



Delta Annex Chapter 14 Abatement District

Delta Region Geologic Hazard

14.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Delta Region Geologic Hazard Abatement District (DR-GHAD or District), a new participating jurisdiction to the 2026 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 the District, with a focus on providing additional details on the planning process, risk assessment, and mitigation strategy for this jurisdiction.

14.2 Planning Process

As described above, the DR-GHAD 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 14-1. Additional details on Plan participation and District representatives are included in Appendix A.

Table 14-1 DR-GHAD – Internal Planning Team

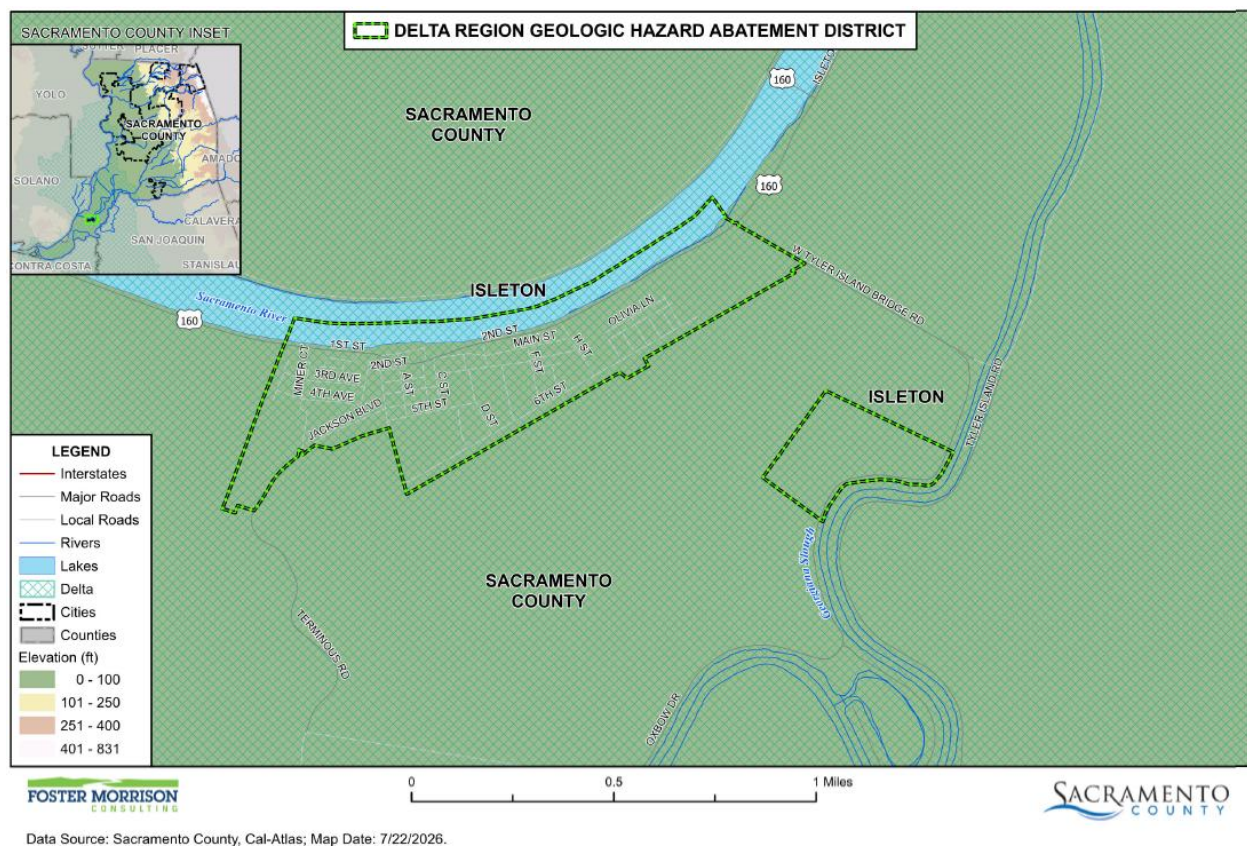
Name	Position/Title	How Participated
Iva Walton	Chair/Delta Region GHAD	Ms. Walton served as Chair of the DR- GHAD. She attended all meetings and provided guidance to the DR-GHAD Manager and Clerk
Pam Bulahan	Board member/DR-GHAD	Board member Bulahan attended all meetings and provided guidance to the DR-GHAD Manager and Clerk
Joeseoph Tootle	Manager/DR-GHAD	Mr. Tootle, as part of the ENGEO team, provided management services to the DR-GHAD
Jeff Adams	Staff/ DR-GHAD	Mr. Adams, as part of the ENGEO team, provided management services to the DR-GHAD
Haley Ralston	Staff/ DR-GHAD	Ms. Ralston as part of the ENGEO team, provided management services to the DR-GHAD
Dr., Kathleen Schaefer	Clerk/DR-GHAD	Dr. Schaefer serves at the DR-GHAD clerk
Mark Niebuhr	EPIC Brokers	Mr. Nieburh facilitated the procurement of the Parametric Insurance policy that provides disaster recovery funds for the residents of Isleton

Name	Position/Title	How Participated
Michael Mierzwa	DWR	Mr. Mierzwa provided planning assistance on behalf of the Department of Water Resources.
Deborah Halberstadt	DOI	Ms. Halberstadt provided insurance support on behalf of the Department of Insurance

14.3 Community Profile

The community profile for the DR-GHAD is detailed in the following sections. Figure 14-1 displays a District map and the location of DR-GHAD within Sacramento County.

Figure 14-1 DR-GHAD



14.3.1. Overview and Background

California has a unique government entity called a Geologic Hazard Abatement District (“GHAD”). The California Legislature established them to allow local communities to develop a self-funding tool to lessen the damaging effects of large-scale hazards such as landslides, earth movement, erosion, floods, and other natural hazards. GHADs are state-level agencies that can prevent, respond to, and mitigate flood risk. Although formed by a local agency, a GHAD is a political subdivision of the State and is not an agent or instrument of a local agency. The design of the GHAD ensures the long-term risk reduction and

maintenance of real property that geologic hazards may threaten. When established, a GHAD is an independent political subdivision of the State, governed by a locally elected Board. However, it is not an agency or instrument of a local agency and therefore is not subjected to control by a local agency. It is, however, granted similar authority as other local agencies.

A GHAD has the responsibility to address the prevention, mitigation, reduction, and control of geologic hazards on designated land within its boundaries. Further, as a prudent landowner, a GHAD can acquire, construct, operate, manage, or maintain improvements on any land it owns. There are no limits or requirements about size, number of units, or contiguous boundaries (i.e., a GHAD may contain numerous non-contiguous parcels).

The 1979 Beverly Act (GHAD Law) provided for the establishment of Geologic Hazard Abatement Districts (GHADs) as independent, state-level public agencies to oversee geologic hazards in defined geographic areas. GHADs operate with a focus on the prevention, mitigation, and abatement of geologic hazards to protect communities. GHAD Law broadly defines a “geologic hazard” as an actual or threatened landslide, land subsidence, soil erosion, earthquake, fault movement or any other natural or unnatural movement of land or earth.

The GHAD is charged with responsibilities that relate to the prevention, mitigation, abatement, or control of geologic hazards, which include the maintenance of flood control facilities and associated improvements. DR-GHAD was formed on June 29, 2021. DR-GHAD has the same physical boundaries as the City of Isleton. The District is located in the southwestern corner of Sacramento County in the Sacramento-San Joaquin Delta (Delta), adjacent to the Sacramento River. The District sits close to at or below sea level (as shown on Figure 14-1). Once a great marsh, the Delta now is a network of channels and sunken “islands” that cover—together with Suisun Marsh—about 1,300 square miles. These islands and channels have been built over with the infrastructure of a 21st century economy: water supply conduits; major arteries of the state’s electrical grid; natural gas fields, storage facilities, and pipelines; highways and railways; and shipping channels, all surrounded by an increasingly urban landscape. Water from the vast Delta watershed, spanning over 45,000 square miles (30 million acres), fuels both local economies and those in export areas hundreds of miles away.

According to the United States Census Bureau, the City (and DR-GHAD) has a total area of 0.5 square miles, of which, 0.4 square miles of it is land and 0.05 square miles of it is water. According to the Köppen Climate Classification system, the District has a warm-summer Mediterranean climate.

14.4 Risk Assessment

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. “It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.”

That definition is a useful framework, but on its own it can understate what is at stake in the DR-GHAD. Risk is not only a matter of how likely an event is or how much damage it causes. It also depends on whether a community can recover afterward.

In Isleton, the two are tightly linked. A failure of the levee protecting the town of Isleton would not cause a temporary disruption. The town would remain inundated for at least six months. Few residents and businesses have adequate financial protection to rebuild after a loss of that duration, so a single failure could permanently end the community. For the District, then, the most important risk measure is the potential for a catastrophic, unrecoverable loss, not only the expected annual damage.

The DR-GHAD risk assessment identifies and profiles relevant hazards and assesses the exposure of lives, property, infrastructure, and the environment to them. It also considers the financial and social capacity of the community to recover. This gives the District a better understanding of its potential risk and vulnerability and a framework for developing and prioritizing mitigation actions, including actions that strengthen financial protection, to reduce the likelihood and consequences of future hazard events.

The DR-GHAD risk assessment identifies and profiles relevant hazards and assesses the exposure of lives, property, infrastructure, and the environment to these hazards. The process allows for a better understanding of the District's potential risk and vulnerability to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

Building on the District Profile above, a risk assessment was performed for the District utilizing the existing District boundaries. This includes the following sections:

- 14.4.1 Assets Inventory and Growth and Development Trends
- 14.4.2 Hazard Identification
- 14.4.3 Hazard Profiles and Vulnerability to Specific Hazards

14.4.1. Assets Inventory and Growth and Development Trends

This section provides an inventory of the DR-GHAD's total assets potentially at risk to hazards and an overview of growth and development trends. This section is broken into two parts:

- **Asset Inventory** – The assets inventory identifies the DR-GHAD's total assets, including the people and populations; structures; critical facilities and infrastructure; community lifelines; natural, historic, and cultural resources; and economic assets and community activities of value. This data is not hazard specific, but is representative of total assets within the District, potentially at risk to identified hazards as discussed in Section 14.4.3 Hazard Profiles and Vulnerability to Specific Hazards.
- **Growth and Development Trends** – A discussion of growth and development trends in the District, both current and future, is presented.

Assets Inventory

The District's asset inventory is detailed in the following sections:

- People and Populations
- District Assets and Critical Facilities and Infrastructure
- Community Lifelines
- Natural, Historic, and Cultural Resources
- Economic Assets and Community Activities of Value

A discussion of each of these assets follows and serves as the template for the asset discussion for each hazard in Section 14.4.3.

People and Populations

The most important asset within any community are the people and populations that reside in the community. People and populations in the District include both District staff and workers as well as those populations located within District boundaries and are served by the District. This section includes an inventory of past and current populations of the District and also discusses vulnerable populations and underserved communities as a subsection of people and populations located within the District and potentially at risk to hazards. Information from the District and other sources as detailed below form the basis of this discussion.

Historic Population Trends and Current Population

The most important asset within any community are the people and populations that both work and reside in the District. For special districts, this generally includes District staff and contractors as well as those populations located within its boundaries and served by the District. The District has only volunteer staff that work for the District. The District serves the City of Isleton. The City populations and population trends are discussed in their Annex to this LHMP.

The California Office of the Small Business Advocate lists Isleton as a “low wealth” community, meaning it has a poverty rate of at least 150% of the California statewide poverty rate per the most recently updated data available from the U.S. Census Bureau’s American Community Survey 5-Year Estimates.

The Census Reporter lists Isleton as having a population of 522. The median per capita income is \$29,128 and the per capita household income is \$53,194, about half the amount in California. The census estimates that 27% of the children and 32% of the seniors live below the poverty line. Children and seniors make up 42% of the population.

Approximately 43% of Isleton residents are Hispanic. It is likely that many are undocumented. If there were a disaster, these households would be ineligible for disaster assistance. A key concern is the lack of housing for the underserved population. The Delta Stewardship Council, Science for Communities project identified the lack of housing resources should Isleton households need to relocate.

The Town of Isleton is small, with limited fiscal capacity and few staff to manage the demands of a public agency. Its small tax base makes it difficult to offer compensation competitive enough to recruit and retain experienced municipal management, and this has contributed to repeated financial strain. The town's vulnerability to a sudden financial shock was demonstrated in 2022, when its wastewater treatment ponds failed. To cover emergency repair costs while awaiting federal reimbursement, the town took out a substantial loan. Several years later, the town is still waiting to be fully reimbursed by FEMA. If Isleton cannot absorb the cost of a single infrastructure failure without approaching insolvency, it has little capacity to recover from a catastrophic flood.

District Assets and Critical Facilities and Infrastructure

This section considers the DR-GHAD's assets at risk, with a focus on key District assets such as structures, critical facilities and 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. Critical facilities are defined for this Plan as:

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

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

The District owns no land, structures, or critical facilities.

In 2023, the levees protecting the City's wastewater treatment plant failed. The costs of responding to the failure, combined with delays in federal reimbursement, have left the City in a precarious financial position, with bankruptcy a real possibility. In this context, it is unlikely that City residents would approve a new assessment sufficient to sustain the GHAD, and the City's leadership has limited capacity to advance the District's mission. As a result, the DR-GHAD is pursuing expansion of its service area beyond the City of Isleton. A larger and more diverse funding base would give the District a more stable financial foundation and allow it to continue reducing risk in the communities it serves.

Community Lifelines

Assessing the vulnerability of the DR-GHAD to natural hazards and disasters also involves reviewing and inventorying the community lifelines in place that could be affected. It is important to include these items in hazard discussions as the continuous operation of critical government and business functions is essential to human health and safety, property protection, and economic security. The importance of community lifelines is discussed below:

- Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function.
- FEMA has developed a method for objectives-based response that prioritizes the rapid stabilization of Community Lifelines after a disaster.
- The integrated network of assets, services, and capabilities that provide lifeline services are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function.
- When disrupted, decisive intervention (e.g., rapid re-establishment or employment of contingency response solutions) is required to stabilize the incident.

Community lifelines, as defined by FEMA, include the following:

- **Safety and Security** – Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety
- **Food, Hydration, Shelter** – Food, Water, Shelter, Agriculture
- **Health and Medical** – Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management
- **Energy** – Power Grid, Fuel
- **Communications** – Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
- **Transportation** – Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime
- **Hazardous Material** – Facilities, HAZMAT, Pollutants, Contaminants
- **Water Systems** – Potable Water Infrastructure, Wastewater Management

It should be noted that these community lifelines are all in place and functional as part of regular government operations in the Sacramento County Planning Area serving as a partnership between the cities, local special districts and agencies, and Sacramento County. Most all of the District’s community lifelines overlap with the Planning Area’s and include many of the critical facilities and infrastructure assets inventoried for this LHMP. As such, specific information on these community lifelines in the District and how they may be affected by a hazard event or disaster are discussed collectively for all jurisdictions in the Base Plan.

Natural, Historic, and Cultural Resources

DR-GHAD has a variety of natural resources of value to the District. These natural resources parallel that of the City of Isleton as a whole. Information can be found in Section 1.4.1 of the City of Isleton Annex.

Historic and Cultural Resources

DR-GHAD has a variety of historic and cultural resources of value to the District. These historic and cultural resources that of the City of Isleton as a whole. Information can be found in Section 1.4.1 of the City of Isleton Annex.

