

Delta Annex Chapter 8 Reclamation District 554

8.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 554 (RD 554 or District), a previously participating jurisdiction to the 2016 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 554, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

8.2 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 8-1. Additional details on plan participation and District representatives are included in Appendix A. **FILL OUT TABLE WITH NAMES, TITLES, AND HOW EACH PERSON PARTICIPATED**

Table 8-1 RD 554 – Planning Team

Name	Position/Title	How Participated

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 8-2. **FILL OUT TABLE – IF THERE WAS NO PLANNING DONE, SIMPLY PUT N/A IN THE FIRST COLUMN AND STATE THAT NO MITIGATION RELATED PLANNING MECHANISMS HAVE BEEN COMPLETED SINCE 2016**

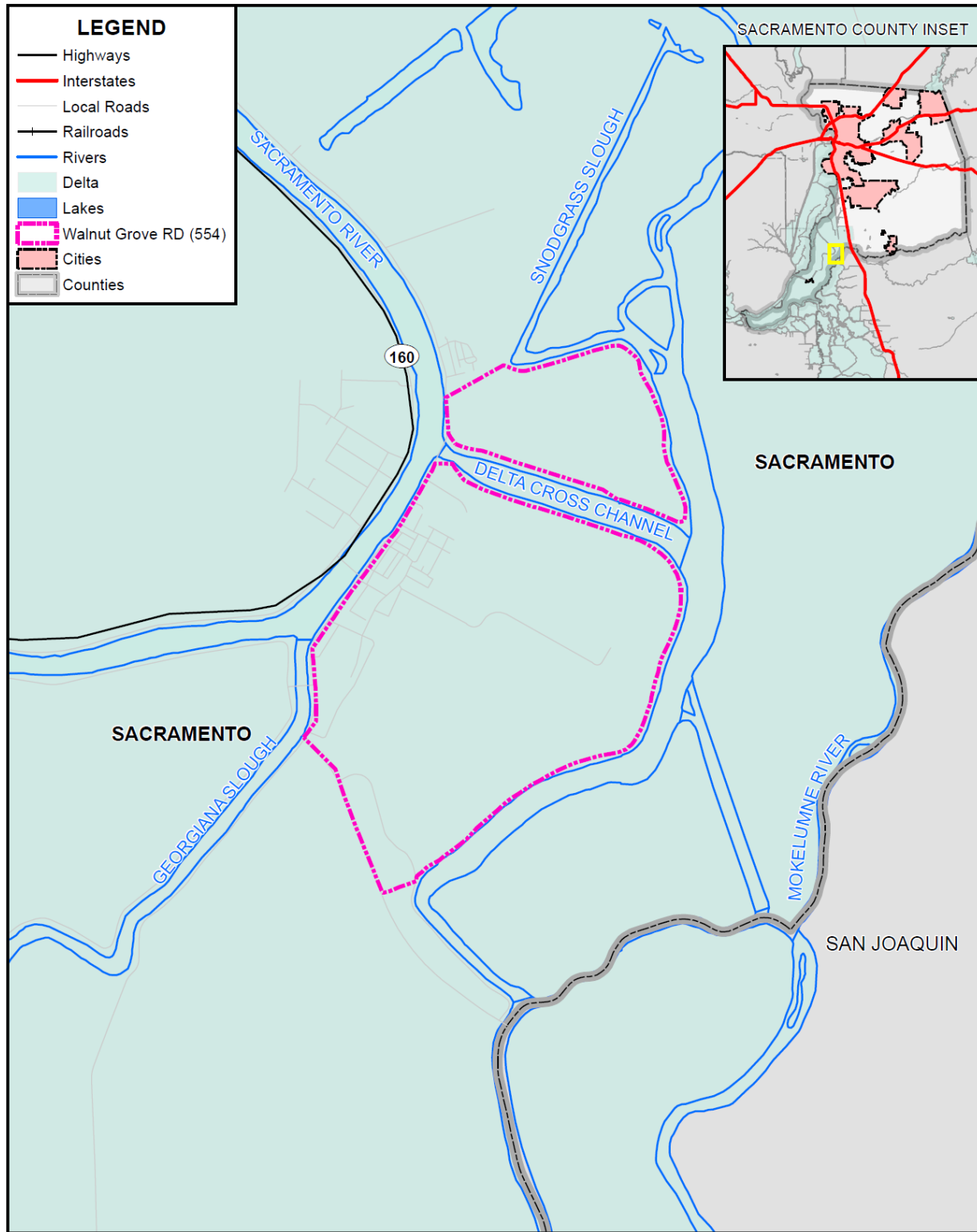
Table 8-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?

8.3 District Profile

The District profile for the RD 554 is detailed in the following sections. Figure 8-1 displays a map and the location of the District within Sacramento County.

Figure 8-1 RD 554



Data Source: Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

8.3.1. Overview and Background (UPDATE?)

Reclamation District 554 protects the urban, eastern side of Walnut Grove, 374 acres of cropland, and the Walnut Grove Marina service area. Walnut Grove was established in 1850 by John Sharp and became a thriving agricultural center and shipping port by 1865.

Reclamation District 554 is the upper 452-acre portion of Tyler Island that is separately protected by 3.58 miles of levee. The District includes the east Walnut Grove urban area. It is the only town in the Delta that is interdependent and occupies both sides of the Sacramento River. The main commercial corridor is on this side of Walnut Grove along with the main sewer collection system and key government services. But the majority of the land use in this small district is rural/agricultural since the urban area is only 77 acres.

RD 554 is bordered by Sacramento River, Georgiana Slough, Snodgrass Slough, the Delta Cross Channel, and the cross levee between RD 554 and RD 563 (lower Tyler Island). Levees along the Sacramento River, Georgiana Slough, and the Delta Cross Channel are federal project levees (1.6 miles). The Cross Channel, Snodgrass Slough, and the cross-levee are non-project levees (1.98 miles), but are still held to the project levee standard. Reclamation District 554 manages levee inspections, levee maintenance, and two pumping stations on the island. The pumping stations are both located along Snodgrass Slough.

8.4 Hazard Identification

RD 554 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 8-3). **FOSTER MORRISON USED THE 2016 TABLE. VERIFY THE RANKINGS AND CHANGE ACCORDINGLY.**

Table 8-3 RD 554—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Climate Change	Limited	Occasional	Negligible	Low	–
Dam Failure	Extensive	Unlikely	Catastrophic	Medium	Medium
Drought & Water Shortage	Significant	Likely	Critical	Medium	High
Earthquake	Limited	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Medium	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Highly Likely	Limited	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Significant	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence	Limited	Occasional	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Likely	Limited	Medium	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			

8.5 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.

8.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 8.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 8-3) 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.

8.5.2. 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 554’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 (a structure, infrastructure, equipment or service), that is adversely affected during a hazardous event may result in interruption of services and operations for the District 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 Facilities.

Table 8-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 554’s physical assets, valued at over \$36 million, consist of the buildings and infrastructure to support the District’s operations. **VERIFY VALUES AND ADD TO TABLE WITH DISTRICT ASSETS. ADD ANY OTHER DISTRICT FACILITIES AND ASSETS. FILL OUT LAST COLUMN OF TABLE – WHAT ARE THEY AT RISK FROM?**

Table 8-4 RD 554 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Levee	Infrastructure	\$30,000,000	
Cross-levee	Infrastructure	\$5,000,000	
Pump Station	Infrastructure	\$500,000	
Pump Station	Infrastructure	\$500,000	
Total		\$36,000,000	

Source: RD 554

In general, the most vulnerable District assets include the levees and pumping stations that the District owns and maintains. There are approximately 3.58 miles of levee surrounding the District. The levees along Georgiana Slough and the Delta Cross Channel are federal project levees. Snodgrass Slough and the cross-levee are non-project levees. The levee system is subject to riverine flooding. However, it is highly unlikely the levee system will fail due to overtopping. A high water situation could increase the hydraulic gradient within the levee that could result in under or through seepage. Seepage, if left unchecked, can result in levee failure and subsequent flooding. The District owns two pumping stations that are critical for island drainage. If the drainage system becomes compromised the District could experience localized flooding. If the system becomes compromised in a flood situation, damages could be worse than anticipated.

CAN THE DISTRICT ALSO PROVIDE A LIST OR TABLE THAT DETAILS BY LEVEE SEGMENT OR SYSTEM THE CURRENT STATUS OF THE LEVEE AND IF IT IS UNDERGOING ANY IMPROVEMENTS AND WHAT THAT LEVEL OF PROTECTION WILL INCREASE TO?

