

Delta Annex Chapter 5 Reclamation District 349

5.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 349 (RD 349 or District), a new participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 349, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

5.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 5-1. Additional details on plan participation and District representatives are included in Appendix A.

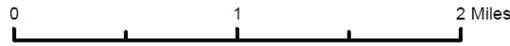
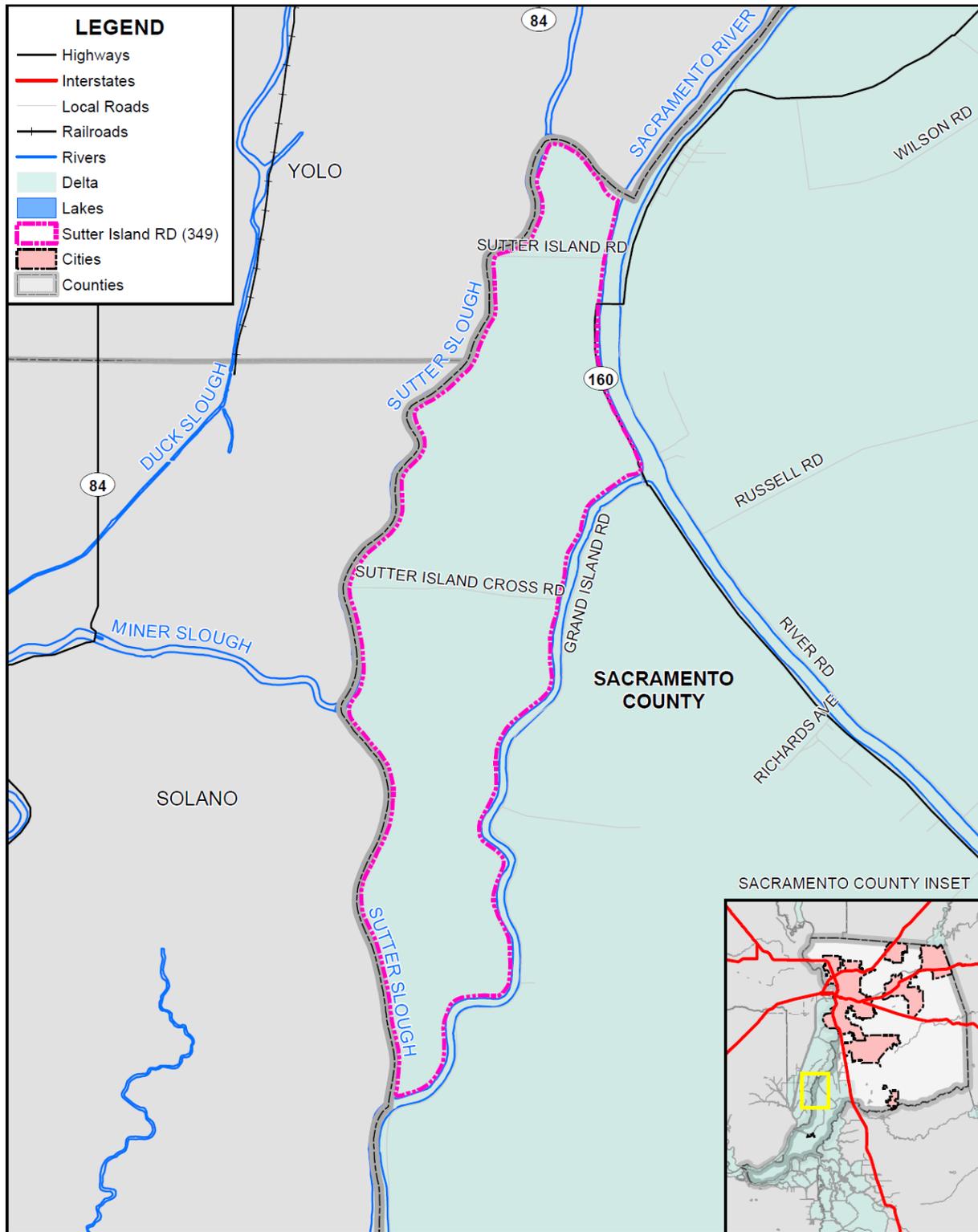
Table 5-1 RD 349 – Planning Team

Name	Position/Title	How Participated
Richard Elliot	President	Evaluated District issues and developed solutions
Matt Hemly	Trustee	Evaluated District issues and developed solutions
Joe Salman	Secretary	Evaluated District issues and developed solutions
Gilbert Cosio/MBK	District Engineer	Evaluated District issues and developed solutions

5.3 District Profile

The District profile for the RD 349 is detailed in the following sections. Figure 5-1 displays a map and the location of the District within Sacramento County.

Figure 5-1 RD 349



Data Source: Sutter Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

5.3.1. Overview and Background

Reclamation District 349, Sutter Island, is the local public entity that provides flood control and drainage services to landowners of Sutter Island. These functions are provided in the most economical and environmentally sound manner, with the greatest consideration of the areas rich agrarian culture and heritage.

Established in 1880, Sutter Island was given the number Reclamation District No. 349. The area protected by Reclamation District No. 349 has remained the same for essentially the entire time of its existence. The Reclamation District protects 2,383 (or 2533) acres.

The Reclamation District No. 349 levees are part of the Federal Sacramento River Flood Control Project. As part of a Federal project, the State of California is the local sponsor with Reclamation District No. 349 acting as the local maintaining agency. In order to verify that the District is maintaining its levees properly, the State inspects the levees two times a year (spring and fall) and Reclamation District No. 349 inspects its levees twice a year (summer and winter). The key inspection is the fall inspection performed by the State of California. This inspection, which occurs just prior to the flood season, is used by the Corps of Engineers to determine whether the levee is being properly maintained in order for Reclamation District No. 349 to qualify for Federal emergency funding through Public Law 84-99. The Corps of Engineers also performs inspections periodically every 5 to 10 years.

