:

- Marin County Department of Public Works leads the BayWAVE program for eastern Marin's bay shoreline
- Marin County Community Development Agency leads the C-SMART program for western Marin's ocean coast

BayWAVE coordinates with all of East Marin's cities and towns to provide an ongoing public process that helps local communities understand and prepare for sea level rise. BayWAVE's multi-jurisdictional coordination is critical, as sea level rise crosses political boundaries to impact our shared resources, utilities, and infrastructure. In 2017, BayWAVE completed the Marin Shoreline Sea Level Rise Vulnerability Assessment, a technical report detailing how shoreline flooding will worsen with sea level rise if no actions are taken. In addition to the public works projects and reports identified below, these Marin County climate adaption and long-range planning efforts have given rise to several planning and pre-design studies intended to support community response to increasing flood hazard. In 2017, Marin County released a shoreline vulnerability assessment which characterized current and potential future loss risks for bay connected communities. Since that time, studies to strategize for elevating at risk communities and provide living shoreline protections are ongoing with particular focus on low-income communities in San Rafael and Mill Valley.

**Collaboration: Sea-level Marin Adaptation Response Team (C-SMART)** is working to develop this understanding for Marin's Ocean Coast, so that together, we can prepare to meet the challenge of sea level rise. Between 2015 and 2021, the C-SMART program has developed coastal adaption planning studies for the Stinson Beach and Tomales Bay regions, identifying current and future (with sea level rise) coastal flood hazards, and developing a range of potential traditional and living shoreline solutions for community adaption.

**Marin County Local Coastal Program (LCP)** is a planning document that identifies the location, type, densities, and other ground rules for future development in the coastal zone. Each LCP includes a land use plan and its implementing measures. These programs govern decisions that determine the short- and long-term conservation and use of coastal land, water, and other resources. Amendments to the LCP in place in 2015 were adopted by Marin County and certified by the California Coastal Commission in 2021. Updates to environmental hazards policies were still underway. The new components of Marin's LCP, including many new and improved policies and code provisions designed to balance community needs with measures that protect natural resources, and preserve agricultural uses, as well as clarify permit processes.

### 1.1.1.2 Community Plans and Codes

This 2019 RLAA addresses incorporated regions of Marin County for the first time, and identified RLAs for five (5) communities: Corte Madera, Mill Valley, Novato, Ross and San Rafael. Relevant City/Town plans and codes are presented below. These jurisdictions are all partners in the Marin County Multi-Jurisdictional Local Hazard Mitigation Plan.

#### **Town of Corte Madera**

The Town of Corte Madera’s city center is located on valley floodplain at the foot of Mt Tamalpais. Communities occupy hillsides, a valley bottom with multiple creeks, and lands adjoining San Francisco Bay. The Town of Corte Madera has adopted numerous municipal regulations relevant to flood hazard minimization and abatement. In addition to these regulations, the Town of Corte Madera participates in FEMA CRS program, and has obtained a CRS ranking of 6. Resources flood hazard awareness and insurance information resources are available through the public works department via their our [Flood Protection](#) page. Public Works also ensures that property owners comply with FEMA requirements within the Special Flood Hazard Area (SFHA). This includes issuing a [Floodplain Development Permit](#) for all work in the SFHA.

The town has made substantial efforts in climate change hazard assessment and abatement addressing both sea level rise and fire protection. Since 2018, the town of Corte Madera has been working on a comprehensive climate adaption assessment. The assessment provides analysis, and recommendations for strategies and adaptation-related capital improvement projects for transportation infrastructure, land uses and natural habitats. Public input to the plan is ongoing, and is intended to shape planning and infrastructure improvement measures integrated across town, County and regional transportation interest (Town of Corte Madera,2021).

#### **Mill Valley**

Like Corte Madera, the City of Mill Valley’s city center is located on valley floodplain at the foot of Mt Tamalpais. Communities occupy hillsides, a valley bottom with multiple creeks, and lands adjoining San Francisco Bay. The City of Mill Valley in not currently enrolled in FEMA’s CRS program. However, the City has adopted numerous municipal regulations supporting flood and fire hazard mitigation and abatement (Attachment D) which include standards for construction, protection of floodways and tidelands. A permit is required prior to any construction conducted in a floodplain designated by Federal Emergency Management Agency (FEMA) as “AO, AE or Floodway” (defined below), and subject to specific development restrictions and conditions. Flood insurance is also required if the property is mortgaged from federally regulated or insured lenders. The city provides flood, floodplain and fire management information to its community via the city web site (<https://www.cityofmillvalley.org>) which includes a floodplain management handouts, and a Hazard and Public Safety Plan. This plan states:

Due to its setting, Mill Valley is vulnerable to a number of natural disasters, including earthquakes, wildfire, severe winter storms, landslides, flash floods, and tidal flooding. Many parts of Mill Valley are subject to potential flooding due to overflowing creeks caused by high rains and flash flooding; severe winter storms and high tides; or a combination of the two. The primary cause of natural disasters in Mill Valley is storm-related, with flooding being the primary type of natural disaster.

Mill Valley's Hazard and Public Safety plan defines the following related measures: HZ.1-2 Incorporate hazard maps into public education and outreach, the Hazard Mitigation Plan and Fire Plan, and other planning documents; HZ.6-4 Ensure that all grading and site improvements and structures minimize geotechnical, seismic, and flood hazards. Mill Valley has also developed a climate action plan, and integrated this effort into their 2040 general plan (City of Mill Valley, 2016). This plan includes sea level adaption efforts for low lying areas which are expected to expand the areas subject to flooding to include low-lying areas of Mill Valley from Bothin Marsh to Sycamore Park.

In 2016, Mill Valley completed an eight (8) year period of study and began development of a Flood Control and Drainage Master Plan. Planning effort are targeted at enhancing protection of low-lying areas of development, many of which were historic Baylands. The study identified sources of flooding, community infrastructure, and numerous areas where private residences are constructed adjoining and overlying natural watercourses. Options evaluated included flood storage and bypass, property acquisition and home elevation. A key conclusion was that many of these measures required implementation on private property, outside of City jurisdiction, and provided only 10-yr protections without consideration of sea level rise. Due to the City's limited jurisdiction, subsequent efforts lean heavily on Marin Countywide assessments identified above. Ongoing work focuses on the evaluation of Mill Valley's undersized community storm water drainage infrastructure, improvement needs and priorities for work. Mill Valley's Flood Management and Storm Drainage Master Plan (completed in 2021) and serves as a guidance and prioritization document to support ongoing flood hazard mitigation efforts.

A portion of Mill Valley is supported by Marin County efforts associated with Flood Zone 3. Zone 3 includes the city of Mill Valley and several unincorporated areas. In 2017, "Marin County began work with Caltrans to develop flood reduction strategies for the Manzanita area. These strategies include short-, medium- and long-term flood mitigation solutions to the persistent flooding issues at the Manzanita parking area and Shoreline highway. Community infrastructure includes five (5) pump stations and 1.3miles of flood protection levees, and numerous tide gates and trash racks. Mill Valley benefits from Marin County's routine maintenance of pumps and facilities, and vegetation clearing within streams and along the banks throughout Flood Zone 3.



## **Novato**

The City of Novato, the largest city in Marin County, also has both commercial center and a large portion of residential development on valley bottoms subject to both creek and San Francisco Bay tidal flooding. The city provides information and notification to residents via annual letters and the city's web site (<https://www.novato.org/community/flood-information>). The City's resources state:

Novato has a number of creeks and tributaries that are susceptible to flooding during heavy rains, posing a threat to safety and property. Over 5,000 acres within Novato are designated as being in a Special Flood Hazard Area (SFHA). Properties upstream of the confluence of Novato, Warner and Arroyo Avichi Creeks have been particularly susceptible to flooding. Other areas with high flood danger include Ignacio, Arroyo San Jose, and Vineyard Creeks, as well as the Bahia area. However, your property need not be in the SFHA to sustain flood damage. When drainage courses or storm drains become clogged, they will backup and overflow causing property damage to even upland structures.

These resources remind residents that homeowner's insurance does not cover flooding and encourage residents to get flood insurance. The city participates in the FEMA CRS program, and has a community rating of 6. In 2000, Novato developed a repetitive loss plan as part of their participation in the CRS program. Following 2005 extreme storms, the City had 37 repetitive loss properties in 2009, concentrated in 3 geographic areas. In 2008 Novato published a flood hazard mitigation plan, which continues to guide efforts to increase community flood protections.

Flood Zone 1 encompasses the Novato Creek watershed, including 4 pump stations, nine (9) miles of bayland flood protection levees, and numerous tide gates and trash racks. County work in Zone 1 includes annual vegetation maintenance over 15 miles of creeks and tributaries, and routine dredging of sediments from tidally influenced reaches of Novato, Warner and Arroyo Avichi Creeks. A watershed wide flood management assessment was completed for Zone 1 in 2016, which serves at the foundation for current Marin County headed efforts to improve flood conveyance in the low lying tidally influenced reaches most at risk for both stream and coastal flooding. Flood Zone 1 efforts since 2015 include: development of a virtual map and tour for public outreach in 2017, receipt of state grants for design of integrated bayland restoration flood management projects at the Deer Island basin in 2018; and hydraulic modeling to optimize bayland channel maintenance dredging in 2019.

## **Town of Ross**

The town of Ross is a small affluent village of 1.5 sq miles and assets over \$1.4B. The town has limited municipal codes regulating development of land and water resources. Ross Town Code 13.16. bars obstruction of watercourses. Stipulations include:

13.16.010 Purpose. The free and unobstructed flow of each and every creek, channel or watercourse in the town is essential to the proper drainage of the town and to the protection of life and property therein. Any weeds, trees, bushes, shrubs, brush, undergrowth, debris, or rubbish of any character or description which, at any time, interferes with the free and

unobstructed flow of water in any creek, channel or watercourse constitutes a public nuisance and is subject to summary abatement, and/or abatement in accordance with Chapter 9.04. (Ord. 309 §2(part), 1970). 13.16.020 Duty of owner. Every owner of property in the town shall, at all times, keep all creeks, channels or watercourses or portions thereof which flow upon, over, or across, the property of the owner free and clear of obstructions, of the class set forth in Section 13.16.010 hereof, which measurably reduce the hydraulic capacity of the creek, channel or watercourse. The failure to do so shall constitute a public nuisance which may be abated in accordance with Chapter 9.04, and the costs thereof assessed against the property. (Ord. 309 §2(part), 1970).