Natural Resources

RD 554 has a variety of natural resources of value to the District. Due to the urban nature of RD 554 there are only a few areas of freshwater wetland, upland, and riparian habitats. The size of the island and development that has taken place over time, has resulted in mostly ruderal vegetation. See Figure 8-2 for a map of vegetation types. According to the Department of Fish and Game Levee Log in the 5-Year Plan, riparian, scrub shrub, and freshwater marsh habitat types exist on and adjacent to the levees. The estimated amount of each type of habitat per lineal feet is shown on Table 8-5.

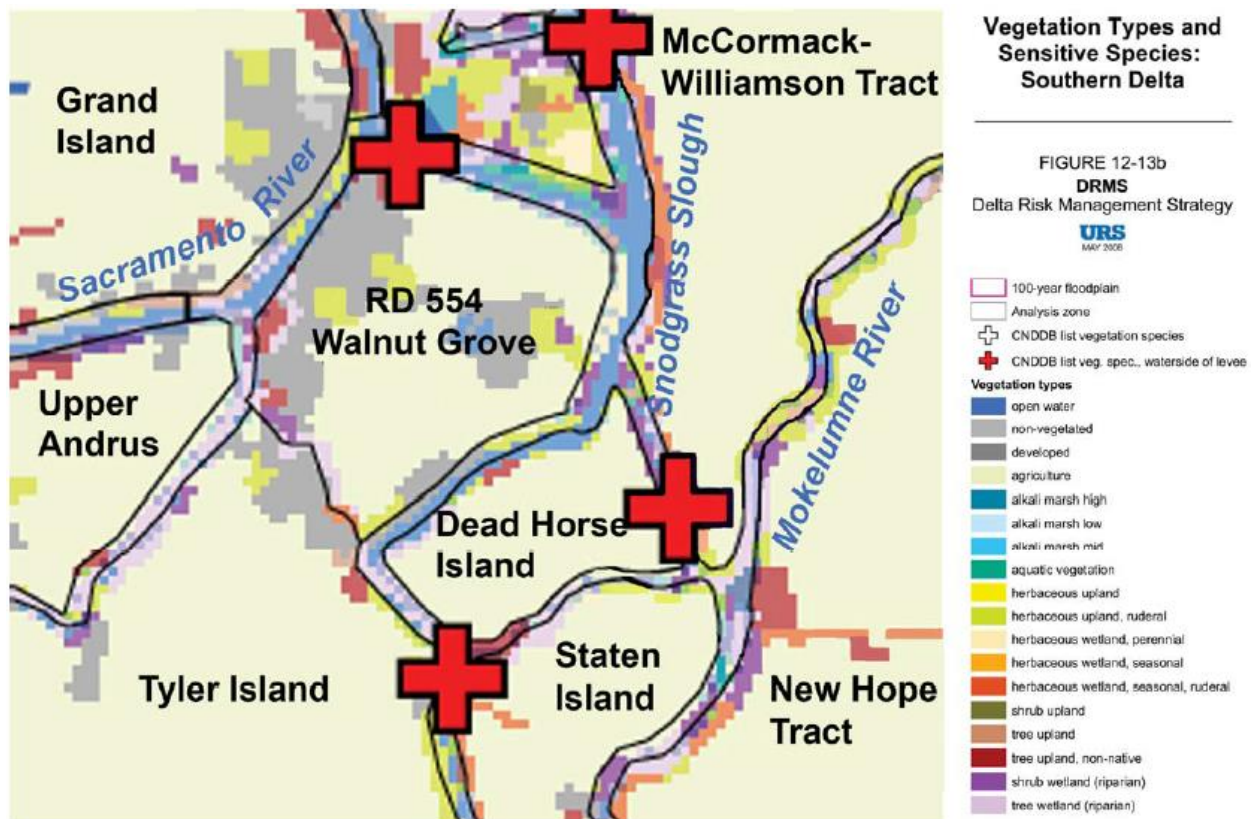
Table 8-5 RD 554 Vegetation Types

Type	Waterside	Landside
Riparian	2223 lf (3.66 ac.), 29 single trees	1710 lf (1.35 ac.), 15 single trees
Scrub Shrub	880 lf (0.62 ac.), 23 single trees	1700 lf (1 ac), 40 single trees
Freshwater Marsh	1229 lf (0.37 ac.)	0 lf

Source: RD 554 2012 5-Year Plan

Note: These estimates are for non-project levees comprising the location of proposed projects in this plan.

Figure 8-2 RD 554 Vegetation Types



Source: RD 554 2012 5-Year Plan

Historic and Cultural Resources

RD 554 has a variety of historic and cultural resources of value to the District. In the Walnut Grove area, there are three nationally registered historic districts, the Walnut Grove Chinese and Japanese American Historical Districts, and the Walnut Grove Commercial/Residential Historic District. There are three nationally registered historical buildings, Guaken Hall, The Imperial Theatre, and the Jean Harvie Community Center. These are shown on Figure 8-3.

Figure 8-3 Historic Sites in Walnut Grove



- JAPANESE AMERICAN HISTORIC DISTRICT
- CHINESE AMERICAN HISTORIC DISTRICT
- COMMERCIAL/RESIDENTIAL HISTORIC DISTRICT
- HISTORICAL BUILDING

Source: RD 554 2012 5-Year Plan

Growth and Development Trends

Limited growth is expected to occur in the District due to limits of Walnut Grove's SPA. **ANYTHING FOR THE DISTRICT TO ADD? IS THERE GROWTH OCCURRING?**

Development since 2016

No District facilities have been constructed since 2016. **TRUE? HAVE ANY DISTRICT FACILITIES BEEN IMPROVED? SEEN A DECLINE? IF ANY FACILITIES HAVE BEEN CONSTRUCTED SINCE 2016 - WERE THEY IN ANY IDENTIFIABLE HAZARD AREAS?**

Future Development

There are approximately 10 acres of land available for development. One new home has been built in the last decade; any anticipated growth is expected to be slow and small in nature. **DOES THE DISTRICT HAVE ANY PLANS FOR DEVELOPMENT OF NEW DISTRICT FACILITIES? INCLUDE ANY INFORMATION ON PLANNED OR ONGOING LEVEE IMPROVEMENTS.**

8.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 8-3 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. **HOW IS THE DISTRICT AFFECTED BY POWER OUTAGAES? DO ANY DISTRICT FACILITIES NEED BACKUP POWER?**

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. **HAS THIS BEEN OR IS THIS AN ISSUE FOR THE DISTRICT?**

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

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 and Extent

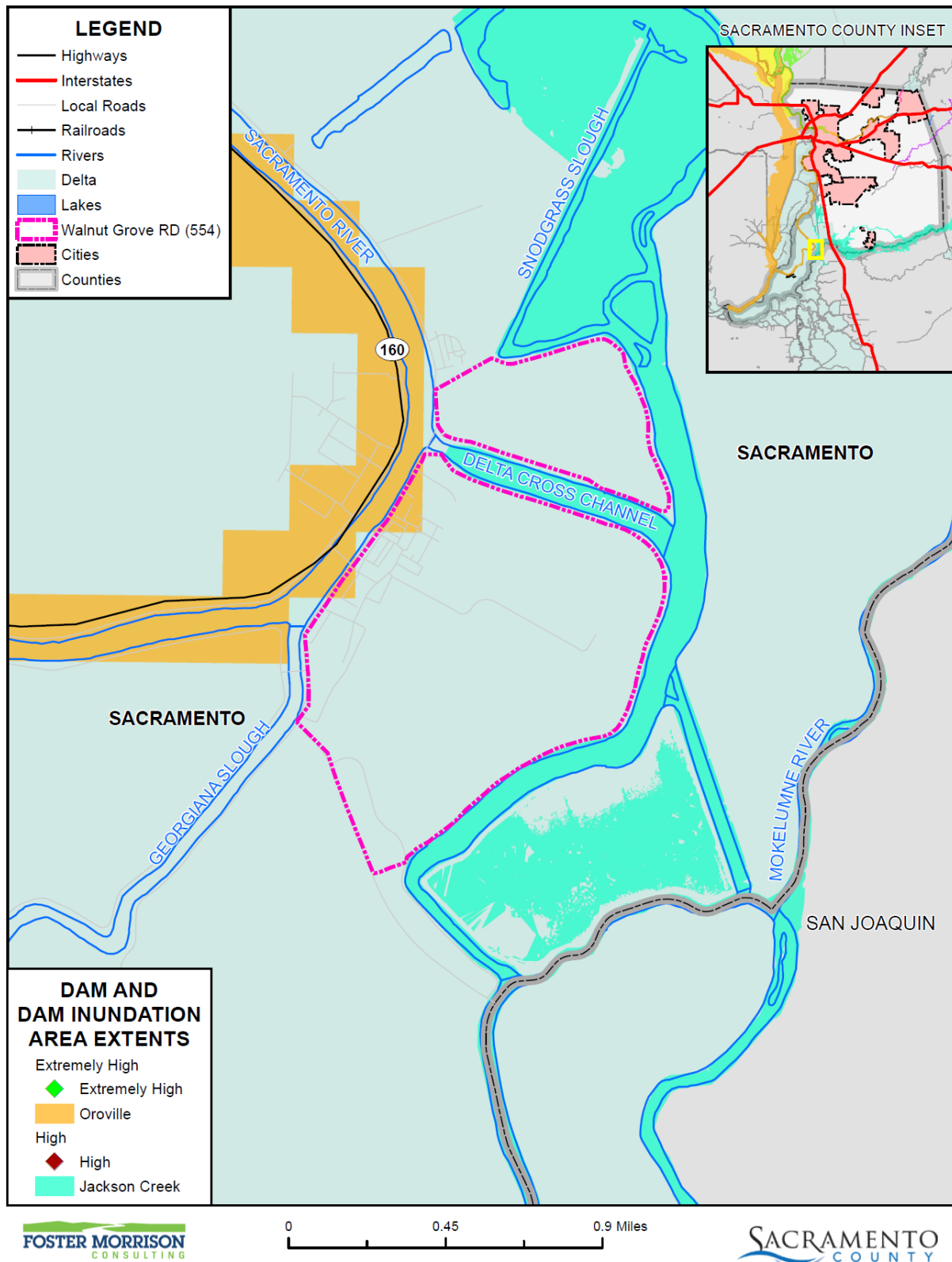
Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There