Reclamation District No. 349 provides flood protection in the form of levee maintenance and rehabilitation. The District also provides interior island flood protection and drainage. The District operates and maintains all the levees that protect the landowners of Sutter Island. The District's project levees include 6.55 miles along Sutter Slough, 4.35 miles along Steamboat Slough, and 1.59 miles along the Sacramento River for a total of 12.49 miles. The District also maintains ditches and canals, and 1 pumping plant to drain the properties of Sutter Island.

5.4 Hazard Identification

RD 349 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 5-2).

Table 5-2 RD 349—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Climate Change	Extensive	Occasional	Limited	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Likely	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Significant	Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Low	Low
Subsidence	Significant	Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid			
Likelihood of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			
		Climate Change Influence Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact			

5.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District’s hazards and assess the District’s vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

5.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 5.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 5-2) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

5.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District’s total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 349’s assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 5-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 349’s physical assets, valued at over \$251 million, consist of the buildings and infrastructure to support the District’s operations.

Table 5-3 RD 349 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pumping Plant – Sutter Slough	Drain Pump	\$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Levees	Flood Control System	\$249,800,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Total		\$251,800,000	

Source: RD 349

Natural Resources

RD 349 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. Sutter Island is one of the few in the Delta that still has substantial riverine and freshwater forested/shrub wetland habitat on the waterside slopes of its levees. Agricultural ground and ditches also support wildlife.

Historic and Cultural Resources

RD 349 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. Sutter Island is located within the Legal Delta which is now considered to be a National Heritage Area. The majority of the acreage on Sutter Island is considered to be Prime Agricultural land. Some of that acreage is dedicated to pear orchards that date back almost a century.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Future Development

Future development in these areas generally parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

Grand Island is within the Primary Zone of the Delta. Therefore, in addition to Sacramento County, development is controlled by a State agency, the Delta Protection Commission. Therefore, there is little, if any, potential for growth beyond that allowed by agricultural zoning. There are no current plans to add any new District facilities. The District is planning upgrades to District facilities. This is shown on Table 5-4. None of these planned repairs listed in Table 5-4 are intended to induce growth due to land use regulations.

Table 5-4 RD 3 Proposed Maintenance and Improvement Projects

Proposed Projects	Levee Segment
2017 Storm Damage, Waterside Erosion Repairs	Steamboat Slough
2017 Storm Damage Waterside Erosion Repairs	Sutter Slough
Interior Drainage Improvements	Sacramento River and Steamboat Slough

5.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 5-2 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that

plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District has experienced power outages, typically related to high winds and storms that damage the power lines. The District can utilize generators as needed but do not have a back-up power source otherwise.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The District is not located within an area that is subject to a PSPS and has not been affected by any activity.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence—Occasional/Unlikely
Vulnerability—High

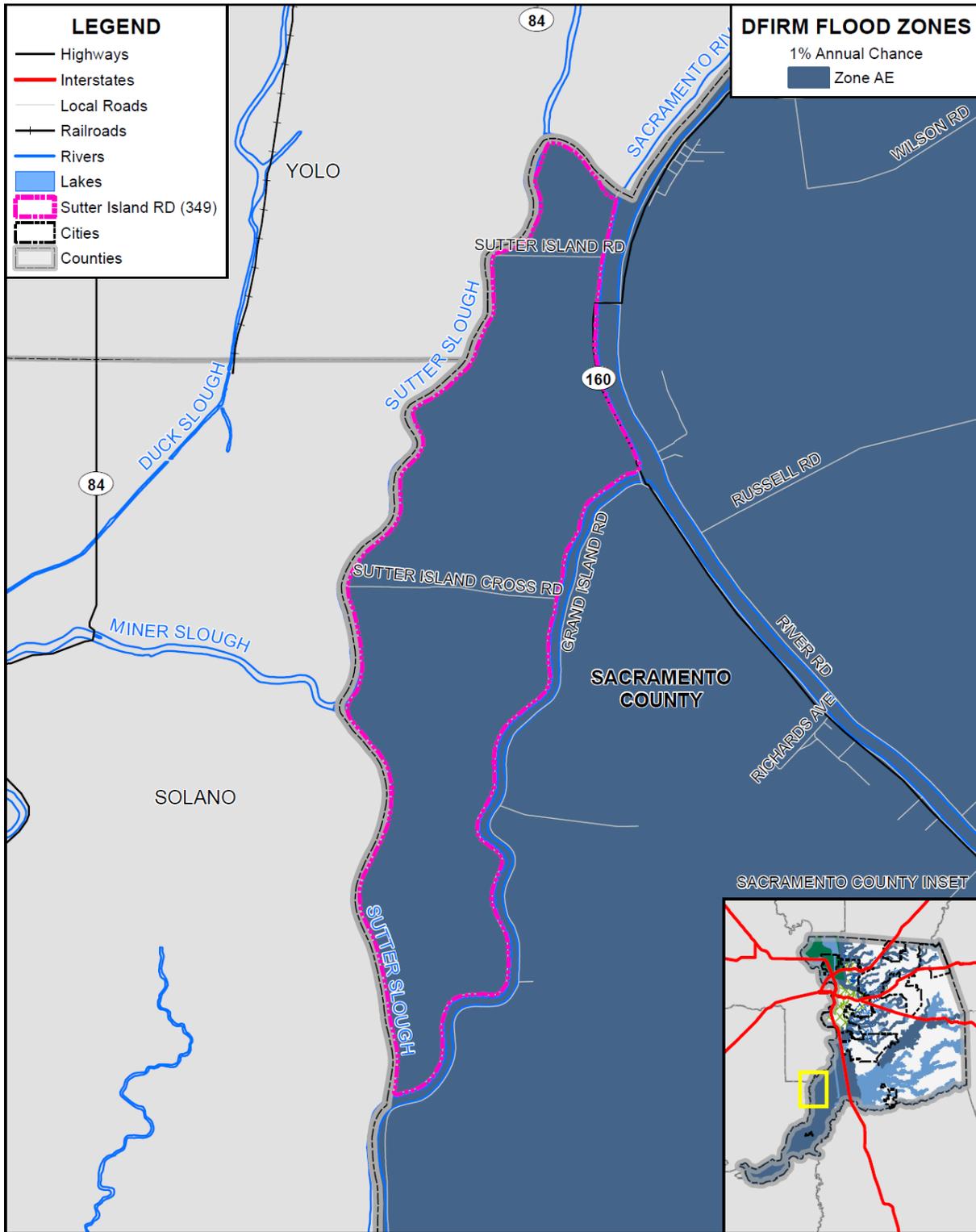
Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 349 have been subject to historical flooding.

