

LOGO?

Annex D Sacramento River West Side Levee District

D.1 Introduction

This Annex details the hazard mitigation planning elements specific to Sacramento River West Side Levee District (SRWSLD), a new participating jurisdiction to the 2004 Colusa County Local Hazard Mitigation Plan (LHMP). 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 the District, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

D.2 Planning Process

As described above, the District followed the planning process detailed in Section 3 of the Base Plan. In addition to providing representation on the Colusa 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 D-1. Additional details on plan participation and District representatives are included in Appendix A.

Table D-1 SRWSLD Planning Team

Name	Position/Title	How Participated
Meegan Nagy	Deputy Manager	Attended meetings. Provided hazard ID tables. Provided hazard input and data. Provided mitigation actions
Lewis Blair	General Manager	Provided input to hazard data.

D.3 District Profile

The community profile for the District is detailed in the following sections. Figure D-1 displays a map and the location of the District within Colusa County.

Figure D-1 Sacramento River West Side Levee District

IS THERE A MAP?

Source: SRWSLD

D.3.1. Overview and Background

Prior to construction of the levees, the Sacramento River would rise up out of its banks during the wet winter months to form an inland sea across the valley floor. Many miners who had previously been farmers, recognized the potential of the fertile soils that covered the Sacramento Valley and set out to reclaim the swamp lands from overflow.

The first levees were built by individual landowners using substandard materials. The Sacramento Flood Control Project was authorized by Congress in 1917 and completed by the Army Corps of Engineers in 1960. Today the flood control districts act as the local maintaining agency to perform maintenance on the levees. All of the levees constructed have now become part of the federally authorized Sacramento River Flood Control Project. There are over 1,600 miles of State/Federal Project levees.

The levees south of Colusa were initially maintained by Reclamation District No. 108, but the costs for levee construction and maintenance were high and borne by few landowners whereas the benefits of flood protection extended beyond RD 108 boundaries. In 1915 the legislature created the Sacramento River West Side Levee District to more accurately reflect the lands benefited. All of the levees were originally built by landowners and have become part of the federally authorized Sacramento River Flood Control Project.

According to the Grimes Basin EOP, the SRWSLD maintains levees along the Sacramento River protecting nearly 194,000 acres of farmland, the City of Colusa, and Town of Grimes. SRWSLD currently does not have any staff. RD 108 staff maintain the levees and infrastructures of the Sacramento River West Side Levee District under contract.

D.4 Hazard Identification

SRWSLD's planning team identified the hazards that affect the District and summarized their location extent, frequency of occurrence, potential magnitude, and significance specific to the District (see Table D-2).

Table D-2 SRWSLD – Hazard Identification Assessment

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Ag Hazards: Severe Weather/Insect Pests	–	–	–	–	–
Climate Change	Extensive	Highly Likely	Critical	High	–
Dam Failure	Extensive	Occasional	Catastrophic	High	Medium
Drought and Water Shortage	–	–	–	–	–
Earthquake (minor/major)	Limited	Occasional/Unlikely	Limited	Low	Low
Flood: 100/200/500-year	Extensive	Occasional/Unlikely	Catastrophic	High	High
Flood: Localized/Stormwater	Significant	Highly Likely	Limited	Low	Medium
Hazardous Materials Transportation	–	–	–	–	–
Landslide, Mudslide, and Debris Flows	Limited	Unlikely	Negligible	Low	Low
Levee Failure	Extensive	Likely	Catastrophic	High	Medium
Severe Weather: Extreme Cold and Freeze	–	–	–	–	–
Severe Weather: Extreme Heat	–	–	–	–	–
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: High Winds/Tornadoes	Extensive	Highly Likely	Limited	Medium	Medium
Stream Bank Erosion	Significant	Likely	Limited	Medium	Medium
Subsidence	–	–	–	–	–
Volcano	–	–	–	–	–
Wildfire (smoke, tree mortality)	Limited	Unlikely	Negligible	Low	Low
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area Probability 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.		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 Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact Climate Change Impact: Low: Not likely to increase the probability of this hazard. Medium: Is likely to increase the probability of this hazard. High: Is very likely to increase the probability of this hazard.			