is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

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 generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

There are no dam inundation areas from dams inside the County that can affect the District. Dams outside the County that can affect the District can be seen on Figure 8-4.

Figure 8-4 RD 554 – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District. **STILL TRUE? WERE YOU AFFECTED AT ALL BY THE OROVILLE EVENT?**

Vulnerability to and Impacts from 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. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

While unlikely, it is possible that dam failure can create a high water situation in the adjacent channels that could put the levee system at risk of failure from overtopping, under seepage, through seepage or debris impact. Given the distance from the dam system, a dam surge could dissipate prior to reaching this point in the Delta and result in a minor change in water elevation. **ANYTHING TO ADD?**

Assets at Risk

As shown in the figures above, the levees and all District facilities in Table 8-4 could be at risk to dam failure, depending on the dam that fails and the nature of its failure. Riparian habitats that border the channel can be lost due to erosive forces of high flows from dam failure. Historic homes could be lost as a result of flooding due to dam failure. **ANYTHING TO ADD AS TO THE RISK TO DISTRICT FACILITIES?**

Drought & Water Shortage

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area’s usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been two state and one federal disaster declaration due to drought since 1950. This can be seen in Table 8-6.

Table 8-6 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

Although California did recently experience an extended drought, agriculture in this District remained largely unaffected due to senior water rights and riparian water rights. Some farmers voluntarily cut water use by 25% in the Delta in response to the drought in the Summer of 2015. HOW WAS THE DISTRICT AFFECTED BY PAST DROUGHT ISSUES?

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Sacramento County Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District. During periods of drought, vegetation can dry out which increases fire risk.

This hazard could disrupt crop irrigation. Prolonged disruption could result in the loss of a crop that year. In the event that orchards or vineyards experience disruption in irrigation, they could be lost for multiple years until they are replanted and begin producing a crop between 3 to 5 years. Agriculture is the primary industry on the island. Agricultural users pay assessments for levee maintenance and improvements. While there is some population on the island their assessment fees are low, but if agriculture is lost the District will not be able to cover levee maintenance or make any necessary improvements.

The residents and businesses could be impacted by drought, but it is unlikely due to senior water rights and a prioritization system that puts municipal water at a higher priority than agriculture.

Assets at Risk

The District noted none of their assets at risk from drought and water shortage.

Earthquake: Liquefaction

Likelihood of Future Occurrence—Occasional

Vulnerability—Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are

rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or that affected the District in any meaningful way. **TRUE?**

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event.

The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

In the event an earthquake is intense enough to result in shaking that could cause the sandy soils to liquefy, the levees could resettle, move off their foundations and possibly fail. Failure could compromise the levee system and result in flooding. Liquefaction at the base of historic buildings and residences can compromise the structures and possibly result in significant damage. Riparian habitats that border the channel can be lost due to a destabilization of the bank from liquefaction. Liquefaction could also introduce substantial sediment into the waterway through the destabilization of soils. Sedimentation could impact sensitive aquatic species. Historic homes could be lost as a result of compromised foundations from soil liquefaction.

Assets at Risk

The District levees and unreinforced historic buildings are the most at risk from this hazard.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence—Occasional

Vulnerability—High

Hazard Profile and Problem Description

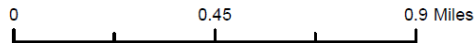
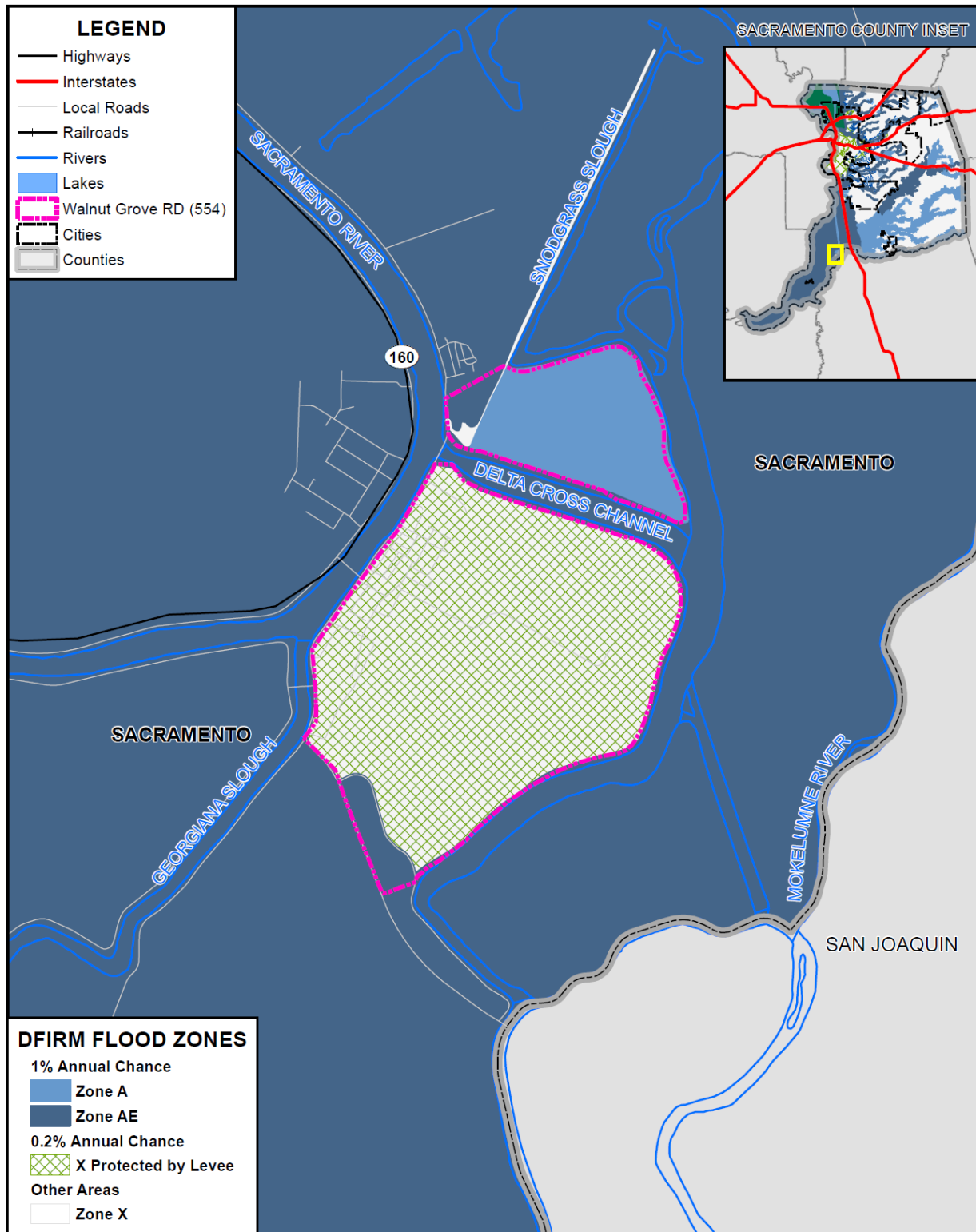
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at 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 554 have been subject to historical flooding.

Location and Extent

The RD 554 has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure 8-5.

Figure 8-5 RD 554 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 8-7 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 8-7 RD 554– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
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	X

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 8-8. These events also likely affected the District to some degree.