Location and Extent

The RD 349 has areas located in the 1% annual chance floodplain. This is seen in Figure 5-2.

Figure 5-2 RD 349 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sutter Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Table 5-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 5-5 RD 349– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 5-6. These events also likely affected the District to some degree.

Table 5-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Past river floods, most recently in 1986, 1997/1998, 2006 and 2017, have damaged the RD 349 levees in the form of erosion. Restoration erosion repair has typically been performed by the Corps of Engineers as authorized under PL 84-99. Repair work under PL 84-99 was performed by the Corps of Engineers on Sutter Island levees following the recent floods of 1986, 1997, 1998, and 2006. The District temporarily lost eligibility in the PL84-99 program is hoping to regain eligibility through the preparation and execution of a Systemwide Improvement Framework (SWIF).

Most recently, high water events in 2017 and 2019 have resulted in considerable waterside erosion and exacerbated sites that have experienced erosion over time throughout the District levees. The flood event of 2017 also resulted in increased levee patrols and pumping costs.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Namely, orchard crops and vineyards on the District can be completely lost if they are inundated for an extended period of time. Crop losses will continue years after as it will take at least 5 years to produce a viable orchard or vineyard crop. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

Should a flood breach the levees, the entirety of the assets and population of RD 349 would be at risk. There are approximately 62 people that live on Sutter Island, given the small size of the District, a failure would fill up the island relatively quickly impacting evacuation. These assets include approximately 2,500 acres of crops grown within the District. RD 349's drain pump would be flooded and therefore, RD 349 could not drain the flooded areas with their existing pumps; auxiliary pumps would have to be brought in.

A flood event could also deteriorate the District levees on waterside slopes causing significant erosion as seen in the aftermath of the 2017 event. If a breach were to occur, the levees could experience erosion on the landside slopes from wave wash.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely

Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The RD 349 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding: In past flood events, boils formed on the landside of the levee. Animal burrows, abandoned or unmaintained pipes, and vegetation can increase the likelihood of seepage during high water events that can result in localized flooding. No specific damages were recorded.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected

with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

As stated above, stormwater flooding has the potential to result in significant damage due to the increased acreage of permanent crops. Stormwater flooding can result in losses of less flood resistant crops planted at low elevations.

Levee Failure

Likelihood of Future Occurrence—Occasional
Vulnerability—Extremely High

Hazard Profile and Problem Description

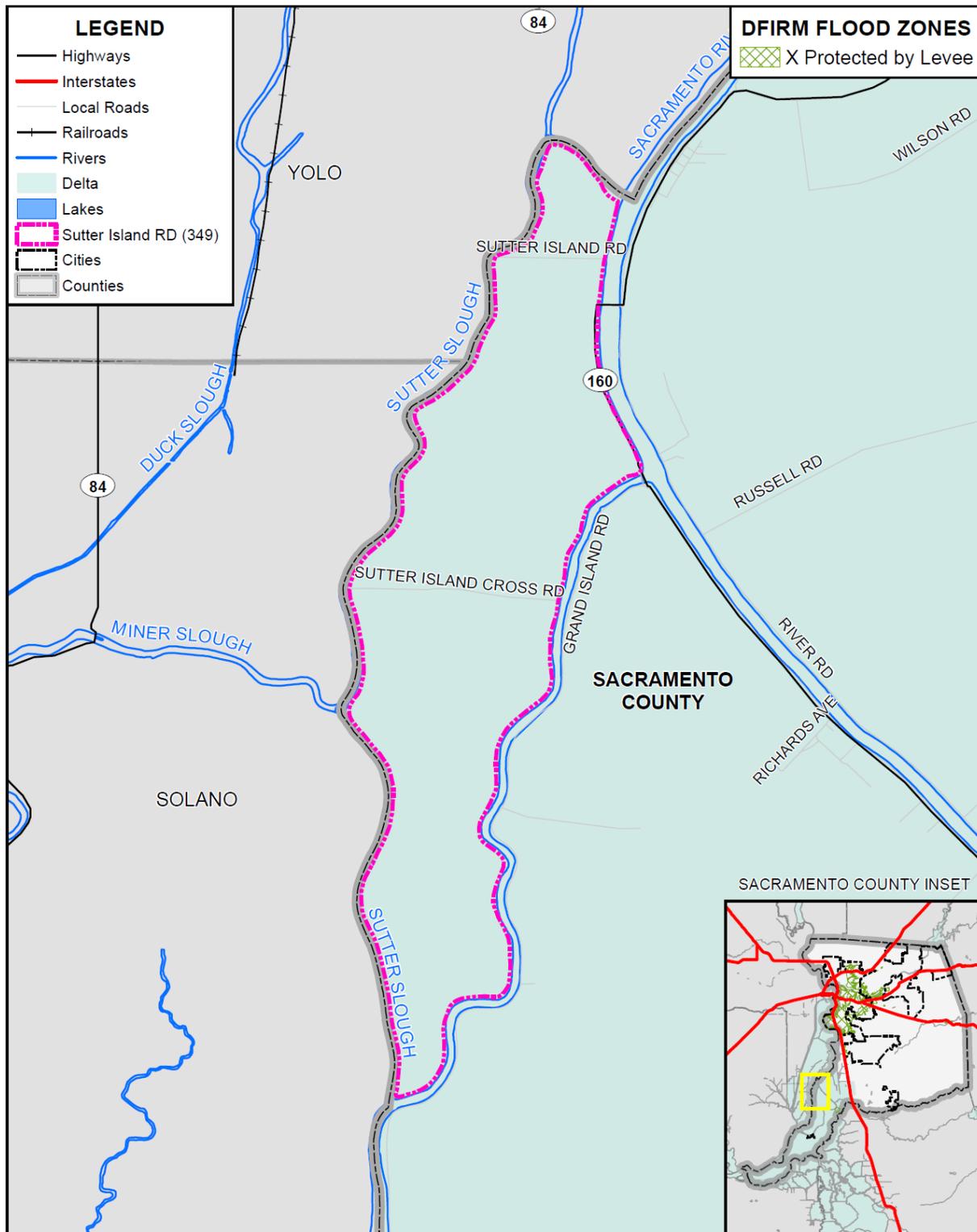
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower stream channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 5-3.