Economic Assets and Community Activities of Value

Assessing the vulnerability of the DR-GHAD to natural hazards and disasters also involves inventorying the economic assets and community activities of value in the District.

Economic Assets

After a disaster, economic resiliency is one of the major drivers of a speedy recovery. Each community has specific economic drivers. Economic assets for the City were discussed in Section 1.4.1 of the City of Isleton Annex and are assumed to be the same or similar for the District.

Community Activities of Value

Inventorying economic assets in the District and their vulnerability to natural hazards and disasters also involves inventorying activities that have value to the community. This includes activities that are important to a community, like long-standing traditions such as a festival or fair or other activities that bring

money into the communities such as sports tournaments and other recreational activities. Community Activities of Value for the City were discussed in Section 1.4.1 of the City of Isleton Annex and are assumed to be the same or similar for the District.

Growth and Development Trends

As part of the planning process, the District looked at changes in growth and development, both current and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. This inventory section details future development/redevelopment projects that are likely to occur over the next five years covered by this 2026 LHMP. For Districts, this generally includes the following:

- Construction/development projects related to adding new District facilities, infrastructure, land acquisition, etc.
- Plans for expansion or build out of the District's service area, including new service hookups, and other District functions related to where the District will be expanding services.

Population Trends and Projections

Population trends and projections for the District are the same as that for the City of Isleton. Those were shown in Section 1.4.1 of the City of Isleton annex. That shows population to be flat or declining in the City and the District.

Future Development Areas

It is important to review future development plans for the District. Future development should be sited in areas that are away from known hazard risks. If this is not possible, mitigation should be done to ensure that future development is protected against future hazards. The District has no plans to acquire land or structures.

14.4.2. Hazard Identification

The DR-GHAD identified the hazards that affect the District and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance (or priority of a hazard) specific to the District (see Table 14-2). Those hazards identified as a high or medium significance in Table 14-2 are considered District priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact in the District were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, natural and cultural resources, and economic damage. The ability of a jurisdiction to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used to prioritize those hazards of greatest significance, enabling the District to focus resources where they are most needed.

Table 14-2 DR-GHAD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/Severity	Significance	Climate Change Influence
Aquatic Nuisance Species (plant/animal)	Limited	Likely	Limited	Low	Low
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure	Extensive	Unlikely	High	High	Medium
Drought & Water Shortage (w/tree mortality)	Extensive	Likely	Limited	Low	High
Earthquake (w/subhazards)	Extensive	Unlikely	High	High	Low
Flood: 1%/0.5%/0.2% annual chance	Extensive	Occasional	High	High	Medium
Flood: Localized Stormwater	Extensive	Likely	High	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Extensive	Likely	High	High	High
Sea Level Rise	Extensive	Likely	High	High	High
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind)	Extensive	Likely	High	High	Medium
Severe Weather: High Winds and Tornadoes	Extensive	Likely	Limited	Low	Low
Subsidence	Extensive	Highly Likely	High	High	Medium
Wildfire (with smoke and air quality)	Limited	Unlikely	Limited	Low	High
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area 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. 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 Influence Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact					

14.4.3. Hazard Profiles and Vulnerability to Specific Hazards

This section includes the hazard profiles and vulnerability assessment for the DR-GHAD's priority hazards (i.e., those ranked of medium or high significance specific to the District as identified in the Significance column of Table 14-2). This section focuses on where and how the District is affected by their priority hazards. Chapter 4 of the Base Plan provides 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 4.2 of the Base Plan.

Hazard Profiles and Vulnerability Assessment

Each hazard is profiled in the following format:

- **Hazard Profile** – A hazard profile is included for each hazard. This includes information on:
 - ✓ **Hazard Overview** – A general discussion of the hazard and related issues is detailed here.
 - ✓ **Location and Extent** – Location is the geographic area within the District that is affected by the hazard. Extent is the expected range of intensity for each hazard. These are discussed in specific detail for mapped hazards, and in more general detail for those hazards that do not have discrete mapped hazard areas.
 - ✓ **Past Occurrences** – Past occurrences are discussed for each hazard. A discussion of disaster declarations is included in each hazard section. NCEM events are also discussed. Other past occurrences data specific to the District follow the disaster declarations and NCEM events for each hazard.
 - ✓ **Climate Change** – This section contains the effects of climate change (as applicable). The possible influence of climate change on the hazard is discussed.

After the hazard profile, a vulnerability assessment is presented. As part of the vulnerability assessment, an estimate of the vulnerability of the District to each identified hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections. 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.

After this classification, a general discussion of hazard vulnerabilities occurs. This is done in the following format:

- **Vulnerability Overview** – A general discussion of the hazard vulnerability and related issues is detailed here.
- **Local Concerns** – This includes District provided information on how the District is uniquely affected by or vulnerable to each hazard.
- **Assets at Risk** – A discussion of the assets at risk follows, presented in the same order as in Section 14.4.1 above, with a few exceptions. This includes sections on: People and Populations; District Assets: and Critical Facilities, and Other Facilities; and Natural, Historic, and Cultural Resources. These are discussed in specific terms for mapped hazards, and in more general terms for those hazards that are unmapped. Sections on Community Lifelines and Economic Assets and Community Activities of Value are not included in the Sections below, as they are common to all jurisdictions and are fully covered in Section 14.4.1 above and in Chapter 4 of the Base Plan.
- **Impacts** – A discussion on hazard impacts follows. Impacts describe how each hazard can affect the District and its assets. The type and severity of impacts reflect both the potential magnitude of the hazard and the vulnerability of the asset.
- **Future Conditions/Future Development** – A discussion of how future conditions and future development may affect the hazard is also included. This considers both new District assets and improvements as well as any changes with the District’s service area.

Power Interruption/Power Failure: A Common Vulnerability of all Hazards

An impact or vulnerability of almost all hazards evaluated as part of this LHMP Update relates to power shortage and/or power failures. There are two major power providers in the Sacramento County Planning Area - Sacramento Municipal Utility District (SMUD) and Pacific Gas and Electric (PG&E). . 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 U.S. 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. Much of the Sacramento County Planning Area is served by Pacific Gas & Electric (PG&E) and Sacramento Municipal Utility District (SMUD). More information on types of power disruptions can be found in Section 4.3 of the Base Plan.

Public Safety Power Shutoff (PSPS)

An intentional disruption type of power shortage/failure event has been implemented in California as a result of wildfires starting 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 preparing all Californians for the threat of wildfires and power outages during times of extreme (fire) weather. To help protect customers and communities during extreme fire weather events, electric power may be shut off for public safety in an effort to proactively prevent wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3 of the Base Plan. PG&E noted no PSPS events in the Sacramento County Planning

Area since the 2021 LHMP. SMUD noted that it has had no PSPS events for its service territories since 2021.

Local Concerns

It was noted that Isleton routinely experiences unintentional power outages in the summers. There have been no intentional (including PSPS events) power outage issues associated with hazard events affecting the District since 2021. However, with an increase in climate change related issues (e.g., extreme heat conditions, atmospheric river storms) occurring in the Sacramento County Planning Area, the potential for future hazard related power outages remain a concern.

Hazard Profiles and Vulnerability Assessment by Hazards

The following sections provide the hazard profile and vulnerability assessments for each of the hazards identified in Section 14.4.2 Hazard Identification.

Dam Failure

Likelihood of Future Occurrence–Unlikely

Vulnerability– Extremely High

Hazard Profile

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 given 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. In addition, with storms increasing in volume and intensity, as seen with the atmospheric river events of recent years, controlled releases from dams can also impact downstream levees and flood control structures resulting in increased and widespread flooding.

Dam failures, for purposes of this Plan, can also result from any one or a combination of the following:

- Earthquake
- Overtopping and uncontrolled releases
- Controlled releases
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

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.

Location and Extent

An inventory map of dams located within and around Sacramento County was shown in Section 4.3.8 in the Base Plan. Inundation mapping and analyses were conducted on Extremely High and High Hazard dams with inundation areas located in the Sacramento County Planning Area. Dams with an inundation area within area serviced by DR-GHAD are shown on and Figure 14-3. Three Extremely High Hazard dams intersect the District (Camanche, Oroville, and Rancho Seco. The District is affected by one High Hazard dams (from inside the County) – Nimbus).

There is no scale with which to measure dam failure. However, FEMA and CA DWR Division of Safety of Dams (DSOD) assign hazard potential classifications 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. FEMA categorizes the downstream hazard potential into three categories in increasing severity: Low, Significant, and High. DSOD adds a fourth category of Extremely High. Dams are classified in these four categories that identify the potential hazard to life and property. These were discussed in more detail in Section 4.3.8 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. For dam overtopping, the speed of onset is somewhat slower than that of a dam break, and the duration is longer (as evidenced in the 2017 Oroville Dam spillway event). The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Geographic flood extent from the DSOD dam inundation areas is shown on Figure 14-2 and in Table 14-3 for Extremely High Hazard dams; and in Figure 14-3 and in Table 14-4 for High Hazard (inside the County) dams.

Figure 14-2 DR-GHAD – Extremely High Hazard Dam (Outside the County) Inundation Areas

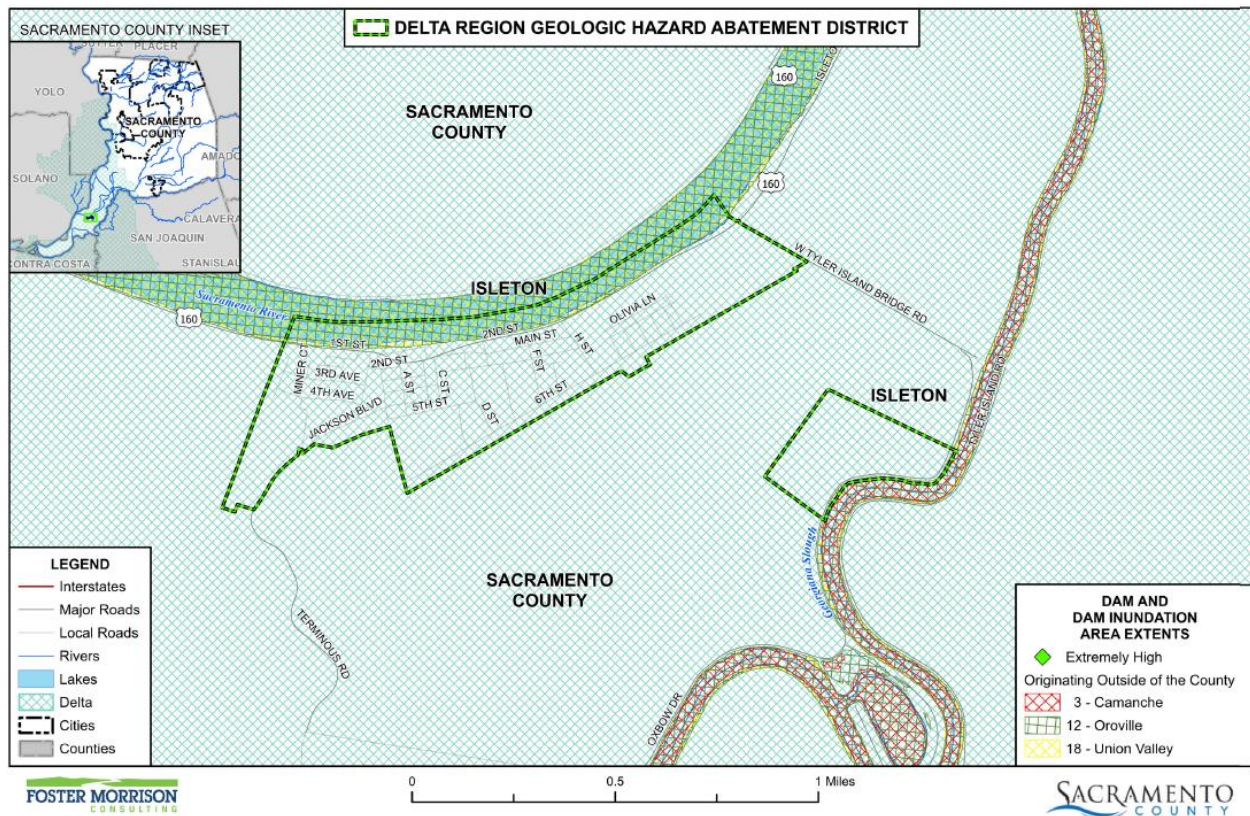


Table 14-3 DR-GHAD – Extremely High Hazard Dam (Outside the County) Inundation Area Geographical Extents

Jurisdiction / Dam Inundation Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Camanche	0.1	0.1%	0	0%	0.1	0.1%
Oroville	10	4%	2	3%	8	5%
Union Valley	9	4%	2	2%	7	4%

Source: DSOD

Figure 14-3 DR-GHAD – High Hazard Dam (Inside the County) Inundation Areas

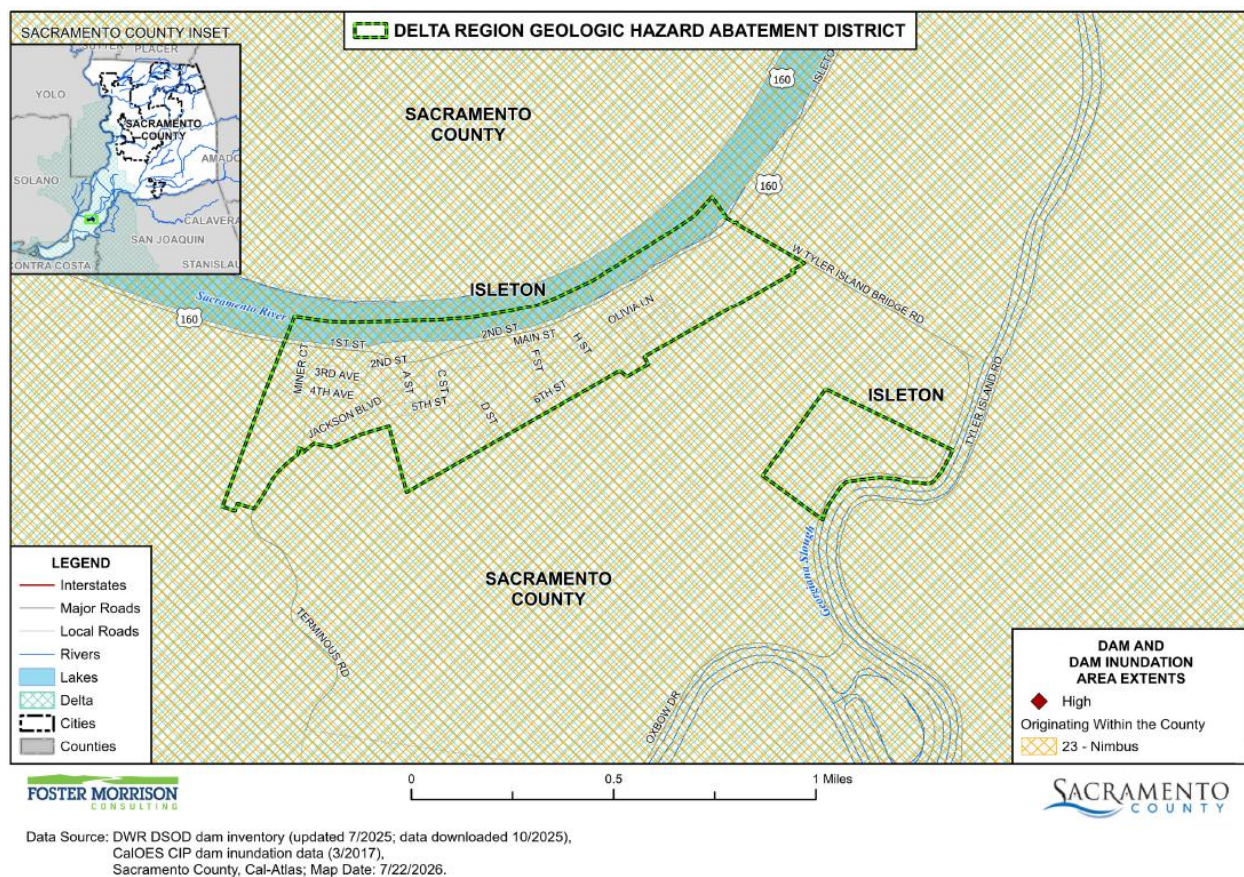


Table 14-4 DR-GHAD – High Hazard (Inside the County) Dam Inundation Area Geographical Extents

Dam Inundation Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Nimbus	233	100%	66	100%	167	100%

Source: DSOD

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations for dam failure in Sacramento County.