D.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile SRWSLD’s hazards and assess the District’s vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Sections 4.2 Hazard Profiles and 4.3 Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Planning Area and describes the hazard problem description, hazard 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, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the District and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

D.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section D.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the District and includes information on past hazard occurrences. The intent of this section is to provide jurisdictional specific information on hazards and further describe how the hazards and risks differ across the Planning Area.

D.5.2. Vulnerability Assessment and Assets at Risk

This section identifies SRWSLD’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 District’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 Plan.

A critical facility is classified by the following categories: (1) Essential Services Facilities and (2) At-Risk Populations Facilities

Essential Service Facility: *A facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response, and/or disaster recovery functions.*

At-Risk Populations: *Pre-schools, public and private primary and secondary schools, before and after school care centers, daycare centers, group homes, and assisted living residential or congregate care facilities with multiple residents.*

Table D-3 lists particular critical facilities and other District assets identified by the SRWSLD planning team as important to protect in the event of a disaster. SRWSLD’s physical assets, valued at over \$550 million, consist of the buildings and infrastructure to support SRWSLD’s operations.

Table D-3 SRWSLD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Address	Replacement Value
Levees	Essential Service	N/A	\$550 million

Source: SRWSLD

Natural Resources

SRWSLD has a variety of natural resources of value to the District. These natural resources parallels that of the County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

SRWSLD 108 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of the County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

Growth in the District parallels that of the County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Future Development

The District has no control over future development in areas protected by District levees. Future development in these areas parallels that of the County as a whole. More general information on growth and development in Colusa County as a whole can be found in “Growth and Development Trends” in Section 4.3.1 Colusa County Vulnerability and Assets at Risk of the Base Plan.

D.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table D-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 Colusa County Planning Area). In general, the most vulnerable structures are the levees owned by the District.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of risk 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.

Climate Change

Likelihood of Future Occurrence—Highly Likely

Vulnerability—High

Hazard Profile and Problem Description

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average. While the Earth’s climate has cycled over its 4.5-billion-year age, these natural cycles have taken place gradually over millennia, and the Holocene, the most recent epoch in which human civilization developed, has been characterized by a highly stable climate – until recently.

This LHMP Update is concerned with human-induced climate change that has been rapidly warming the Earth at rates unprecedented in the last 1,000 years. Since industrialization began in the 19th century, the burning of fossil fuels (coal, oil, and natural gas) at escalating quantities has released vast amounts of carbon dioxide and other greenhouse gases responsible for trapping heat in the atmosphere, increasing the average temperature of the Earth. Secondary impacts include changes in precipitation patterns, the global water cycle, melting glaciers and ice caps, and rising sea levels. According to the Intergovernmental Panel on Climate Change (IPCC), climate change will “increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems” if unchecked.

Location

Climate change is a global phenomenon. It is expected to affect the whole of the District.

Extent

There is no single scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

While the HMPC noted that climate change is of concern, no specific impacts of climate change could be recalled. HMPC members noted that the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to Climate Change

According to the California Natural Resource Agency (CNRA), climate change is already affecting California and is projected to continue to do so well into the foreseeable future.

Impacts

Current and projected changes include increased temperatures, sea level rise, a reduced winter snowpack altered precipitation patterns, and more frequent storm events. Over the long term, reducing greenhouse gases can help make these changes less severe, but the changes cannot be avoided entirely. Unavoidable climate impacts can result in a variety of secondary consequences including detrimental impacts on human health and safety, economic continuity, ecosystem integrity and provision of basic services. Climate change is expected to bring more intense storm events that could impact the frequency and size of future flood events which will impact the levee performance.

As noted in the Base Plan in Section 4.3.4, climate change has the potential to disrupt many features that characterize the region, including ecosystems health, snowpack, and the tourist economy. Specific regional impacts include the following:

- Flooding
- Agriculture
- Public Health, Socioeconomic, and Equity Impact
- Water Supply
- Fire

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard.