Figure 5-3 RD 349 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Sutter Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

To reduce the risk of flooding the District is planning to perform the repairs listed in Table 5-4 to reduce the likelihood of levee failure. To further reduce damages in the event of a levee failure, the District could perform a relief cut near the bottom the District either on the Sutter Slough Levee or Steamboat Slough levee. This action, if timed appropriately, can reduce flood depths and inundation timing.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

District assets previously mentioned would experience significant damages in the event of a levee breach. A levee failure could result in the loss of both row crops and permanent crops. If a breach were to occur there could be a potential loss of life due to limited evacuation time and disruptions in evacuation routes.

A levee failure and subsequent flooding on Reclamation District 349 could result in wave fetch that could damage the interior slopes of the District's levee system as well as those of adjacent Districts.

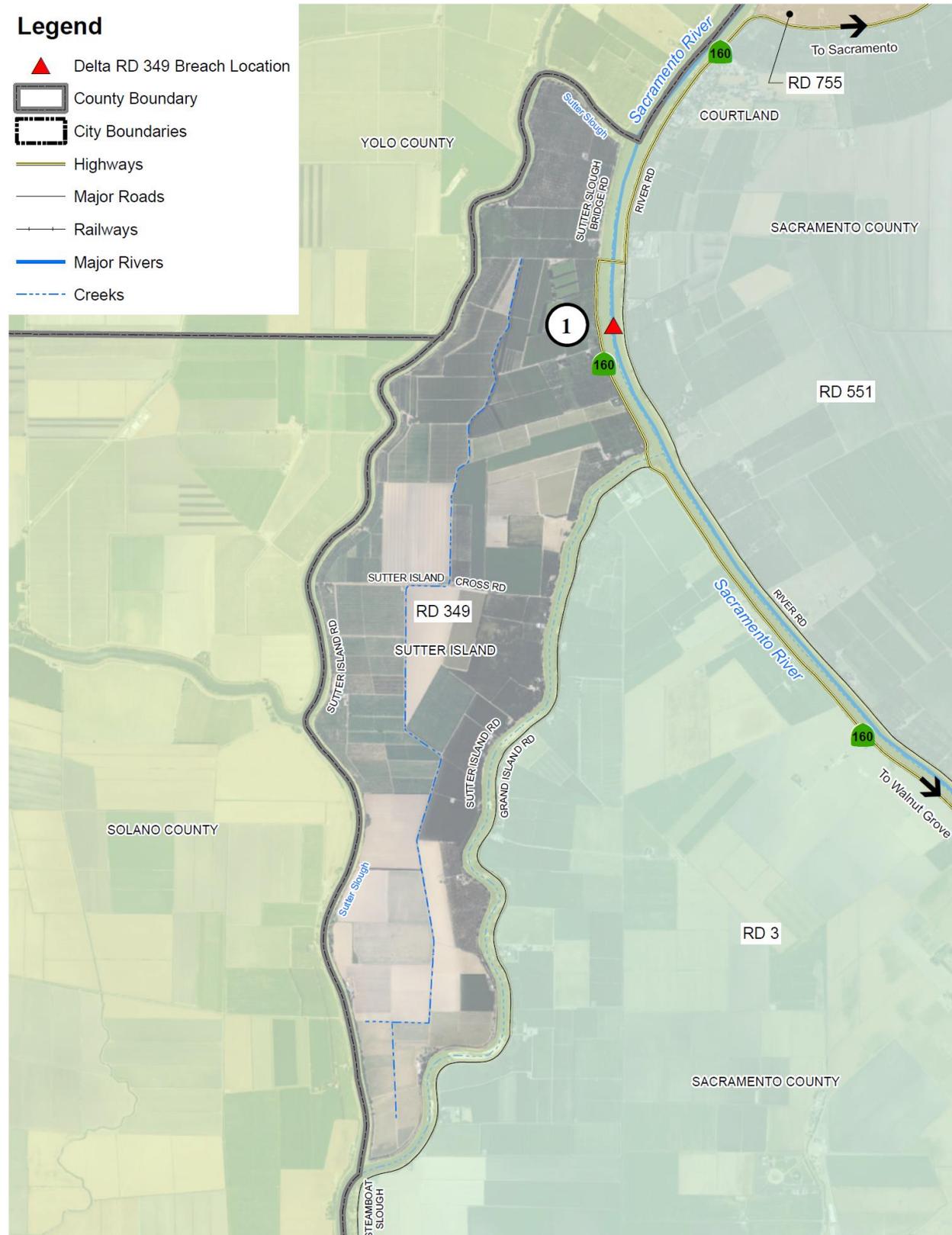
Scour at the breach area is another concern. Once the breach is repaired this location may prove to be too low to support any agriculture due to drainage difficulties.