NCDC Events

The NCDC does not contain any dam failure events for Sacramento County.

DR-GHAD Events

The District Planning Team noted no past occurrences of dam failure of any type to affect the District.

Climate Change and Dam Failure

It is likely that climate change will increase the chance of future occurrence as well as future impacts associated with dam failure. More information on future impacts to the District can be found below and in the Future Conditions/Future Development section of the Vulnerability Assessment below.

The 2023 California State Hazard Mitigation Plan noted that modeling described in California’s Fourth Climate Change Assessment projects less frequent but more extreme daily precipitation. Year-to-year precipitation will become more volatile, and the number of dry years will increase by mid-century. As the climate continues to warm, atmospheric rivers will carry more moisture, and extreme precipitation may increase. Climate model projections show a tendency for the northern part of the State to become wetter. Increases in both precipitation and heat causing snow melt in areas upstream of dams could increase the potential for dam failure and uncontrolled (and controlled) releases in Sacramento County. The District could be affected by these changes, especially in those areas of the District located within dam inundation areas.

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events. The County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme precipitation events is four. The average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

In general, California exhibits “booms and busts,” which refers to the existence of both very wet years and very dry years. The amount of precipitation that falls in any particular year is largely influenced by occurrences of large, discrete winter storms, also known as atmospheric rivers, which often provide a substantial fraction of the region’s annual precipitation, inclusive of the county. In California, atmospheric rivers vary in intensity; some are beneficial for water supply and replenish snowpack that naturally melts during the summer, serving as the water supply for people and agriculture, while others are responsible for widespread and adverse impacts (NOAA 2023). Extreme precipitation from these atmospheric rivers in the future may prove to be more variable, volatile, and potentially more severe. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods, thus possibly leading to more dam failure events, including the need for more controlled releases from dams.

Vulnerability to Dam Failure

The vulnerability of the District to dam failure flooding would vary depending on which dam fails and the nature and extent of the dam failure and associated flooding. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam. A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is generally

confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions. Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding.

An assessment of a community's vulnerability to dam failure begins with an understanding of local exposure to dam failure. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

Isleton is concerned about Folsom Dam because it has the potential to raise Sacramento River water levels such that it would result in a levee failure.

Assets at Risk

Assets at risk from dam failure include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations (including both District staff and the population within District boundaries) located in dam inundation areas are vulnerable to dam failure. Certain vulnerable populations may be at increased risk to dam failure, especially during a large event with minimal advance notice. These vulnerable populations may include: the unhoused, those with limited mobility, and those that lack the resources to leave the area.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, most structures and critical facilities and infrastructure in the area served by the District have some measure of risk to dam failure. Dam failure flooding can affect the built environment of the District. Structures in dam inundation areas in the City or BALMD are at risk and depending on flood depths, can range from slight damage to totally inundated. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP.

Natural, Historic, and Cultural Resources

A major dam failure event and associated flooding could have a devastating impact on the District. Large flood events can affect all natural, historic, and cultural resources that lie in the dam inundation areas. There are a number of ways floodwaters associated with a dam failure event can impact natural resources and the environment: Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute

ivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levées can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survive the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to these structures within the inundated areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged, and lost during extreme dam failure flood events.

Impacts from Dam Failure

While the District itself is unlikely to be impacted (due to not owning land or buildings), impacts to the area served by the District from dam failure flooding could be extensive and widespread and 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 may be necessary and compounded by impacts to transportation systems and infrastructure. Economic losses to the area served by the District and the larger Sacramento County Planning Area can also be significant.

Other impacts associated with dam failure include landslides, bank erosion, and destruction of habitat. Dam failures can cause downstream flooding and can transport large volumes of sediment and debris and contaminants from the floodwaters. Other environmental impacts can include contamination from septic system failures and releases of contaminants from hazardous materials facilities, contamination of potable water supplies; changes in configurations of streams; loss of wildlife habitats; and degradation of wetlands. A large dam failure event could have significant and catastrophic impacts.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the Climate Change and Dam Failure discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the District include the following:

- Climate change is likely to exacerbate future rain and storm conditions and associated impacts and vulnerability of the District to dam failure. This was discussed in greater detail in the Climate Change and Dam Failure section of the Hazard Profile above.

- Population projections within the jurisdictional boundaries of the District show general populations to be flat or slightly declining. The District may add staff, but this number would be relatively small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Land use planning should be proactive to address future hazard conditions. Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect dam failure impacts to the District. Locating new development, structures, and critical facilities and infrastructure within or near areas of dam failure risk may put additional development at risk.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. Future dam failure events may occur in the District. Although new growth and development may fall in the area flooded by a dam failure, given the limited potential of total dam failure and the large area that a dam failure would affect, development in the dam inundation area will continue to occur.

Earthquake (w/Subhazards)

Likelihood of Future Occurrence—Occasional (minor)/Unlikely (major)

Vulnerability—High

Hazard Profile

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes cause ground shaking, possible liquefaction, landslide, settlement, and can cause fires that follow the earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, wastewater, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Liquefaction Potential

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

Since earthquakes are regional events, the whole of the District is at risk to earthquake. The DR-GHAD, Sacramento County, and surrounding areas have some level of risk from seismic and geologic hazards. Regional faults were shown in Section 4.3.10 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface, likely inactive, faults in the Delta, such as the Midland fault. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. To the east, the Bear Mountain fault zone trends northwest-southeast through Sacramento and El Dorado Counties. As noted in the Base Plan, there have been historically active faults outside the County. These include: San Andreas, Vaca, Concord, Greenville, Hayward, Calaveras, Foothill Fault System, Las Positas, Midland, and West Napa. A significant seismic event on any of these major faults could cause damage in the DR-GHAD.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.11 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The District is located in an area where earthquakes of some magnitude could occur, so both magnitude and intensity of earthquakes are expected to remain low to moderate. Seismic shaking maps for the area in Section 4.3.10 of the Base Plan show Sacramento County and the District fall within a low to moderate shake risk.

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, liquefaction zones were mapped by CGS for the first time in 2025. These zones do not extend into the Delta. This does not indicate that the Delta is free from risk from liquefaction, but that the mapping for this area has not been completed. Due to this, no analysis is performed on geographic extents here (or on assets at risk in the Vulnerability to Earthquake section below)

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations in Sacramento County from earthquake.

NCDC Events

The NCDC does not track earthquake events.

DR-GHAD Events

As shown in the Base Plan, no disaster declarations or other significant events causing significant damage have occurred in the County due to earthquake, including its subhazards such as liquefaction. The District Planning Team noted no past occurrences of earthquakes that affected the District in any meaningful way.

Climate Change and Earthquake

Climate change is unlikely to increase earthquake frequency or strength. More information on future impacts can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

Vulnerability to Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquakes as a result of the periodic release of tectonic stresses. Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while more rural areas are less vulnerable. The primary impacts of concern are life safety and property damage. Although several active faults are near the Sacramento County Planning Area and the District, seismic hazard mapping indicates that the District has low to moderate seismic hazard potential. There is the potential for the District and Sacramento County Planning Area to be subject to some level of moderate seismic shaking during earthquake events occurring on these regional faults depending on the location and magnitude of the event. Some degree of structural damage due to strong seismic shaking could be expected in the District.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The DR-GHAD is located within Zone 3.

Earthquake shaking can also cause liquefaction to occur. Areas with loose soil and high water tables are at risk from liquefaction. There are limited areas in and near the District prone to liquefaction according to the mapping of this hazard. This mapping is incomplete for the Delta area. Liquefaction prone areas may exist, but are not on any current liquefaction maps.

The whole of the District is at some measure of vulnerability to earthquake. An assessment of a community's vulnerability to earthquakes begins with an understanding of local exposure to earthquakes. This is included in the Local Concerns section below. After that section, assets at risk are discussed.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The District is potentially affected by earthquake events from several active, regional faults as described above. As detailed in Section 4.3.10 of the Base Plan, Hazus deterministic analyses were performed on four different potential earthquake scenarios associated with four regional faults. Hazus is FEMA's loss estimation tool used to model earthquake damages for planning purposes. For deterministic Hazus scenarios, a single scenario event is selected based on a specific fault, the epicenter location, and the potential magnitude of the event. The faults and scenarios included the following: Calaveras (6.86M event), Concord (6.8M event), Hayward (7.58M event), and San Andreas (8.04M event). These scenarios likely affected the District in some way. A small portion of the damages from the Hazus analyses may also be attributed to the District.

The most significant earthquake vulnerability in the District is not damage to individual buildings but the performance of the levees that protect the community. The levees in the Delta are built on soft, saturated soils and are highly susceptible to liquefaction and lateral spreading during strong ground shaking. The most likely outcome of a major earthquake on any of the regional faults evaluated above is that sections of the levee system would fail, allowing water to inundate the community. Because the land behind the levees lies below the surrounding water levels, the flooding would not recede on its own, and the community could remain underwater for months. The Hazus scenarios estimate direct shaking damage to buildings and infrastructure, but they do not fully capture the consequences of levee failure and prolonged inundation, so the losses shown above should be considered a lower bound. Given the limited financial capacity of the City and its residents to recover from an event of this magnitude, the District's primary mitigation strategy for this hazard is to strengthen the levees, reducing the likelihood that an earthquake will lead to catastrophic flooding.

The DR-GHAD was established as a pilot program to test the viability of providing a recovery payment to all households in the community. The pilot was a success. It proved that state funds could be used to purchase a parametric insurance policy that would provide an immediate cash payment for household expenses.

Although the pilot has ended, the DR-GHAD continues to seek support for the program. Because it is unlikely that there will ever be adequate funds to ensure that the levees do not fail, community-based insurance is a key mitigation measure and the focus of the DR-GHAD.

Assets at Risk

Many assets in the District are at risk to ground shaking and other earthquake related impacts. Assets at risk from earthquake include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations are at risk from earthquake events (including both District staff and the population /within District boundaries). Those at heightened risk include: the unsheltered, individuals dependent on medical equipment, and individuals with impaired mobility.

The greatest risk to people and populations from earthquake is death and injury. More information on people and populations at risk to earthquake shaking events can be seen in the Hazus scenarios developed for this LHMP. More information on the Hazus scenarios and how the District and County is affected is included in Section 4.3.10 of the Base Plan.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, all of the structures and critical facilities and infrastructure in the area served by the District have some measure of risk to earthquakes and earthquake induced levee failure. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP. The Hazus scenarios conducted for the entire Sacramento County Planning Area show how structures and critical facilities may be affected.

Natural, Historic, and Cultural Resources

The 2023 State Hazard Mitigation Plan noted that environmental problems from earthquakes can be numerous. It is possible for earthquakes to reroute streams, which can change the water quality, possibly damaging habitat and feeding areas. Streams fed by groundwater and/or springs may dry up because of changes in underlying geology. Another threat to the environment from earthquakes is the potential release of hazardous materials into the natural environment causing contamination that can be difficult to contain. Historical and cultural resources are at risk, often due to their age and construction types. The Hazus scenarios in Section 4.3.10 of the Base Plan and included below are relatively silent on the vulnerability to natural, historic, and cultural resources, but impacts to these resources could be long lasting.

Impacts from Earthquake

Earthquakes strike without warning and can cause sudden, dramatic changes to the landscape, resulting in injuries, loss of life, and devastating impacts on the built environment. The greatest impact is to the life safety of DR-GHAD staff, residents, and visitors. Earthquakes can also damage infrastructure, including roads, bridges, and other transportation facilities. They can interrupt or destroy utilities and critical services such as gas, power, water, wastewater, and communications systems, and they can damage homes, businesses, and other structures.

For the District, the most serious earthquake impact is the potential failure of levees. Strong ground shaking can cause soils to liquefy and spread laterally, compromising the levees, dams, and reservoirs that hold back water. Where facilities and communities lie behind levees or downslope from dams and reservoirs, failure can cause flooding that is sudden, deep, and prolonged. The District includes areas with significant flood risk of this kind, including communities and facilities protected by levees and other flood control structures that could be compromised by a major earthquake.

Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Structural and property damage;
- Disruption of and damage to public infrastructure, utilities, and services;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community; and

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the Likelihood of Future Occurrence discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the DR-GHAD include the following:

- Climate change is likely to have no effect on future earthquake conditions and associated impacts and vulnerability of the District. This was discussed in greater detail in the Climate Change and Earthquake section of the Hazard Profile above.
- Population projections for the area served by the District show the population to be flat or shrinking, which limits additional impacts to the District. The District may add staff, but this number would be small. The District noted it has no control over population changes within its District boundaries; it merely reacts to them.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect earthquake and associated impacts to the District. In addition, adherence to protective building codes for new development will also assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. Although new growth and development corridors would fall in areas affected by earthquake, given the limited chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the District is subject to these building codes and land use planning.

Flood: 1%/0.5%/0.2% Annual Chance

Likelihood of Future Occurrence—Occasional (1%)/Unlikely (0.5/0.2%)

Vulnerability—High

Hazard Profile

This section addresses flooding associated with the FEMA DFIRM 1%, 0.5%, and 0.2% annual chance floods. These are the larger floods that can occur in the streams that surround Brannan Andrus Island, and they have caused damage in the past. Flooding is a significant concern for the District.

Historically, the District has been at greater risk of flooding in the winter and spring, when rivers and sloughs swell with heavy rainfall and snowmelt runoff. In Isleton, that protection comes primarily from the levees that surround the town. The levees are high enough to contain most flood flows, but they suffer from erosion and from through-seepage and underseepage. The more often flows in the surrounding rivers and sloughs are high, the greater the likelihood that seepage will cause a levee to fail. When extended heavy rains push floodwaters beyond normal high-water boundaries, or when a levee fails, the result will be catastrophic. The District has also been at risk during atmospheric river flood events. Rain on snow events occurring in upper elevations during the spring months can also be significant and contribute to greater downstream runoff and flooding during large storm events.

Location and Extent

The DR-GHAD has areas located in the 1% annual chance flood zones. This is seen in Figure 14-4.