Future Development

SRWSLD does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSLD will continue to work with these entities in the future to ensure that future development is sited in proper areas.

Dam Failure

Likelihood of Future Occurrence—Occasional

Vulnerability—High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location

According to the District Planning Team and the Colusa County General Plan Background Report, six dams outside of the County retain water from tributaries of the Sacramento River and could cause damage in Colusa County if their dams were to fail: Black Butte Lake, Indian Valley, Lake Oroville, Lake Shasta, Thermalito, and Whiskeytown Lake. Maps showing the location of these dams can be seen in Section 4.2.8 of the Base Plan. Of the six dams of concern to the Colusa County Planning Area, failures of Lake Oroville and Lake Shasta present the most concern to the District, with potentially catastrophic consequences.

Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, dam failure would most probably happen in consequence of the natural disaster triggering the event. There is no scale with which to measure dam failure. While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is not long – only as long as it takes to empty the reservoir of water the dam held back. Maps showing this can be seen in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been no past occurrences of dam failure that have affected the District.

Vulnerability to Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Based on the risk assessment, it is apparent that a major dam failure could have a devastating impact on the Planning Area.

Impacts

The District Planning Team noted that the primary danger associated with dam (and resulting levee failure) is the high velocity flooding of those properties downstream of the breach. A significant dam failure could cause levees to fail, and result in significant erosion of the leveed areas. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies.

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard. In addition, the levee system and the areas it protects would also be at risk.

Future Development

SRWSLD does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSLD will continue to work with these entities in the future to ensure that future development is sited in proper areas.

Flood: 100/500-year

Likelihood of Future Occurrence—Occasional/Unlikely
Vulnerability—High

Hazard Profile and Problem Description

As previously described in Section 4.2.11 of the Base Plan, the Colusa County Planning Area and the District have been subject to historical flooding. The 2007 City of Colusa General Plan noted that Colusa is situated on the southern bank of a bend in the Sacramento River, which drains the northern half of the Central Valley. No other major bodies of water are located within the Planning Area. The river levee that protects a portion of the City of Colusa from catastrophic flooding falls under the jurisdiction of and is operated and maintained by Sacramento River West Side Levee District

Location

Most of the District is located along the Sacramento River in the 1% and 0.2% annual chance flood zones as defined by the FEMA. The levees are expected to protect the District; however, should they fail the entire area of the District could be affected. If the levees fail, flood water would immediately inundate the areas behind the levees.

Extent

Flood extents are usually measured in depths of flooding. Expected flood depths in the District vary. Flood durations in the City 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 Sacramento River running next to SRWSLD.

Past Occurrences

The District Planning Team noted that flood damages have occurred in 2017, 2011, 2006, 1998, 1997, 1986, and 1955. **CAN YOU TELL US HOW YOU WERE AFFECTED? OR A GENERAL OVERVIEW OF WHAT IS AFFECTED DURING A FLOOD EVENT?**

Vulnerability to Flood

Flooding is a significant problem in Colusa County. Historically, the Colusa County Planning Area 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. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

The 2007 General Plan also noted that flooding within the City's Planning Area occurs, and can do so even during mild storms. Periods of flooding can cause significant circulation problems and has resulted in some property damage in flood-prone areas. Flooding events cause inconveniences and potential safety hazards to motorists traveling through the flooded streets and nearby property owners. Minor flooding events can appear as quickly as one hour after significant rainstorms. While flooding may occur as quickly as one hour after the initiation of a storm event, generally speaking, the flooded areas drain within two or three hours after the end of the storm event.

Impacts

1% and 0.2% annual chance flooding can cause significant life safety concerns and cause significant property damage. Circulation problems can also occur creating potential safety hazards to motorists traveling through the flooded streets and nearby property owners. Should the District levees fail as a result of a large flood event, all of the area protected by SRWSLD would be at risk causing impacts to property and posing life safety concerns. Additional impacts include dewatering of the levee protected areas, as well as erosion of leveed areas, and the rebuilding of the levees.

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard.