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

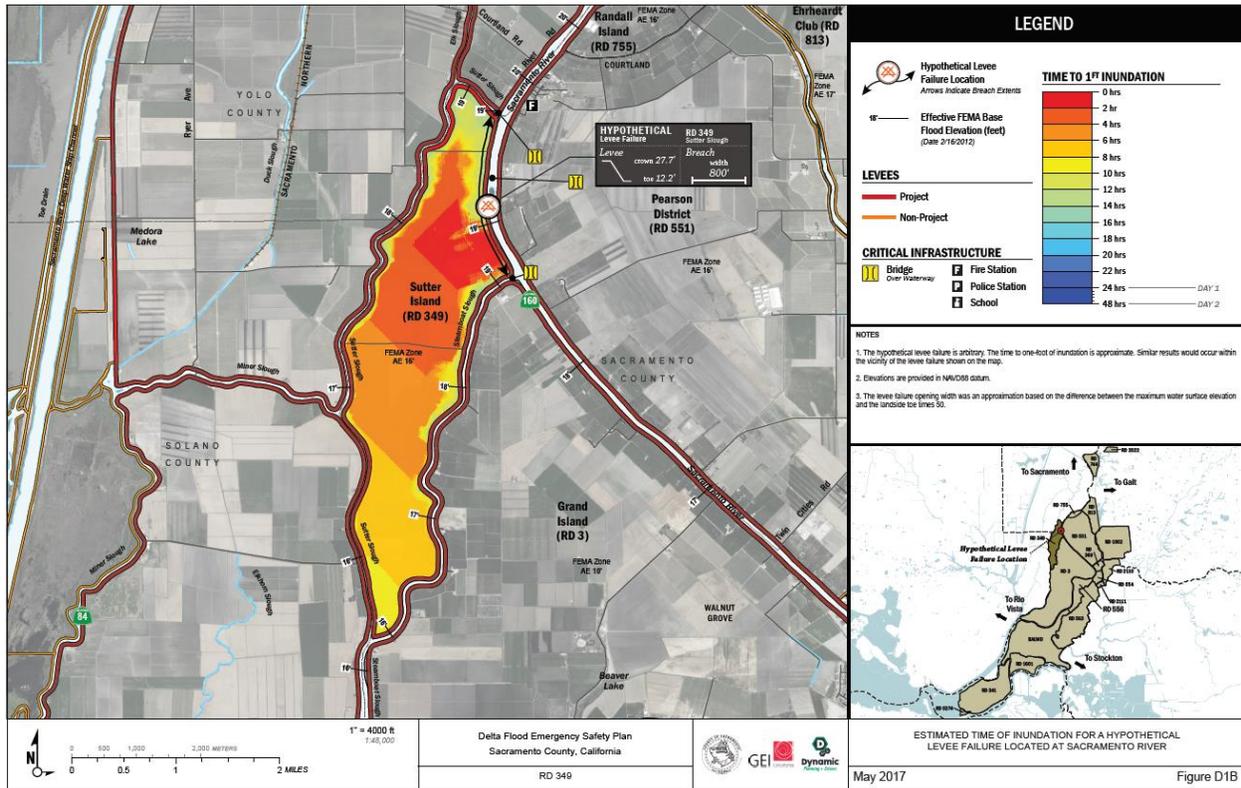
For RD 349, Figure 5-4 details the locations in the Delta within RD 349 where flooding could occur. The red triangles denote potential levee breach locations. RD 349 has a potential levee break scenario. Maps regarding time to one foot inundation (Figure 5-5), estimated flood depths (Figure 5-6), and suggested evacuation routes (Figure 5-7) are displayed below.