Ross Town Code 13.16.040 Free Flow of Water Required: Issuance of building permits. Before issuing any building permit for erection or construction of any building or structure, the building inspector shall determine whether or not such structure or building would interfere with free flow of any water in any creek, channel or watercourse in the town. If in the opinion of the building inspector such a building or structure would interfere with the flow of water in any season, the building permit shall not be issued until the applicant or owner of the premises involved has made ample provisions for the free flow of water in the channel of the creek, channel or watercourse. The building permit may be issued only after provision for the flow of water has been completed.

Ross also has code defining Floodway Districts.

In Section 18.31.020 Town code classifies (F) a floodway district:

This district classification is applied to lands which lie within stream or drainage channels and to adjacent areas which are periodically inundated, or which will be inundated by a design flood. The design flood shall be specifically defined for each particular F zone on the zone map. (Ord. 375 §10(part), 1977).

18.31.030 Permitted uses. (a) Uses permitted without a use permit: (1) Recreational uses on open land; (2) Flood control management facilities. (b) Conditional uses requiring use permits: Water, sewer, roadway, bridge and other such facilities necessary for public health, safety and convenience. (Ord. 375 §10 (part), 1977).

## **City of San Rafael**

San Rafael is one of Marin County's largest cities, encompassing 22.5 square miles and a population of 61,000. The City of San Rafael is bounded by hillside neighbors to the west north and south, and San Pablo Bay to the east. The City of San Rafael is not currently enrolled in FEMA's CRS program. However, in January 2018, City of San Rafael completed and received certification of a Local hazard mitigation plan for their jurisdiction. The largest municipal RLA identified is within the City of San Rafael, in a low-lying community subject to increasing risk of tidal inundation and impeded storm water drainage due to sea level rise. The City's 2040 general plan amendment adopted their Local Hazard Mitigation Plan as part of their safety and resilience element.

The City codified municipal regulations under Title 17 and Title 18 of City code supporting flood and fire hazard mitigation and abatement which reference FEMA flood hazard mappings and impose standards for construction, protection of floodways

and tidelands. City code relevant to flooding, building and hazard abatement include:

**11.30.030 - Obstructing or altering watercourses.**

It is unlawful for any person to divert, obstruct, or alter in any way the courses or bed of any watercourse, drainage basin or channel within the city, except in cases approved by the department of public works and/or the city engineer.  
(Ord. 993 § 1 (part), 1970).

**11.30.140 - Free flow of water required— Issuance of building permit.**

Before issuing any building permit for the erection or construction of any pier, retaining wall, bulkhead, building, bridge or any other structure, the building inspector shall determine whether or not such pier, retaining wall, bulkhead, building, bridge or structure will interfere with the free flow of any water in any watercourse. If in the opinion of the building inspector such a pier, retaining wall, bulkhead, building, bridge or other structure will interfere with the free flow of water in any season, the building permit shall not be issued until the applicant or owner of the premises involved has made ample provision for the free flow of water in the watercourse. The building permit may be issued only after provision for the flow of water has been installed or upon the posting of a bond to complete such work within such time and within such amount as the building inspector may require.

(Ord. 993 § 1 (part), 1970).

In addition to provisions for flood hazard abatement, San Rafael’s Title 18 codifies Protection in Flood Hazard Areas. Requirements for residential construction include designation of a flood plain administrator, minimum standards for residential construction in floodways requiring elevation of structures above BFEs in flood hazard zones, and protective measures in coastal hazard areas. Standards provided for subdivision require construction above the base flood elevations, flood proofing and survey verification of elevations above BFEs.

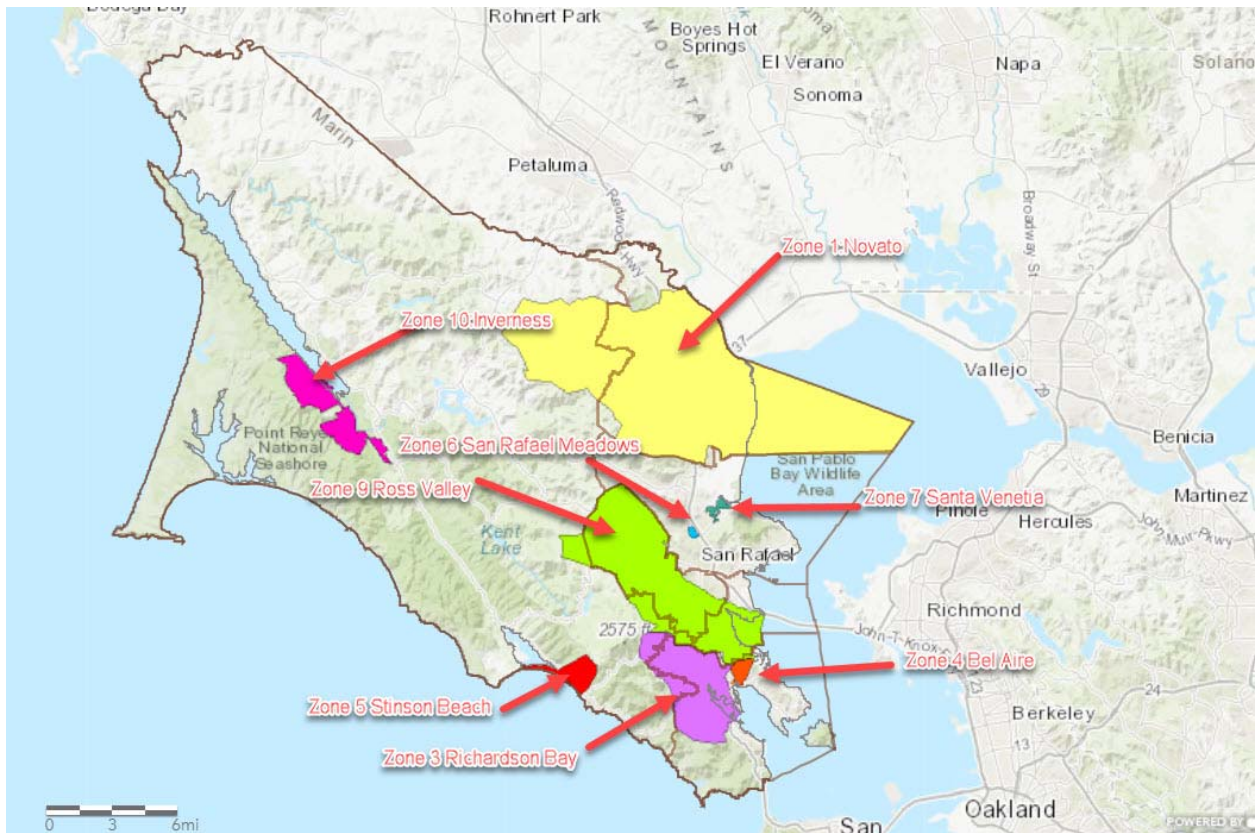
The City developed, adopted, and received FEMA approval of their Local Hazard Mitigation Plan (LHMP) in 2017, and subsequently incorporated that document into the City’s 2040 general plan under Title 18 as indicated above. In addition to these efforts, the City’s general plan encompasses a broad range of sea level rise adaptations strategies, per their 2040 general plan: *“These include retreat, armoring or hardening the shoreline, elevating buildings and infrastructure, and nature-based improvements that slow wave action and restore or enhance natural systems. Additional planning measures include development of a sea level rise planning zone identifying maps and resources intended to:” a) maximize public awareness and disclosure to property owners and the public. b) assess and address impacts to future development. c) establish a zoning “overlay zone” and building code requirements for future planning and adaptation. d) plan opportunity areas for adaptation. e) inform funding and financing decisions about short-term and long-term adaptation projects.”*

### 1.1.1.3 Marin County Watershed Program Flood Studies

The Marin County Flood Control and Water Conservation District (District), a special district under the Marin County Department of Public Works, recognizes that a multi-agency approach is needed to mitigate flooding. This is carried out through eight (8) flood control zones using a watershed approach that crosses jurisdictional boundaries to address management of flood-prone creeks and bayland areas. The Zone Advisory Boards, who meet at least annually, include City Council members from neighboring cities, and are open to residents and the public. Directed by Marin County Department of Public Works, the watershed program is the backbone of public engagement in community flood and coastal infrastructure improvement efforts. Figure 3.1 maps the following currently active Marin County Flood Zones:

- Zone 1: Novato
- Zone 3: Richardson Bay
- Zones 4/4A: Bel Aire and Strawberry
- Zone 5: Stinson Beach
- Zone 6: San Rafael Meadows
- Zone 7: Santa Venetia
- Zone 9: Ross Valley
- Zone 10: Inverness

Zones 2/8 are unassigned and inactive.



**Figure 3.2: Marin County Flood Zones**

Working across jurisdictional boundaries expanded further between 2015 and 2019 in countywide watershed programs, which expands the scope and mission of flood zones. The watershed program objective is to identify multi-benefit infrastructure, mitigation and restoration programs to maintain and improve natural resources, habitat and community flood protection. One on-going multi-benefit project in the Novato Baylands (Zone 1) restores seasonal and tidal wetlands floodplains to absorb tidal and stream flood waters and mitigate for 2 feet of anticipated sea level rise. Utilizing natural systems design, the project also reduces dredge maintenance and nutrient loading in receiving waters. improves water quality.

The County Flood Control District staff supported by crews from the Conservation Corp North Bay (CCNB) in the Creek Maintenance Program. This program endeavors to keep storm drains and creeks free of obstructions to the free flow of water while retaining as much vegetation in the channel as possible to preserve habitat. The County also stockpiles sand and bags at various locations throughout the County for emergency use by residents and businesses during a storm event.