Future Development

SRWSLD does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSLD will continue to work with these entities in the future to ensure that future development is sited in proper areas.

Levee Failure

Likelihood of Future Occurrence—Likely
Vulnerability—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. A natural levee is formed when sediment settles on the stream bank, raising the level of the land around the stream. To construct a man-made levee, workers place dirt or concrete along the stream banks, creating an embankment. This embankment is flat at the top, and slopes at an angle down to the water. For added strength, sandbags are sometimes placed over dirt embankments. Current FEMA DFIRM maps in Colusa County show the Sacramento River levees as providing protection from the 100-year flood event. However, based upon geotechnical conditions (erosion and seepage) the level of protection is assumed to be less than 100-year.

The flood control system relies on a variety of management tools such as reservoirs, bypasses, and weirs to provide relief for overflows. Over the years the carrying capacity of the River has changed. Riparian habitat has been restored and promoted along the river banks. Woody debris and other vegetation builds up in the river channels creating sand bars and islands in the middle of the floodway.

Excessive rains do not always preface flooding. The numerous miles of levees create a challenge for maintenance and upkeep, combined with the age of the levees. Deteriorating levees have become a challenge for the State to ensure flood protection.

Location

Levees in the District are located along the Sacramento River. The Sacramento River runs along the east side of the Colusa Basin and Knights Landing Basin in a single meandering channel. In general, the ground elevation descends from the Sacramento River southwestward toward the Colusa Basin Drain. **WHAT IS THE LEVEL OF PROTECTION FROM THE LEVEES? 100-YEAR? 50-YEAR? FIS AND DFIRMS DIDN'T INDICATE. CAN WE GET A TABLE OR INFORMATION THAT PROVIDES THIS? IS IT THE GRIMES LEVEE MAP FOR SRWSLD THAT WAS SENT?**

The levees are expected to protect the District; however, should they fail the entire area of the District would be affected.

Extent

There is not a scientific scale or measurement system in place for levee failure. Maps showing inundation depths due to a levee failure in the County were not available for this Plan Update. The District noted that the USACE states that inundation depths range from 1' to 15'. The speed of onset is slow as the river rises, but if a levee fails the warning times are 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. The 2004 LHMP noted that since dredging the river bottom has been discontinued, the bottom of the river has become higher, thus the water levels reach higher on the banks of the levees. When northern California reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. The potential for levee breaches and erosion damage has increased over time.

Past Occurrences

There are no recorded catastrophic levee failures of SRWSLD levees within the Colusa County Planning Area. In 2017, the SRWSLD had damages to levees consisting of seepage and boils as well as erosion. Active flood fighting occurred, including sand back rings to stop boils and an emergency seepage berm.

HAVE THE LEVEES IN THE DISTRICT EVER FAILED? OTHER CLOSE CALLS?

Vulnerability to Levee Failure

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. 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. It's important to remember that 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.

Impacts

Should the District levees fail, all of the area protected by SRWSLD would be at risk causing property damage and life safety concerns. Approximately 8,000 people are at risk as well as over \$1.3 billion in property damage. Flood depths can be as deep as 15' within the County and greater than 15' to the south, in Yolo County, where the floodwaters would ultimately pool against the Colusa Basin Drain levee. Relief cuts would be necessary to minimize damage and dewater the basin. Additional issues include dewatering of the levee protected areas, as well as the rebuilding of the levees.

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard.

Future Development

SRWSLD does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSLD will continue to work with these entities in the future to ensure that future development is sited in proper areas.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence—Highly Likely

Vulnerability—Medium

Hazard Profile and Problem Description

Storms in the Colusa County Planning Area occur throughout the Planning Area 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 Colusa County area falls mainly in the fall, winter, and spring months.

Location

Heavy rain events occur on a regional basis throughout the Colusa County Planning Area. Rains and storms can occur in any location of the County, including the area of the District. Most of these rains occur during the winter months. Since heavy rains are regional phenomenon, the entire District is at risk to heavy rains and storms.

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the County. Most of these rains occur during the winter months. Since heavy rains are regional phenomenon, the entire District is at risk to heavy rains and thunderstorms. Excessive rains do not always preface flooding.

Extent

There is no scale by which heavy rains and 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 heavy rain storms in California is often short, ranging from minutes to hours. Steady, drenching rains can occur for extended periods.

Past Occurrences

According to historical hazard data, heavy rains and storms are an annual occurrence in Colusa County and in RD 108. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future.

SPECIFIC PAST OCCURRENCES THAT CAUSED DAMAGES OR CONCERNS?

Vulnerability to Heavy Rain and Storms

Heavy rain and storms are the most frequent type of severe weather occurrences in the District. Wind and lightning often accompany these storms and have caused damage in the past. Hail is rare in the District. However, actual damage associated with the primary effects of severe weather have been limited. It is the secondary hazards caused by severe storms, such as floods and possible levee and dam failure, that pose the greatest concern to the County and SRWSLD.

Impacts

Impacts from severe weather include greater stream flows, which can cause erosion to levees. Levee failure and overtopping could occur if enough rain falls. Localized flooding in the District occurs during heavy rains. All of these issue could affect SRWSLD levees and the land, property and people that they protect.

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard.

Future Development

SRWSDL does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSDL will continue to work with these entities in the future to ensure that future development is sited in proper areas.

Severe Weather: High Winds/Tornadoes

Likelihood of Future Occurrence–Highly Likely

Vulnerability–Medium

Hazard Profile and Problem Description

The District is subject to potentially destructive straight-line winds and tornadoes. High winds are common throughout the area and can happen during most times of the entire year and outside of a severe storm event. Tornadoes are less common. Straight line winds are primarily a public safety and economic concern.

Location

Wind events occur on a regional basis throughout the District Planning Area. Winds that accompany storms can occur in any location of the County, including the area of the District. Since high winds are regional phenomenon, the entire District is at risk to winds. The District may be at risk to tornadoes, but they occur infrequently.

Extent

Magnitude of winds is measured often in speed and damages. The speed of onset of thunderstorms can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorm winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical measure that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort wind force scale. This was shown in Section 4.2.5 of the Base Plan.

Past Occurrences

Since winds are a regional phenomenon, the past occurrences for wind are much the same as those for the County. Those were shown in Section 4.2.5 of the Base Plan. **WERE THERE WIND EVENTS THAT DAMAGED LEVEES?**

Vulnerability to High Winds

Windstorms and tornadoes can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind or tornado events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. In the District, winds can cause wave actions that can damage District levees.

Impacts

Impacts from wind damages include greater levee maintenance and increased risk of levee failure. Should the levees fail, the area protected by the levees would be flooded.

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard.

Future Development

SRWSLD does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSLD will continue to work with these entities in the future to ensure that future development is sited in proper areas. Future mitigation actions are planned to armor the District levees to reduce risk.

Stream Bank Erosion

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile and Problem Description

According to Cal DWR, any flowing body of water (brook, creek, stream, river) is a stream. Stream flow is expressed as volume per unit time, usually cubic meters per second, cubic feet per second, sometimes cubic kilometers per second, or acre-feet per second or day. Stream flow varies tremendously with time. Erosion of levees along stream banks is a primary concern of SRWSLD.

Location

Levees in the District are located along the Sacramento River. The Sacramento River runs along the east side of the Colusa Basin and Knights Landing Basin in a single meandering channel. All of these areas are at risk to levee erosion.

Extent

As noted in the levee discussion in Section 4.2.15 of the Base Plan and above, since dredging the river bottom has been discontinued, the bottom of the river has become higher, thus the water levels reach higher on the banks of the rivers and levees. When northern California reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on our levees. As a result, the potential for levee and stream bank erosion damage has increased.

DO YOU HAVE DATA ON WHERE LEVEES ARE MOST AT RISK? NEED TO TALK ABOUT THE MAPS TO MAKE SURE WE ARE ON THE SAME PAGE.

Past Occurrences

SPECIFIC PAST OCCURRENCES? List areas and provide some magnitude of damages/impacts.