Figure 14-4 DR-GHAD – FEMA DFIRM Flood Zones

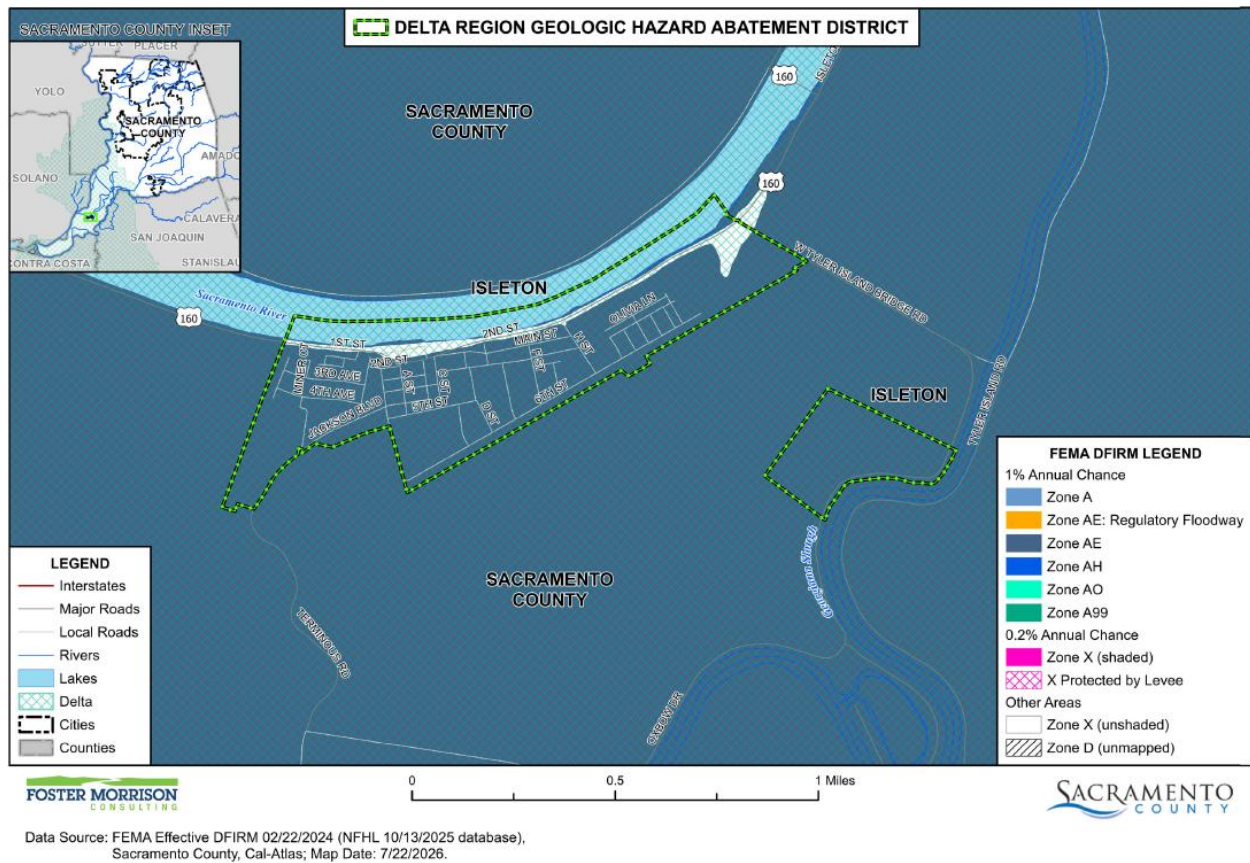


Table 14-5 details the DFIRM mapped flood zones located within the District.

Table 14-5 DR-GHAD– DFIRM Flood Hazard Zones

Flood Zone	Description	Present in District
A	1% annual chance flooding; No base flood elevations provided	
AE Regulatory Floodway	1% annual chance flood: Regulatory floodway; Base flood elevations provided	
AE	1% annual chance flooding; Base flood elevations provided	X
AH	1% annual chance flood areas of shallow flooding between one to three feet deep. Regulatory floodway; Base flood elevations provided	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system.. No Base Flood Elevations (BFEs) or depths are shown.	

Flood Zone	Description	Present in District
X (shaded)	0.2% annual chance flooding: 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	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	
X (unshaded)	Areas of minimal flood hazard	
D	Unmapped areas	

Source: FEMA DFIRM 02/22/2024

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.

Geographical flood extents for the District from the FEMA DFIRMs are shown in Table 14-6.

Table 14-6 DR-GHAD – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard	220	94%	61	93%	159	95%
0.2% Annual Chance Flood Hazard	0	0%	0	0%	0	0%
Other Areas	13	6%	5	7%	9	5%
Total	233	100%	66	100%	167	100%

Source: FEMA DFIRM 02/22/2024

Past Occurrences

Disaster Declaration History

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 14-7. These events also likely affected the District to some degree.

Table 14-7 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	26	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times), 2022*, 2023 (three), 2024 (twice)	18	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times), 2023 (three times)*, 2024*

Source: Cal OES, FEMA

*included a landslide component.

NCDC Events

The NCDC tracks flood events for the County. Events have been tracked for flooding since 1993. Sacramento County has seen 174 events. These events most likely had some impact on the District.

DR-GHAD Events

The District noted that any flood events that affected the City of Isleton would have affected the District. Those are discussed in the City of Isleton annex to this LHMP Update.

Climate Change and Flood

It is likely that climate change will increase the chance of future occurrence as well as future impacts associated with flood. More information on future impacts to the District can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

According to the 2024 CAS, climate change may affect flooding in California, the Sacramento County Planning Area, and the District. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is possible that average soil moisture and runoff could decline, however, due to increasing temperature, evapotranspiration rates, and spacing between rainfall events. Reduced snowpack and increased number of intense rainfall events are likely to put additional pressure on water infrastructure which could increase the chance of flooding associated with breaches or failures of flood control structures such as levees and dams.

Cal Adapt future precipitation projections were shown in Section 4.3.4.

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events, such as sustained periods of heavy precipitation, increased rainfall intensity during precipitation events, and increased risk of rain-on-snow events. Further, more winter-time precipitation that falls as rain instead of snow, and higher temperatures that will cause earlier snowmelt, which could produce substantial surface water flows over a short period of time and may potentially affect dams and spillways and overwhelm levee systems designed for historical precipitation patterns. Historically, the County experienced an average of four extreme precipitation events per year (as shown in Section 4.3.4 of the Base Plan). Under the medium and high emissions scenarios, the County is

expected to experience five to six extreme precipitation events per year by mid-century and six to seven extreme precipitation events per year by the late century.

The 2026 American, Bear, and Cosumnes Watersheds Resilience Plan noted that a key driver of climate vulnerability, adaptive capacity, and implementation readiness in the watershed group is flooding. An equity analysis was performed as part of this Plan. An Equity Analysis Technical Appendix demonstrates how social vulnerability aligns with the physical hazard environment across the watershed. It noted that flooding impacts are most severe downstream, where rising flows increasingly stress Sacramento's levee system; a modeled levee-breach scenario affects 12.5% of the watershed population, and 59% of those affected fall into the highest flood-sensitivity category.

Future flooding exacerbated by climate change will result in a range of potential impacts across the County and the District. For populations, there is an array of social vulnerability factors that exacerbate flood-related risks, and those residing in floodplains are especially vulnerable to the direct impacts of flooding. Floodwaters can interact with sources of pollution and distribute hazardous pollutants locally and regionally, which may result in water contamination and a range of human health impacts. Additionally, flooding can disrupt transportation networks, cause economic losses through business and government facility closures, disrupt communications, disrupt the provision of utilities, and cause significant damage to buildings and critical infrastructure. Further, flooding may also threaten ecosystems and agricultural resources; unlike natural flooding regimes that deposit useful sediment resulting in increased soil fertility as well as groundwater recharge, catastrophic flooding from levee overtopping could lead to soil erosion and loss of viable cropland. It could also release sewage and hazardous materials into the environment if wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

The June 2025 Delta Adapts Adaptation Plan noted that climate change will affect flooding in the Delta. Located at the confluence of the Sacramento and San Joaquin Rivers and San Francisco Bay, the Delta is a complex system whose water levels are influenced by riverine inflows, tides, storm surge, and in some locations, flood hazard management and water supply infrastructure. Climate change will affect many of these factors, increasing the risk of flooding. Riverine flows are the primary driver of high-water levels in the north and south Delta, where more frequent and stronger watershed precipitation events and a shift in winter precipitation from snow to rain will drive flood vulnerabilities. In contrast, higher sea levels will increase the likelihood of flooding in Suisun Marsh and the western and central Delta. Climate change is expected to increase the frequency of large runoff events across the Delta watershed. Most of the Delta's flood management infrastructure, including 1,100 miles of levees and upstream reservoirs, were designed to operate under historical conditions that did not consider climate change. Climate change will place greater stress on the flood management system, and Delta levees will become increasingly vulnerable to breaches, overtopping, or other types of failure if no action is taken.

Vulnerability to Flood: 1%, 0.5%, and 0.2% Annual Chance

Floods have been a part of the District's history and will continue to be in the future. During the winter months, the duration and timing of precipitation largely determine the threat of flooding, and those same characteristics determine the potential for widespread structural and property damage, injury, and loss of life. In the District, however, high water is not itself the source of vulnerability. The vulnerability lies in the levees that hold the water back. Prolonged high flows in the surrounding rivers and sloughs increase the

load on the levees and the likelihood that erosion, through-seepage, or underseepage will cause one to fail. If a levee fails, the area behind it is inundated, and the town could remain flooded for months.

Because the levees are the principal protection for the community, the whole of the District is vulnerable to flooding to some degree. The larger 1%, 0.5%, and 0.2% annual chance floods matter most because they place the greatest stress on the levees, and the consequences of a failure grow with the depth and duration of the flooding. Elsewhere in the region, the effects of these floods are generally confined to areas near the waterways, and the threat grows as small drainages combine into larger channels. Where levees fail, the flooding extends well beyond the waterway itself and into the community.

The whole of the District is at some measure of vulnerability to floods. An assessment of a community's vulnerability to flood begins with an understanding of local exposure to flood. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The District's chief concern from flood is that a levee will fail. If a levee were to fail, most of the City of Isleton would be flooded for at least 3 months, with a chance of it being 6 months. With the exception of the homes in the new subdivision on the east side of the City, remodeled properties that have been elevated, and properties along Main Street, all of the structures will be damaged by a flood. The low-income residents will have no place to live for at least 3 months. Many will be required to elevate their homes before they can repair the damage. Virtually no one has flood insurance. Thus, the community will cease to exist.

The DR-GHAD was established as a pilot program to test the viability of providing a recovery payment to all households in the community. The pilot was a success. It proved that state funds could be used to purchase a parametric insurance policy that would provide an immediate cash payment for household expenses.

Although the pilot has ended, the DR-GHAD continues to seek support for the program. Because it is unlikely that there will ever be adequate funds to ensure that the levees do not fail, community-based insurance is a key mitigation measure and the focus of the DR-GHAD.

Assets at Risk

Assets at risk from flood include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations located in the 1% annual chance floodplains within the District (including both District staff and the population within District boundaries) are at some risk to flooding. Certain vulnerable populations located within areas prone to flooding may be at increased risk to this hazard, especially during

a large event with minimal advance notice. These vulnerable populations include: the unsheltered, those with limited mobility, and those that lack the resources to leave the area.

Populations within District boundaries can be the most vulnerable. Not only are the residents at risk, but their homes and contents are all at risk, compounding the impacts associated with significant hazard events.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, all of the structures within the District are at risk of flooding. Flooding presents a threat to all of the critical infrastructure systems serving the community. If a levee were to fail, the water and wastewater systems would be inoperable for at least 6 months. The elevation of the fire station and the city hall is above the base flood but due to the lack of water and wastewater systems, they would be inoperable for 6 months while the floodwater is pumped out. A levee failure would inundate Highway 12 a major transportation route between the Central Valley and the Bay Area. The loss of Highway 12 for 6 months would have a significant economic impact on the area surrounding the Delta. The levees along Georgiana Slough and the Sacramento River are a part of the State water supply system. If the levees fail the pumps providing water to Southern California will have to be shut down for an extended period of time, impacting the water supply to Southern California.

Natural, Historic, and Cultural Resources

Large flood events can affect natural, historic, and cultural resources. There are a number of ways floodwaters can impact natural resources and the environment. Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levees can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase downstream. Trees can be uprooted by high-velocity water flow. Plants that survived the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures within the flooded areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged and lost during extreme flood events. Any of these that fall in the flood zones shown on Figure 14-4 would be vulnerable.

Impacts from Flood: 1%, 0.5%, and 0.2% Annual Chance

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Large flood events, including those associated with 1% and 0.2% annual chance floods, can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. People may be swept away in floodwaters, causing injuries or deaths. 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. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Structures can be damaged directly from floodwaters and can also be damaged from trees falling as a result of water-saturated soils. 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

causing power outages. The interruption of power causes major problems and can result in the closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues.

Standing water can cause damage to crops, roads, foundations, and electrical circuits. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the DR-GHAD include the following:

- Climate change is likely to exacerbate future flood conditions and associated impacts and vulnerability of the District to 1% and 0.2% annual chance flooding. This was discussed in greater detail in the Climate Change and Flood section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect flooding and associated impacts to the District. Additional development traditionally leads to additional flooding. In addition, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. Future development in the District may be built in the floodplain, as long as it conforms to the standards of the floodplain ordinance. The City of Isleton enforces their floodplain management ordinance

on areas inside the District. More detail on the specifics of the floodplain ordinance can be found in Section .4.3 of the City of Isleton annex.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile

Flooding occurs in areas other than the FEMA mapped 1%, 0.5%, 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 District, during the rainy season from November through April. Prolonged heavy rainfall (including that from atmospheric river events) contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The DR-GHAD is subject to localized flooding throughout the District. Areas prone to localized flooding are included in **Error! Reference source not found.** below. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations from localized floods. There would most likely have been localized flood events during the disaster declarations from flood as shown in the previous 1%/0.2% annual chance flood section. Some of these events may have affected the District.

NCDC Events

The NCDC occurrences of localized flooding are included in the 1% and 0.2% annual chance flood hazard profile above where past flood events were noted.

DR-GHAD Events

The District noted that localized flooding generally occurs during periods of heavy rain and storms and often occurs in conjunction with the larger, more significant flood events. These occur every year.

Climate Change and Localized Flood

It is likely that climate change will increase the chance of future occurrence as well as future impacts from localized flood. More information on future impacts to the District can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

Even if average annual rainfall may decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century, increasing the likelihood of overwhelming stormwater systems built to historical rainfall averages. This makes localized flooding more likely.

Vulnerability to Localized Flood

Flood vulnerability and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the District during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially significant impacts to certain areas of the District. However, while flooding can cause significant impacts, depending on the duration and volume of precipitation and the drainage in any given area, many of the floods in the District are minor, localized flood events that are more of a nuisance than a disaster.

Many areas of the District are at some measure of vulnerability to localized flooding. An assessment of a community's vulnerability to localized flooding begins with an understanding of local exposure to localized flooding. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

Isleton is subject to two kinds of floods. Fluvial flooding caused by a levee failure (discussed in the Levee Failure section below) and pluvial flooding caused by heavy rains that exceed the capacity of the local storm drain system, result in groundwater that rises to the surface or that infiltrates into the wastewater collection system, surcharging local manholes, overflowing onto an undersized storm drain system and ultimately onto adjacent property. Those areas are discussed in more detail in the City of Isleton annex to this LHMP Update.

The District's stormwater problem is less about surface flooding than about what happens to rainwater once it enters the ground. The town has a small number of stormwater pumps, but the larger problem is that stormwater infiltrates the cracked and broken wastewater collection system. This inflow and infiltration greatly increases the volume of water reaching the wastewater treatment ponds during heavy rain. In 2022, intense rainfall ultimately caused the ponds to fail. The failure and the cost of responding to it have placed the town in a precarious financial position and remain a serious concern for the District. Although the consequences are significant, they are not as catastrophic as a levee failure, which would inundate the entire community for months and could end the town altogether. Stormwater and wastewater conditions therefore

deserve attention as a fiscal and public health concern, but they do not change the District's central priority, which is levee protection.