Figure 5-4 RD 349 – Potential Levee Breach Location



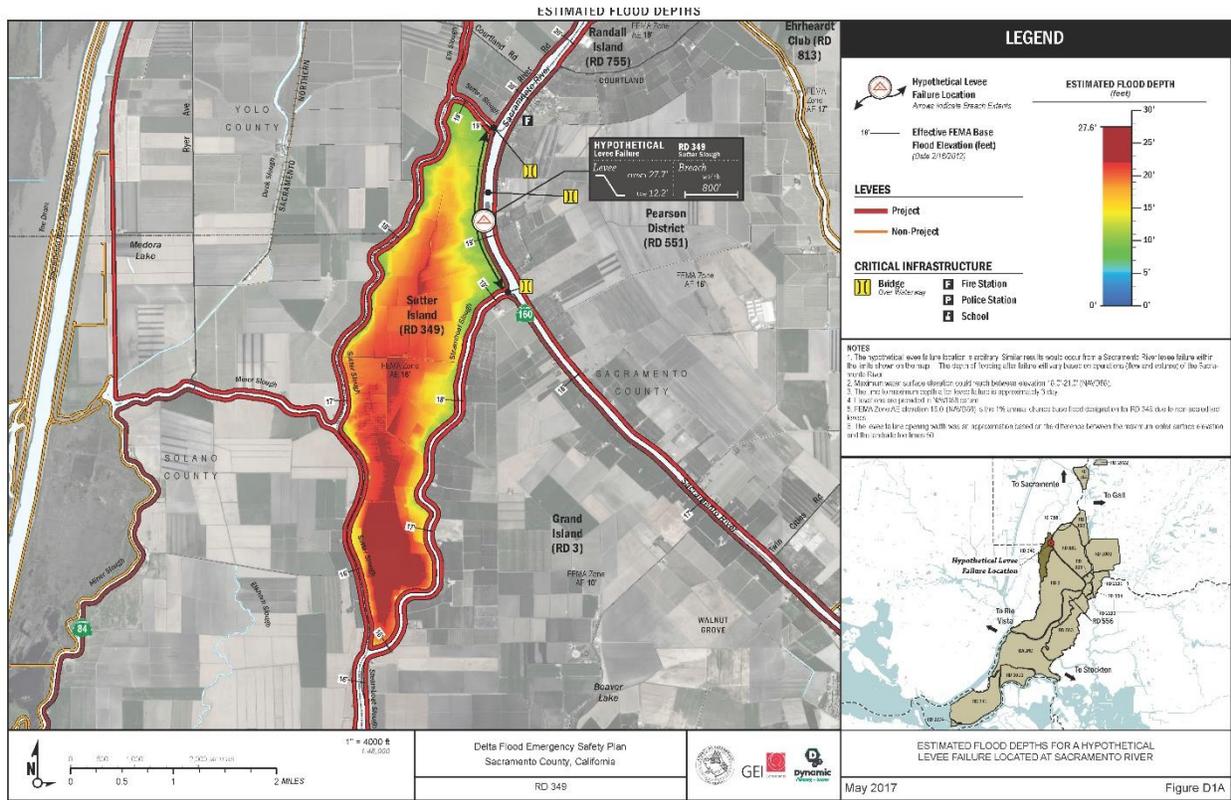
Source: Sacramento County Storm Ready – retrieved April 29, 2021

Figure 5-5 RD 349 – Time to One Foot Inundation after Levee Breach



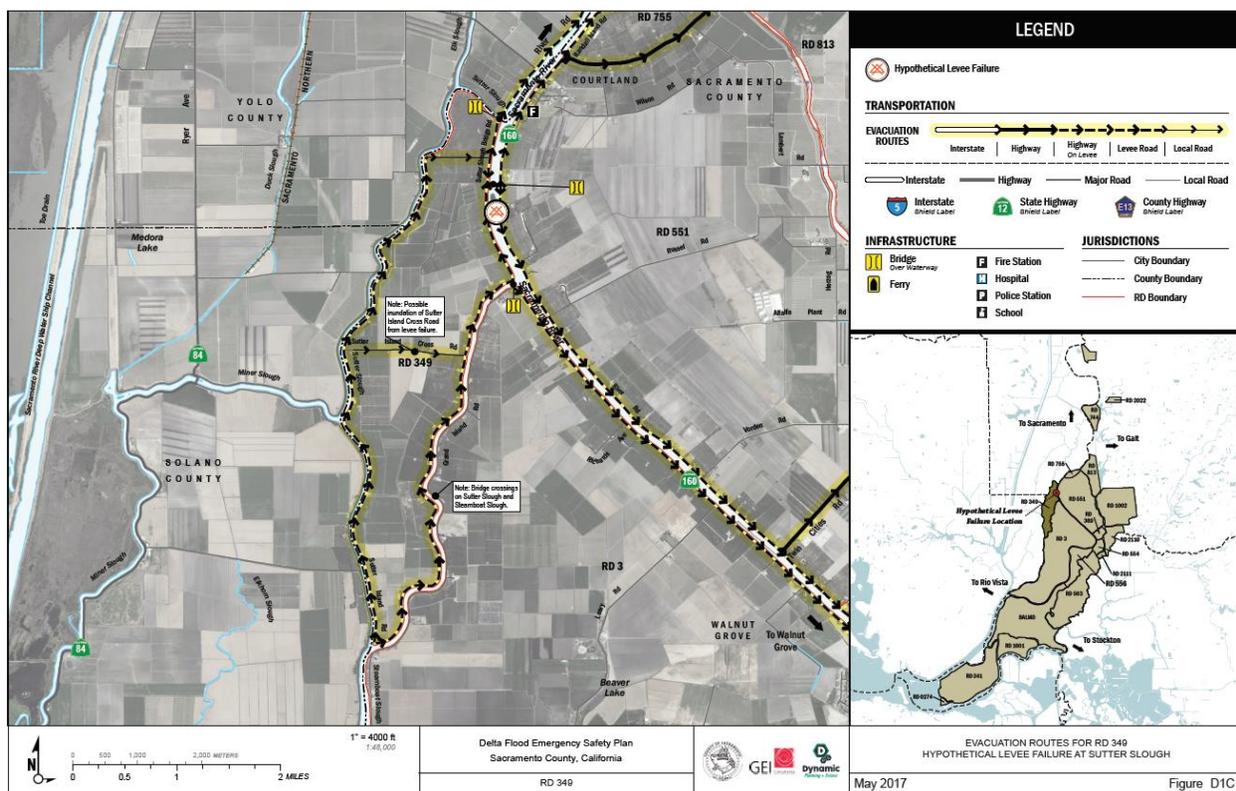
Source: Sacramento County Storm Ready – retrieved April 29, 2021

Figure 5-6 RD 349 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved April 29, 2021

Figure 5-7 RD 349 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved April 29, 2021

Assets at Risk

A levee failure would impact almost all the assets and critical facilities on Grand Island; including the small State Highway 160 as well as a several county roads are at risk. Approximately 2,500 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Sutter Island, such as wine grapes and pears that would be destroyed. Production of such permanent crops can take approximately 5 years to produce a viable harvest.

A levee failure could cause flooding that could damage the District’s pump and drainage system. A levee failure can also result in subsequent levee failures around the District and on adjacent islands due to increased fetch of the flooded area and subsequent erosion on exposed levee slopes.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it

contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding. In 2017, heavy rains resulted in additional pumping and subsequent costs to ensure adequate drainage.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services. During periods of heavy rains and storms, power outages can also occur. These power outages can affect pumping stations that help alleviate flooding.

Problems associated with the primary effects of severe weather include erosion, flooding, pavement deterioration, washouts, landslide/mudslides, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 349. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 349 millions in damages. Although water surface elevation is a major factor to levee seepage and overtopping, severe weather can cause significant damage, such as erosion, that puts the integrity of the Grand Island levee system at risk.

Assets at Risk

Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past. Problems associated with the primary effects of severe weather include erosion, flooding, pavement deterioration, washouts, landslide/mudslides, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 349. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 349 millions in damages as stated previously under a levee failure scenario.

High winds during storm events can knock down power lines and result in a loss of power to the District pumps. This will require the District to bring in diesel powered auxiliary pumps and will likely result in increased flooding within the District.

5.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

5.6.1. Regulatory Mitigation Capabilities

Table 5-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 349.

Table 5-7 RD 349 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	Not within this jurisdiction's authority
Capital Improvements Plan	N	Not within this jurisdiction's authority
Economic Development Plan	N	Not within this jurisdiction's authority
Local Emergency Operations Plan	Y/2021	Through a state grant, Sacramento County is funding revisions to the District's existing Flood Emergency Safety Plan for RD 349. The plan update will be complete in early 2022. This plan will also evaluate and create an action plan for a relief cut in the event of a levee failure.
Continuity of Operations Plan	N	Not within this jurisdiction's authority
Transportation Plan	N	Not within this jurisdiction's authority
Stormwater Management Plan/Program	Y	RD 349 consistently evaluates flooding of low areas and the need for improvements in its drainage system

Engineering Studies for Streams	N	Not within this jurisdiction's authority
Community Wildfire Protection Plan	N	Not within this jurisdiction's authority
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Annual routine maintenance plans and participation in the state Delta Levees Subventions Program which assists in funding levee maintenance. RD 349 is also preparing a Letter of Intent to participate in the Corps of Engineers PL84-99 program through the development of a System-Wide Improvement Framework (SWIF) to respond to maintenance and rehabilitation issues brought up by the Corps of Engineers Periodic Inspection Report
Building Code, Permitting, and Inspections	Y/N	Are codes adequately enforced?
Building Code	N	Version/Year: Not within this jurisdiction's authority
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score: Not within this jurisdiction's authority
Fire department ISO rating:	N	Rating: Not within this jurisdiction's authority
Site plan review requirements	N	Not within this jurisdiction's authority
		Is the ordinance an effective measure for reducing hazard impacts?
Land Use Planning and Ordinances	Y/N	Is the ordinance adequately administered and enforced?
Zoning ordinance	N	Not within this jurisdiction's authority
Subdivision ordinance	N	Not within this jurisdiction's authority
Floodplain ordinance	N	Not within this jurisdiction's authority
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	Not within this jurisdiction's authority
Flood insurance rate maps	N	Not within this jurisdiction's authority
Elevation Certificates	N	Not within this jurisdiction's authority
Acquisition of land for open space and public recreation uses	N	Not within this jurisdiction's authority
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary. Sediment removal from drainage system canals as necessary.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		

Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database.

In implementation of the District's SWIF, the District will require increased coordination from permitting agencies as well as landowners. Many issues identified are going to require significant permitting and come at a high cost to landowners. Programmatic permitting capabilities as well as a grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure.

The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund.

Source: RD 349

5.6.2. Administrative/Technical Mitigation Capabilities

Table 5-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 349.

Table 5-8 RD 349's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	Not within this jurisdiction's authority
Mitigation Planning Committee	N	Not within this jurisdiction's authority
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	RD 349 annually performs \$40,000 in maintenance. In addition, it periodically constructs projects to repair deficiencies in the levee such as planned erosion and seepage repairs.
Mutual aid agreements	N	None formally established with adjacent Reclamation Districts. Informally resources will be shared in the event of an emergency.
Other	N	
Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	N	Not a position within this jurisdiction
Floodplain Administrator	N	Not a position within this jurisdiction
Emergency Manager	Y	Matt Hemly
Community Planner	N	Not a position within this jurisdiction
Civil Engineer	Y	Gilbert Cosio, Michael Moncrief and the staff at MBK Engineers has served as District Engineer for over 40 years and has participated in many flood fight actions.
GIS Coordinator	N	Not a position within this jurisdiction
Other		
Technical		

Warning systems/services (Reverse 911, outdoor warning signals)	Y	There are sirens at fire houses in adjacent towns. The process of using these as flood warnings should be revisited by local volunteer fire departments. District has a phone list, but does not have staffing beyond the trustees, civil engineer, and secretary.
Hazard data and information	Y	Civil Engineer has hazard data and information to aide district
Grant writing	N	Not a position within this jurisdiction
Hazus analysis	N	Not a position within this jurisdiction
Other		
How can these capabilities be expanded and improved to reduce risk?		
Consistent and available funding opportunities can aide in planning and outlaying substantial improvement projects.		

Source: RD 349

5.6.3. Fiscal Mitigation Capabilities

Table 5-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 5-9 RD 349's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	RD 349's annual assessment includes funding for future anticipated capital projects
Authority to levy taxes for specific purposes	Y	RD 349 calls assessments based on the budgetary needs of the District
Fees for water, sewer, gas, or electric services	N	Not within this jurisdiction's authority
Impact fees for new development	N	Not within this jurisdiction's authority
Storm water utility fee	N	Not within this jurisdiction's authority
Incur debt through general obligation bonds and/or special tax bonds	Y	RD 349 has the ability to levy special assessments and also obtain warrants to perform unanticipated repairs
Incur debt through private activities	N	Not within this jurisdiction's authority
Community Development Block Grant	N	Not within this jurisdiction's authority
Other federal funding programs	Y	The District is preparing a Letter of Intent to become eligible for the Corps of Engineers PL84-99 program
State funding programs	Y	The District participates in the Delta Levees Subventions program that provides a 75/25 state to local cost share.
Other		
How can these capabilities be expanded and improved to reduce risk?		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
<p>Substantial funding will be required both publicly and privately in implementation of the District’s SWIF. A grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund. Furthermore the District has utilized other funding opportunities such as the Flood System Repair Program to address critical issues. Continued funding of such programs would greatly benefit the District’s ability to perform necessary repairs and improvements.</p>		

Source: RD 349

5.6.4. Mitigation Education, Outreach, and Partnerships

Table 5-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 5-10 RD 349’s Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	No formal program currently exists within this jurisdiction
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	RD 349 maintains a web page with appropriate information to educate the public. With SWIF implementation, the District will perform outreach to landowners for education and assistance in addressing encroachment issues.
Natural disaster or safety related school programs	N	No formal program currently exists within this jurisdiction
StormReady certification	Y	The RD 349 manager, trustees, and District Engineer have been, or soon will be, trained in SEMS and NIMS
Firewise Communities certification	N	No formal program currently exists within this jurisdiction
Public-private partnership initiatives addressing disaster-related issues	N	No formal program currently exists within this jurisdiction
Other		
How can these capabilities be expanded and improved to reduce risk?		

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
<p>Many risks to the integrity of the levee system can come from noncompliant and aging encroachments such as pipes through the levee. Repair and replacement of encroachments, particularly pipes can place a large financial burden on landowners leading to deferred maintenance and ultimately a dangerous situation within the flood control system. It would be beneficial if a program were established that would create a local agency/private landowner partnership that provides funding and permitting assistance to address these issues before they result in levee failure.</p>		

Source: RD 349

5.6.5. Other Mitigation Efforts

RD 349 has been an active participant in the state’s Delta Levee Subventions Program. Along with development of a Systemwide Improvement Framework (SWIF) the District will reduce risk by leveraging state and federal resources to address levee deficiencies and respond to emergencies.

5.7 Mitigation Strategy

5.7.1. Mitigation Goals and Objectives

The RD 349 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

5.7.2. Mitigation Actions

The planning team for the RD 349 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to

implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The high water events of 2017 and 2019 resulted in 9 areas that had experienced erosion on the waterside slope of the Sacramento River and Steamboat Slough levees. Some areas had experienced erosion in previous high water events (1986 and 1997) that became worse following these events.

Project Description: Repairing waterside erosion at various locations along Sacramento River and Steamboat Slough that resulted from the 2017 and 2019 high water events. Utilizing rip rap material to re-establish the existing levee slope.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 349 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 349, Department of Water Resources

Cost Estimate: \$2.5 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of \$23 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Operations and Maintenance Program

Timeline: Scheduled to be completed by 2026

Project Priority (H, M, L): High

Action 2. Interior Drainage Improvements

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The District has been studying the interior drainage system and issues with the intent to include a new or upgrade existing pumps to resolve localized flooding issues.

Project Description: Install a new pumping facility or upgrade an existing facility within the existing District drainage system to improve efficiency and reduce residency time of flood waters. This could also include the acquisition of an ancillary diesel pump to use in the event of pump damage or power outages.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 349 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 349, Department of Water Resources

Cost Estimate: \$2 million

Benefits (Losses Avoided): Assists with dewatering the island which could result in losses of up to \$23 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program

Timeline: Scheduled to be completed by 2030

Project Priority (H, M, L): High

Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: USACE Sacramento District identified five Unacceptable deficiency categories in its PIR, four of which affect PL 84-99 eligibility: encroachments, slope stability, animal control, and erosion/bank caving. Although the depression/rutting category does not affect eligibility, RD 349 will also address those Unacceptable items.

Project Description: Addressing these unacceptable items to maintain eligibility in the PL84-99 program with a worst first approach. If an item in one of the lower priority categories poses a greater risk it will be addressed sooner. Once the unacceptable items are addressed the District will continue to correct items listed in the USACE Periodic Inspection Report in its effort to achieve an acceptable rating.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 349 Five Year Plan, System Wide Improvement Framework

Responsible Agency/ Department/Partners: Reclamation District 349, Department of Water Resources

Cost Estimate: \$6 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of \$120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program, Deferred Maintenance Program

Timeline: Schedule for completion 2050

Project Priority (H, M, L): High

Action 4. Relief Cut Plan

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: In the event of a levee breach, the District is planning on a relief cut near the bottom of the District to help drain the island quicker and reduce damages to property.

Project Description: A relief cut plan will be established by the District and coordinated with various emergency planning agencies and adjacent reclamation districts in the event of a levee breach in the northern portion of the District

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Community Flood Risk Reduction Feasibility Study, Sacramento County Flood Safety Plan Update

Responsible Agency/ Department/Partners: Reclamation District 349, Sacramento County Office of Emergency Services

Cost Estimate: \$2 million

Benefits (Losses Avoided): Reduces the amount of time floodwaters impact the District which could cause an estimated \$120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Repair Project

Timeline: No current schedule for completion

Project Priority (H, M, L): Medium