Vulnerability to Erosion

Streams erode by a combination of direct stream processes, like down cutting and lateral erosion, and indirect processes, like mass-wasting accompanied by transportation. Water tends to move downstream in slugs that extend all the way across a channel as shown in Figure 4 44. When the channel bends, water on the outside of the bend (the cut-bank) flows faster and water on the inside of the bend (the point) flows slower. This distribution of velocity results in erosion occurring on the outside of the bend (cut) and deposition occurring on the inside of the bend. Levees in the District are at risk to erosion from the Sacramento River.

Impacts

Impacts from stream bank erosion include greater levee maintenance and increased risk of levee failure. Should the levees fail, the area protected by the levees would be flooded.

Assets at Risk

The District Planning Team noted that the levees would be at risk to this hazard.

Future Development

SRWSLD does not control future development in areas protected by levees, that is the purview of the County or cities of Colusa and Williams. SRWSLD will continue to work with these entities in the future to ensure that future development is sited in proper areas.

D.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.

D.6.1. Regulatory Mitigation Capabilities

Table D-4 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 District.

Table D-4 SRWSLD's 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	N	
Capital Improvements Plan	N	
Economic Development Plan	N/A	
Local Emergency Operations Plan	Y 2017	The plan addresses hazards.
Continuity of Operations Plan	N	
Transportation Plan	N/A	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N/A	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
Building Code, Permitting, and Inspections		
	Y/N	Are codes adequately enforced?
Building Code	N/A	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	Score:
Fire department ISO rating:	N/A	Rating:
Site plan review requirements	N/A	
Land Use Planning and Ordinances		
	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	N/A	
Subdivision ordinance	N/A	
Floodplain ordinance	N/A	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N/A	
Flood insurance rate maps	N/A	
Elevation Certificates	N/A	
Acquisition of land for open space and public recreation uses	N/A	
Erosion or sediment control program	N/A	
Other	N/A	
How can these capabilities be expanded and improved to reduce risk?		

Source: SRWSLD

Grimes Basin Joint Flood Safety Plan and EOP

The purpose of the Grimes Basin Joint Flood Safety Plan is to ensure that the staff of the levee maintaining agencies can meet response objectives in a flood emergency and interact efficiently with each other and other jurisdictions performing public safety functions within the Grimes Basin. Levee Maintaining Agencies (LMA) that are part of the Grimes Basin Joint Flood Safety Plan are:

- Reclamation District 108 (RD108),
- Reclamation District 787 (RD787),
- Sacramento River Westside Levee District (SRWSLD),
- CA Department of Water Resources' (DWR) Maintenance Area 12 (MA 12), and
- City of Colusa

This plan is intended to be used in conjunction with the emergency operations plans of the State of California and the Colusa and Yolo Operational Areas to facilitate multijurisdictional coordination within LMA boundaries.

D.6.2. Administrative/Technical Mitigation Capabilities

Table D-5 identifies the District staff/roles responsible for activities related to mitigation and loss prevention in the District.

Table D-5 SRWSLD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N/A	
Mitigation Planning Committee	N/A	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		
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/A	
Floodplain Administrator	N/A	
Emergency Manager	Y	General Manager, Deputy Manager and Superintendent can all serve as Emergency Manager.
Community Planner	N/A	
Civil Engineer	Y	Under contract

GIS Coordinator	N	
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N/A	
Hazard data and information	N/A	
Grant writing	Y	General Manager and Deputy Manager write all grant applications with support from contractors.
Hazus analysis	N/A	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		

Source: SRWSLD

D.6.3. Fiscal Mitigation Capabilities

Table D-6 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table D-6 SRWSLD'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	Typically cost shared with State grants.
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N/A	
Impact fees for new development	N/A	
Storm water utility fee	N/A	
Incur debt through general obligation bonds and/or special tax bonds	N/A	
Incur debt through private activities	Y	Currently holding a loan for capital improvement project
Community Development Block Grant	N/A	
Other federal funding programs	N/A	
State funding programs	Y	Multiple grants through the State.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		

Source: SRWSLD

D.6.4. Mitigation Education, Outreach, and Partnerships

Table D-7 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. More information can be found below the table.