The DR-GHAD was established as a pilot program to test the viability of providing a recovery payment to all households in the community. The pilot was a success. It proved that state funds could be used to purchase a parametric insurance policy that would provide an immediate cash payment for household expenses.

Although the pilot has ended, the DR-GHAD continues to seek support for the program. Because it is unlikely that there will ever be adequate funds to ensure that the levees do not fail, community based insurance is a key mitigation measure and the focus of the DR-GHAD.

Assets at Risk

Assets at risk from localized flood include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

People and populations (including both District staff and the population within District boundaries) are traditionally not highly vulnerable to localized flooding, but their structures and contents can be at risk. Likewise, most vulnerable populations are not uniquely vulnerable to localized flooding. Localized flooding may cause transportation issues as roads and bridges are impacted or closed and affect the ability for people to travel throughout the District.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, those assets and critical facilities and infrastructure in District boundaries with localized flooding can be affected if floodwaters intrude into the structure. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP. Structures and critical facilities in low lying areas, can be at greater risk. Buildings with older foundations that are prone to water intrusion are also at greater risk. Once water finds its way into a structure, it tends to continue to do so until the path that brings water into a structure is mitigated. Structures can also be damaged by trees that have become uprooted and fall during rain and storm events. Large trees falling onto structures can cause significant damage.

Natural, Historic, and Cultural Resources

Natural resource assets may have some vulnerabilities to localized flood during major storm events, but can benefit from floodwaters, often by design. Many parks and green spaces are designed to take overflow water and release it into the underlying soils and natural areas. Wetland areas in the District actually help reduce the risk of flooding, as they can absorb excess rainfall that would have to be drained away from impervious surfaces. Flooding can provide many benefits to the natural environment, including recharging wetlands and groundwater, increasing fish production, creating wildlife habitat, and rejuvenating soil fertility. These smaller localized flooding events often provide more benefits to the environment in

comparison to negative impacts associated with large flood events. Historic and cultural resources may be at some measure of vulnerability if they are located in areas subject to repeated localized flooding.

Impacts from Localized Flood

Primary concerns associated with localized stormwater flooding include impacts to infrastructure that provide 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.

Life safety issues from localized flooding would be more limited. The amount and type of damage or flooding that occurs varies from year to year and from storm to storm, depending on the quantity of precipitation and runoff.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the Likelihood of Future Occurrence discussion above), changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. These are discussed below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the DR-GHAD include the following:

- Climate change is likely to exacerbate future heavy rain conditions and associated impacts and vulnerability of the District to localized flood. This was discussed in greater detail in the Climate Change and Localized Flood section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect flooding and associated impacts to the District. Additional development traditionally leads to additional localized flooding. However, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities inside District boundaries to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. The District will need to work with the City to be proactive to ensure that increased development has proper siting and drainage for stormwater. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding can reduce future flood losses.

Levee Failure

Likelihood of Future Occurrence—Likely

Vulnerability—Extremely High

Hazard Profile

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 streambank, raising the level of the land around the stream.

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 a release from or failure of a dam. 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 is 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.

Over 518 miles of levees are located throughout the Sacramento County Planning Area. These include both accredited and unaccredited levees, as discussed in Section 4.3.14 of the Base Plan, all which pose a risk to adjacent communities should a levee fail or overtop. While the levee analysis included in this section focuses on the accredited levees and those with improvements in process based on the DFIRM A99 and X-Protected by Levee Flood Zones, there are many older, unaccredited levees located throughout the County Planning Area, including the District, that may have a greater potential for overtopping or breaching and pose a significant risk to communities should they fail.

Location and Extent

The entire District are at risk to levee failure flooding. There is not a scientific scale or measurement system in place for levee failure. It is usually measured in area covered and depth of flooding. A map of levees located in the Sacramento County Planning Area is shown in Section 4.3.14 of the Base Plan. Note, not all levees and levee inundation depths are depicted on these maps. 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. Those levees

accredited as providing protection against the 1% or greater annual chance flood and those in levees in the certification process are identified in the FEMA DFIRMs which also include those areas protected by the levees.

There are no DFIRM levee protected areas in the District, as the District sits outside of accredited levee areas. As such no mapping is shown and no tabular analysis is performed. While this gives the initial appearance of limited levee failure risk, it should be noted that these unaccredited levees may have a greater potential for failure or breach and can pose even a greater risk to those communities in which they are located.

Past Occurrences

Disaster Declaration History

There have been two state and two federal disasters declarations directly related to levee failure in Sacramento County, as shown on Table 14-8. Also, it is important to note that many of the flood disaster declarations included in Section 4.3.11 of the Base Plan (like the December 31, 2022 event near Wilton) also may include flooding associated with levee breach or failure events.

Table 14-8 Sacramento County – State and Federal Disaster Declarations Summary 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

NCDC Events

There have been no NCDC levee failure events in Sacramento County, as the NCDC does not track levee failure flooding as a stand-alone hazard.

DR-GHAD Events

Significant issues with the levee performance can be found in the BALMD Chapter to the Delta Annex of this LHMP update.

Climate Change and Levee Failure

The 2024 Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events. The County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme precipitation events is four. The average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

In general, California exhibits “booms and busts,” which refers to the existence of both very wet years and very dry years. The amount of precipitation that falls in any particular year is largely influenced by occurrences of large, discrete winter storms, also known as atmospheric rivers, which often provide a substantial fraction of the region’s annual precipitation, inclusive of the county. In California, atmospheric rivers vary in intensity; some are beneficial for water supply and replenish snowpack that naturally melts during the summer, serving as the water supply for people and agriculture, while others are responsible for widespread and adverse impacts (NOAA 2023). Extreme precipitation from these atmospheric rivers in the future may prove to be more variable, volatile, and potentially more severe. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods, thus possibly leading to more levee failure events.

The June 2025 Delta Adapts Adaptation Plan noted that climate change will affect levee failure flooding in the Delta. The Delta’s 1,300 miles of levees protect more than 800,000 acres of land and play a critical role in conveying water supply through the Delta. By mid-century, overtopping of Delta levees by an event with a 1-percent annual chance of occurrence may result in the exposure of over \$1.8 billion in annual agricultural and commercial economic activity and \$10.5 billion in agricultural, residential, commercial, and infrastructure assets. Most of the Delta’s flood management infrastructure, including levees and upstream reservoirs, are designed to operate under historical sea level and hydrologic conditions that do not consider potential future climate change. Changing climatic conditions will place greater stress on the flood management system in the future.

Vulnerability to Levee Failure

According to historical hazard data and levee mapping, levee failures can occur in or near the District. All of the District are at some measure of vulnerability to levee failure floods, including failure or breach of accredited levees, those in the certification process, and unaccredited levees. Because the levees are the principal protection for the community, the whole of the District is vulnerable to flooding to some degree. The larger 1%, 0.5%, and 0.2% annual chance floods matter most because they place the greatest and most prolonged stress on the levees, and the consequences of a failure grow with the depth and duration of the resulting flood. Elsewhere in the region, the effects of these floods are generally confined to areas near the waterways, and the threat grows as small drainages combine into larger channels. In the District, a levee failure extends the flooding well beyond the waterway itself and into the community.

An assessment of a community’s vulnerability to levee failure flooding begins with an understanding of local exposure to levees. This is included in the Local Concerns section below followed by a discussion of the District’s Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

A levee failure would inundate virtually every property south of Main Street, with depths reaching as much as 8 feet in the most southerly areas. Two distinct mechanisms can cause a levee failure in the District, and it is important to distinguish between them.

The first, and most likely, mechanism is failure from underseepage or through-seepage. Extended periods of high flood flow in the rivers surrounding Brannan-Andrus Island, including the 1%, 0.5%, and 0.2% annual chance events, increase the hydraulic loading on the levees and the probability that seepage will weaken or fail them. Sea level rise adds to this risk by raising base water levels and extending the duration of high-loading conditions over time. The second mechanism is failure triggered by an earthquake, in which strong ground shaking causes liquefaction or structural weakening of the levee itself.

This distinction matters because the appropriate mitigation measure differs by failure mechanism, and FEMA Hazard Mitigation Grant Program (HMGP) funding requires that a proposed project be tied to a specific, documented hazard. The most effective mitigation measure for underseepage and through-seepage is to widen the landward side of the levee, which lengthens the seepage path and reduces the potential for failure. Without clearly identifying underseepage as the mechanism at issue, a project to widen or strengthen the levee cannot be shown to address a specific hazard, and HMGP grant applications for that work would not be considered eligible.

Assets at Risk

Assets at risk from levee failure include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations (including both District staff and the population within District boundaries) located in leveed areas are at some risk to levee failure flooding. Certain vulnerable populations located within areas prone to levee failure flooding may be at increased risk to this hazard, especially during a large event with minimal advance notice. These vulnerable populations include: the unsheltered, those with limited mobility, and those that lack the resources to leave the area.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, certain assets in the boundaries of the District are at risk of levee failure flooding and primarily include those structures located adjacent to levee protected areas. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP.

Natural, Historic, and Cultural Resources

Large flood events, such as those occurring as a result of a levee failure, can affect natural, historic, and cultural resources. There are a number of ways floodwaters can impact natural resources and the environment. Wildlife habitats can be destroyed by floodwaters. Contaminated floodwater can pollute rivers and habitats. Silt and sediment can destroy natural areas. Riverbanks and natural levees can be eliminated as rivers reach bankfull capacity. Rivers can be widened, and deposition can increase

downstream. Trees can be uprooted by high-velocity water flow. Plants that survived the initial flood may die due to being inundated with water. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures within the flooded areas, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged and lost during extreme flood events.

Impacts from Levee Failure

Floods and their impacts vary by location, including impacts associated with a levee failure flood event, and will only affect certain areas of the District that are in areas protected by levees. Based on the areas of the District surrounded by levees, it is evident that levee failure floods could potentially have significant impacts to the District boundaries, depending on the location, timing, and severity of the event. Impacts that are not quantified, but could be anticipated in large levee failure event, include:

- Injury and loss of life
- Structural and property damage
- Crop damage
- Disruption of and damage to public critical infrastructure and services
- Health hazards associated with mold and mildew, contamination of drinking water, etc.
- Impacts to natural resource areas, including stream bank erosion
- Damage to roads/bridges resulting in loss of mobility

In addition to flood related levee failures, the levees in the District are potentially at risk to failure during an earthquake event. Levee failure flooding could accompany an earthquake and could be compounded further if a dam or storage reservoir fails. Channels and water courses with earthen banks and levees are particularly vulnerable and could collapse in a major earthquake resulting in partial or complete blockage of channels causing flooding upstream of the impoundment. Levees are especially susceptible to rapid settlement due to liquefaction or horizontal spreading of underlying soils.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the DR-GHAD include the following:

- Climate change is likely to exacerbate future flood and levee failure conditions and associated impacts and vulnerability of the District to levee failure flooding. This was discussed in greater detail in the Climate Change and Levee Failure section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect levee failure flooding and associated impacts to the District. Additional development traditionally leads to additional flooding, especially in levee protected areas. However, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. Future development considerations should be ongoing and proactive by the City of Isleton. Ensuring that comprehensive land use planning is conducted, regulatory requirements, such as building codes and the floodplain ordinance, are followed, and levee improvements, inspections, and maintenance is ongoing will help reduce impacts to future development.

Sea Level Rise

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile

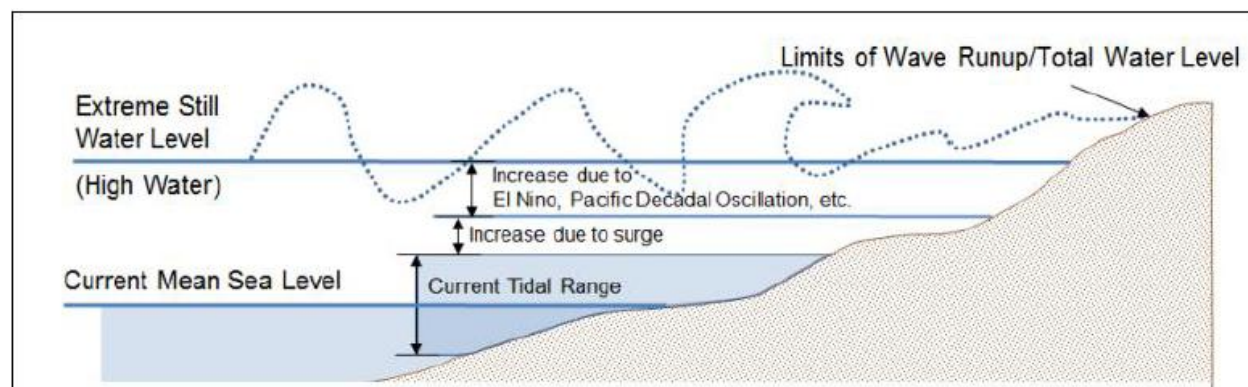
Sea level rise is typically discussed as a coastal hazard, but the Sacramento-San Joaquin Delta is tidally influenced and connected to San Francisco Bay and the Pacific Ocean, so changes in sea level propagate upstream through the Delta's channels and sloughs. The Sacramento River, as it flows through the southwestern portion of Sacramento County and into the Delta, is subject to these tidal influences, and the area of the County near the Delta, including the District, is vulnerable to the effects of sea level rise even though it lies many miles inland from the coast.

The Delta's vulnerability to sea level rise is compounded by two conditions specific to this region. First, many Delta islands and tracts, including the land protected by the levees surrounding Isleton, have subsided well below the surrounding water levels due to over a century of drainage, oxidation, and compaction of peat soils. As sea level rises, the difference between the water surface in the surrounding channels and the ground level of the protected community grows larger, increasing the hydraulic head against the levees. Second, the Delta's levees, including those protecting the District, are already vulnerable to underseepage and through-seepage, as discussed above. Sea level rise raises base water levels in the channels surrounding

the District and extends the duration of high-water conditions, increasing the frequency and length of time the levees are subject to the loading that drives seepage-related failure.

The 2023 California State Hazard Mitigation Plan notes that sea level rise progressively worsens the impact of high tides and storm-driven high water, and that these effects compound with the increased frequency, severity, and duration of high water events associated with climate change. In the Delta, this means more frequent and more prolonged periods of high water in the channels surrounding leveed islands and tracts, which in turn increases the number of opportunities for seepage-related levee failure over time. El Niño events add to this risk, producing higher tides and larger storm surges on top of the sea level rise and typical tidal patterns already affecting the Delta. Sea level rise also increases the risk of saltwater intrusion into the Delta, which can affect water quality for agricultural and municipal uses that rely on Delta water. The combined effects of high tides, storm surge, atmospheric patterns such as El Niño, and sea level rise are shown in Figure 14-5.

Figure 14-5 Additive Effects of Sea-Level Rise



Source: 2023 California State Hazard Mitigation Plan

King Tides may also affect sea level rise. This was discussed in detail in Section 4.3.15 of the Base Plan.

Location and Extent

The coastally influenced areas of the Sacramento Planning Area are at risk from sea level rise (especially during periods of extreme tides and as compounded by storm events). Sacramento County is located inland within the Central Valley of California. The southwestern portion of the County follows the course of the Sacramento River as it flows into the Sacramento-San Joaquin Delta. The area of Sacramento County near the Delta is vulnerable to the influences of sea-level rise. Duration of sea level rise is thought to be long. The speed of onset is slow. There is no scientific scale for sea level rise, other than the actual physical measurement of sea level and depth.