Under the County's Watershed Program, numerous flood studies were conducted to understand causes of flooding and proposed watershed-scale flood control measures. The watershed programs provides a framework to integrate flood protection and environmental

restoration with public and private partners to protect and enhance Marin’s watersheds. The Table 3.4 presents regional flood studies and other related flood hazard mitigation work conducted and the associated beneficiary RLAs. These studies and many other useful resources are publicly available on the Marin County Watershed Program website at <http://www.marinwatersheds.org/>.

**Table 3.4: Marin County Watershed Program Studies**

Study Area	RLAs	Study Subject/Source/Date
<b>Zone 9 - Ross Valley:</b> Corte Madera Cr San Anselmo Cr. Fairfax Cr.	RL-01,02,03,13	Watershed Wide Creek Improvements (Stetson, 2011; Watershed Science, 2018) DWR Levee Funding Agreement (DWR, 2018) Hydraulic Flood Mitigation Alternatives (Stetson, 2018/19) Levee Geotechnical Studies (A3GEO, 2019) Floodwall Design (2020) San Anselmo Flood Flow Reduction Study (2015) San Anselmo FRRS EIR (Marin County, 2017) Sunnyside Detention Basin (Stetson, 2018)
<b>Zone 3 Mill Valley:</b> Arroyo de Corte Madera del Presidio <b>Richardson Bay:</b> Coyote Creek Marin City	RL-10 RL-09	Watershed Wide, Stetson, 2012 Coyote Cr. Watershed and Drainage (PWA ,2005; NCI 2013; GEI/HDR 2014) Marin City Drainage (Wood Rodgers, 2018) Manzanita Drainage Study (Anchor 2021) Richardson Bay Resilience Study (MaCo, 2021)
<b>Zone 1: Novato Cr.</b>	RL-08	Watershed Wide (KHE, 2014) Deer Island Basin Design (ESA, 2017) Creek Hydraulics (Stetson, 2019) Bayland Dredging (Stetson, 2020) Levee Geotechnical (GEI, 2020) Lower Novato Creek Flood Bypass (Wood Rodgers, 2017& 2021)
<b>Zone 10:</b> Tomales Bay Lagunitas Creek		Tomales Bay Living Shorelines Concepts (ESA, 2022)
<b>Zone 7: Santa Venetia,</b> Las Gallinas Cr.	RL-04	Watershed: (NCI and USACE 2013) Santa Venetia Drainage (GHD, 2014) Gallinas Creek Improvements (MaCo, 2016) Santa Venetia Levee Geotech (Kleinfelder, 2014) Levee Evaluation Report (2017, USACE) Gallinas Creek Sea Level Rise (MaCo, 2018) Levee Upgrade Pilot Plan (GHD, 2020)
<b>Zone 5: Stinson Beach</b>	RL-06	Watershed (OEI, 2014) Easkoot Creek and Park Lot Hydraulics (Atkins, 2020), Community Flood Protection (ESA, 2019) Stinson Beach Adaption Study (ESA, 2021)

### **3.1.3. Flood Insurance Data**

The National Flood Insurance Act of 1968 and the Flood Disaster Prevention Act of 1973 established the National Flood Insurance Program (NFIP) which is administered by FEMA. The NFIP provides insurance coverage to property owners within flood hazard areas that are delineated on published Flood Insurance Rate Maps (FIRMs) for both the 100-year and 500-year flood events. In order to qualify for the program, candidate municipalities and unincorporated county areas must adopt local floodplain development policies and enforce flood control measures for new construction and redevelopment projects within their jurisdictions. FEMA prepares Flood Insurance Studies and associated FIRM maps to delineate flood hazard areas and set insurance rates. FEMA also promotes commensurate local land use planning and flood control decision-making. A FIRM shows potential flood risk according to zones of severity and is used in setting flood insurance rates. The regulatory floodplain used by FEMA for the floodplain management and insurance aspects of the NFIP is based on the elevation of the 100-year or base flood. It should be noted that a property not within the FIRM flood zone does not necessarily mean this property has no risk of flooding. The FIRM maps do not account for localized flooding caused by storm drain problems or other parcel scale contributors.

The County of Marin entered into the NFIP in 1982, the date the original FIRM maps were published for the incorporated area. The current effective FIRM maps were updated in 2017 for the entire Marin County. Marin County maintains a current and publicly available map service which allows for web-based viewing of FEMA FIRM maps, and download of supporting documentation. Public access is available in a map viewer sourced by zip code or site address ([www.marinmap.org](http://www.marinmap.org)) The current effective flood maps for the RL areas are presented with RLA mapping presented in Attachment A. In addition to current FEMA resources, this Marin County service also provides searchable public information and mapping regarding sea level rise and fire hazard risks utilizing local, county and state resources.

### **3.1.4. Flood Hazard Mapping and Drainage Information**

Regional drainage issues and watershed-wide drainage discussions for these RL areas are presented below. Discussions of mitigation options for RL areas are presented in the recommendations of Step 5: Document the Findings.

Topographic data, imagery, County and Municipal map sources are utilized to delineate flood control infrastructure including creeks, storm drains, pumps, trash racks, and tide gates. The associated data is compiled as a digital geodatabase. Drainage information and prior studies for RL areas containing five (5) or more parcels are described below.

## 1.1.1.4 RL-04: Santa Venetia

The Santa Venetia RL area (RL-04) contains the most RL properties, twenty (20) of 75 or 27% of claims in the 2019 FEMA list. The area is associated with Flood Zone 7. The stormwater drainage data in this area were obtained from the County and examined. Drainage facilities in the Santa Venetia area includes storm drains and surface ditches, pump stations and seasonally deployed pumps. An aged and discontinuous wooden flashboard and earthen perimeter levee (non-engineered) provides protection from tidal flood waters. Drainage facilities and their capacity and limitations have been the subject of County watershed program studies (Section III), with focus on measures to improve the perimeter levee at the forefront of efforts since 2014. Conditions and mapping of the systems are well characterized in these ongoing studies. Parcels claims are driven locally by stormwater inundation, with conveyance constrains impeded by pump or discharge capacity. Regional flooding of this low-lying development has not occurred in the past 5 years, but has historically been drive by overtopping of perimeter levees subject to tidal influence and runoff from the upstream Gallinas Creek tributary areas. Parcels inspected had slab on grade structures, visually estimated to have with crawl spaces of 0-3 ft in height.

The Santa Venetia community was one of the first subdivisions in Marin County constructed on fill overlying bay mud. This area is protected from exterior flooding by levees along Gallinas Creek. Due to low initial parcel grades and the ongoing consolidation of underlying bay mud, the area is now below the high tide level. Stormwater is collected via pipes and discharged into Gallinas Creek via a series of five County operated pump stations and four portable pumps (one is privately owned and operated). Additionally, three gravity interceptor drains at the base of the hillside above the community collect and convey stormwater from adjoining uplands to Gallinas Creek. The three gravity interceptor drains are at Meadow Drive, La Pasada, and Sunny Oaks. The La Pasada interceptor was improved in 2014 to reduce siltation by slip lining the last 260 feet of 48-inch storm drain with a 27-inch pipe, extension of the pipe by an additional 13 feet into the channel, and installation of a new tide gate. The Meadow Drive interceptor is subject to rapid siltation from tidewaters, resulting in reduced hydraulic capacity. Sea level rise, land subsidence and aging infrastructure remain key flood protection challenges as well as the costs of maintaining the stormwater pumping system.

A study for the Santa Venetia stormwater drainage systems, conducted by GHD Inc. for the County (December 2014), identified the hydraulic capacity deficiency problems of pipes and pump stations and developed preliminary alternative solutions. The analysis of alternative solutions looked at 10-year, 50-year and 100- year flood events under existing tidal conditions as well as two sea level rise scenarios: 12-inch sea level rise (corresponding approximately to year 2030) and 24-inch sea level rise (corresponding approximately to year 2050). The study developed a series of flood reduction alternatives including stormdrain system and pumping changes. The County is currently assessing options for developing a funding source to implement these options.



#### **1.1.1.5 RL-06: Stinson Beach**

The Stinson Beach RL area (RL-06) contains the second most RL properties, fifteen (20) of 75 or 20% of claims in the 2019 FEMA list. The area is associated with Flood Zone 5. This area is in the lower Easkoot Creek watershed and has been subject to flooding when large storms produce high rates of runoff and carry high sediment loads from the steep coastal and largely undeveloped tributary drainage. The severity and extent of flooding is strongly influenced by community development, stream realignment and bridge/roadway floodplain encroachment. Encroachment has significantly reduced channel capacity of lower Easkoot Creek, and drives ongoing sediment aggradation, channel evulsion in storms and community flooding. Watershed sediment sources have a strong influence on flooding in lower Easkoot Creek, as the current stream alignment and floodplain capacity provide no opportunity for sediment storage. A County managed sediment basin is routinely maintained, but capacity is exceeded seasonally and in single large events. As a result, Easkoot Creek frequently overtops its banks, and flooding, scour and sedimentation adversely impact downstream parking lots, roads and parcels along the 2500 LF floodway between the creeks hillside source and its outfall in Bolinas Lagoon.

The dominant watershed erosion process in upper Easkoot Creek is hillside erosion (landslides) on the steep slopes adjacent to stream channels; landslide rates increase during intense, long-duration rainstorms. Sediment delivered to tributary channels may be stored for several years in and adjacent to the channel awaiting high stream flow events that are capable of transporting sediment to lower Easkoot Creek. A Stinson Beach Watershed Program Flood Study (OEI, 2014)) for the County focused on riverine flood protection (not coastal flood protection), habitat restoration, and emergency access. The study identified a suite of potential projects to address flooding and sedimentation issues in the lower sections of the Easkoot Creek while maintaining and improving habitat for steelhead salmon. The OEI study resulted in the proposal of a tax measure for Zone 5. The proposed tax to fund implementation of alternatives failed to pass. Marin RL 06. This study identified flood mitigation measures and prioritized parcels for elevation and flood protection.