Table 8-8 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

1986 was the closest the District came to experiencing a 100-year flood event when adjacent lower Tyler flooded. The District has not experienced a 200 or 500-yr flood.

WHAT FLOOD EVENTS HAVE AFFECTED THE DISTRICT SINCE 2016? CAN THE DISTRICT PROVIDE DAMAGE AND IMPACT INFORMATION FROM THE PA WORKSHEETS ASSOCIATED WITH THE RECENT DISASTER DECLARATIONS SINCE THE 2016 LHMP OR OTHER SOURCES?

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. Loss of power is usually a precursor to closure of governmental offices and community businesses. 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. 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.

A 1%, /0.5%/0.2% annual chance flood event could cause flooding within the District. A high water event, depending on the water elevation, is unlikely to cause failure due to overtopping as many other surrounding Districts are lower and more likely to fail before failure of RD 554 levees. Higher levels of water could increase hydraulic gradients within the levee section resulting in landside seepage or boils. Continued seepage, if left unaddressed, could erode the levee and result in failure. Heavy flows could also cause erosion and scour on the waterside bank that could undermine the levee and cause failure.

There are three nationally registered historic districts protected by the levee system, the Walnut Grove Chinese and Japanese American Historic Districts and the Walnut Grove Commercial/Residential Historic District. There are also three nationally registered historical buildings, Gauken Hall, Imperial Theater and Jean Harvie Community Center. There are also historic homes that are over 100 years old. A 100/200/500 year flood event could inundate these districts and historic places if the event results in levee failure. Such an event may also exceed the District's pumping facility and improper drainage could also flood the districts. Flooding could cause irreparable damage to the structures and they could be lost.

Assets at Risk

The levee system and pumping stations are vulnerable to a 1%/0.5%/0.2% annual chance flood. As the flows could exceed the capacity of both the levee system and the pumping station that is needed to drain the island.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence—Highly 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 554 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. **SPECIFIC PROBLEM AREAS**

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:

Some form of localized stormwater flooding occurs during most heavy rains. The most likely time this could have occurred in the past was during the wet year in 2006. **RD 554 PAST OCCURRENCES SINCE THE 2016 LHMP**

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.

Localized stormwater flooding can occur during heavy rains or seepage events that exceed the District's drainage capabilities. Lower areas around the island may be subject to minor flooding.

Assets at Risk

Localized flooding can overtax the District's pumping system and create for a more hazardous situation involving the levee system by limiting the ability for inspection.

Levee Failure

Likelihood of Future Occurrence—Occasional

Vulnerability—Extremely High

Hazard Profile and Problem Description

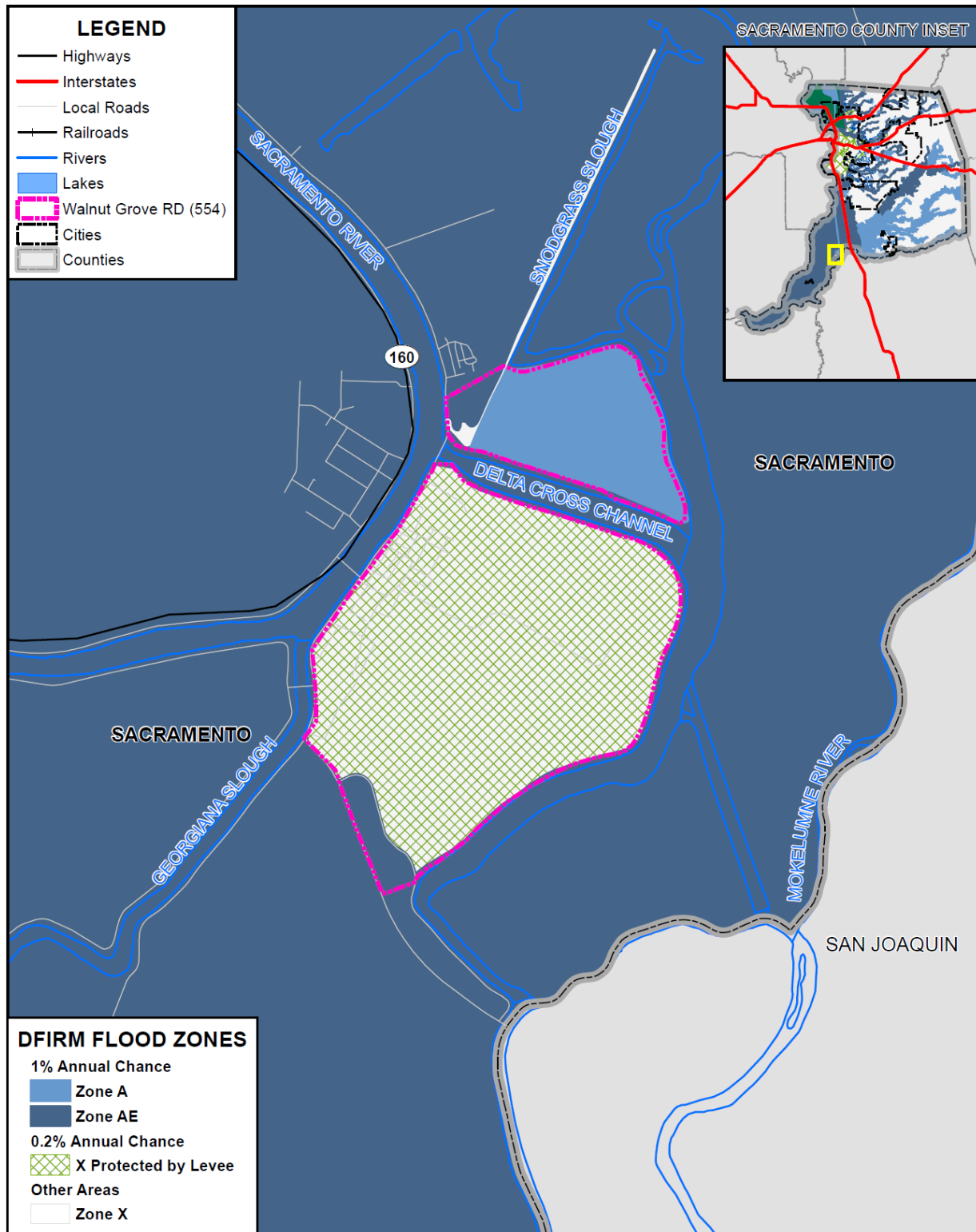
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower stream channel, levees can also increase the speed of the water. Levees can be 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 8-6.

Figure 8-6 RD 554 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

**IS THERE A MAP AND TABLE OF LEVEES AND THE LOP THEY PROVIDE FOR THE DISTRICT?
CAN WE ALSO GET INFORMATION ON ANY ONGOING LEVEE IMPROVEMENT PROJECTS?**

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The 5-Year Plan noted that in 1986, lower Tyler Island flooded and threatened to flood RD 554. At that time, an effort was undertaken to enhance the cross levee height by adding a berm on the lower Tyler side of the levee to ensure that the urban area did not get flooded. The added height was not necessary when the water crested but the emergency construction paved the way for the more permanent configuration that exists today. That levee upgrade then led to a successful LOMR for eastern Walnut Grove and its Zone X determination in 1987. **ANYTHING SINCE 2016?**

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.

ANY UPDATE TO THE BELOW?

The 2012 5-Year Plan addressed levee repair costs due to failure. To repair a levee breach and pump out the island the average cost has been estimated to be approximately \$25 million. But the total truly depends on access, the size and severity of the breach, volume of water to be pumped out, weather conditions, etc. The \$25 million figure assumes costs for \$5/yd³ of on-island replacement fill, 15/yd³ of off-island fill, 6% per linear foot of engineering costs, and \$5/foot for rip rap. The Jones Tract failure in 2004 is the most recent levee failure to provide insight into determining what a levee breach could cost today. It has been publicized that the 500-foot levee breach cost approximately \$90 million for the repair, recovery, and associated damage. Many knowledgeable locals consider that figure inflated by as much as a factor of two.

Not only would a breach inundate RD 554, but it would also overtop (or by an intentional breach) the dry cross levee and flood the rest of Tyler Island. Flood waters would flow down to the lower part of the island since it is at a lower elevation than RD 554. The lowest elevation on the southern part of Tyler Island is -15.0 feet (NAVD 88) according to the LIDAR survey supplied by DWR. By the same survey, the lowest elevation on RD 554 is -1.0 feet.