Sea level rise scenarios identified in the Sacramento County Climate Action Plan (2024) and the Sacramento County Climate Change Vulnerability Assessment (2017) based on SLR GIS mapping from Cal-Adapt, and California Coastal Inundation Depth Layer Mosaics (2016) were utilized for this assessment. Three sea level rise scenarios were selected based on guidance from the State of California Sea Level Rise Guidance 2024 Science and Policy Update that includes available Cal-Adapt SLR GIS data

providing coverage for the Sacramento County area. It should be noted that the SLR scenarios include both the SLR combined with a likely 100-year storm. The scenarios are:

- 0-meter scenario – reflects existing conditions (no SLR) with a 100-year storm
- 0.5 meter scenario – with a 100-year storm is roughly equal to the median projection for 2060 (mid century) and was selected to be representative of plausible 2060 intermediate to high conditions
- 1.41 meter scenario– with a 100-year storm is roughly equal to the median projection for 2100 (end of century) and was selected to be representative of plausible 2100 intermediate to high conditions

Inundations for these three scenarios are shown on the three maps below. They are broken out for the 0-meter (Figure 14-6), 0.5 meter (Figure 14-7), and 1.41 meter (Figure 14-8) scenarios individually. Geographical extents by scenario for the District are detailed in Table 14-9.

Figure 14-6 DR-GHAD – Sea Level Rise 0-meter Scenario

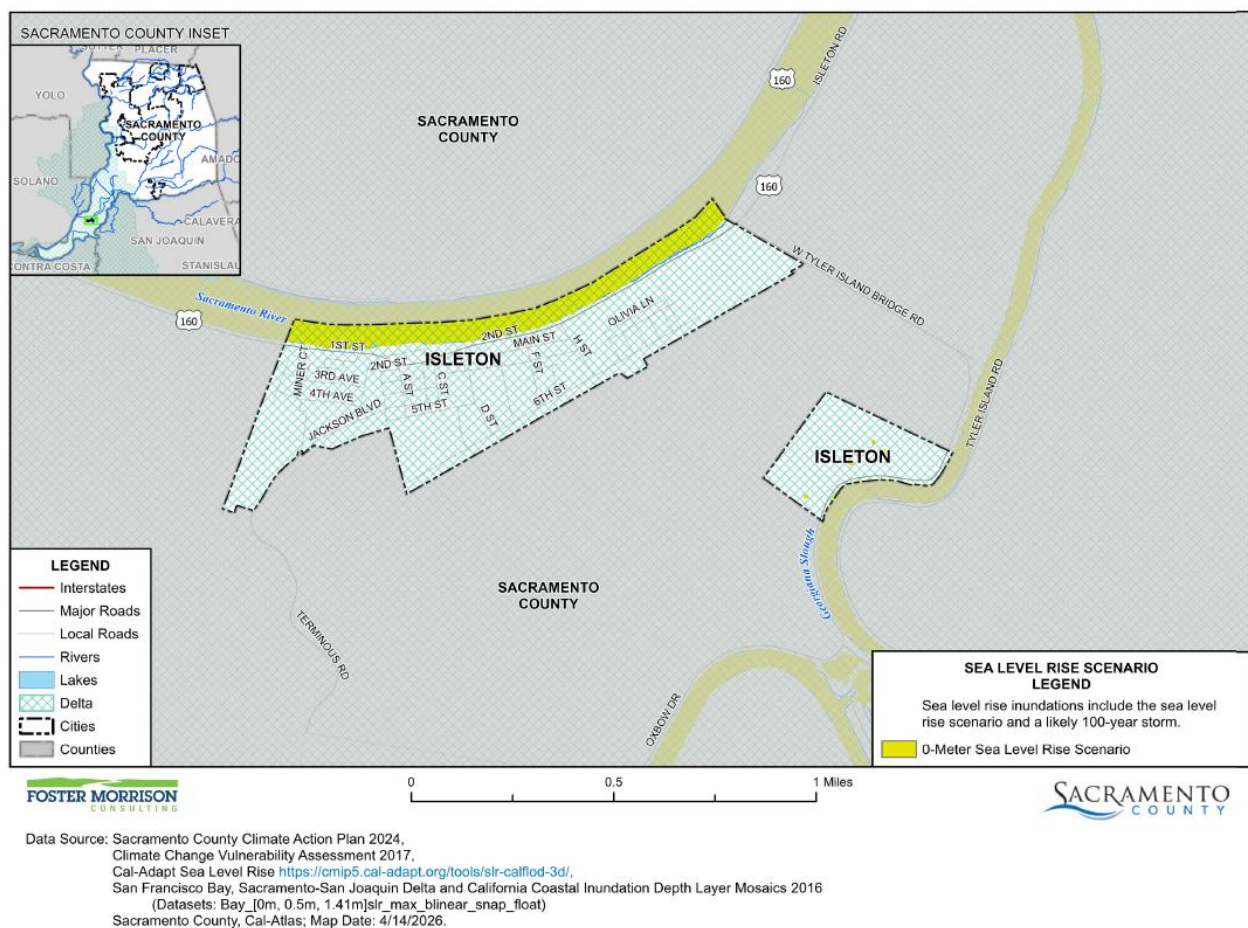
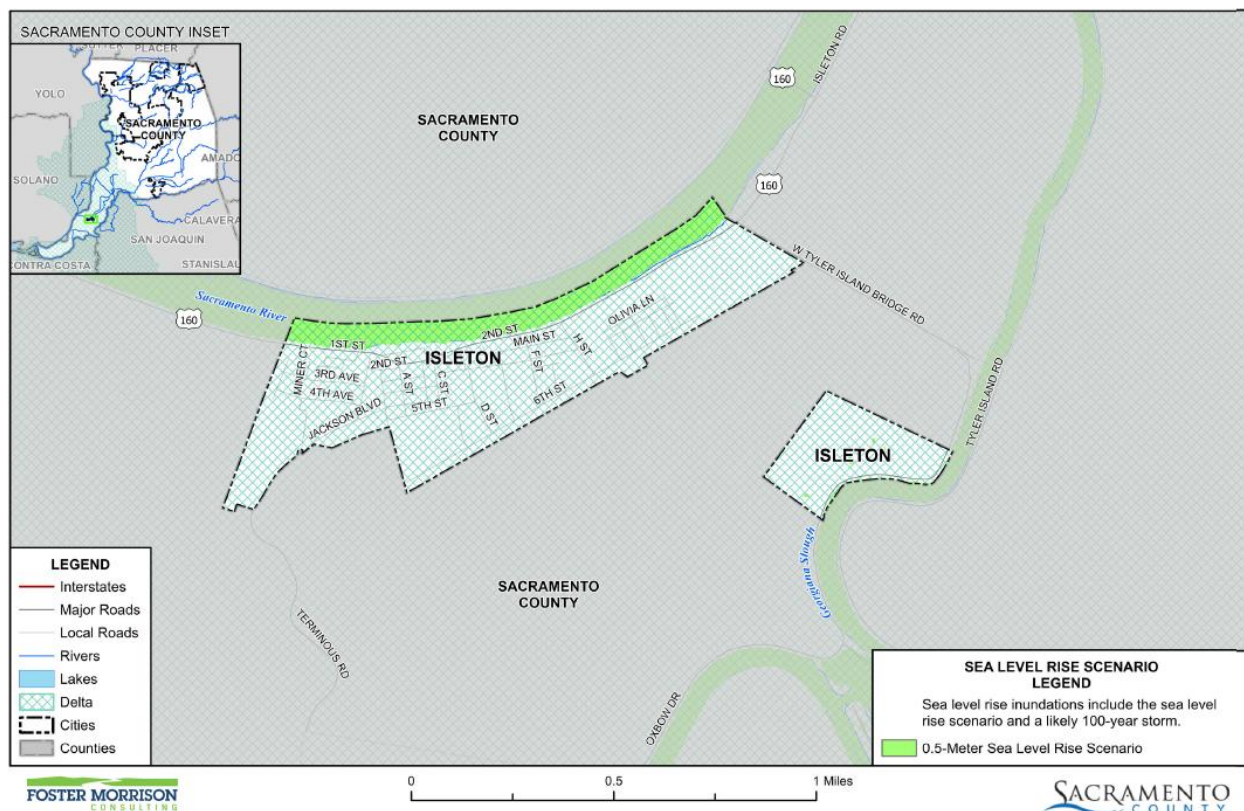


Figure 14-7 DR-GHAD – Sea Level Rise 0.5-meter Scenario



Data Source: Sacramento County Climate Action Plan 2024,
Climate Change Vulnerability Assessment 2017,
Cal-Adapt Sea Level Rise <https://cmip5.cai-adapt.org/tools/slr-califod-3d/>,
San Francisco Bay, Sacramento-San Joaquin Delta and California Coastal Inundation Depth Layer Mosaics 2016
(Datasets: Bay_0m, 0.5m, 1.41m)slr_max_bilinear_snap_float)
Sacramento County, Cal-Atlas; Map Date: 4/14/2026.

Figure 14-8 DR-GHAD – Sea Level Rise 1.41-meter Scenario

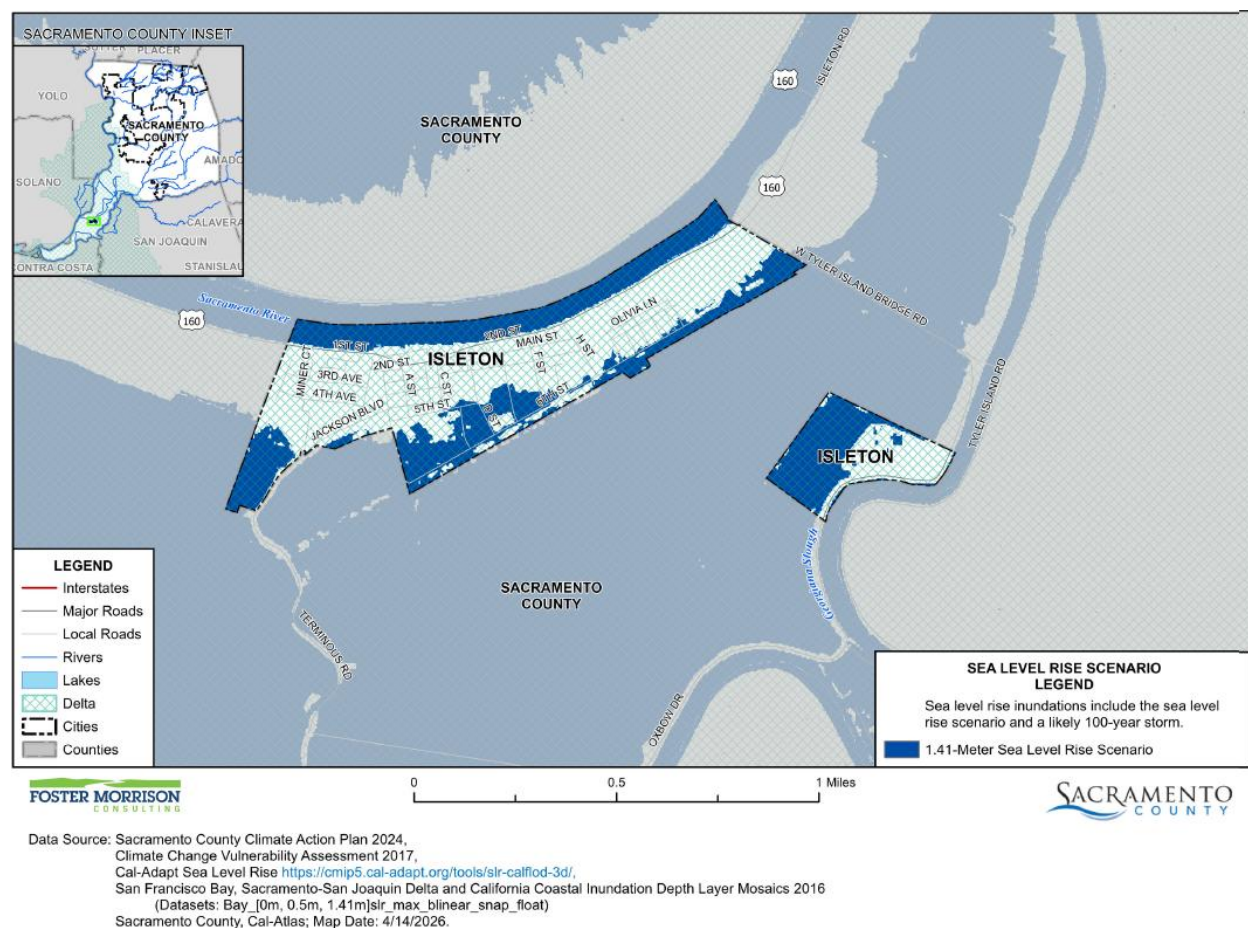


Table 14-9 DR-GHAD – Sea Level Rise Scenario Geographical Extents by Scenario

Sea Level Rise Scenario	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres"
0-Meter Sea Level Rise Scenario	6	3%	0.3	1%	6	4%
0.5-Meter Sea Level Rise Scenario	7	3%	1	1%	7	4%
1.41-Meter Sea Level Rise Scenario	86	37%	9	14%	86	51%

Source: Sacramento County Climate Action Plan (CAP) 2024, Climate Change Vulnerability Assessment 2017, Cal-Adapt Sea Level Rise, UC Berkeley, San Francisco Bay, Sacramento-San Joaquin Delta and California Coastal Inundation Depth Layer Mosaics 2016

Past Occurrences

Disaster Declaration History

No disaster declarations have occurred specific to sea level rise.

NCDC Events

The NCDC does not track sea level rise.

DR-GHAD Events

The District noted that no standalone sea level flood rise events have been documented in the District. Instead, sea level rise has acted as a background amplifier during other flood related hazards. These were discussed in Section 4.3.15 of the Base Plan.

Climate Change and Sea Level Rise

The 2023 California State Hazard Mitigation Plan noted that coastal areas may be impacted by climate change in different ways. A warmer atmosphere means storms have the potential to be more intense and occur more often. Sea level rise is driven by climate change. As the planet warms, land ice melts and flows into the ocean. Ocean temperatures rise and thermal expansion takes place.

The 2017 Sacramento County Climate Vulnerability Assessment noted that an effect of global climate change is sea level rise. The average global sea level rose approximately seven inches during the last century. Assuming that it continues to reflect global trends, sea levels along the California coastline, and other areas affected by sea level rise, could be 10-18 inches higher in 2050 than 2000 levels, and 31-55 inches higher than 2000 levels by the end of this century.

Vulnerability to Sea Level Rise

According to historical hazard data and hazard mapping, sea level rise is occurring in the Sacramento County Planning Area. The whole of the District is at some measure of vulnerability to increased flooding and inundation of land areas from sea level rise.

The 2024 Sacramento County CAP noted that while many of the potential impacts associated with sea level rise are similar to those with flooding, sea level rise presents additional potential impacts, such as saltwater intrusion, which can affect the quality of the region's water supplies, especially when coupled with increased municipal and agricultural demand for freshwater.

Sea level rise can be exacerbated during king tides. King tides are simply the very highest tides. They are naturally occurring, predictable events. King tides of today may give an idea of future normal conditions that may occur due to sea level rise. High tides may coincide with heavy rain causing increased flooding, bluff erosion, and landslides, such as were experienced during the 1998 and 2016 El Nino storms. The 2023 California State Hazard Mitigation Plan noted that coupled with increased frequency, severity, and duration of high tide and storm events related to climate change, sea level rise will exacerbate these extreme

events along the coast and other affected areas. These events may expose coastal and other areas to severe flooding and erosion; damage to structures, real estate, public access, and habitat areas; and seawater intrusion into Delta areas and coastal aquifers. El Niño events exacerbate storms and sea level rise inundation above that already occurring due to sea-level rise and normal coastal weather and tidal patterns.

An assessment of a community's vulnerability to levee failure flooding begins with an understanding of local exposure to sea level rise. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The greatest risk to the District is sea level rise contributing to levee failure of BALMD levees (discussed above in greater detail in the Levee Failure section and in the BALMD Chapter to the Delta Annex to this LHMP Update). Climate change-related sea level rise will likely increase pressure on fragile levees.

In addition, the District noted that the 2017 Sacramento County Climate Vulnerability Assessment noted that that sea level rise will likely affect the salinity of the Sacramento-San Joaquin Delta waters. The salinity of the Sacramento-San Joaquin Delta has historically been extremely changeable. The salt content of the Delta ebbs and flows depending on the function of a variety of variables such as tides, storms, and river outflow. As California has developed, the freshwater demand has introduced an additional strain on the Delta that has affected water quality and ecosystem health. The Delta provides a freshwater source for the State Water Project and the Central Valley Project, which diverts approximately two thirds of the State's freshwater supply for agricultural and municipal purposes in Southern California.

Assets at Risk

Assets at risk from sea level rise include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All people and populations (including both District staff and the population within District boundaries) that live or work in areas prone to sea level rise are often the most vulnerable to future impacts from this hazard. Not only are the residents at risk, but their homes and contents are all at risk, compounding the impacts associated with this hazard. Certain vulnerable populations might be at greater risk to this hazard and include low income populations that cannot afford to relocate. Due to the very slow progression of this hazard, most populations located within sea level rise inundation areas should have sufficient advance notice to relocate to other areas, but not without economic impact.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. Certain assets and critical facilities in the District boundaries are at risk to sea level rise and primarily include those structures located in areas in and around the Delta area. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP. Sea level rise presents a threat to critical facilities and infrastructure. Critical infrastructure plays an immensely important role in our communities. Damage to any one of these systems can threaten public safety, wreak havoc on daily life, impact properties far from flood zones, and result in economic impacts that cascade throughout California.

Natural, Historic, and Cultural Resources

According to the 2024 CAP, rising sea levels can disrupt coastal wetlands by drowning plant species, increasing salt levels in the soil and water, and outpacing wetland's migration further inland. This puts important ecosystems in danger, threatens habitats, and leaves communities exposed to dangerous storm surge. Without wetlands and other critical ecosystems, many species could lose their homes or become extinct. Large flood events exacerbated by sea level rise can affect natural, historic, and cultural resources. Any of these resources that fall in the sea level rise scenarios shown on Figure 14-6, Figure 14-7, or Figure 14-8 would be vulnerable.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the District include the following:

- Climate change is likely to exacerbate future sea level rise conditions and associated impacts and vulnerability of the County. This was discussed in greater detail in the Climate Change and Sea Level Rise section of the Hazard Profile above
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect sea level rise flooding and associated impacts to the District. Additional development in coastally influenced areas traditionally leads to additional flooding. However, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. The 2024 CAP noted that guiding development out of areas vulnerable to sea level rise will reduce future flooding impacts to people and property. The District should work closely with the County and cities in which it is located to determine how and where to expand District assets to avoid placing future development in harms way.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely

Vulnerability–Medium

Hazard Profile

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. Wind often accompanies these storms; hail and lightning are rare in the District. In recent years, heavy rain and storms have been compounded by more frequent and higher intensity atmospheric river events. Rain on snow events occurring in the upper elevations can also be significant and contribute to greater downstream runoff and flooding during large storm events.

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 and storms. Most of the severe rains occur during the fall, winter, and spring months in the District as discussed below (with problem flooding areas associated with heavy rains and storms shown in **Error! Reference source not found.** in the Flood: Localized Stormwater section). 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. Hail and lightning are rarer in the District and Sacramento County. Duration of severe storms in the District can range from minutes to hours to days. According to the WRCC, average annual precipitation in the County is 18.15 inches per year. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

Disaster Declaration History

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This contributes to many of the federal disaster declarations related to flooding. Disaster declarations from flooding are shown on Table 14-10, many of which likely affected the District.

Table 14-10 Sacramento County – State and Federal Disaster Declarations from Flood (Heavy Rain and Storms) 1950-2025

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	26	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times), 2022*, 2023 (three), 2024 (twice)	18	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times), 2023 (three times)*, 2024*

Source: Cal OES, FEMA

NCDC Events

The NCDC data recorded 9 hail, 29 heavy rain, 1 lightning, and 2 winter storm weather incidents for Sacramento County since 1950. Winter weather events tend to be rain in the County.

DR-GHAD Events

In 2023, intense rainfall in the District caused the City of Isleton wastewater treatment ponds to fail.

Climate Change and Heavy Rains and Storms

It is likely that climate change will increase the chance of future occurrence as well as future impacts from heavy rains and storms. More information on future impacts to the District can be found in the Future Conditions/Future Development section of the Vulnerability Assessment below.

According to the 2024 CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is unlikely that hail will become more common in Sacramento County and the DR-GHAD. The amount of lightning is not projected to change.

Cal-Adapt noted that, on average, the projections show little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. Cal-Adapt modeled scenarios are shown in Section 4.3.4 of the Base Plan.

According to the 2024 CAP, the County is projected to experience a steady increase in average annual precipitation through the end of the century, with much of that precipitation likely to occur during extreme precipitation events, which can lead to flood impacts. According to Cal-Adapt, the historic average annual precipitation in Sacramento County is 18.3 inches, and the historic average annual number of extreme

precipitation events is four. As shown in Section 4.3.4 of the Base Plan, the average annual precipitation across the County may rise upwards of 22 inches, with the number of extreme precipitation events potentially exceeding 7 per year by the end of the century, depending on the level of current and future GHG emissions.

Vulnerability to Heavy Rain and Storms

Heavy rain and severe storms are among the most frequent type of severe weather occurrences in the District. These events can cause both significant and localized flooding. Flooding can be worse during times where the ground is already saturated. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District, but also can cause damage, with lightning occasionally igniting wildfires.

The whole of the District is at some measure of vulnerability to heavy rain and storms. An assessment of a community's vulnerability to heavy rains and storms begins with an understanding of local exposure to heavy rain and storms. This is included in the Local Concerns section below followed by a discussion of the District's Assets at Risk to this hazard.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

The District noted that heavy rains and storms cause localized flooding in the District. Severe weather causes excessive inflow and infiltration into the collapsed and broken wastewater collection system. It surcharges onto low lying areas and floods homes. It also overflows the wastewater treatment ponds.

Assets at Risk

Assets at risk from heavy rain and storms include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

All populations (including vulnerable populations) in the District (including District staff and those within its boundaries) have some measure of risk to heavy rains and storms. Those populations that work or recreate outside and unhoused individuals are more vulnerable to impacts from heavy storm events. Heavy rains and storms occur every year and do not generally cause significant adverse impacts to individuals; it is the secondary hazard, flooding, which poses the biggest impact to people. Populations at risk to flooding resulting from heavy rains and storm events include those who live in floodplains (discussed in further detail in the Flood: 1%/0.2% Annual Chance and Levee Failure section above) and those who live in and near localized flooding areas (discussed in further detail in the Flood: Localized Stormwater Flooding section above).

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, in its boundaries, heavy rain and storms can affect critical facilities and infrastructure during large events. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP. Structures built to modern building codes are built to withstand heavy rains and storms (including thunderstorm winds and lightning); older structures may be more vulnerable. During a heavy storm, localized flooding may cause water intrusion into buildings from the outside. Trees can be downed causing impacts to structures. Older homes and buildings may be at increased risk to heavy rains and storms. Power outages during severe storm events can occur, impacting the use of structures until the power is back online. Local roads, streets, and bridges can be impacted resulting in closures restricting traffic flow in the District. In certain areas, large storms can cause erosion and localized landslides which can impact affected facilities.

Natural, Historic, and Cultural Resources

Large rain and storm events and associated flooding can affect natural, historic, and cultural resources. Silt and sediment can damage natural areas. Trees can be uprooted and downed by high winds. Extended periods of rainfall can erode natural banks along waterways and degrade soil stability for terrestrial species. While some natural systems can be adversely impacted during these large storms, heavy rain events can also provide benefits. Groundwater and wetland areas can be recharged and water supplies replenished. Historic and cultural resources may also be affected. Generally, the impacts are associated with damage to structures affected by large storm events, but other cultural resources such as those associated with Native Americans and old tribal areas can also be disturbed, damaged, and lost during extreme rain and storm and events.

Impacts from Heavy Rain and Storms

Impacts from heavy rains and storms include damage to property, critical facilities and infrastructure, and the natural landscape. This includes: erosion; downed trees; damaged utility structures and infrastructure; power outages; road damage and blockages; and even lightning strikes to critical infrastructure and people. Lightning can also cause wildfires and urban fires to occur. Landsliding and erosion occur when the soil on slopes becomes oversaturated and fails. Climate change may cause these impacts to worsen.

Actual damage associated with the primary effects of severe storms and heavy rains has been somewhat limited. It is the secondary hazards caused by these severe weather events, such as floods, landslides, and erosion that would likely have the greatest impact.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the District include the following:

- Climate change is likely to exacerbate future heavy rain and storm conditions and associated impacts and vulnerability of the District to flooding. This was discussed in greater detail in the Climate Change and Heavy Rains and Storms section of the Hazard Profile above.
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect heavy rains and storm and associated impacts to the District. In addition, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. Building codes in the City ensure that new development is built to current building standards, which should reduce the risk to future development in the District from heavy rains and storms.

Subsidence

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile

Subsidence is the gradual settling or sinking of the earth’s surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. According to the Sacramento County 2022 General Plan Background Report, Sacramento County is affected by five types of subsidence: liquefaction caused by earthquake shaking, compaction by heavy structures, the erosion of peat soils, peat oxidation, and fluid withdrawal. Groundwater extraction for residential, commercial and agricultural uses causes the greatest amount of subsidence in Sacramento County. . Because Brannon Andrus Island is heavily subsided, it will take months for the floodwater to be pumped out of the island in the event of a levee failure. Subsidence is also impacting the stormwater collection system within the community. Exacerbating the flooding associated with heavy rains.

Location and Extent

In Sacramento County, the western and southwestern portions of the County are prone to some level of subsidence, with the Delta area (including the DR-GHAD and City of Isleton) at high risk of subsidence. These areas were shown in the Section 4.3.16 of the Base Plan. There is no scientific scale used to measure subsidence. Subsidence is measured in inches or feet of elevation over time. Speed of onset of subsidence is slow, with rates of change often less than 1" to 2" per year. The duration of subsidence is long, as it is rare for subsidence to be reversed.

Past Occurrences

Disaster Declaration History

There have been no state or federal disaster declarations for subsidence in Sacramento County.

NCDC Events

The NCDC does not contain any subsidence events for Sacramento County.

DR-GHAD Events

There have been no subsidence events that have impacted the DR-GHAD.

Climate Change and Earthquake

Changes in precipitation, reduced snowpack, and more frequent droughts are likely to increase the demand on groundwater sources, risking overdraft, ground subsidence, and decreased water quality. Climate change may further contribute to subsidence in the County, by increasing evapotranspiration rates for agriculture and other vegetation and by increasing periods of drought, both of which can increase demand for water, accelerate groundwater pumping and the drilling of new groundwater wells and lead to further lowering of the groundwater table and increasing subsidence.

Vulnerability to Subsidence

Historically, the District has been at risk from subsidence. Subsidence in the District, City of Isleton, and larger Delta is an ongoing concern. According to the Sacramento County 2022 General Plan Background Report, subsidence has created major problems for flood control, particularly in the Delta. As levees sink under their own weight and are weakened by the erosive force of water, expensive periodic rebuilding is necessary. According to the California Department of Water Resources, the Sacramento-San Joaquin Delta's peat soils are subsiding at an estimated 0.4 to 0.6 inches per year. However, according to USGS estimates, developed islands in the Central and Western Delta are subsiding at 1-2 inches per year on average. Many islands in the Delta that, at one time, were at or above sea level are now between 10 and 25 feet below sea level.

The whole of the District is at some measure of vulnerability to subsidence. An assessment of a community's vulnerability to subsidence begins with an understanding of local exposure to subsidence. This is included in the Local Concerns section below. After that section, assets at risk are discussed.

Local Concerns

The District has specific concerns and unique vulnerabilities regarding this hazard. These concerns form a portion of the basis for the mitigation strategy and mitigation actions that seek to reduce risk and vulnerability to this hazard.

Subsidence poses a particular concern for the District because of its direct effect on levee performance. The land protected by the levees surrounding Isleton, like much of the Delta, has subsided significantly below the surrounding river and slough levels as a result of over a century of drainage and the oxidation and compaction of the underlying peat soils. This process continues today, gradually increasing the elevation difference between the water surface outside the levees and the ground surface within the protected community. As this difference grows, so does the hydraulic head against the levees, increasing the pressure that drives underseepage and through-seepage and raising the long-term likelihood of levee failure. Subsidence therefore does not create a hazard on its own so much as it steadily worsens the District's existing vulnerability to levee failure, compounding the effects of high river flows, sea level rise, and seismic activity discussed elsewhere in this section.

Assets at Risk

Many assets in the District are at risk to ground shaking and other earthquake related impacts. Assets at risk from earthquake include people and populations; District assets and critical facilities and infrastructure); and natural, historic, and cultural resources. These are discussed in the following sections.

People and Populations

People and populations in the District boundaries are at limited risk from direct effects of subsidence. However, subsidence that affects levees surrounding the District could have secondary impacts if levees overtop or fail due to subsidence. All people and populations located in the levee protected areas are at some risk to flooding. Certain vulnerable populations located within areas prone to flooding may be at increased risk to this hazard, especially during a large event with minimal advance notice. These vulnerable populations include: the unhoused, those with limited mobility, and those that lack the resources to leave the area.

District Assets and Critical Facilities and Infrastructure

The District owns no assets that would be at risk to this hazard. However, some structures and critical facilities and infrastructure in the area served by the District have some measure of risk to subsidence, depending on the severity and location of the event. These are discussed in the City of Isleton and BALMD chapters of the Delta Annex to this LHMP.

Natural, Historic, and Cultural Resources

The largest of California's drinking water sources is the Sacramento-San Joaquin Delta and its tributaries. Land subsidence of Delta islands indirectly affects the north-to-south water transfer system, which is predicated on the available water supply (annual inflows to the Delta), the viability of aquatic species populations, and acceptable water quality in the southern Delta. The statewide water-transfer system in

California is so interdependent that decreased water quality in the Delta, whether due to droughts or levee failures, might lead to accelerated subsidence in areas dependent on imported water from the Delta.

The Delta provides at least a portion of the water supply for about two-thirds of California's population, and provides a migratory pathway for four fish that are listed as endangered or threatened pursuant to the federal Endangered Species Act. Subsidence causing saltwater intrusion could affect this water supply. Any historic or cultural resources located in or near a leveed area at risk to subsidence would be at risk to flood related damages should a levee overtop or fail due to subsidence.

Impacts from Subsidence

According to Sacramento County, the City of Isleton and the subsided islands of the Sacramento-San Joaquin Delta are perpetually at risk of flooding in the event of levee breaks or overtopping and many have flooded in the past, causing millions of dollars in damage. As subsidence progresses, the levees must be regularly maintained and periodically raised and strengthened to support the increasing stresses on their banks. Delta island flooding can also interfere with freshwater exports from the Delta.

Subsidence has caused impacts on critical water infrastructure, including reduced conveyance capacity in local, State, and federal conveyance facilities, reduced levee heights, and damaged well casings. Throughout California, subsidence has damaged buildings, aqueducts, well casings, bridges, and highways.

As the land sinks, it can experience increased flooding and adverse impacts on sewer lines and stormwater drainage. As subsidence progresses, areas protected by levees are impacted. The levees in the Sacramento-San Joaquin Delta must be regularly maintained and periodically raised and strengthened to support the increasing stresses on them that result when the Delta islands subside. Compaction of the aquifer system may permanently decrease its capacity to store water. Subsidence can lead to damage to critical infrastructure and facilities.

Impacts to identified assets at risk to this hazard and the overall vulnerability of the District may be affected in the future by climate change (which was discussed in the hazard profile section above), changes in population patterns, and changes in land use and development. The influencing effects of these factors on this hazard are discussed further in the Future Conditions/Future Development discussion below.

Future Conditions/Future Development

This section provides a discussion of how future conditions will influence or affect the hazard over time and also discusses future development relative to each hazard.

Future Conditions

Future conditions may be affected by climate change, changes in population patterns (migration, density, or the makeup of socially vulnerable populations), and changes in land use and development. Findings on this for the District include the following:

- Climate change is likely to exacerbate future sea level rise conditions and associated impacts and vulnerability of the County. This was discussed in greater detail in the Climate Change and Subsidence section of the Hazard Profile above
- Population projections within the jurisdictional boundaries of the District show the population to be flat or slightly declining. It is unknown how population patterns and demographics will change in the near future. The District may add staff, but this number would be small. The District noted that it has no control over population changes within its jurisdictional boundaries. With no notable changes in populations numbers and makeup, the vulnerability of the District to this hazard is unlikely to change.
- Changes in land use and development in the District are expected to be limited in the near future and thus are not likely to affect subsidence and associated impacts to the District. Additional development in known subsidence areas traditionally leads to additional problems. However, adherence to protective building codes for new development will assist in limiting future impacts and associated vulnerabilities of the District to this hazard.

Future Development

The District owns no buildings and has no plans to acquire or develop new properties or add structures to support District objectives. Further, the District noted that it has no control over future development within its boundaries. Responsibility for growth and development within District boundaries resides with the City of Isleton. The City will need to ensure that comprehensive land use planning is conducted, regulatory requirements, such as building codes, are followed, and varying needs for different demographic groups with intersecting identities that reside within the County are considered can help to make for a more resilient community.

14.5 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.

14.5.1. Regulatory Mitigation Capabilities

Table 14-11 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 DR-GHAD.

Note: The District does not have the authority to regulate land use and development within its jurisdiction. Authority for promulgating and enforcing zoning, land use, and development requirements falls to counties and incorporated communities. As such development within the District’s jurisdictional boundaries will conform to the zoning and land use development ordinances and building codes of the county or incorporated community in which the District is located.

Table 14-11 DR-GHAD's Regulatory Mitigation Capabilities

Plans	In Place Y/N	Does the plan address hazards? Can the plan be used to carry out mitigation actions? When was it last updated??
Capital Improvements Plan	NA	
Climate Change Adaptation Plan	NA	
Community Wildfire Protection Plan	NA	
General Plan/Comprehensive Plan/Master Plan	NA	
Continuity of Operations Plan	NA	
Economic Development Plan	NA	
Land Use Plan	NA	
Local Emergency Operations Plan	NA	
Stormwater Management Plan	NA	
Transportation Plan	NA	
Other		
		Is the ordinance an effective way to reduce hazard impacts?
Land Use Planning and Ordinances	Y/N	Is the ordinance adequately administered and enforced?
Acquisition of land for open space and public recreation use	NA	
Building code	NA	
Flood insurance rate maps	NA	
Floodplain ordinance	NA	
Natural hazard-specific ordinance (stormwater, steep slope, wildfire)	NA	
Subdivision ordinance	NA	
Zoning ordinance	NA	
Other	NA	
How can these capabilities be expanded and improved to reduce risk?		
The District has none of these capacities. The only expansion is for the District to continue to work with Isleton and the County, who provide these planning and regulatory capabilities in the areas in which the District operates.		

Source: DR-GHAD

14.5.2. Administrative/Technical Mitigation Capabilities

Table 14-12 identifies the District department(s) responsible for activities related to mitigation and loss prevention in the DR-GHAD.

Table 14-12 DR-GHAD's Administrative and Technical Mitigation Capabilities

Administration	In Place Y/N	Describe capability Is coordination effective?
Staff		Is staffing adequate to enforce regulations?
		Is staff trained on hazards and mitigation?
		Is coordination between agencies and staff effective?
Chief Building Official	NA	
Civil Engineer, including dam and levee safety	NA	
Community Planner	NA	
Emergency Manager	NA	
Floodplain Administrator	NA	
GIS Coordinator	NA	
Planning Commission	NA	
Other	NA	
Technical	Y/N	Has capability been used to assess/mitigate risk in the past?
Grant writing	NA	
Hazard data and information	NA	
GIS analysis	NA	
Mutual aid agreements	NA	
Other	NA	
How can these capabilities be expanded and improved to reduce risk?		
The District has none of these capacities. The only expansion is for the District to continue to work with Isleton and the County, who provide these administrative and technical capabilities in the areas in which the District operates.		

Source: DR-GHAD

14.5.3. Fiscal Mitigation Capabilities

Table 14-13 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 14-13 DR-GHAD's Fiscal Mitigation Capabilities

Funding Resource	In Place 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	NA	
Community Development Block Grant	NA	
Federal funding programs (non-FEMA)	NA	

Funding Resource	In Place 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	NA	
Impact fees for new development	NA	
State funding programs	Y	Funding was used to purchase a \$2.5M parametric flood insurance policy.
Stormwater utility fee	NA	
Other	NA	
How can these capabilities be expanded and improved to reduce risk?		
The District is seeking additional funding to expand the parametric flood insurance policy pool.		

Source: DR-GHAD

14.5.4. Mitigation Education, Outreach, and Partnerships

Table 14-14 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 14-14 DR-GHAD's Mitigation Education, Outreach, and Partnerships

Program/Organization	In Place Y/N	How widespread are each of these in your community?
Community newsletters	N	
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs, public events)	Y	The Delta Region GHAD hosted a Flood Awareness Week Event at the Courtland Schoolhouse during flood awareness week. It was supported by DWR, the Delta Protection Commission, the Delta Stewardship Council, Sacramento County, the engineering firms of KSN, ENGEO, and EPIC Brokers
Local news	Y	There have been several news articles on the Delta Region GHAD.
Organizations that interact with underserved and vulnerable communities	Y	The DR-GHAD participated in a Delta Stewardship Council Science for Communities program that resulted in a storyboard displaying possible hotel locations for emergency evacuation.
Social media		
How can these capabilities be expanded and improved to reduce risk?		
Additional expansion of these programs will be pursued, and additional funding sources sought.		

Source: DR-GHAD

14.5.5. Other Mitigation Efforts

Mitigation is most often understood as physical measures that reduce the likelihood or severity of a hazard event, such as levee improvements, ground stabilization, or drainage upgrades. These measures remain the District's highest priority. However, FEMA's own definition of mitigation, sustained actions that reduce or eliminate long-term risk to people and property, is broader than physical hazard reduction alone. Risk depends not only on the probability and severity of a hazard event, but on a community's capacity to recover from it. A community that cannot finance its own recovery can suffer permanent, irreversible losses even from an event that structural mitigation has already reduced in likelihood.

This is a direct concern for the District. As discussed elsewhere in this plan, a levee failure protecting the town of Isleton would inundate the community for an extended period, and few residents or businesses in the town carry insurance adequate to fund rebuilding afterward. Without a mechanism to provide rapid, reliable funding after a disaster, a catastrophic event could result in the permanent loss of the community, regardless of how well the levees themselves perform. The District's experience with the 2022 wastewater pond failure illustrates this same vulnerability at a smaller scale: the City was forced to take out a loan to bridge the gap while awaiting FEMA reimbursement, a gap that, years later, remains unresolved and has left the City in a precarious financial position.

To address this gap, the District, in partnership with the Delta Region GHAD, has developed a community-based insurance pilot program. The program is designed to provide the community with a dedicated, pre-arranged source of funds following a disaster, rather than relying on ad hoc borrowing or delayed federal reimbursement. By ensuring that recovery funding is available quickly and reliably, the program reduces the likelihood that a hazard event, even one for which structural defenses have already been strengthened, results in the community's permanent decline. On this basis, the District considers the community-based insurance program a mitigation measure in its own right: it does not reduce the probability of a hazard event, but it directly reduces the community's vulnerability to that event's long-term, potentially catastrophic consequences. Expanding this program to additional communities within the District is identified as a mitigation action in this plan.

14.6 Mitigation Strategy

14.6.1. Mitigation Goals and Objectives

The DR-GHAD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

14.6.2. NFIP Mitigation Strategy

The District does not participate in the NFIP, as it is not an eligible participant. Some of the District's projects work to reduce impacts from flooding thus furthering the objectives of the NFIP.

14.6.3. Mitigation Actions

The Planning Team for the DR-GHAD 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, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Drought & Water Shortage (w/tree mortality)
- Earthquake (w/subhazards)
- Flood: 1%/0.5%/0.2% annual chance
- Flood: Localized Stormwater
- Levee Failure
- Sea Level Rise
- Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind)
- Subsidence

Low priority hazards for mitigation planning include:

- Aquatic Nuisance Species (plant/animal)
- Climate Change
- Landslide, Mudslide, Debris Flow
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: High Winds and Tornadoes
- Wildfire (with smoke and air quality)

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 and jurisdictions regardless of hazard priority. Collectively, this LHMP's 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 each jurisdiction has focused on identifying those mitigation actions and projects to address their priority hazards, which are both realistic and reasonable for them to implement for this 5-year planning process, and would like to preserve their right to modify hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement. The participating jurisdictions are not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the jurisdictions to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the mitigation categories and criteria contained in Appendix C.

Mitigation Actions

The District has put forward the actions as shown in Table 14-15. Details of the actions can be found below the table. **FOR ITEMS IN YELLOW, FILL OUT THE MITIGATION ACTIONS BELOW.**

Table 14-15 DR-GHAD Mitigation Actions

Action Title	New Action/ Previous Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 1. Expand efforts to provide community based flood insurance.	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 2. Obtain funding to support the long-term management of the DR-GHAD.	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 3. Conduct education and outreach to the community on new options for flood insurance.	New Action	X	X	X	Prevention Property Protection Natural Resource Protection
Action 4. Provide support to the City of Isleton and BALMD in efforts to obtain funding for levee maintenance.	New Action	X	X	X	Prevention Property Protection Natural Resource Protection
Action 5. Continue efforts to expand the community based insurance program to the entire Delta	New Action	X	X	X	Prevention Property Protection Natural Resource Protection

Action 1. Expand efforts to provide community based flood insurance.

Hazards Addressed: Multi-hazard (Dam Failure, Drought & Water Shortage (w/tree mortality), Earthquake (w/subhazards), Flood: 1%/0.5%/0.2% annual chance, Flood: Localized Stormwater, Levee Failure, Sea Level Rise, Severe Weather: Heavy Rains and Storms (Hail, Lightning, Wind), Subsidence)

Goals Addressed: 1, 2, 3, 4, 5, 6, 7

Issue/Background (Problem Statement): The DR-GHAD's community-based insurance pilot, developed in partnership with the Delta Region GHAD, has demonstrated a viable model for increasing financial resilience to catastrophic flood loss. Expanding this program into Isleton would materially reduce the community's exposure to an uninsured, unrecoverable loss following a levee failure. However, expansion requires sustained local partnership and community engagement that the District, as an outside special district, cannot provide on its own. The District currently lacks a functioning community advisory structure in Isleton: board seats have gone unfilled, and the District has been unable to sustain the local governmental partnership and community outreach necessary to move the program forward. Without a stable local partner

and a functioning board, the District cannot effectively design or administer an expanded program in this community.

Project Description: Rebuild the local governance and outreach capacity needed to support expansion of the community-based insurance program into Isleton. This includes recruiting and supporting community members to serve on the relevant advisory board, providing training and technical assistance to new board members, and, where direct engagement with City staff is not productive, conducting outreach through community organizations, local business associations, and residents directly. The District will also seek a neutral third party, such as Sacramento LAFCo, DWR, or a professional facilitator, to help establish a durable working relationship with the City of Isleton.

Other Alternatives: Prioritize expansion of the community-based insurance program in other DR-GHAD communities where local governmental partnership and board participation are functioning, and revisit Isleton expansion when local conditions allow. Alternatively, pursue expansion through a County or State intermediary rather than direct City partnership.

Existing Planning Mechanism(s) through which Action Will Be Implemented: DR-GHAD's ongoing community-based insurance initiative with the Delta Region GHAD; DR-GHAD board recruitment and outreach processes.

Responsible Office/Partners: DR-GHAD Board and staff; Delta Region GHAD; Sacramento LAFCo; California Department of Water Resources; local community organizations in Isleton.

Benefits (Losses Avoided): A functioning local partnership is a prerequisite for expanding insurance coverage into Isleton, which would reduce the risk of an unrecoverable, catastrophic financial loss to residents and the community following a levee failure. Rebuilding local governance capacity also improves the District's ability to coordinate future mitigation and emergency response actions in the community.

Potential Funding (Local Budgets, Grant Funds, etc.): HMGP planning funds; DWR grant programs supporting local capacity building; foundation or technical assistance grants for governance and community engagement.

Timeline: Ongoing; governance capacity building is expected to take five before program expansion can proceed.

Project Priority (High, Medium, Low): High

Action 2. *Obtain funding to support the long-term management of the DR-GHAD.* **FILL OUT**

Hazards Addressed:

Goals Addressed: 1, 2, 3, 4, 5, 6, 7

Issue/Background (Problem Statement):

Project Description:

Other Alternatives:

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office/Partners:

Benefits (Losses Avoided):

Potential Funding (Local Budgets, Grant Funds, etc.):

Timeline:

Project Priority (High, Medium, Low):

Action 3. Conduct education and outreach to the community on new options for flood insurance.
FILL OUT

Hazards Addressed:

Goals Addressed: 1, 2, 3, 4, 5, 6, 7

Issue/Background (Problem Statement):

Project Description:

Other Alternatives:

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office/Partners:

Benefits (Losses Avoided):

Potential Funding (Local Budgets, Grant Funds, etc.):

Timeline:

Project Priority (High, Medium, Low):

Action 4. Provide support to the City of Isleton and BALMD in efforts to obtain funding for levee maintenance. **FILL OUT**

Hazards Addressed:

Goals Addressed: 1, 2, 3, 4, 5, 6, 7

Issue/Background (Problem Statement):

Project Description:

Other Alternatives:

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office/Partners:

Benefits (Losses Avoided):

Potential Funding (Local Budgets, Grant Funds, etc.):

Timeline:

Project Priority (High, Medium, Low):

Action 5. Continue efforts to expand the community based insurance program to the entire Delta.
FILL OUT

Hazards Addressed:

Goals Addressed: 1, 2, 3, 4, 5, 6, 7

Issue/Background (Problem Statement):

Project Description:

Other Alternatives:

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Office/Partners:

Benefits (Losses Avoided):

Potential Funding (Local Budgets, Grant Funds, etc.):

Timeline:

Project Priority (High, Medium, Low):