Table D-7 SRWSLD’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.	Y	Annual Landowner meetings to discuss District operations as well as emergency preparedness.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Quarterly newsletters in conjunction with RD 108
Natural disaster or safety related school programs	N/A	
StormReady certification	N/A	
Firewise Communities certification	N/A	
Public-private partnership initiatives addressing disaster-related issues	N/A	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		

Source: SRWSLD

The Grimes Basin EOP noted that partnerships on mitigation outreach. The jurisdictions identified below have the responsibility for providing emergency response to the general public within the area protected by this plan. The Grimes Basin LMAs will promptly notify these jurisdictions of identified threats to their levees or internal drainage system in accordance with the Colusa Basin Unified Flood Fight Command protocols and will provide detailed information on the characteristics of the threat.

- Colusa County Sheriff’s Department
- Yolo County Sheriff’s Department
- Colusa County and Yolo County OES offices
- Knights Landing Fire District
- Dunnigan Fire Protection District
- Sacramento River Fire Protection District
- City of Colusa Police and Fire Departments

Grimes Basin LMAs will coordinate operations with these jurisdictions through the Colusa Basin Unified Flood Fight Command and the Colusa and Yolo Operational Areas. LMAs will assist, to the extent possible, with notification of the public if requested. Response procedures for above public safety agencies will be found in agency emergency plans and Colusa Basin Unified Flood Fight Command protocols.

D.6.5. Other Mitigation Efforts

SRWSLD has many other ongoing mitigation efforts and past projects that include the following:

- Districts and Maintenance Area performs the following routine preparedness actions.
 - ✓ Inspect levees in accordance with each LMAs operations & maintenance (O&M) program
 - ✓ Vegetation and rodent control per each LMA's O&M program
 - ✓ Inspect and inventory of LMA flood fight supplies
 - ✓ Inspect access gates, irrigation/drainage gates, and levee penetrations and report problems to infrastructure owners per LMA O&M program
 - ✓ Annual employee training in accordance with training policy
 - ✓ Semi-annual joint inspection of levees with State inspectors
 - ✓ Periodic joint inspection of levees with Federal inspectors LMA operations & maintenance programs are available in separate documents. RD108 and RD787 also operate and maintain area drainage systems including pumping stations.

The District is currently completing a Seepage mitigation project within Yolo County which will mitigate for under and through seepage.

D.7 Mitigation Strategy

D.7.1. Mitigation Goals and Objectives

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

D.7.2. Mitigation Actions

The planning team for the District 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.

It should be noted that many of the projects submitted by each jurisdiction in Table 5 2 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 Update.

Action 1. Seepage Mitigation of Sacramento River Levee

Hazards Addressed: Climate Change, Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, High Winds, Stream Bank Erosion

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

Issue/Background: Levees within the District are primarily comprised of sand which contributes to through seepage. In addition, foundation materials in various locations are sandy. These conditions allow water to seep through the levee or foundation placing the levee at risk of failure during major or long duration floods.

Project Description: HOW WOULD THIS BE REMEDIED BY THIS ACTION

Other Alternatives: Fix on a case by case basis

Existing Planning Mechanisms through which Action will be Implemented:

Responsible Office: SRWSLD

Priority (H, M, L): High

Cost Estimate: \$8,000,000

Potential Funding: DWR grant, local cost share, PDM, HMGP

Benefits (avoided Losses):

Schedule: 2019

Action 2. Hardening of Sacramento River Levee

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, High Winds, Stream Bank Erosion

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

Issue/Background: The banks of the Sacramento river are susceptible to erosion. There are areas that historically erode quickly during high water.

Project Description: HOW WOULD THIS BE REMEDIED BY THIS ACTION

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented:

Responsible Office: SRWSLD

Priority (H, M, L): High

Cost Estimate: \$5,000,000

Potential Funding: DWR grant, PDM, HMGP

Benefits (avoided Losses): \$1.3B in property and approximately 8,000 lives

Schedule: 2022