The 5-Year Plan broke down costs by land use type:

- **Residential** – For RD 554, it is estimated that there could be a one-time displacement cost of \$57,500 for all occupied households along with an additional \$4,780 per day to house these residents elsewhere. On lower Tyler Island, the estimated one-time displacement could be \$9000 and an additional \$756 per day. The Walnut Grove Marina adds a transient population that is difficult to quantify since there are no statistics covering that element to determine associated costs. Furthermore, this number would fluctuate with the seasons. To house this population in emergency shelters it is estimated to cost \$85 a day. As there would be sufficient time to evacuate, the costs to accommodate this unique group of part-time residents may not be significant. But the marina would be shut down until the island was pumped out.
- **Commercial** – Commercial structures will be adversely impacted from the time they are inundated through the time it takes to repair such damage and damage to surrounding infrastructure. There are about 48 businesses on all of Tyler Island. Overall, a flood could cost Walnut Grove and Tyler Island businesses an estimated \$113,000 per day. Some businesses may be unable to recover from a flood and could possibly be lost as the result of a flood event. Even west side residents and business would be affected because the sewer service may have to be curtailed.
- **Agricultural** – Crops grown on Tyler Island are generally alfalfa, wheat, corn, pears, truck crops, tomatoes, rice, and wine grapes. Tyler Island has a total of 8,687 acres of crops. Average cost for rehabilitation and field cleanup is \$235 per acre. This involves the removal of debris and sediment deposits after floodwaters have receded. Silt and debris can also clog drainage and irrigation ditches adding a variable cost to rehabilitation. The estimated total one-time cost for clean-up and rehabilitation is estimated to be \$2.7 million. If inundation lasts longer than 14 days, it is assumed that the crops will be permanently lost. Any flood event that occurs between planting and harvest, could completely destroy the crops. Reestablishment of a lost crop dramatically increases economic losses. The inundation period is assumed to be five weeks on lower Tyler Island, meaning all crops on the lower end could potentially be lost in a flood event. However, due to the smaller size of RD 554 and an assumed inundation period of five days, not all crops may be lost. Not including clean-up costs, reestablishment of all crops on the island could total an estimated \$29 million.

The 5-Year Plan also addressed infrastructure issues related to levee failure. Levee failure on Reclamation District 554 could cause direct physical damage to the island’s infrastructure. If a break were to occur in the north inundating Walnut Grove/Thornton Road/J11, it would disrupt the island’s connection to Highway 160 or 1-5, delaying up to 1,500 trips. The cost due to lost trips is small but the estimated time delay could cost \$48,000 per day, \$53,000 if 10% are assumed to be truck trips. Walnut Grove’s surface streets could be inundated affecting the area on a local level by removing access to the town’s businesses and services. The District also houses a FM radio and television transmission tower with support facilities serving KOVR, KXTV, and KQCA. This 2049’ tower currently serves the Stockton-Sacramento-Modesto broadcasting area stations and radio stations (Fybush). The transmitter building is on stilts so the equipment will not be affected in a flood. But a flood could still restrict maintenance access to the building, and potentially interfere with broadcasting if there is a lengthy power disruption.

Overall, residential, commercial, agriculture, and infrastructure losses due to a flood event on all of Tyler Island could cost approximately \$185,000 per day. The one-time/direct cost of the event to relocate the residents and businesses and reestablish cropland would be around \$2.2 million. Assuming an inundation residence period 5 days on RD 554 (upper Tyler) a flood event there could cost approximately \$1.6 million. Lower Tyler with an assumed inundation residence period of 5 weeks (35 days), a flood event could cost approximately \$27.2 million of direct and indirect costs. These figures include daily losses to residents and business, one-time costs of displacement, rehabilitation costs of cropland, and reestablishment and annual production loss costs for vineyards and orchards. A flood event occurring between February and October,

that would delay planting until the next season and is assumed to kill all crops, could add up to approximately \$78.3 million of direct and indirect costs for both districts. This figure includes the estimated costs associated with repairing the breach and pumping out the islands, about \$30 million.

Water quality issues were also addressed in the 5-Year Plan. Due to the urban nature of a portion of RD 554, a flood could release household and commercial chemicals potentially contaminating the surrounding waterways. A flood could also suspend sediment, metals, fertilizers, and pesticides that are attached to soil particles. Increased sedimentation of the waterway can reduce the amount of sunlight to reach submerged aquatic plants and also smother fish larvae and harm fish by clogging their gills. The extent of the effects on fish and aquatic species from suspended sediment and chemicals depend on the quantities of pollutants, amount of dilution, and frequency of freshwater releases.

Besides those listed above, other potential in-island pollutant sources could degrade water quality on the island and in the waterways. A long inundation period could create anoxic conditions in the soil can release toxic substances, such as manganese that is naturally occurring but can be dangerous to health in high concentrations. Other toxic substances such as, organochlorine “legacy” pesticides that, although have been banned for over 20 years, slowly degrade in the environment and can still be present in soils where it was applied. This can have harmful effects on fish species in terms of reducing food production, namely a primary producer, phytoplankton if released into the waterway. Although not harmful in small traces, “legacy” pesticides can become more concentrated through bioamplification and not only harm fish species but terrestrial and avian species as well.

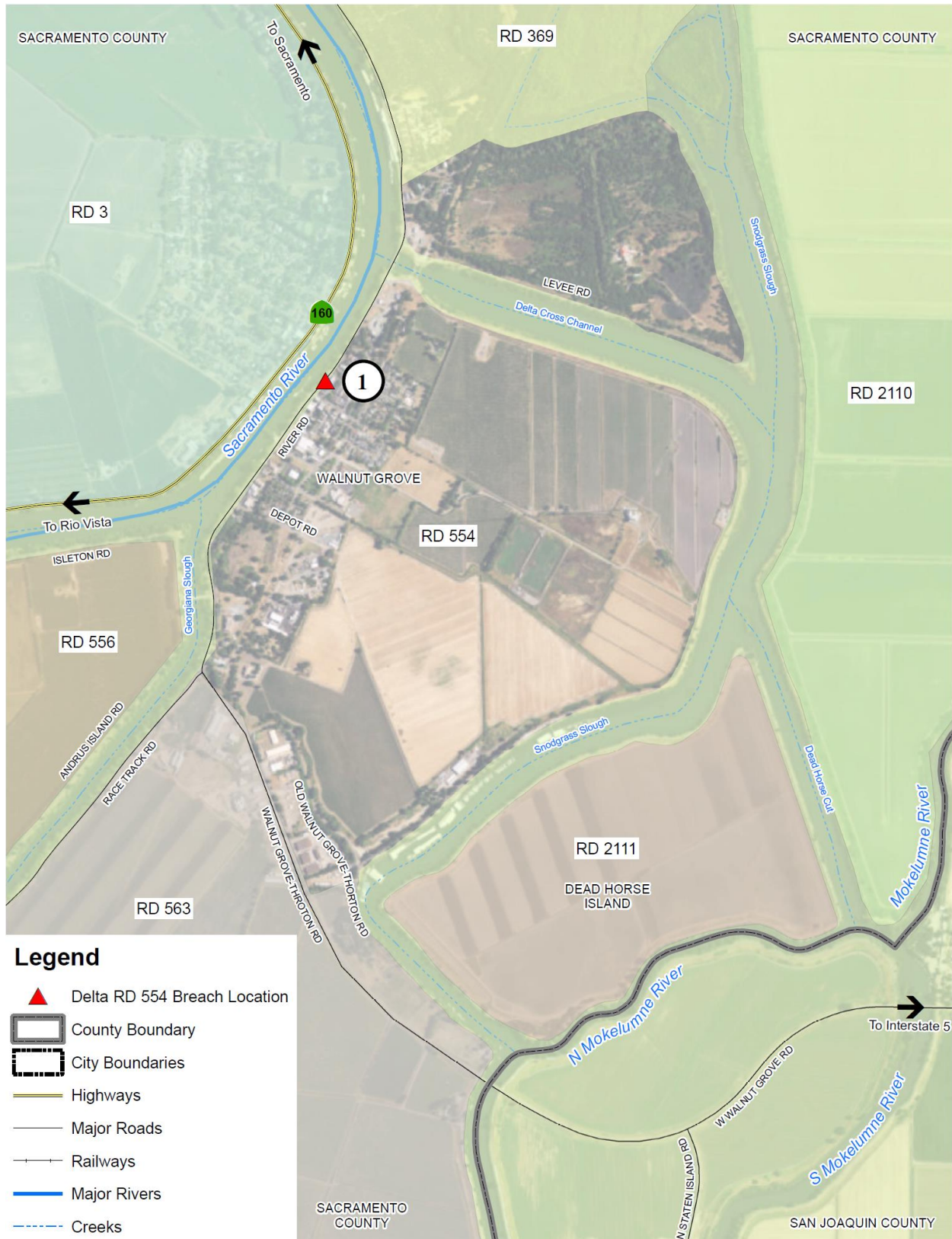
Waterside habitat that is adjacent to the break could be lost due to the erosive forces of the water flowing through the break.

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.