#### **1.1.1.6 RL-09: Coyote Creek**

The Coyote Creek RL area (RL-09) contains the third most RL properties, eight (8) of 75 or 11% of claims in the 2019 FEMA list. The area is associated with Flood Zone 3. The Coyote Creek channel was initially dredged by US Army Corps of Engineers (USACE) for flood control. Currently it is managed by Marin County Flood Control and Water Conservation District (the County) according to an Operations and Maintenance (O&M) manual dated in the mid-1960s. County periodically surveys the channel to determine if dredging is required to restore the channel to its engineered cross section. The Coyote Creek flood control project includes approximately 2,950 feet of concrete channel and 4,150 feet of earthen channel. It was designed in 1959 to contain a 20-year recurrence interval peak flow downstream of the Tennessee Creek confluence. Sediment aggradation is ongoing, and the reduced channel capacity results in more frequent flooding. A study of Coyote Creek Sediment Removal Project conducted by NCI in 2014 assessed the condition and performance of the levees along Coyote Creek, and developed preliminary improvements suitable for FEMA levee certification for 100-year flood protection. In 2017, a water level gage was installed in the area to provide flood

control managers better information for community flood protection and design of future mitigation actions. Since that time City of Mill Valley (City) developed a 2040 Master Plan which includes both storm drainage and sea level rise adaption planning and a public hazards mitigation program incorporating educational programs for residents in floodplains, and ongoing work to maintain flood easements and conveyance capacity in aggrading flood conveyance channels (City of MV, 2020).

Specific to the RL-09, three pump stations servicing the area are provided with annual service and maintenance by Marin County. In 2017, Marin County began work with CALTRANS on solutions for routine flooding at the Hwy 1/101 confluence. This low-lying area is subject to tidal inundation and impeded flood conveyance at high tides. In 2019, the city hired consultants to develop a storm drain master plan for the City. Flood control work in ongoing, with results published in 2020, projects alternatives considered by the city in 2021, and future actions to be implemented either by Marin County or the City of Mill Valley are yet to be determined. Until that time, flood control operations are ongoing and rely primarily on drainage ditches and pumps which serve as the primary means of flood protection for the communities and RLAs.

The other RL areas in Table 3 contain 3 or less RL properties in the FEMA list. Flooding in the unincorporated RL areas are local occurrences due to either coastal high water or local drainage impediments during large storm events.

### 3.1.5. Site Visit Data Collection

Between June and September of 2019, site visits were conducted to inspect publicly accessible RP properties in each of the RLAs to gain a better understanding of all of the factors that contribute to flooding. The purpose of the site visits is threefold:

- To verify the delineation of the RL area boundaries;
- To assess the causes of flooding and the conditions of buildings and lands within in the RL areas; and
- To confirm the buildings on the RL list are present, with foundations on lands not considered waters and to look for signs of retrofits or other remedial actions which would reduce future risk of repetitive flooding.

Table 5 presents site visit data for each RL area. All buildings in the study areas are wood frame and appear to be in good condition except for some buildings in RL 101 and RL-05 which were in fair conditions. Some of the RL-05 structures are manufactured. Some of the structures within RLA-01,02,05,18 are on piers overlying waters. As of 2014, the site visits identified four (4) RL properties that had been raised to prevent future flooding. As of 2019, several structures in RL-06 (Stinson Beach) that were not RLPs had coastal sea walls or other structures for foundation protection and one property was elevation. In RL-07 (Stinson Beach No.) minor coastal expansion of rock revetments was observed in aerial imagery (Google Earth, 2018-2019). No additional RLAs had properties that had been modified as of 2019. 26 of the 81 properties in the RL list were insured through the FNIP.

**Table 3.5: Site Visit Results Summarized for Buildings in RL Area**

RL Area	City	Causes of Flooding	Foundation Type	Foundation Condition	Height Above Grade (ft)	Structure Type	Structure Condition
RL-01	Greenbrae: Boardwalks	Tidal	Pier	Good	2 - 4	Wood Frame	Fair
RL-02	Greenbrae: Creekside	Local-Tidal	Pier/Slab	Good	0 - 4	Wood Frame	Good
RL-03	Kentfield	Local: Tidal	Crawlspace/Slab	Good	0 - 4	Wood Frame	Good
RL-04	San Rafael: Santa Venetia	Interior Drainage	Slab/Crawlspace	Good	0 - 4	Wood Frame	Good
RL-05	Novato: Petaluma River Estuary	Local-Tidal	Pier on Fill	Good	0 - 1	Manufactured	Fair
RL-06	Stinson Beach	Coastal	Slab/Crawlspace/ Pier	Good	0 - 4	Wood Frame	Good
RL-07	Stinson Beach	Coastal	Slab/Crawlspace/ Pier	Good	0 - 4	Wood Frame	Good
RL-08	N/A						
RL-09	Mill Valley: Coyote Creek	Local-Tidal	Slab/Crawlspace	Good	0 - 2	Wood Frame	Good
RL-10	Mill Valley: Reed Creek	Stream	Crawlspace/Slab	Good	0 - 3	Wood Frame	Good
RL-11	Fairfax: Upper Watershed	Local	Slab	Good	0 - 1	Wood Frame	Good
RL-12	Point Reyes Station	Local-Stream	Slab/Crawlspace	Good	0 - 3	Wood Frame	Good
RL-13	Kentfield	Stream	Crawlspace/Slab	Good	0 - 4	Wood Frame	Good
RL-14	Muir Beach	Stream	Crawlspace	Good	0 - 3	Wood Frame	Good
RL-15	Nicasio	Stream	Crawlspace/Slab	Good	0 - 3	Wood Frame	Good
RL-16	Mill Valley: Strawberry	Local-Tidal	Slab	Good	0 - 1	Wood Frame	Good
RL-17	Mill Valley: Strawberry	Local-Tidal	Slab	Good	0 - 1	Wood Frame	Good
RL-18	Inverness	Local-Tidal	Pier	Good	0 - 5	Wood Frame	Good
RL-19	Forest Knolls	Stream	Crawlspace	Good	1-3	Wood Frame	Good
RL-19	Forest Knolls	Stream	Crawlspace	Good	1-3	Wood Frame	Good
RL-19	Forest Knolls	Stream	Crawlspace	Good	1-3	Wood Frame	Good

RL-20	Mill Valley	Tidal	Crawlspace /Slab	Good	0-2	Wood Frame	Good
RL-21	San Rafael: Harbor View	Tidal	Crawlspace /Slab	Good	0-2	Wood Frame	Good
RL-101	Novato: Nave Gardens	Stream /Tidal	Crawlspace /Slab	Good	2-3	Wood Frame	Good
RL-102	Novato: Scottsdale Pond	Stream /Tidal	Slab	Good	0-2	Cinder Block/ Wood Frame	Good
RL-103	San Rafael: No. Canal @ Hwy 101	Hwy/ Tidal	Slab/ Above Street Grade	Good	0-2	Steel Frame (Non-Residential)	Good
RL-104	Ross: Sir Francis Drake	Stream	Crawlspace /Slab	Good	0-2	Wood Frame	Good
RL-105	Corte Madera: Corte Madera Ave.	Street/ Hillside	Crawlspace /Slab	Good	0-4	Wood Frame	Good

## 4. Contact Agencies

Coordination with relevant agencies, offices, and organizations is an important step in the analysis process. This step helps to understand whether these entities have plans that could affect the cause or impacts of the flooding. The following agencies and organizations were contacted in order to complete this analysis:

- Marin County Flood Control and Water Conservation District
- Marin County Community Development Agency
- Marin County Office of Emergency Services
- Marin County GIS Department
- Marin Municipal Water District
- U.S. Army Corps of Engineers
- FEMA
- Town of Corte Madera
- City of Novato
- City of Mill Valley
- City of San Rafael
- Town of Ross

## 5. Review Alternative Mitigation Measures

Knowing the flooding history, and types and conditions of the buildings in the areas leads to the fourth step in the area analysis procedure – a review of alternative mitigation approaches to protect properties from, or reduce, future flood damage. Many types of flood hazard mitigation exist, and there is not one mitigation measure that fits every case. Nor is there even one application that fits most cases. Successful mitigation often requires multiple strategies. The following two categories of flood hazard mitigation measures were reviewed:

Category #1 - Flood Hazard Mitigation Measures Undertaken by Property Owners on a Building-by-Building or Parcel Basis. These measures include, but are not limited to:

- I. Acquisition
- II. Elevating the houses above the 100-year flood level
- III. Barriers to floodwaters
- IV. Dry floodproofing
- V. Utility protection
- VI. Maintaining flood insurance

Category #2 - Flood Hazard Mitigation Measures Undertaken by the County along with Federal, State, and Other Local Agencies:

- VII. Preventive measures
- VIII. Emergency services
- IX. Structural projects
- X. Public information

Following are descriptive summaries of the above measures.

### 5.1. Category #1 - Flood Hazard Mitigation Measures Undertaken by Property Owners on a Building-by-Building or Parcel Basis

This section reviews the following flood hazard mitigation measures (Acquisition, Elevation, Barriers to Floodwaters, Dry Floodproofing, Utility Protection, and Maintaining Flood Insurance) that can be undertaken by property owners to reduce risks and impacts associated with flood loss.

- Responsibility: Property Owners
- Timeline: As Soon as Practical
- Funding: Private Funding or Grant Funding

## 5.1.1. Acquisition

This measure involves buying one or more properties and clearing the site. If there is no building subject to flooding, then there is no flood damage. Acquisitions are usually recommended where the flood hazard is so great or so frequent that it is not safe to leave the structure on the site. An alternative to buying and clearing the whole subdivision is buying out individual, “worst case,” structures with FEMA funds.

**Cost:** This approach involves purchasing and clearing the lowest or the most severe repeatedly flooded homes. If FEMA funds are to be used, three requirements would apply:

1. The applicant for FEMA must demonstrate that the benefits exceed the costs, using FEMA’s benefit/cost software.
2. The owner must be a willing seller.
3. The parcel must be deeded to a public agency that agrees to maintain the lot and keep it forever as open space.

**Feasibility:** Due to the high cost and difficulty to obtain a favorable benefit-cost ratio in shallow flooding areas, acquisitions are reserved for the worst-case buildings. Not everyone wants to sell their home, so a checkerboard pattern of vacant and occupied lots often remains after a buyout project, leaving “holes” in the neighborhood. The vacant lots must be maintained by the new owner agency, and additional expense is added to the community. If the lot is only minimally maintained, its presence may reduce the property values of the remaining houses.

## 5.1.2. Elevation

Raising the structure above the flood level is generally viewed as the best flood protection measure, short of removing the building from the floodplain. All damageable portions of the building and its contents are elevated above 100-yr flood levels and dry during a flood, which flows under the building instead of into the house. Houses can be elevated on fill, posts/piles, or a crawlspace. A house elevated on fill requires adding a specific type of soil to a lot and building the house on top of the added soil. A house elevated on posts/piles is either built or raised on a foundation of piers that are driven into the earth and rise high enough above the ground to elevate the house above the elevation of flood waters.

A house elevated on a crawlspace is built or raised on a continuous wall-like foundation that elevates the house above the flood level. If a crawlspace is used, it is important to include vents or openings in the crawlspace that are appropriately sized: one square inch for each square foot of the building’s footprint. The following photo shows an elevated structure in the study area.



**Figure 5.1 An Elevated House in the Study Area**

**Cost:** The cost to elevate a building is primarily in the preparation and foundation construction. Elevation is typically most cost-effective for wood frame buildings on posts/piles or crawlspace because lifting equipment can be placed under the floor minimizing disruption to the habitable part of the house. Elevating structures on concrete slabs is likely to be more costly and disruptive. The actual cost of elevating a particular building depends on factors such as its condition, whether it is masonry or brick faced, and if additions have been added on over time. The cost of elevating a home can vary widely. Owners may qualify for FEMA grant support, however, subject to maximums that are independent of an owner's individual cost. In some cases, additional funding assistance may be available via Increased Cost of Compliance (ICC) funds (discussed below), or state funds.

**Feasibility:** Federal funding support for an elevation project requires a study that shows that the benefits of the project exceed the cost of the elevation. Project benefits include savings in insurance claims paid on the structure. FEMA utilizes a pre-calculated benefit (\$175,000) for home elevation. This is likely to be less than the typical cost for repair or replacement of homes candidate for elevation in Marin County due to the locally high cost of living and property values. As a result, FEMA funding may provide some relief for property owners, but is likely to represent a relatively low percentage of the overall project cost and benefit due to locally high cost of construction and value of structure factors.



### 5.1.3. Barriers to Floodwaters

Small floodwalls, levees, or berms can be constructed around one or more properties if flood depths are less than 3 feet. Small floodwalls are appropriate for some of the homes in the study area, since most of the respondents said they had experienced up to 3 feet of floodwater during a flood event. Homes that typically receive three feet of floodwater or less, or where the water does not stay up for a considerable amount of time, can benefit from small floodwalls, levees or berms.

Levees and berms are more suitable for larger lots, and small floodwalls that are located close to the house are appropriate for suburban style neighborhoods with front and side yard space. Given the suburban styling of the County study area and neighborhood as a whole, floodwalls are more appropriate than levees and berms that take up space in the smaller lots.



**Figure 5.2 An Example of Barrier to Floodwaters**

(This home is surrounded by a floodwall which doubles as a planter and deck space to reduce the visual impact of a flood protection structure.)

Barriers can be an appropriate mitigation measure for homes where flooding is short in duration and depths are less than one to two feet. Residents who experience floodwaters that remain for several hours or days should not consider barriers to floodwaters, as seepage can occur and water will end up inside the barrier. The more permeable the soil, the more floodwaters seep under the barrier. Homeowners who are interested in constructing barriers to protect their homes should consider the following requirements:

- A method to close openings, such as the door. Generally, this requires “human intervention,” meaning someone needs to be available and have enough time to take action;
- Relatively impervious soils to minimize seepage under the floodwall;
- A system to prevent sanitary sewer backup from flowing into the building;
- A system of drain tile (perforated pipes) that collects water that falls or seeps into the protected area and sends it to a collecting basin or “sump;” and

- A sump pump to send the collected water outside the barrier and power to operate the sump pump around the clock during a storm (see Figure 6.3). Rain water and seepage under the floodwall is collected in the basin or sump, and is pumped over the wall by a sump pump.



**Figure 5.3: Sump Pump**

**Cost:** The cost of a local barrier depends on the depth of flooding, the linear footage of area requiring protection and the amount of engineering required for the design. Where flooding is only inches deep and of short duration, almost any barrier of concrete or earth will work.

FEMA does not fund individual floodwalls for residential properties. Homeowners must pay 100% of the cost for a floodwall. The personal cost-benefit assessment would include homeowners determining how much of their own labor they want to contribute (which reduces out-of-pocket costs) and whether the cost of the wall is worth the protection from flooding that it provides.

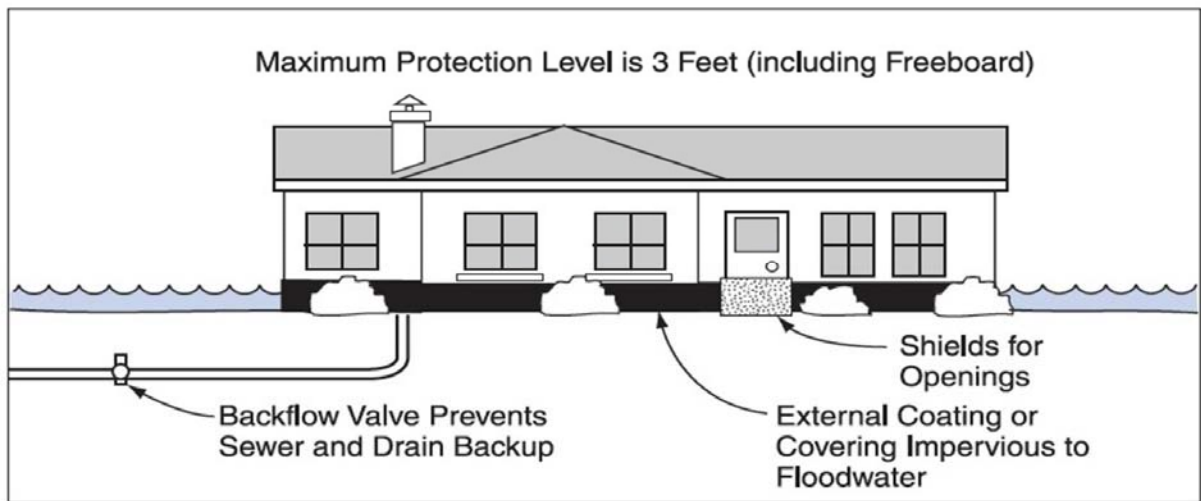
**Feasibility:** Barriers to floodwaters are appropriate where flood depths are shallow and are of relatively short duration. Barriers could be an appropriate mitigation measure for some homes in the County study area since most of the respondents said they had experienced up to 3 feet of floodwater during a flood event.

### 5.1.4. Dry Floodproofing

This measure keeps floodwaters out of a building by modifying the structure. Walls are coated with waterproofing compounds or plastic sheeting. Openings (i.e.; doors, windows, and vents) are closed either permanently, or temporarily with removable shields or sandbags. A floodproofing project has three components:

- Make the walls watertight. This is easiest to do for masonry or brick faced walls. The brick or stucco walls can be covered with a waterproof sealant and bricked or stucco over with a veneer to camouflage the sealant. Houses with wood, vinyl, or metal siding need to be wrapped with plastic sheeting to make walls watertight, and then covered with a veneer to camouflage and protect the plastic sheeting.
- Provide closures, such as removable shields or sandbags, for the openings; including doors, windows, dryer vents and weep holes.
- Account for sewer backup and other sources of water entering the building. For shallow flood levels, this can be done with a floor drain plug or standpipe; although a valve system is more secure.

As seen in the graphic below, dry floodproofing employs the building itself as part of the barrier to the passage of floodwaters. This technique is only recommended for buildings with slab foundations that are not cracked. The solid slab foundation prevents floodwaters from entering a building from below.



**Figure 5.4 Dry Floodproofing Example (FEMA P-312, 2014)**

Even if the building is in sound condition, tests by the Army Corps of Engineers show that dry floodproofing should not be used for flood inundation depths greater than 3 feet over the floor, because water pressure on the structure can collapse the walls and/or buckle the floor. Dry floodproofing is a mitigation technique that is appropriate for some houses in the County study area: those with slab foundations that typically receive floodwater less than three feet in the house.

Not all parts of the building need to be floodproofed. It is difficult to floodproof a garage door, for example, so some owners let the garage flood and floodproof the walls between the garage and the rest of the house. Appliances, electrical outlets, and other damage-prone materials located in the garage should be elevated above the expected flood levels.

Properties that do not have adequate grading can re-grade their lawns. The ground adjacent to a building should slope away from the building so stormwater runoff does not accumulate against the foundation wall, where it can seep into the building. If possible, a minimum ground slope of 1% is desirable. Furthermore, downspouts should extend at least 6 feet away from a building foundation. In cases where the ground adjacent to the building is flat or slopes toward the building, the downspouts should extend far enough to ensure stormwater does not drain back toward the foundation.

Dry floodproofing has the following shortcomings as a flood protection measure:

- It requires human intervention, i.e., someone must be home to close the openings.
- Its success depends on the building's condition, which may not be readily evident. It is very difficult to tell if there are cracks in the slab under the floor covering.
- Periodic maintenance is required to check for cracks in the walls and to ensure that the waterproofing compounds do not decompose.
- Government financial assistance is not available for dry floodproofing. The entire cost of the project must be paid by the homeowner.
- The NFIP will not offer a lower insurance rate for dry floodproofed residences.

**Cost:** The cost for a floodproofing project can vary according to the building's construction and condition, and can vary widely depending on how comprehensive the effort. Owners can do some of the work by themselves, although an experienced contractor provides greater reliability in installing mitigation measures. Each property owner need determine how much of their own labor they can contribute and whether the cost and appearance of a project is worth the protection from flooding that it may provide.

**Feasibility:** As with floodwalls, floodproofing is appropriate where flood depths are shallow and relatively short duration. It can be an effective measure for some of the structures and flood conditions found in the County study area. It can also be more attractive than a floodwall around a house.

## 5.1.5. Utility Protection

This measure applies to several different utilities that can be adversely affected by floodwaters such as:

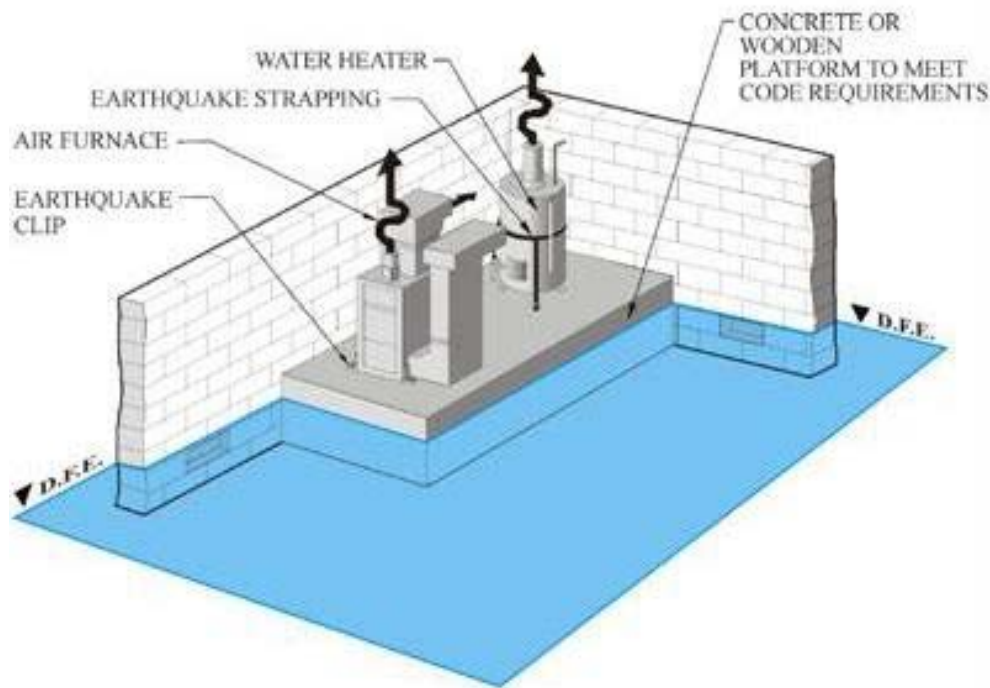
- Heating, Ventilation, and Air Conditioning (HVAC) systems;
- Fuel meters and pipes;
- Electrical service boxes, wiring and fixtures;
- Sewage systems; and
- Water systems.

Damage to utilities can prevent a residence that remains structurally sound after a flood from being reoccupied. Retrofitting utilities includes things as simple as raising them above the flood level and building small walls around furnaces and water heaters to protect from shallow flooding.

FEMA document 348: *Protecting Building Utilities from Flood Damage* covers various ways to protect utilities; whether the building is a new construction, declared substantially damaged, or simply an existing structure in need of retrofitting, this document covers different techniques recommended for protecting utilities.

**Cost:** The cost for protecting utilities varies and is dependent upon the measure, condition of the system, structure, and foundation. A lot of the measures can be performed by the homeowners, although it is recommended homeowners consult a professional contractor and/or engineer (depending on the project). The costs can be lower when done as part of a repair or remodeling project. Residents interested in pursuing a retrofitting measure to protect their utilities should contact the County to determine permit requirements.

**Feasibility:** Given that the flooding experienced by the homeowners in the County study area includes both shallow and deep flooding, utility protection is an acceptable mitigation measure. Interested homeowners should examine their flooding history and decide if utility protection is an appropriate measure for their building.



**Figure 5.5 Elevation of mechanical equipment on a platform in an area used only for storage, building access, or parking**

### 5.1.6. Maintaining Flood Insurance

Although not a mitigation measure that reduces property damage from a flood, a National Flood Insurance Program policy has the following advantages for the homeowner or renter:

- A flood insurance policy covers surface flooding from the overflow of inland or tidal waters or from storm water runoff.
- Flood insurance may be the only source of assistance to help owners of damaged property pay for cleanup and repairs.
- Once in effect there is no need for human intervention<sup>7</sup>.
- Coverage is available for the contents of a home as well as for the structure
- Renters can buy contents coverage, even if the building owner does not buy coverage for the structure itself.

**Cost:** Flood insurance rates are based on several factors including what flood zone the building falls in and the age of the structure. Generally, homes in the X zone have lower flood insurance rates than those in Special Flood Hazard Areas (SFHA) because the X zone indicates a lower risk from flooding. Homes constructed before 1982 in the County are “pre-FIRM” buildings, which means that they were built before the date of the first FIRM for the community, and are thus eligible for the “subsidized” flood insurance premium rates.

Buildings located in the A flood zone and constructed or substantially improved after the date of the most current FIRM, is required to be built above the base flood elevation and is therefore subject to rates based on the actual risk rather than a subsidized rate. Rates on pre-FIRM buildings are subsidized because the flood risk was unknown at the time of construction.

**Community Rating System (CRS):** The Community Rating System is a “voluntary incentive program that recognizes and encourages community floodplain activities that exceed the minimum National Flood Insurance Program (NFIP) requirements” (www.FEMA.gov). Participating communities are rewarded with reduced insurance premiums. Communities that join the CRS complete floodplain management activities that are worth a certain amount of credit. The more credit earned, the better the class ranking of that community. The CRS has 10 classes; a Class ranking of 10 carries the lowest flood insurance premium reduction, whereas a Class 1 carries the maximum discount.<sup>8</sup>

## **5.2. Category #2) - Flood Hazard Mitigation Measures Undertaken by the County along with Federal, State, and Other Local Agencies**

This section reviews the following flood hazard mitigation measures (Preventive Measures, Emergency Services, Structural Projects, and Public Information) that should be undertaken by the County along with Federal, State, and other local agencies.

Responsibility: County of Marin along with Federal, State, and Other Local Agencies

Timeline: Ongoing

Funding: Municipal Revenues, Tax, and Grant Funding

### **5.2.1. Preventive Measures**

Preventive activities keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices. Marin County develops and implements flood mitigation projects through Community Development (Planning) and Public Works divisions. Assessment efforts and mitigation projects are underway for low lying communities associated with repetitive loss areas in Novato, San Rafael, Ross Valley, Corte Madera and Mill Valley. City efforts are currently underway in Corte Madera and Mill Valley.

The County regulates residential and commercial development through its building code, planning and zoning requirements, stormwater management regulations and floodplain regulations. Any project located in a floodplain, regardless of its size, requires a permit from

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<sup>8</sup> There is a 30-day waiting period for a new flood insurance policy before it goes into effect.

the County, unless the project can be characterized as routine maintenance. Depending on the size and scope of the project, a development within the County may also fall under the jurisdiction of Federal, State, and other local regulatory agencies.

### **5.2.2. Emergency Services**

Emergency Services measures are taken during an emergency to minimize its impact. These measures are usually the responsibility of county emergency management staff and the owners or operators of major or critical facilities. Examples of emergency measures implemented since 2015 include levee breaches to reduce flooding, and placement of temporary pumps and flood barriers.

Advance identification of an impending storm is the first part of an effective Flood Warning and Response Plan. To truly realize the benefit of an early flood warning system, the warning must be disseminated quickly to floodplain occupants and critical facilities. Appropriate response activities implemented include: road closures, clearing debris from trash racks, storm drain inlets and flood control facilities, directing evacuations, sandbagging, and moving building contents above flood levels. Marin County implements a “storm patrol” program where staff are deployed to inspect, monitor and implement emergency measures to alleviate impediments to drainage and flood conveyance in locations where there is a known history of flooding.

A community should also take measures to protect public health and safety and facilitate recovery. These measures may include: cleaning up debris and garbage, clearing streets, and ensuring that residents have support to evacuate, and are provided with temporary shelter, food, and safe drinking water.



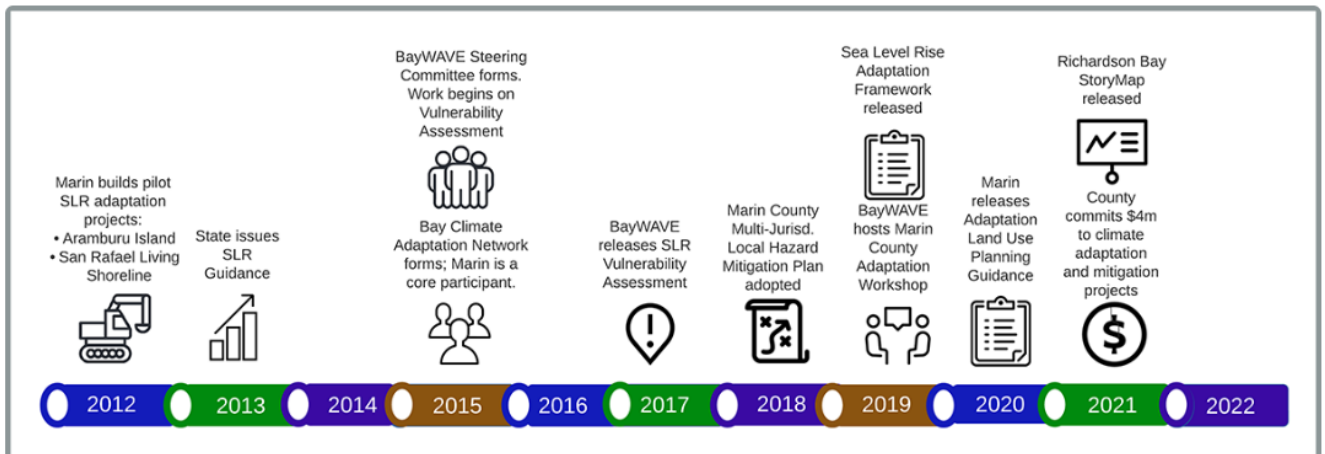
### 5.2.3. Structural Projects

Flood mitigation structural projects keep flood waters away from an area with a levee, reservoir, or other flood control measure. The lead agency for flood mitigation and related projects is Marin County Department of Public Works. Funding sources include taxes, special tax and bond measures, hazard mitigation funds, and other grants.

Marin County's Multijurisdictional Local Hazard Mitigation Plan (2018) and Municipal Local Hazard Mitigation Plans (Mill Valley, San Rafael, Corte Madera, Ross, San Anselmo and Novato) and Emergency Response Plans (Sausalito, Tiburon, Fairfax, Stinson Beach) are ongoing efforts. Plan development, updates and the development and implementation of projects design to improve community resilience to increased risks associated with climate change (sea level rise and fire hazards) are underway through either county or community programs throughout the county. Flood mitigation projects are being conceptualized via several regional adaption programs (described in Section II) Detailed current information about these projects are available in County and Municipal web sites.

The Marin County Watershed Program, authorized by the Board of Supervisors on May 13, 2008 and is staffed by the Marin County Flood Control & Water Conservation District, overarched many of these efforts. The Program focused on watersheds within established County flood zones areas that have support and agreement from City councils and local agencies. The Watershed Program developed a framework that integrated flood protection, creek and wetland restoration, fish passage and water quality improvements with public and private partners to protect and enhance Marin's watersheds. Although the watershed program is no longer funded, watershed master plans have been completed or are underway consideration in large heavily populated watersheds. Marin's more sparsely populated coastal communities have typically develop local response plans. These planning process evaluate short and long term needs and recommended priorities for implementation including information regarding the timing and sequence of construction projects.

In addition to the Marin County Watershed Program implemented via the Public Works division, the Community development agency planning efforts are implemented via two programs discussed in Section 2. Sea-level Marin Adaptation Response Team (C-SMART), which focuses on coastal regions, and the Marin Bay Waterfront Adaptation Vulnerability Evaluation (BayWAVE) which focuses on communities adjoining San Francisco Bay. The C-SMART program completed a coastal sea level rise adaption plan in 2018. (<https://www.marincounty.org/depts/cd/divisions/planning/csmart-sea-level-rise>). The BayWAVE program (<https://www.marincounty.org/main/sea-level-rise/baywave>) has produced a series of reports, obtained funding and began work on numerous projects as illustrated on the timeline in the graphic below (<https://www.marincounty.org/main/sea-level-rise/baywave>). The reader is referred to these websites for details on the numerous planning efforts and projects underway through these programs which utilize funding from local, state and federal sources.



**Marin County B-WAVE Coastal Adaption Program Milestones 2012-2022**

### 5.2.4. Public Information

One of the most important, and often overlooked, aspects of mitigation is public awareness. Awareness starts with recognition of the flood risk. FIRM panels, which designate areas of a community according to various levels of flood risk, can be viewed at [www.FEMA.gov](http://www.FEMA.gov). Also, real estate transactions require disclosure of known flood hazards.

The next level of awareness is related to hazard mitigation measures. Often homeowners can greatly reduce their risks with mitigation efforts; they just do not know it. For that reason, as part of this analysis, every resident in the repetitive loss areas has been contacted and informed of the opportunity to review this report. The County sends out an annual outreach letter to every resident in each repetitive loss area. The B-Wave and C-SMART programs both contain community outreach elements. One of the most successful of these efforts has been the development of a board game called “Game of Floods” which is used to inspire community thinking and collaboration in the complex and multi-objective issues surrounding community flood management.

## 6. Document the Findings

### 6.1. Problem Statement

Flooding in Marin County can originate from storm runoff, tidal activity, or high surf. Areas near streams may be flooded by overbank flows during heavy storms (*watershed flooding*). The bayfront and coastal areas may be flooded during high tidal events (*coastal or tidal flooding*). When watershed flooding occurs in conjunction with high bay tides, the extent and/or depth of overbank flooding or levee overtopping can increase due to an upward adjustment in the floodwater surface due to an increase in the surface elevation of bay water. In addition to watershed flooding and coastal flooding, interior flooding due to high tailwater and/or inadequate interior drainage system in Santa Venetia and local storm drain backup flooding in some localized areas are also causes of flooding.

Damaging floods in Marin County have occurred primarily in the lower lying alluvial valleys and bay plains, with varying degrees of severity. From 1950 to 1970, major floods occurred in 1952, 1955, 1958, 1967 and 1970. Significant flooding occurred in the County in January 1982 (heavy rain), January and December 1983 (high tide), February 1986 (heavy rain), January 1995 (heavy rain), February 1998 (high tide), and the New Year's Eve in 2005 (heavy rain). Of these, the two most severe floods occurred in January 1982<sup>9</sup> and on New Year's Eve in 2005<sup>10</sup>.

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<sup>9</sup> In the storm of January 2-5, 1982, watershed flooding on Corte Madera Creek produced floodplain inundation depths of one to three feet through the Towns of San Anselmo and Ross and the unincorporated areas of Kentfield, and Greenbrae. The same storm produced damaging flooding in portions of the City of Novato along Novato Creek, Warner Creek and Arroyo Avichi. The community of Santa Venetia, which functions as an independent watershed due to its leveed segregation from Gallinas Creek, experienced flooding as watershed runoff and entrained, (i.e., transported by flowing water) hillslope debris obstructed inlet channels and pump station inlets. Nuisance flooding also occurred in San Rafael on the southern tributaries to San Rafael Creek, in the Bret Harte / Picnic Valley and Irwin Street neighborhoods, and on the eastern tributary (i.e., Sisters Creek) to Black Canyon Creek near Dominican College. Along the Pacific Ocean Recreational Corridor, the 1982 storm generated numerous catastrophic landslides and related flooding as land debris obstructed or completely filled drainageways.

<sup>10</sup> A series of intense storms swept in off the Pacific Ocean saturating the county at the end of December 2005 and beginning of January 2006. The storms caused many of the county's rivers to overtop their banks and flood surrounding areas. Coincident high tides, which helped breach super-saturated levees along San Francisco Bay in the Novato area, worsened flooding in some areas. Intense rainfall also triggered numerous landslides throughout the county. A large landslide in Novato caused damage to homes. Corte Madera Creek through San Anselmo and Ross spilled onto its historical floodplain causing millions of dollars in damage as businesses and homes were flooded.

Flooding occurred throughout the Point Reyes National Seashore in West Marin, with Lagunitas Creek flooding many residences in the area.

The expected impacts of damaging floods are economic and non-economic in nature and include, but are not limited to, the following types:

- **Physical Damage:**

- Buildings
- Contents
- Infrastructure
- Landscaping
- Vehicles
- Equipment
- Nursery crops
- Ecosystems

- **Emergency response costs:**

- Evacuation and rescue costs
- Security costs
- Dewatering, debris removal and cleanup costs
- Emergency flood management system repairs
- Humanitarian assistance

- **Loss of functions:**

- Loss of business income
- Loss of rental income
- Loss of wages
- Loss of public services
- Loss of utility services
- Transportation system disruptions

- **Public safety and health impacts:**

- Population at risk
- Casualties
- Displacement/shelter needs
- Critical facilities

## **7. Recommendations**

The following recommendations are provided for the County of Marin and for the residents of the study area:

### **7.1. For the County of Marin**

- Prepare an annual outreach mailing that encourages property owners in the RL areas to pursue a mitigation measure.
- Provide information that encourages homeowners to frequently clear their ditches of debris to ensure open flow for stormwater in accordance with all regulatory permits.
- In the existing flood zones, develop flood control projects for review and approval by the County and Flood Zones. Where appropriate, seek out funding for projects.
- Maintain and expand the County CRS classification and accounting, and continue to improve the County's CRS classification through implementation of floodplain management and flood mitigation measures.
- Adopt this Area Analysis according to the process detailed in the CRS Coordinator's Manual.
- Conduct an outreach program that provides an opportunity for property owners to request more detailed explanation of the RLAA report findings, identify hazard mitigation measures that are currently undertaken by the County, and hazard mitigation measures that can be undertaken by property owners.

### **7.2. For the residents of the study area**

- Contact the County for more information about possible advice and resources available for flood risk and hazard mitigation.
- Review the alternative mitigation measures discussed in this analysis and implement those that are most appropriate for their situation.
- Purchase and maintain a flood insurance policy on the home and its contents.

Table 7.1 identifies suitable flood protection measures for each RL area based on the assessment of causes of flooding specific to each RLA, review of flood studies and planning assessment, and area and building inspections. The solutions are general in nature and applicable for each RL area. They may not be applicable to all properties in the RL area but would be applicable to most of the properties. Property owners should consult with an engineer or contractor regarding mitigation measures for their specific property.

**Table 7.1: Causes of Flooding and Suitable Flood Mitigation Measures**

<b>RL Area</b>	<b>City</b>	<b>Causes of Flooding</b>	<b>Applicable Flood Mitigation Measures</b>
RL-01	Greenbrae	Corte Madera Creek estuary tidal flooding.	Elevation
RL-02	Greenbrae	<ul style="list-style-type: none"> <li>• Corte Madera Creek estuary tidal flooding;</li> <li>• Corte Madera Creek overbank flow flooding.</li> </ul>	Elevation; Barriers; Dry Floodproofing; Utility Protection
RL-03	Kentfield	<ul style="list-style-type: none"> <li>• Creekside Marsh/ McAllister Creek tidal flooding;</li> <li>• McAllister Creek overbank flow flooding;</li> <li>• Local stormdrain backup flooding due to high tailwater or inadequate hydraulic capacity.</li> </ul>	Barriers; Dry Floodproofing; Utility Protection
RL-04	San Rafael: Santa Venetia	Interior flooding due to high tailwater and/or inadequate interior drainage system.	Elevation; Barriers; Dry Floodproofing; Utility Protection; Structural Projects (for Interior Drainage System)
RL-05	Novato: Petaluma River	Petaluma River estuary tidal flooding.	Elevation
RL-06	Stinson Beach	<ul style="list-style-type: none"> <li>• Easkoot Creek overbank flow flooding;</li> <li>• Coastal flooding.</li> </ul>	Elevation; Barriers; Dry Floodproofing; Utility Protection; Structural Projects (for Easkoot Creek)
RL-07	Stinson Beach	Coastal flooding.	Elevation; Barriers; Dry Floodproofing; Utility Protection
RL-08	Novato: Bel Marin Keys	Local storm-drain backup flooding due to high tailwater or inadequate hydraulic capacity.	Barriers; Dry Floodproofing
RL-09	Mill Valley: Coyote Creek	<ul style="list-style-type: none"> <li>• Coyote Creek estuary tidal flooding;</li> <li>• Coyote Creek overbank flow flooding;</li> <li>• Local storm-drain backup flooding due to high tailwater or inadequate hydraulic capacity.</li> </ul>	Elevation; Barriers; Dry Floodproofing; Utility Protection; Structural Projects
RL-10	Mill Valley: Reed Creek	Reed Creek overbank flow flooding.	Elevation; Barriers; Dry Floodproofing; Utility Protection; Structural Projects (for Reed Creek)
RL-11	Fairfax: Upper Watershed	Local flooding due to inadequate local storm drains.	Barriers; Dry Floodproofing

Table 7.1: Causes of Flooding and Suitable Flood Mitigation Measures (Cont.)			
RL-12	Point Reyes Station	<ul style="list-style-type: none"> <li>Lagunitas Creek overbank flow flooding.</li> </ul>	Barriers; Dry Floodproofing
RL-13	Kentfield	<ul style="list-style-type: none"> <li>Corte Madera Creek estuary tidal flooding;</li> <li>Corte Madera Creek breakout flow upstream and Murphy Creek overbank flow flooding.</li> </ul>	Elevation; Barriers; Dry Floodproofing; Utility Protection; Structural Projects (for Corte Madera Creek)
RL-14	Muir Beach	Redwood Creek overbank flow flooding.	Elevation; Barriers; Dry Floodproofing
RL-15	Nicasio	<ul style="list-style-type: none"> <li>Overbank flow flooding from an unnamed creek;</li> <li>Local storm drain backup flooding due to high tailwater or inadequate hydraulic capacity.</li> </ul>	Acquisition; Elevation; Dry Floodproofing
RL-16	Mill Valley: Strawberry	Local storm drain backup flooding due to high tailwater (high tide) or inadequate hydraulic capacity.	Barriers; Dry Floodproofing
RL-17	Mill Valley: Strawberry	Local storm drain backup flooding due to high tailwater (high tide) or inadequate hydraulic capacity.	Elevation; Barriers; Dry Floodproofing; Utility Protection
RL-18	Inverness	<ul style="list-style-type: none"> <li>Coastal flooding;</li> <li>Overbank flow flooding from an unnamed creek.</li> </ul>	Elevation
RL-19	Forest Knolls	San Geronimo Creek overbank flow flooding.	Elevation; Barriers; Utility Protection

Notes: Acquisition, Elevation, Barriers to Floodwaters, Dry Floodproofing, and Utility Protection should be undertaken by property owners on a building-by-building or parcel basis. Structural Projects should be undertaken by the County along with Federal, State, and other local agencies.

## 8. Funding Assistance

There are several possible sources of funding for mitigation projects:

1. FEMA grants: HMGP, FMA, and BRIC
2. Flood Insurance
3. Rebates
4. Small Business Administration Mitigation Loans
5. Regional (ABAG), State and Federal Climate Adaption Funding Sources

Sources of funding are summarized below; the projects covered are presented in Table 6.1.

**Table 8.1: FEMA Grants and the Projects Covered under Each Grant Program**

<b>Types of Projects Funded</b>	<b>HM</b>	<b>FM</b>	<b>PD</b>	<b>SR</b>	<b>IC</b>	<b>SB</b>
Acquisition of the entire property by a gov't agency	√	√	√	√		
Relocation of the building to a flood free site	√	√	√	√	√	√
Demolition of the structure	√	√	√	√	√	√
Elevation of the structure above flood levels	√	√	√	√	√	√
Replacing the old building with a new elevated one	√			√	√	√
Local drainage and small flood control projects	√			√		
Dry floodproofing (nonresidential or historical buildings)				√	√	√
<b>Percent paid by Federal program</b>	<b>75</b>	<b>75</b>	<b>75</b>	<b>75</b>	<b>100</b>	<b>0</b>

### 8.1.FEMA grants:

Most of the FEMA programs provide 75% of the cost of a project. The 25% non-FEMA share is paid by the benefitting property owner. Each program has different Congressional authorization and slightly different rules.

#### 8.1.1. The Hazard Mitigation Grant Program (HMGP):

The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. Projects must provide a long-term solution to a problem (e.g., elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood). Examples of eligible projects include acquisition and elevation, as well as local drainage projects.

For more information, please visit <http://www.fema.gov/government/grant/hmgp/index.shtm>.

#### 8.1.2. The Severe Repetitive Loss Program (SRL):

The Severe Repetitive Loss (SRL) grant program funds mitigation projects for properties on



the severe repetitive loss list. Eligible flood mitigation projects include:

- Acquisition and demolition or relocation of structures that are listed on FEMA's severe repetitive loss list and conversion of the property to open space.
- Elevation of existing SRL structures to at least the Base Flood Elevation (BFE).

There is a new SRL ICC Program that can be used to cover the non-FEMA share of the cost.

For more information, please visit <http://www.fema.gov/government/grant/srl/index.shtm>.

### **8.1.3. The Flood Mitigation Assistance Program (FMA):**

FMA funds assist States and communities in implementing measures that reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties.

For more information please visit: <http://www.fema.gov/government/grant/fma/index.shtm>.

### **8.1.4. Pre-Disaster Mitigation Program (PDM):**

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

For more information please visit: <http://www.fema.gov/government/grant/pdm/index.shtm>.

## **8.2.Flood insurance:**

There is a special funding provision in the National Flood Insurance Program (NFIP) for insured buildings that have been substantially damaged by a flood, "Increased Cost of Compliance." ICC coverage pays for the cost to comply with floodplain management regulations after a flood if the building has been declared substantially damaged. ICC will pay up to \$30,000 to help cover elevation, relocation, demolition, and (for nonresidential buildings) floodproofing. It can also be used to help pay the 25% owner's share of a FEMA funded mitigation project.

The building's flood insurance policy must have been in effect during the flood. This payment is in addition to the damage claim payment that would be made under the regular policy coverage, as long as the total claim does not exceed \$250,000. Claims must be accompanied by a substantial or repetitive damage determination made by the local floodplain administrator. For more information, contact the insurance agent who wrote your flood insurance policy or visit <https://www.fema.gov/national-flood-insurance-program-2/increased-cost-compliance-coverage>. Coverage under the ICC does have limitations:

- It covers only damage caused by a flood, as opposed to wind or fire damage.
- The building's flood insurance policy must have been in effect during the flood.
- ICC payments are limited to \$30,000 per structure.

- Claims must be accompanied by a substantial or repetitive damage determination made by the local floodplain administrator.
- The Structure must be located in an A Zone.

The historical average claim payment in the study area is \$15,620. With an average claim of that amount, it is not likely that many homes in the study area would sustain substantial damage from a flood event. Homeowners should make themselves aware of the approximate value of their homes, and in the case of incurring flood damage, be aware of the need for a substantial damage declaration in order to receive the ICC coverage.

**Severe Repetitive Loss ICC Pilot Program:** While the conventional ICC only covers buildings that are located in the Special Flood Hazard Areas (SFHA), there is a new pilot program that is aiming to target buildings **not** in the SFHA. Focusing specifically on Severe Repetitive Loss (SRL) buildings, this pilot program will offer ICC benefits to those SRL properties that are located in X zones and will include those SRL buildings that have grandfathered X zone rates. Under this new pilot program, the ICC benefits could be used to cover the homeowner's 10% match in a SRL grant.

Alternative language adopted into the local floodplain management ordinance would enable residents with shallower flooding to access ICC funding. Since local ordinances determine the threshold at which substantial damage and /or repetitive claims are reached, adopting language that would lower these thresholds would benefit the homeowners of repetitive loss properties. Adopting alternative language allows for cumulative damages to reach the threshold for federal mitigation resources more quickly, meaning that some of the properties in the County that sustain minor damage regularly would qualify for mitigation assistance through ICC.

**Elevation Certificate:** An Elevation Certificate is an important tool that documents a building's elevation and ensures that the flood insurance premium accurately reflects the risk. Generally, in high-risk zones (a zone beginning with the letter A or V), the higher above the BFE a building is located, the lower the insurance premium will be for that property. The Elevation Certificate provides the documentation necessary to make that determination.

Homeowner's Guide to Elevation Certificate: [http://www.fema.gov/media-library-data/20130726-1914-25045-8243/floodsmart\\_factsheet\\_homeowners.pdf](http://www.fema.gov/media-library-data/20130726-1914-25045-8243/floodsmart_factsheet_homeowners.pdf)

### 8.3.Rebates:

A rebate is a grant in which the costs are shared by the homeowner and another source, such as the local government, usually given to a property owner after a project has been completed. Many communities favor it because the owner handles all the design details, contracting, and payment before the community makes a final commitment. The owner ensures that the project meets all of the program's criteria, has the project constructed, and then goes to the community for the rebate after the completed project passes inspection.

Rebates are more successful where the cost of the project is relatively small, e.g., under \$5,000, because the owner is more likely to be able to afford the bulk of the cost. The rebate acts more as an incentive, rather than as needed financial support.

#### **8.4.Small Business Administration Mitigation Loans:**

The Small Business Administration (SBA) offers mitigation loans to SBA disaster loan applicants who have not yet closed on their disaster loan. Applicants who have already closed must demonstrate that the delay in application was beyond their control.

Measures eligible for SBA mitigation loans may only protect real estate property, not personal items, from the same type of future declared disaster. For example, mitigation loans made following a flood can only be used for a measure to protect against future flooding, not a tornado. If the measure existed prior to the declared disaster, an SBA mitigation loan will cover the replacement cost. If the measure did not exist prior to the declared disaster the mitigation loan will only cover the cost of the measure if it is deemed necessary for repairing the property by a professional third-party, such as an engineer.

### **9. Continuation**

The CRS program requires an annual update to this RLAA. The annual update must review each recommended action, discuss the actions that were implemented and those that were not, and recommend any changes to the recommended actions. The report must be made available to the public, including the media and property owners and residents of the RL areas. This process must continue every year for the County to maintain its standing in the CRS program. Also, this update must preface each CRS cycle verification visit. Refer to Section 510 of the CRS Coordinator's Manual for more information (FEMA FIA-15, 2013).

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