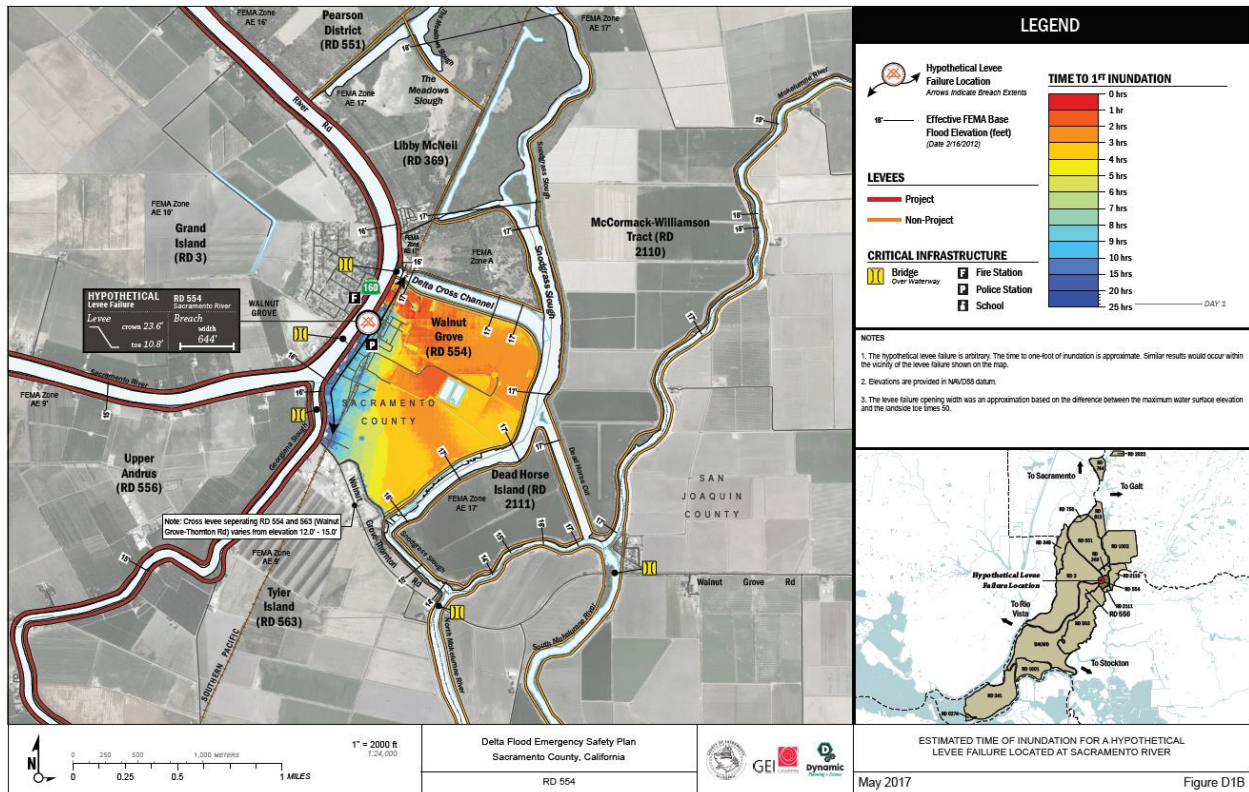
For RD 554, Figure 8-7 details the locations in the Delta within RD 554 where flooding could occur. The red triangles denote potential levee breach locations. RD 554 has a potential levee break scenario. Maps regarding time to one foot inundation (Figure 8-8), estimated flood depths (Figure 8-9), and suggested evacuation routes (Figure 8-10) are displayed below.

Figure 8-7 RD 554 – Potential Levee Breach Location



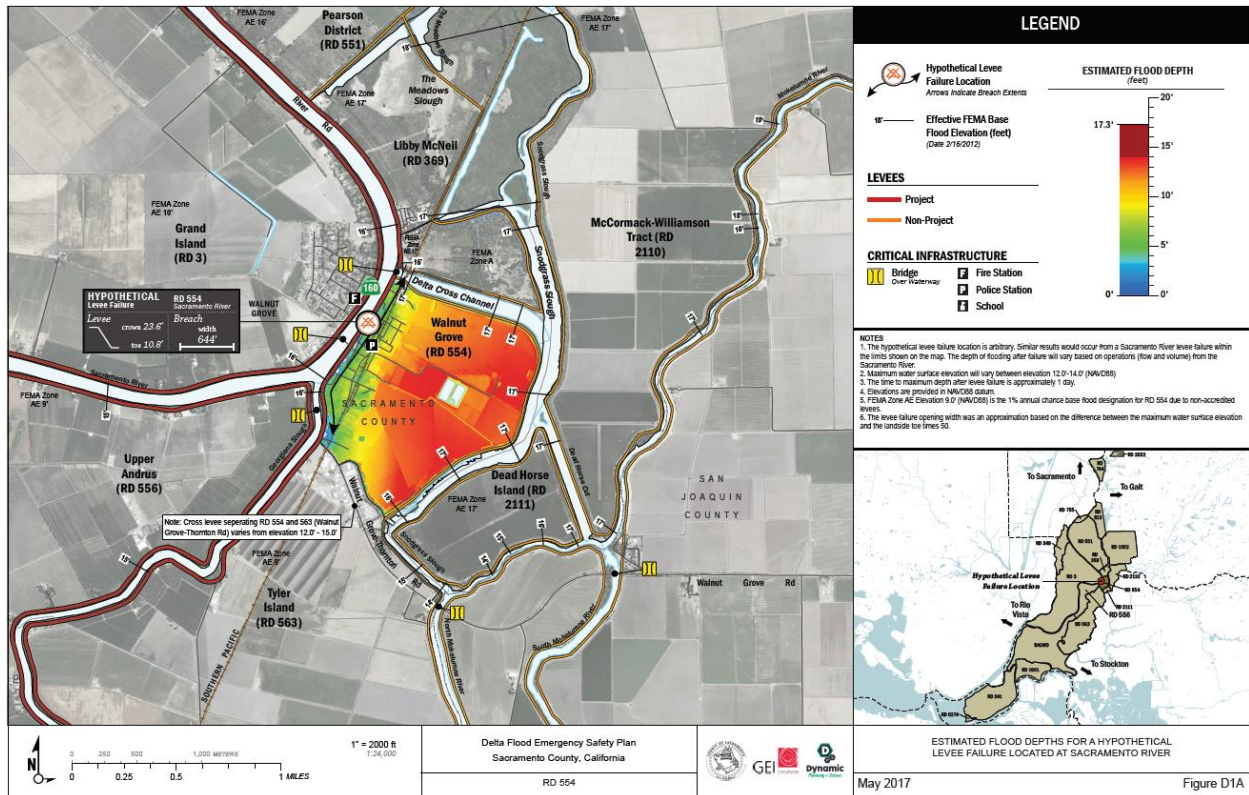
Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 8-8 RD 554 – Time to One Foot Inundation after Levee Breach



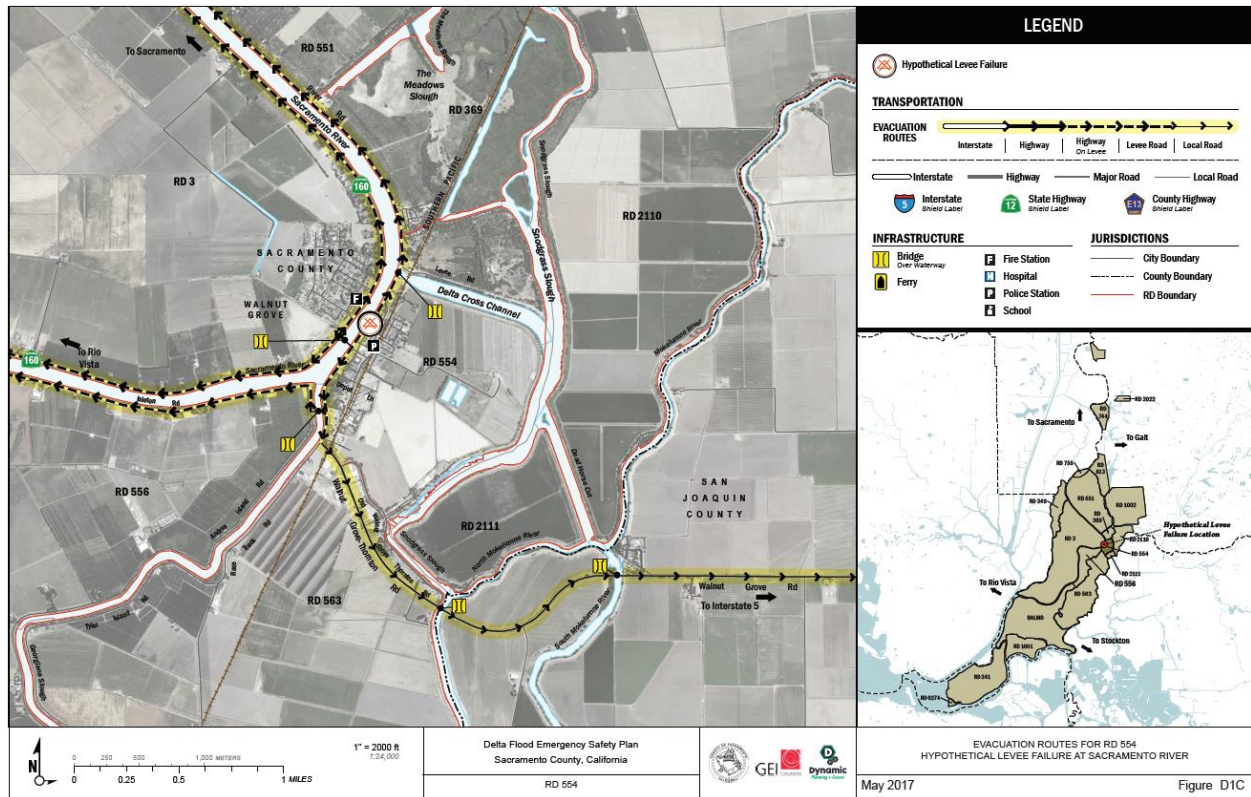
Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 8-9 RD 554 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 8-10 RD 554 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 26, 2021

Assets at Risk

Levees and district pumping plants. On island inundation can create an open water situation where a large fetch could develop and erode the interior of other levees within the District. Inundation of the drainage pump can make it inoperable and require replacement. Other critical facilities at risk include a fire department, police station and elementary school.

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

Likelihood of Future Occurrence—Highly 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.

The last heavy rain and storm event the District experienced was in 2006, 1997 and 1986. No significant damages occurred due to these high water events. **ANYTHING SINCE 2016?**

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 occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Heavy rains and storms can result in higher flood flows that could increase the hydraulic gradients within the levee section and result in seepage or if great enough, possibly overtopping. They can also increase flows and result in erosion of the waterside bank. Riparian vegetation could be lost from high flows as a result of heavy rains and large storms. The historic buildings and districts discussed above could be damaged from heavy storms due to falling trees or flooding.

Assets at Risk

The District levees and pumping plant are at risk of damage from heavy rains and storms.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Highly Likely

Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Wind occurs on a regular basis. The hazard comes when high winds are coupled with high water, which happened in the winter of 2006. There was negligible impact from this event. **EVENTS SINCE 2016?**

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly. During periods of high winds and dry vegetation, wildfire risk increases.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Erosion impacts to levees from wave action
- Occasional building damage, primarily to roofs

Wind could cause trees to fall and create flying debris that could damage historic structures.

Assets at Risk

The District's levees are at risk from wind driven waves. All District facilities are at risk from tornadoes.

Wildfire

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

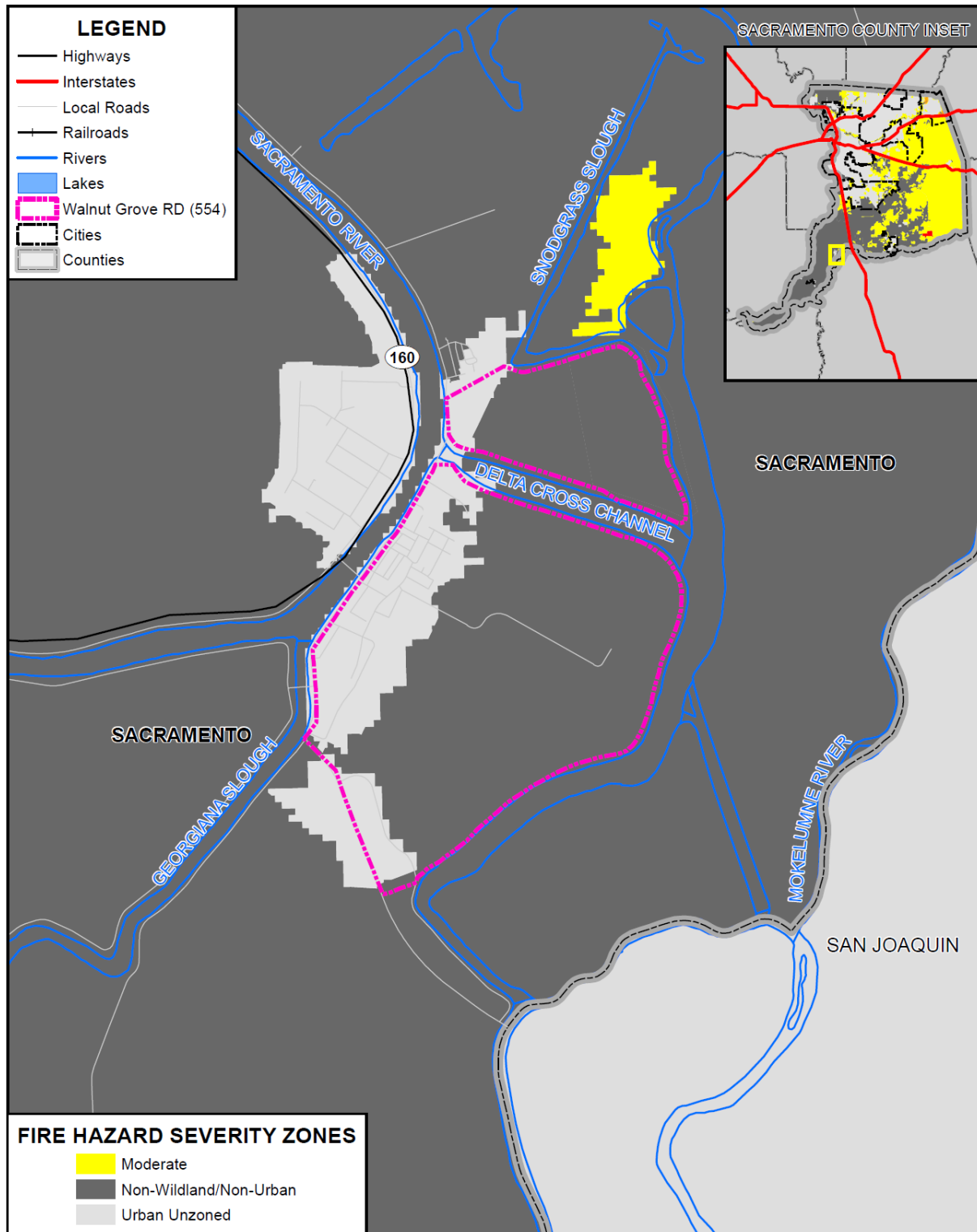
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the RD 554. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

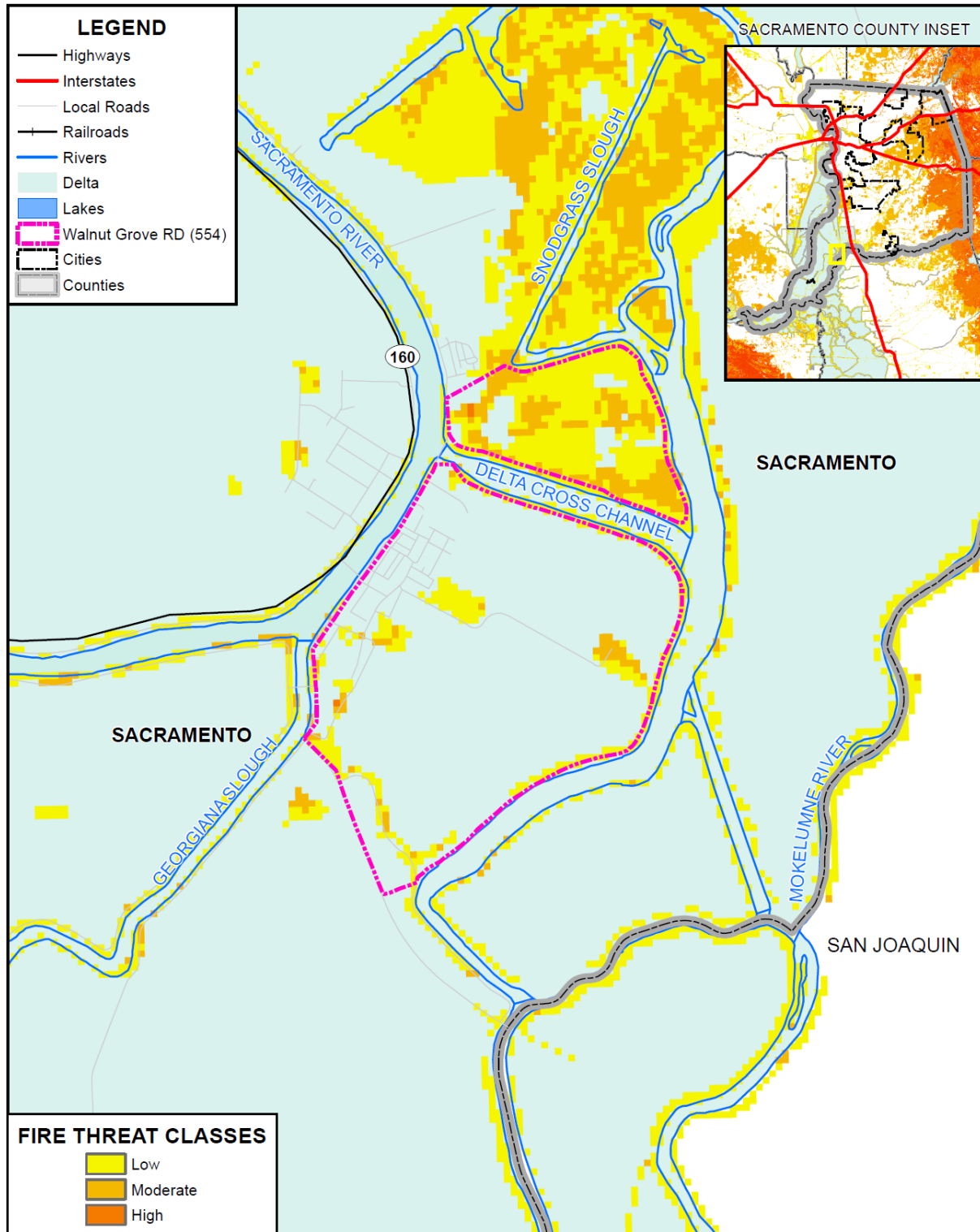
Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.16 of the Base Plan, wildfire maps for the RD 554 were created. Figure 8-11 shows the CAL FIRE FHSZ in the District. As shown on the maps, fire hazard severity zones within the District are Urban/Unzoned and Non-Wildland/Non-Urban. Figure 8-12 shows the CAL FIRE Fire Threat areas in the District. As shown on the maps, fire threat within the District are ranges from No Threat to High.

Figure 8-11 RD 554 – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 8-12 RD 554 – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There has been one state and no federal disaster declarations for Sacramento County from fire. It should be noted that this was from Southern Pacific Railroad Fires and Explosions (Roseville), so it was not truly a wildfire.

Table 8-9 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

There have been no significant wildfires in the District. A fire did cause part of a marina and 14 boats to burn down January 2015. ANYTHING SINCE 2016?

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Sacramento County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time.

Riparian and shrub scrub vegetation could be lost in a wildfire. There are three nationally registered historic districts protected by the levee system, the Walnut Grove Chinese and Japanese American Historic Districts and the Walnut Grove Commercial/Residential Historic District. There are also three nationally registered historical buildings, Gauken Hall, Imperial Theater and Jean Harvie Community Center. There are also historic homes that are over 100 years old. A wildfire on this island would devastate these districts and historic buildings if they become substantially burned.

Assets at Risk

The District’s pumping station could be damaged in a fire. Furthermore the vegetation on the District levees could be burned leaving bare soil that could be subject to erosion.

8.6 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.

8.6.1. Regulatory Mitigation Capabilities

Table 8-10 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 554. **UPDATE TABLE – THIS IS FROM THE OLD PLAN. TRY TO FILL OUT THE LAST COLUMN AS YOU ARE ABLE. MAKE SURE TO FILL OUT THE LAST CELL.**

Table 8-10 RD 554 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	
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	Y	The plan addresses flooding hazards and can be used to implement mitigation actions
Continuity of Operations Plan	Y	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	

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	Y	Version/Year: CBC 2013
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
		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	Y	Walnut Grove Special Planning Area controls land use and development so could aide in reducing hazard impacts through land use and development criteria
Subdivision ordinance	N	
Floodplain ordinance	Y	Yes, Sacramento County Floodplain Ordinance restricts development in the floodplain
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	PAL - District is working on being mapped back in Zone X
Elevation Certificates	Y	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
PROVIDE SPECIFIC DETAILS OF AREAS FOR IMPROVEMENT OF THESE TYPES OF CAPABILITIES AND HOW/WHY IT WILL HELP THE DISTRICT		

Source: RD 554

8.6.2. Administrative/Technical Mitigation Capabilities

Table 8-11 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 554. **UPDATE TABLE – THIS IS FROM THE OLD PLAN. TRY TO FILL OUT THE LAST COLUMN AS YOU ARE ABLE. MAKE SURE TO FILL OUT THE LAST CELL.**

Table 8-11 RD 554's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	

Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Annual vegetation management.
Mutual aid agreements	N	
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	
Floodplain Administrator	Y	Determined via the Emergency Operations Plan
Emergency Manager	Y	Determined via the Emergency Operations Plan
Community Planner	N	
Civil Engineer	Y, FT	Staff is trained to coordinate with agencies and perform tasks in an emergency situation
GIS Coordinator	N	
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Fire Station siren in Walnut Grove, phone tree, Reverse 911
Hazard data and information	Y	
Grant writing	N	
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
RD 554 must organize a more appropriate warning system among trustees, public and staff. Also needs to have a plan in place to determine an Emergency Manager to coordinate Emergency Response activities. ANYTHING TO ADD?		

Source: RD 554

8.6.3. Fiscal Mitigation Capabilities

Table 8-12 identifies financial tools or resources that the District could potentially use to help fund mitigation activities. **UPDATE TABLE – THIS IS FROM THE OLD PLAN. TRY TO FILL OUT THE LAST COLUMN AS YOU ARE ABLE. MAKE SURE TO FILL OUT THE LAST CELL.**

Table 8-12 RD 554'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	Delta Levees Subventions program to maintain levee system.
Authority to levy taxes for specific purposes	Y	Proposition 218 provides the District with the ability to raise assessments through a vote

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?
Fees for water, sewer, gas, or electric services	Y	Fees are assessed by the County for sewer and water. SMUD provides electrical service.
Impact fees for new development		unknown
Storm water utility fee	Y	Assessments are developed for drainage
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	Y	Bonds are obtained from the Bank of Rio Vista
Community Development Block Grant	N	
Other federal funding programs	N	
State funding programs	Y	Delta Levee Subventions Program and Delta Levee Special Projects, Proposition 84 and 1E
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
The involvement of Federal agencies funds would help in reducing risk as well as the removal of the sunset clause on the Delta Levees Subventions Program. ANYTHING TO ADD?		

Source: RD 554

8.6.4. Mitigation Education, Outreach, and Partnerships

Table 8-13 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. **UPDATE TABLE – THIS IS FROM THE OLD PLAN. TRY TO FILL OUT THE LAST COLUMN AS YOU ARE ABLE. MAKE SURE TO FILL OUT THE LAST CELL**

Table 8-13 RD 554’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	Walnut Grove Volunteer Fire Department, Delta Citizens Municipal Advisory Council
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Department of Water Resources Delta Flood Emergency Preparedness, Cal OES
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
PROVIDE SPECIFIC DETAILS OF AREAS FOR IMPROVEMENT OF THESE TYPES OF CAPABILITIES AND HOW/WHY IT WILL HELP THE DISTRICT		

Source: RD 554

8.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

- The US Army Corps of Engineers performed an erosion repair project along the Sacramento River levee summer 2007 to create a riparian bench and resolve erosion issues. The District is currently developing a geotechnical study to locate deficiencies within the system. **UPDATE?** Once problematic areas are identified the District will perform repair projects to improve the levee system and reduce risk.
- **ANYTHING NOT CAPTURED ABOVE? PLEASE INCLUDE ALL LEVEE RELATED IMPROVEMENT PROJECTS AND OTHER DISTRICT MITIGATION PROJECTS**

8.7 Mitigation Strategy

8.7.1. Mitigation Goals and Objectives

The RD 554 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

8.7.2. Mitigation Actions

The planning team for the RD 554 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:

- Dam Failure
- Drought & Water Shortage
- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado
- Wildfire

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.

WILL NEED MITIGATION ACTIONS FOR EACH HAZARD IN THE BULLETED LIST ON THE PREVIOUS PAGE. ONE ACTION MAY ADDRESS MORE THAN ONE HAZARD. MITIGATION ACTION SWILL BE DISCUSSED AT THE 3/30/2021 LHMP MEETING

Multi-Hazard Actions

Action 1.

Hazards Addressed:

Goals Addressed:

Issue/Background:

Other Alternatives:

Existing Planning Mechanisms through which Action will be Implemented:

Responsible Office:

Priority (H, M, L):

Cost Estimate:

Potential Funding:

Benefits (avoided Losses):

Schedule: