2024 Local Hazard Mitigation Plan

Twentynine Palms Water District

Hazard Mitigation Plan Update

Date of Districts Board Approval: XX-XX-XXXX

FEMA Approval Date: XX-XX-XXXX

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SECTION 1. INTRODUCTION

The LHMP update is a "living document" that should be reviewed, monitored, and updated to reflect changing conditions and new information. As required, the LHMP must be updated every five (5) years to comply with regulations and Federal mitigation grant conditions. In that spirit, this Local Hazard Mitigation Plan (LHMP) is an update of the Twentynine Palms Water District Hazard Mitigation Plan under review by FEMA.

1.1 PURPOSE OF THE PLAN

Hazard mitigation intends to reduce and eliminate loss of life and property. FEMA defines hazard mitigation as "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards." A "hazard" is defined by FEMA as "any event or condition with the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, environmental damage, business interruption, or other loss."

The Local Hazard Mitigation Plan aims to demonstrate the plan for reducing and eliminating risk in the Twentynine Palms Water District's service area. The LHMP process encourages communities to develop goals and projects to minimize risk and build a more disaster-resilient community by analyzing potential hazards.

After disasters, repairs, and reconstruction are often completed in such a way as to restore to pre-disaster conditions simply. Such efforts expedite a return to normalcy; however, restoring things to pre-disaster conditions sometimes results in feeding the disaster cycle: damage, reconstruction, and repeated damage. Mitigation is one of the primary phases of emergency management, specifically dedicated to breaking the cycle of damage. Hazard mitigation is distinguished from other disaster management functions by measures that make TPWD infrastructure development and the natural environment safer and more disaster resilient. Mitigation generally involves the alteration of physical environments, significantly reducing risks and vulnerability to hazards by altering the built environment so that life and property losses can be avoided or reduced. Mitigation also makes responding to and recovering from disasters easier and less expensive.

Also, with an approved (and adopted) LHMP, Twentynine Palms Water District is eligible for federal disaster mitigation funds/grants (Hazard Mitigation Grant Program, Pre-Disaster Mitigation, and Flood Management Assistance) aimed to reduce and eliminate risk.

1.2 AUTHORITY

In 2000, FEMA adopted revisions to the Code of Federal Regulations. This revision is the "Disaster Mitigation Act (DMA)." DMA 2000, Section 322 (a-d) requires that local governments, as a condition of receiving federal disaster mitigation funds, have a Hazard Mitigation Plan that describes the process for assessing hazards, risks, and vulnerabilities, identifying and prioritizing

mitigation actions, and engaging/soliciting input from the community (public), key stakeholders, and adjacent jurisdictions/agencies.

Senate Bill No. 379 will, upon the next revision of a local hazard mitigation plan on or after January 1, 2023, or, if the local jurisdiction has not adopted a regional hazard mitigation plan, beginning on or before January 1, 2028, require the safety element to be reviewed and updated as necessary to address climate adaptation and resiliency strategies applicable to that city or county.

The Twentynine Palms Water District is a consolidated independent Special District formed in and operating under the provisions of the Twentynine Palms Water District Law. The legal authority for Twentynine Palms Water District is outlined in Division 12 of the Water Code in the State of California, section 30000 et. seq. The District is governed by a five (5) member Board of Directors, elected at-large from within the District's service area. The General Manager administers the District's day-to-day operations by policies and procedures established by the Board of Directors. The Board of Directors employs a General Manager and a Financial Consultant. The General Manager employs a District Secretary, Maintenance Superintendent, Office Manager, and Treatment/Production Superintendent. There are 19 full-time non-management employees in the District.

TPWD does not have legal authority for zoning, land use, new construction, planning, building inspections, or codes.

1.3 WHAT'S NEW

The 2018 Twentynine Palms Water District Local Hazard Mitigation Plan contained a detailed description of the planning process, a risk assessment of identified hazards for the TPWD Service Area, and an overall mitigation strategy for reducing the risk and vulnerability from these hazards. Since the approval of the plan by FEMA, TPWD has made progress on the mitigation strategy. As part of this 2023 LHMP update, a thorough review and update of the 2018 plan was conducted to ensure that this update reflects current conditions and priorities to realign the overall mitigation strategy for the next five-year planning period. This section of the plan includes the following:

What's New in the Plan Update. This section provides an overview of the approach to updating the plan and identifies new analyses, data, and information included in this Plan update to reflect current service area conditions. This consists of a summary of new hazard and risk assessment data related to the TPWD Service Area and information on current and future development trends affecting infrastructure vulnerability and related issues. The updated data and analyses are in their respective sections within this 2023 LHMP update.

Summary of Significant Changes to Current Conditions and Hazard Mitigation Program Priorities. This section summarizes significant changes in current conditions, changes in vulnerability, and any resulting modifications to the community's mitigation program priorities.

2018 Mitigation Strategy Status and Successes. This section describes the status of mitigation actions from the 2018 plan. It indicates whether a project is no longer relevant or is recommended for inclusion in the updated 2023 mitigation strategy.

This What's New section provides documentation of TPWD Service Area's progress or changes in their risk and vulnerability to hazards and their overall hazard mitigation program. Completing this 2023 LHMP Update further provides documentation of the TPWD's continued commitment and engagement in the mitigation planning process.

1.4 NEW RISK ASSESSMENT

As part of its comprehensive review and update of each plan section, TPWD recognized that updated data, if available, would enhance the analysis presented in the risk assessment and be utilized in developing the revised mitigation strategy. Highlights of new data used for this Plan Update are identified below and sourced in context within **Section 4**, Risk Assessment. Specific data used is sourced throughout this plan document. This new data and associated analysis provided valuable input for developing the mitigation strategy presented in **Section 5** of this plan. A highlight of new information and analyses contained in this plan update includes the following:

- A new assessment of updated hazards affecting the TPWD Area was completed, resulting in additional hazards added to planning documents;
- An entire rework of the risk assessment for each identified hazard. This included reworking the hazard profile and adding new hazard event occurrences; redoing vulnerability as the whole analysis to add items identified below and updating the vulnerability assessment based on more recent hazard data;
- The flood hazard analysis will be updated to include an analysis of the 100-year flood and an analysis of the 500-year flood, including the new and updated DFIRMs;
- An enhanced vulnerability assessment.

This LHMP update utilized the new 2020 Census data, which was incorporated and analyzed. Census data was used in an intersect analysis to determine how much of the population is exposed to flood, drought and earthquake hazards.

1.5 SUCCESSFUL MITIGATION IMPLEMENTATION

TPWD has completed a review of past seismic retrofit studies and has applied the studies to current and future projects. TPWD participates annually in the Great California Shakeout to prepare and train employees for earthquakes.

- Flood Mitigation project at Wells 14 and 17. TPWD will be completing diversion walls around the wells. Anticipated completion in 1-2 years.

- Earthquake Mitigation at Lupine and Two Mile booster stations. The District installed two permanent backup generators.
- Mitigation of Terrorist events: District installed bulletproof glass at the front counter; Cameras installed at the District office, Fluoride Treatment Plant, and at the paymeter station. These projects were completed in 2021.
- Terrorist Event Mitigation. TPWD installed video surveillance at its critical facilities. This project is currently ongoing and will be completed in 2022.
- District installed two backup generators, one at Lupine and one at Two Mile booster stations. Completed in 2023
- Terrorist Event Mitigation. TPWD Installed security glass at the front counter of their main office as a safety precaution. This project was completed in 2021.
- Earthquake Mitigation. Purchase of generators with transfer switches in the event of power failure. This project was completed in 2024.
- Earthquake Mitigation. Standardized all emergency generator hook-ups. This project was completed in 2022.

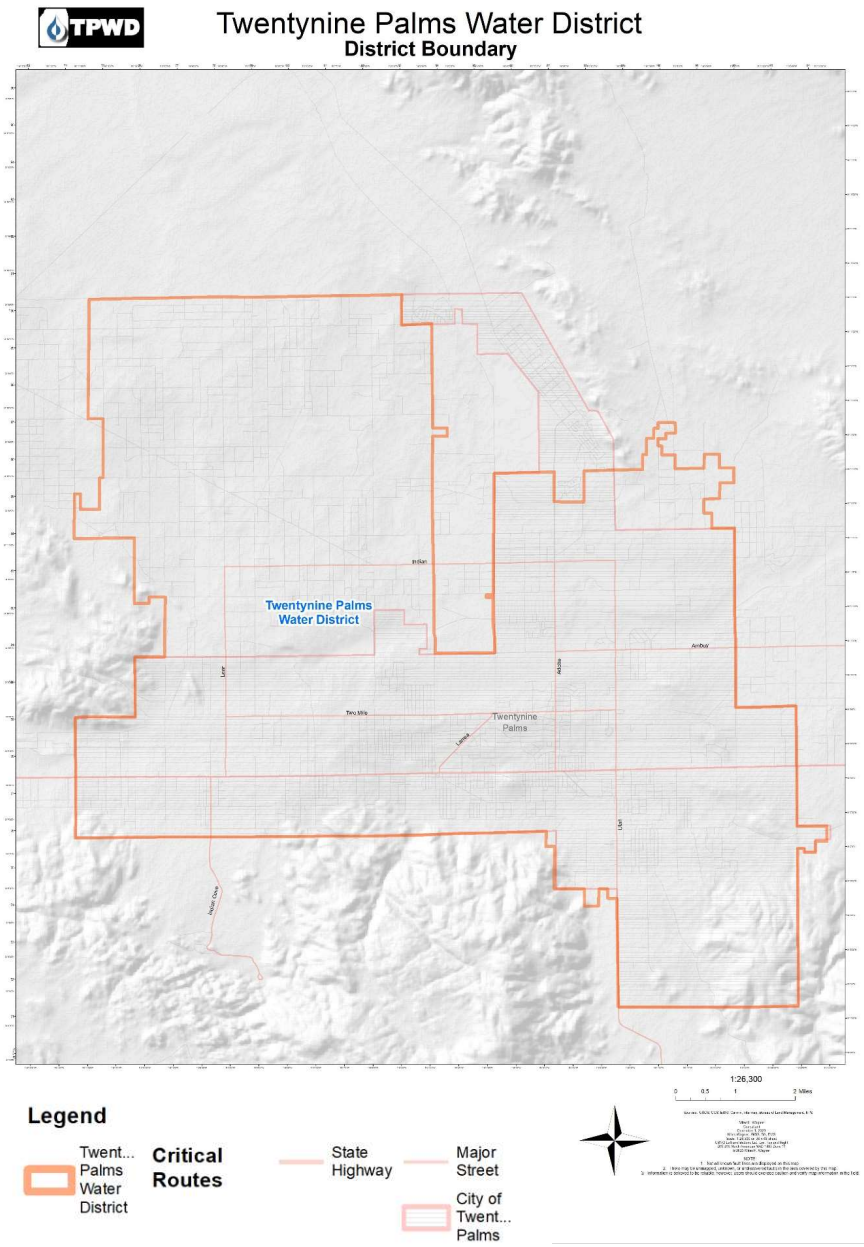
1.6 COMMUNITY PROFILE

PHYSICAL SETTING

The Twentynine Palms Water District serves Twentynine Palms, California, with water. The water services cover the City of Twentynine Palms as-well-as outlying areas in the County of San Bernardino. The District pumps water from the underground aquifer and distributes the water to the customer. The only available water supply is local ground water. The District serves a population of approximately 18,000 residents within an 87-square mile area and maintains approximately 8,250 meter services, 360 miles of pipeline, and 17-million gallons of water storage capacity. When physical operations began in 1955, the District served a population of 4,675 residents within an area of 26.7 square miles. The 1,422 meter services were fed by approximately 94 miles of leaky, undersized, and substandard pipeline. The community's water storage capacity amounted to less than 200,000 gallons.

Twentynine Palms is a unique Hi-Desert community on the southern boundary of the Mojave Desert in San Bernardino County, just north of the Little San Bernardino and Pinto Mountains. Located 54 miles northeast of Palm Springs at 2,000 feet, the area is known for its pure water, crystal clear air, and deep blue skies. It is nestled between the world's most extensive Marine Corps base, the Marine Corps Air Ground Combat Center to the north, and the Joshua Tree National Park to the south. The Oasis of Mara, a large group of springs aligned along the Pinto Mountain fault and bordering Joshua Tree National Park, is a significant archaeological site and was a water source to this area for over 4,000 years.

Figure 1. TPWD Service Map



HISTORY

The earliest settlers of Twentynine Palms were Native Americans who lived around the Oasis of Mara. By the 1870s, early American miners inspired by the Gold Rush traveled to California. They settled around the Oasis, followed by cattlemen in the 1880s who were drawn to the grasslands in the area. The Oasis provided refuge from the harsh surrounding desert environment and continued to attract settlers throughout the 1900's.

To meet growing demand, private developers created and maintained small water distribution companies, and in 1938, the first public water system was developed. More public water agencies formed over the years, and finally, in 1954, Twentynine Palms residents voted to combine the existing public utility agencies to create the Twentynine Palms County Water District **Charter**. Members of the Chamber of Commerce, known as the "water committee," spearheaded this community effort, electing the district's first governing Board of Directors: John Wuerth, John Bagley, William Hatch Jr., John Lyon, and Joseph Wasserburger.

In 1955, the District adopted three more private water companies, acquiring over 200,000 gallons of water. Before this, the community had virtually no storage system, putting the water supply at risk in the case of emergencies. From 1957 to 1969, the District focused on water storage reservoirs.

A groundwater study conducted by the Department of Water Resources in 1983 yielded harrowing results, resulting in the development of the District Master Plan. This plan addressed key issues and highlighted the need for significant infrastructure improvements. The District faced major problems: a badly deteriorating water pipeline system and unacceptably high fluoride levels. By 1984, the California State Health Department demanded that the District submit a timeline for implementing the improvements in the master plan.

With the implementation timeline submitted, funding from the Department of Water Resources and the Environmental Protection Agency allowed the District to make significant infrastructure improvements. Over the next 20 years, more than 100,000 feet of pipeline were replaced, multiple storage reservoirs were constructed, and a $1.7 million fluoride water treatment plant was built. These upgrades brought security and reliability to the Twentynine Palms water supply. In 2005, the District earned another EPA grant to assist in constructing two more 1,000,000-gallon storage reservoirs and 43,000 more feet of pipeline, providing new water storage and enhancing water reliability throughout the District. These improvements allowed the District to accept and deliver water from the fluoride removal plant to the entire area, ensuring adequate water supplies far into the future.

The District operates 1 (one) Fluoride Removal Water Treatment Plant, 11 (eleven) Reservoirs with a total 17-million-gallon storage capacity, 9 (nine) wells, 8 (eight) booster stations, and approximately 360 miles of distribution mains, all of which are prone and at risk from the effects of each identified hazard in **Section 4.3**.

Table 1 TPWD Critical Facilities

Critical Facilities	Hazard Vulnerability
Corporate Yard/ Main Office	Earthquake, Drought, Flooding, Cyber Attacks
Reservoirs (11)	Earthquake, Drought, Flooding, Cyber Attacks
Fluoride Removal Water Treatment Plant	Earthquake, Drought, Flooding, Cyber Attacks
Wells (9)	Earthquake, Drought, Flooding, Cyber Attacks
Booster Stations (8)	Earthquake, Drought, Flooding, Cyber Attacks
Pipeline (360 miles)	Earthquake, Drought, Flooding, Cyber Attacks

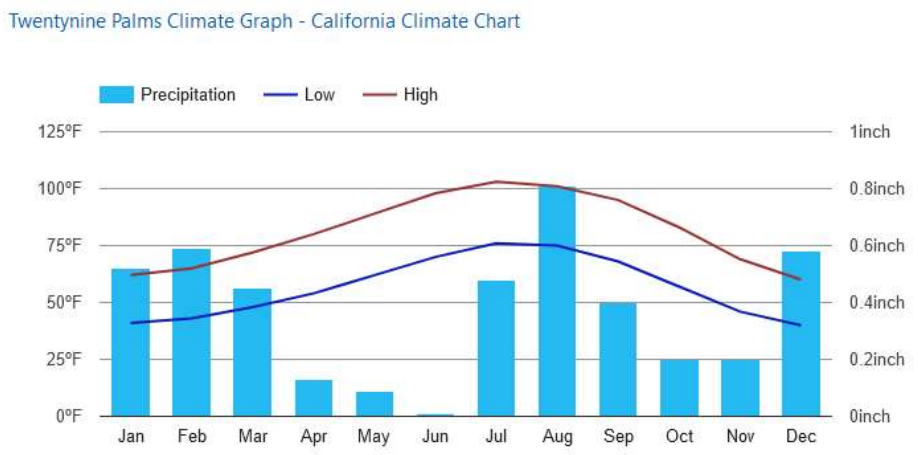
1.7 CLIMATE

The average rainfall[1] for the City of Twentynine Palms, where our Main Headquarters is located, is 0.37 of an inch. Average temperatures range from 56 to 81 degrees Fahrenheit. The region's temperate Mediterranean climate fosters moderate winters, hot summers, and generally low humidity.

Table 2. Average Max and Min Temp and Total Precipitation for the City of Twentynine Palms

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max. Temp (F)	62	65	72	80	89	98	103	101	95	83	69	60	81.4 F
Avg. Min. Temp (F)	41	43	48	54	62	70	76	75	68	57	46	40	56.6 F
Avg. Total Precipitation	0.52	0.59	0.45	0.13	0.09	0.01	0.48	0.81	0.40	0.20	0.20	0.58	0.37in.

[1] Average weather Twentynine Palms 2023 normal US Climate Data https://www.usclimatedata.com/



1.8 DEMOGRAPHICS

Demographics for our service area are based on Census 2020[2]. TPWD manages and distributes the local groundwater supply in the unique Hi-Desert community of Twentynine Palms and portions of the surrounding unincorporated areas of San Bernardino County. TPWD serves a population of approximately 18,000 residents within an 87-square-mile area. The County of San Bernardino and the City of Twentynine Palms handle underserved communities and socially vulnerable populations in emergencies. Twentynine Palms Water District serves a severely economically disadvantaged community based on the 2020 Federal Census.

Table 3. Percentage of the Population at Risk from Identified Hazards within TPWD

% of the Population at Risk from Identified Hazards	Twentynine Palms	Population Total
Population within the Service Area	18,000	18,000
Earthquake	100%	18,000

[2] Service area population from http://datausa.io

Drought	55%	9,900
Flooding	35%	6,300
Cyber Security	0%	0

1.9 EXISTING LAND USE

TPWD does not regulate land use within its service area. The City of Twentynine Palms, is responsible for land use. The existing land use is housing, commercial, and light industry. Incorporated areas are regulated by the City of Twentynine Palms and unincorporated areas by the County of San Bernardino.

1.10 DEVELOPMENT TRENDS

Development within the Twentynine Palms area reduced significantly during the housing industry crash in 2008. Twentynine Palms sees only individual custom or speculation homes being built in the area. No housing tracks are being developed in the District's sphere of influence. Home prices in the area are increasing at a much lower rate than other communities in the high desert and a much lower increase than in the State of California.

All future development that will take place is planned to occur by the General Plan Land Use Zones and will consider all potential hazards identified within this 2023 LHMP. Additionally, all developments will comply with all the county and state Fire, Flood, and Seismic codes at the time of development. There have been no development changes since the 2018 LHMP, which has affected the jurisdiction's overall vulnerability. There have been no changes to the community's priorities since the 2018 LHMP.

SECTION 2. PLAN ADOPTION

2.1 ADOPTION BY LOCAL GOVERNING BODY

Under the mitigation planning regulations, Twentynine Palms Water District LHMP will be submitted to the California Office of Emergency Services (Cal EOS) for review and approval. Cal OES will review the Plan by the Code of Federal Regulations; once this review is complete and any revisions are made, Cal OES will forward the plan to FEMA for another review and revisions, as FEMA requires. CalOES will notify TPWD when FEMA has approved the final LHMP. The final approval letter will be pending adoption by the District's Board of Directors. The Board of Directors Resolution will be sent to CalOES and FEMA. SEMC will send a copy of the LHMP and Resolution to the San Bernardino Office of Emergency Management.

2.2 PROMULGATION AUTHORITY

The Promulgator Authority for the adoption of the Hazard Mitigation Plan Twentynine Palms Water District and the Board of Directors:

Carol Giannini (President)
Twentynine Palms Water District Board of Directors

Bob Coghill (Vice-President)
Twentynine Palms Water District Board of Directors

Michael Arthur (Director)
Twentynine Palms Water District Board of Directors

Randy Leazer (Director)
Twentynine Palms Water District Board of Directors

Amy Woods (Director)
Twentynine Palms Water District Board of Directors

2.3 PRIMARY POINT OF CONTACT

The Points of Contact for information regarding this LHMP are:

Matt Shragge, General Manager
Twentynine Palms Water District
72401 Hatch Rd, Twentynine Palms, CA 92277
(760) 367-7546 (Office)

Consultant Primary Contact:
Gary Sturdivan, Project Lead
Sturdivan Emergency Management Consulting, LLC.
(909) 658-5974
GSturdivan@semcllc.com

SECTION 3. PLANNING PROCESS

3.1 PREPARING FOR THE PLAN

TPWD developed a broad approach in preparation for our hazard mitigation plan update. As an active participant in the County of San Bernardino's Multi-Hazard Multi-Jurisdictional Mitigation Plan, TPWD used the county-provided resources to assist in developing and evaluating data to start updating the plan.

Internally, TPWD has many experienced and resourceful employees who benefit from the program. The TPWD team participated in regular discussions, staff meetings, and health and safety committee meetings supporting the plan update. The TPWD internal planning team was invited to the conference through emails and the Microsoft Outlook calendar. This team also participated in community outreach events such as farmers market and local city functions.

In addition to participating in the 2022 County level update, TPWD staff participated in plan updates with local agencies that were also undergoing plan updates in 2023. This included staff from the City of Twentynine Palms and Joshua Basin Water District. This team also participated in the community outreach with local businesses, including community-based organizations that work directly with and/or provide support to underserved communities and socially vulnerable populations and members of the public through fairs, farmers markets, and events. Organizations within TPWD service boundaries that conduct outreach and assistance for vulnerable populations include the American Red Cross, KCDZ 107.7 FM Local radio station, and City of Twentynine Palms Community Center. Underserved and vulnerable populations they serve include people who are socioeconomically disadvantaged; people with limited English proficiency; geographically isolated or educationally disenfranchised people; people of color as well as those of ethnic and national origin minorities; women and children; individuals with disabilities and others with access and functional needs, and seniors.

The District's approach to updating the plan consisted of the following:

- Establishing the internal planning team;
- Coordination with outside agencies, organizations, jurisdictions, and the public;
- Documenting past events;
- Posting the meeting agendas, meeting minutes, and draft LHMP onto the TPWD website and asking for public input and comments on the planning process;
- Conducting public outreach;
- Reviewing and updating the hazards;
- Reviewing and updating mitigation measures;
- Plan Adoption.

During the planning process, the Planning Team utilized the following plans to gain information on the area's hazards and TPWD's mitigation goals. Relevant information from the following

plans, including local City and County Governments priorities, was included when aligned with TPWD strategies and projects and incorporated into the TPWD LHMP. There have not been any changes in priorities since the approval of the 2018 LHMP.

TPWD Water Master Plan is a basin plan that deals with community water systems, water storage, water shortage, and climate change to ensure all the water agencies that take water from the local basin are all in agreement about water shortages, water replenishment, and effects of climate change to our water. The following plans were used:

Table 4 Plans Used

Study Plan	Key Information
TPWD Urban Water Management Plan	Land Use Trends
2018 TPWD LHMP	Hazard Identification, Mitigation Measures
USGS Golden Guardian 2008	Earthquakes, Affects, Planning
2020 San Bernardino County LHMP	Land Use For Area, Future Projects
2018 California HMP	Goals For The State Of California
San Bernardino County Flood Control	Gain Information On Future Flood Control Projects
FEMA Flood Insurance Study for SB County	Flood History

The planning process consisted of:

3.2 PLANNING TEAM

As identified in **Section 3.1**, several planning teams were associated with preparing the update. The Hazard Mitigation Plan was compiled and authored by members of the following District Planning Team:

Matthew Shragge
General Manager, Twentynine Palms Water District
Description of Involvement: Member of the Planning Team

Mike Minatrea
Maintenance Superintendent, Twentynine Palms Water District
Description of Involvement: Member of the Planning Team

Cindy Fowlkes
District Secretary, Twentynine Palms Water District
Description of Involvement: Member of the Planning Team

Robert Shelton
Treatment/Production Superintendent, Twentynine Palms Water District
Description of Involvement: Member of the Planning Team

Austin Murphy
Service Worker II, Twentynine Palms Water District
Description of Involvement: Member of the Planning Team

Jayna Olsen
Customer Representative, Twentynine Palms Water District
Description of Involvement: Member of the Planning Team

3.3 COORDINATION WITH OTHER EXTERNAL JURISDICTIONS, AGENCIES, AND ORGANIZATIONS

The Internal and External Planning Teams include six people from Twentynine Palms Water District and two from local agencies. The County of San Bernardino OES was invited to be on the Planning Team but could not attend. However, they reviewed the plan's content. Appendix A is the meeting matrix outlining the subjects covered and the attendees.

The Planning Team participated in monthly meetings to coordinate efforts, provide input, and receive support for the LHMP. The support included receiving technical expertise, resource materials, and tools. The district facilitated the LHMP process and provided information that followed FEMA requirements for the program. The tools, resource materials, and other project-related information are maintained on a project portal on the District's website https://29palmswater.com/, which allows access to the information by all participants and the public; screenshots are located under Appendix B. For questions and concerns, Mr. Gary Sturdivan's contact information was on each document. The Planning Team reviewed the document and made corrections or voiced concerns to the consultant. These comments were discussed at the next team meeting, and corrections were made to the document; these meetings were not publicly held.

Accomplishing a shared goal for emergency preparedness and hazard mitigation requires the coordinated efforts of various jurisdictions, agencies, and organizations.

This team's objective consisted of:

- Assisting all participating jurisdictions with the Hazard Mitigation Plan planning process;
- Guiding the CalOES and FEMA requirements;
- Assisting in the development of regional maps and support information regarding hazards;
- Providing a forum to all jurisdictions participating in the update for questions and issues to be discussed.

TPWD staff participated in each of the scheduled stakeholder meetings and conference calls facilitated by SEMC related to the update project. See **Appendix A** for meeting agendas discussing LHMP updates.

3.4 PUBLIC INVOLVEMENT/OUTREACH

In support of the Twentynine Palms Water District's LHMP update, the District solicited information from members of the public through various methods. TPWD conducted their outreach through various social media including Facebook and Instagram, along with posting sections of the draft LHMP onto TPWD's website and including notices on billing statements

requesting comments. Outreach to nonprofit organizations, including community-based organizations and the agencies listed in **Section 3.1**, was conducted to give an opportunity for those representing vulnerable populations to be involved in the planning process. TPWD outreach included solicitation for comment through phone calls and emails to the organizations in Section 3.1 on numerous occasions but was unable to elicit feedback.

These methods consist of:

- Community Outreach events
- Local Emergency Coordination meetings
- Plan/Project inclusion in the District's Programs includes mitigation actions that require public involvement and are open to public comment. (10-Year Capital Improvement Plan, Annual Budget Report, etc.)

Any information and public feedback collected from the public outreach phase, public events, and meetings will be documented in Appendix B, including outreach to representatives of the underserved and vulnerable populations who were allowed to be involved. There were no comments made.

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October 2023, The Great ShakeOut

Twentynine Palms Water District participated in The Great ShakeOut. Through this plan, we provide information on disaster response related to the District's business and water. This information includes steps the District has taken to respond to earthquake emergencies that impact the District and the surrounding community.

3.5 ASSESS THE HAZARD

A critical component of the LHMP process is assessing the hazards that may impact the District's facilities and operations. It is essential to thoroughly understand these hazards without overanalyzing remote or highly unlikely hazards.

This LHMP has been developed through an extensive review of available information on hazards TPWD has faced and most likely will face in the future. The Planning Team reviewed and discussed items that have happened in the State of California as well as disasters that have occurred in the District's service area and Southern California. The team reviewed documents such as engineering drawings, photographs, and available geotechnical and geologic data from the Internet and outside sources such as FEMA Hazard Mapping, San Bernardino County hazard maps, and documents.

Additionally, for each profiled hazard, the TPWD Planning Team analyzed the community's exposure to each hazard (inventory of assets) and the potential impact under scenario events. The

Planning Team used HAZUS and hazards intersect analyses recently completed within San Bernardino County to produce this information. **See Section 4 for more details.**

3.6 SET GOALS

The goal-setting process for the 2023 Hazard Mitigation Plan update consisted of the Planning Team reviewing the hazard exposure and scenario impacts developed during the Risk Assessment portion of the process. With an understanding of the risk the community is potentially facing, the Planning Team then re-evaluated the 2018 Hazard Mitigation Plan Goals and Objectives, assessed their status and effectiveness in meeting the 2018 Mitigation Measures, and identified new Goals and Objectives.

3.7 REVIEW AND PROPOSE MITIGATION MEASURES

Identifying mitigation measures began with reviewing and validating the previous mitigation measures in the District's 2018 Hazard Mitigation Plan. Using the existing plan as a starting point, the planning team assessed whether the measures were valid. Through this discussion, the development of new mitigation measures was determined.

The planning team identified and analyzed mitigation measures relative to the hazards that influence the District. This analysis assisted the District in developing an implementation strategy for the prioritization of mitigation measures. Meetings (in-person and virtual) were held with the planning team as a group and through meetings within their departments to solicit input on the plan updates.

A wide variety of mitigation measures that can be identified to help reduce the impact or the severity of damage from hazards was examined. The projects were identified to help implement the Planning Team's goals and objectives. The following categories were used in the review of possible mitigation measures:

1. Public Information and Education - Outreach projects and technical assistance.
2. Preventive Activities - Zoning, building codes, stormwater ordinances
3. Structural Projects - Retention basins, reservoirs, road, and bridge improvements
4. Property Protection - Acquisition, retrofitting
5. Emergency Services - Warning, sandbagging, road signs/closures, evacuation
6. Natural Resource Protection - Wetlands, protection, best management practices.

In addition to the STAPLEE methodology, each Planning Team incorporated other criteria/factor questions into the process to help engage and solicit member input. The STAPLEE method was applied to prioritize the chosen mitigation actions.

Based on STAPLEE, the Planning Team addressed the following questions to determine mitigation options:

Does the Action:

1. Solve the problem
2. Address Vulnerability Assessment?
3. Reduce the exposure or vulnerability to the highest priority hazard
4. Address multiple hazards.
5. Address more than one (1) Goal/Objective.
6. Benefits equal or exceed costs?

Can the Action:

1. Be implemented with existing funds?
2. Be implemented by existing state or federal grant programs?
3. Is it completed within the 5-year life cycle of the LHMP?
4. Be implemented with currently available technologies?

Will the Action:

1. Be accepted by the community?
2. Be supported by community leaders.
3. Adversely impact segments of the population or neighborhoods?
4. Result in legal action such as a lawsuit?
5. Positively or negatively impact the environment?

Is there:

1. Sufficient staffing to undertake the project?
2. Sufficient funds to complete the project?
3. Existing authority to undertake the project?

After going through this process for each project, the Planning Team could identify the higher-priority projects.

3.8 DRAFT THE HAZARD MITIGATION PLAN

The Project Manager drafted the TPWD Hazard Mitigation Plan Update based on input and comments from the Planning Team. As indicated previously, the Planning Team used the 2018 LHMP as a starting point but revised it to reflect updated information.

The District's consultant led the Planning Team and prepared the draft LHMP with input from the Planning Team, local agencies in the area, and the public. The Planning Team reviewed and commented on the draft LHMP, and subsequent changes were made before the LHMP was finalized and adopted by the Board of Directors. All draft documents were posted on the District's website. Notices were sent to all water customers in the service area via billing statements and public updates on social media that TPWD has at its disposal. All LHMP documents were posted on the website, and comments were requested.

The LHMP was reviewed in comparison to the FEMA-designed Review Tool. The Review Tool links the federal requirements, identifies the sections in the LHMP where the information can be found, and provides a rating as to the level of compliance with the federal regulations.

Once the LHMP update was drafted, the Planning Team finalized the plan and forwarded it to Cal/OES and FEMA for approval.

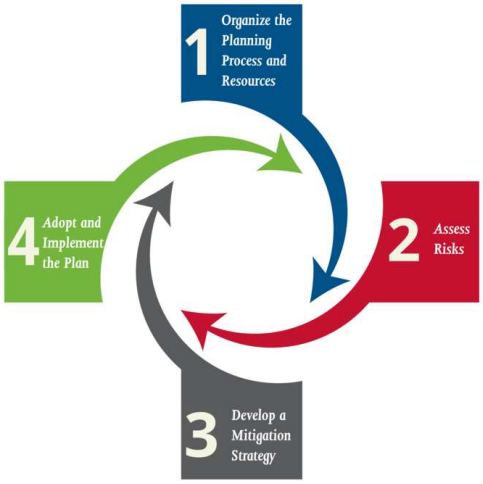
3.9 ADOPT THE PLAN

After the public review, the draft plan will be submitted to the State of California OES for review. Once the State has approved the LHMP, the document will be sent to FEMA by the State. When the Hazard Mitigation Plan update meets all federal requirements, FEMA will provide the District with an "Approval Pending Adoption" letter. Upon receipt of this letter, the final plan will be posted on the District's Website for a 30-day public comment period and then submitted to TPWD's Board of Directors for consideration and adoption. Once adopted, the final resolution will be forwarded to FEMA for incorporation into the Local Hazard Mitigation Plan, and a copy of the resolution will be sent to CalOES and FEMA. A copy of the final LHMP will be delivered to the San Bernardino County Office of Emergency Management.

SECTION 4. RISK ASSESSMENT

The goal of mitigation is to reduce the hazard's future impacts, including property damage, disruption to local and regional economies, and the amount of public and private funds spent for recovery. Mitigation decisions are based on risk assessments where the probability of an event is evaluated concerning the anticipated damages caused by such an event.

This section aims to understand the hazards and risks in the Twentynine Palms Water District service area. This process generally has four steps: 1) Hazard Identification, 2) Vulnerability Analysis, 3) Risk Analysis, and 4) Vulnerability Assessment, including an estimation of potential losses. These are four items; however, the terms can be used interchangeably.



4.1 HAZARD IDENTIFICATION

The Planning Team discussed potential hazards and evaluated their probability of occurrence. The following sections describe this process and the results.

4.2 HAZARD SCREENING CRITERIA

Screening the hazards aims to help prioritize which hazards create the most significant concern for TPWD. A list of natural hazards to consider was obtained from the Federal Emergency Management Agency's (FEMA) State and Local Mitigation Planning How-to Guide: Understanding Your Risks (FEMA 386-1). The team used the Stafford Act, the California Emergency Service Act, and STEPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental feasibility) criteria to help rank each risk. The risks were ranked from 1 – 4, with (1) being a "Highly Likely" event, (2) being a "Likely" event, (3) being a "Somewhat Likely" event, and (4) being a "Least Likely" event. The Planning Team reviewed

each hazard on the list using their experience and historical data about each hazard and developed the following ranked list in Table 5.

Table 5 Hazard Risk Rankings

Hazard	Risk Ranking (1-4)
Earthquake	1
Flooding	2
Climate Change Induced Drought	2
Cyber Security	2
Windstorm	4
Dam Inundation	4
Wildfire	4
Freezing events	4
Volcanoes	4
Tsunami	4
Landslides	4

The natural hazards considered not to affect or be a risk to TPWD were ranked 4 "Least Likely" and are not considered applicable to TPWD for mitigation.

Hazard Assessment Matrix

TPWD used a qualitative ranking system for the hazard screening process, which consisted of generating a high/medium/low rating style for the probability and impact of each screened hazard.

Probability Ratings: Highly Likely, Likely, or Somewhat Likely

Impact Ratings: Catastrophic, Critical, or Limited

SCREENING ASSESSMENT MATRIX

The screening assessment matrix was used to assess TPWD's hazards. The hazards have been placed in the appropriate cell of the corresponding "Screening Assessment Matrix" based on the Planning Team's collective experience. The hazard screening assessment is shown in Table 6.

Prioritization of the hazards is discussed in the following section. The Probability/Impact rating is based on a 5-year occurrence. The percentages represent the likelihood within the 5-year occurrence.

Table 6 Screening Assessment Matrix

	Impact			
Probability	**Probability/Impact Rating**	***Catastrophic***	***Critical***	***Limited***
	Highly Likely (1) ***(75 – 100%)***	Earthquake (1)	Climate Change Induced Drought (2)	
	Likely (2) ***(50-75%)***		Flooding (2) Cyber Security (2)	
	Somewhat Likely (3) ***(25 – 50%)***			

4.3 HAZARD PROFILES

This section looks at all the hazards identified by the Planning Team that may impact TPWD within its boundaries. This section gives an overview of each hazard, the definition of each hazard, and a description of how each hazard is expected to affect TPWD's service and service area using observed hazards in TPWD's service area, the hazards identified on the FEMA website, and the FEMA software program known as HAZUS (Hazards United States). HAZUS contains models of natural disasters and the effects the catastrophes can have on a region.

4.3.1 EARTHQUAKES

Probability: (75-100%) Highly likely – Historical earthquake data for TPWD and its region indicate at least eight significant earthquakes within the last 14 years. However, some earthquakes in southern California occur daily but are insignificant to TPWD. This equates to an average significant earthquake every 1.75 years or a 57.14 percent chance of a substantial earthquake in any given year. TPWD determined that future earthquake occurrences within their boundaries are highly likely based on this data.

Impact: Catastrophic

Priority: Highly Likely

* This section looks at all the hazards affecting the district within its boundaries, which the Planning Team identified.

General Definition: An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the earth's surface. The plates move slowly over, under, and past each other to create mountains, valleys, and all other geological formations. Usually, the movement is gradual; however, increased movement occurs when the plates become locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake. Most earthquakes occur at the boundaries where plates meet; however, some earthquakes occur in the middle of plates.

Ground shaking from earthquakes can collapse buildings and bridges and disrupt gas, electric, water utilities, and phone service. Additionally, earthquakes can trigger landslides, avalanches, fires, and destructive ocean waves such as tsunamis. Buildings with foundations resting on unconsolidated fill material and other unstable soil, as well as homes not tied to their foundations, are at risk because they can be shaken off their mountings even during a mild earthquake. An earthquake in a populated area may cause deaths, injuries, and extensive property damage.

Earthquakes strike suddenly and without warning at any time of year. Every year, 70 to 75 damaging earthquakes occur worldwide. Estimates of losses from a 7.8-magnitude earthquake in the southern section of the San Andreas Fault System (located in the regional area near Los Angeles County) could easily reach $200 billion in damages. This information was pulled from the California Great ShakeOut© USGS scenario.

Earthquakes pose a moderate to very high risk for 45 states and territories in the United States of America, and earthquakes occur in every region of the Country. California experiences the most frequent damaging earthquakes of the 45 states and territories of the United States; however, Alaska experiences the most significant number of large earthquakes, most located in uninhabited areas. The nearby southern section of the San Andreas Fault is ranked in the top five (5) faults that are most likely to cause significant damage in the United States, according to the United States Geological Survey (USGS).

The source for the earthquake profile is a report that describes a new earthquake rupture forecast for California developed by the 2007 Working Group on California Earthquake Probabilities (WGCEP 2007). The Earthquake Working Group was organized in September 2005 by the USGS, the California Geological Survey (CGS), and the Southern California Earthquake Center (SCEC) to understand the locations of faults in California better. The group produced a revised, time-independent forecast for California for the National Seismic Hazard Map.

Climate Change Impacts:

The following summarizes changes in exposure and vulnerability to earthquake hazards resulting from climate change:

Population– Vulnerability to earthquakes is unlikely to increase due to climate change.

Critical facilities – All critical facilities' exposure and vulnerability are unlikely to increase due to climate change.

Vulnerability: The socially vulnerable population includes the young, the elderly, people with mental health issues, and people experiencing poverty who may live under bridges, in tents, or makeshift housing along waterways or freeway bridges. The socially vulnerable populations are most susceptible based on many factors, including how the people respond to their financial ability to purchase supplies. Food, clothing, and safe housing may be manageable for only short periods and then fall into extreme poverty, with a lack of resources and the ability to navigate special needs in an emergency or to manage to obtain adequate food, housing, clothing, or medical treatment.

In an earthquake, vulnerable populations may be unable to find adequate shelter as the landscape streets and shelters are unavailable in the short term. Shelter must be developed and put in place by the affected cities, counties, States, or FEMA.

Table 7 is a replacement cost estimate for all TPWD-owned critical facilities.

Table 7 Earthquake Magnitude Replacement Costs

TPWD / Earthquake Magnitude	Replacement Value
Magnitude 7.0 or Above (Very High Impact)	
TPWD – All Critical Assets	$300 Million
Magnitude 5.0 or 6.9 (Moderate Impact)	
TPWD – All Critical Assets	$250 Million
Magnitude 1.0 or 4.9 (Low Impact)	
TPWD – All Critical Assets	$5 Million

Description: The area around TPWD Facilities is seismically active since it is situated on the boundary between two fault lines. There have been many earthquakes in and around the District's service area; the 1992 Landers earthquake caused over $1 million in damages to the District.

Figure 2. TPWD Earthquake Fault Lines

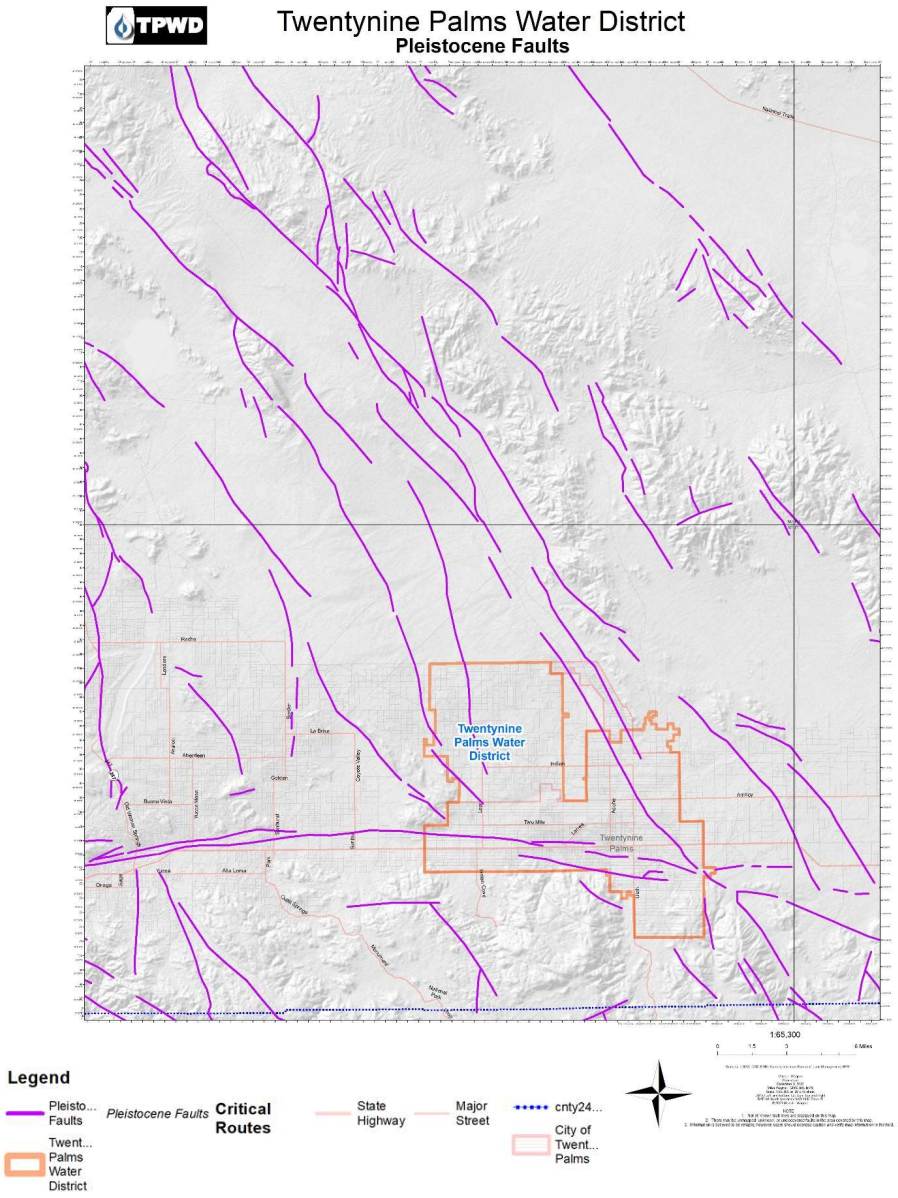


Figure 3 Twentynine Palms Water District, USGS ShakeOut Map

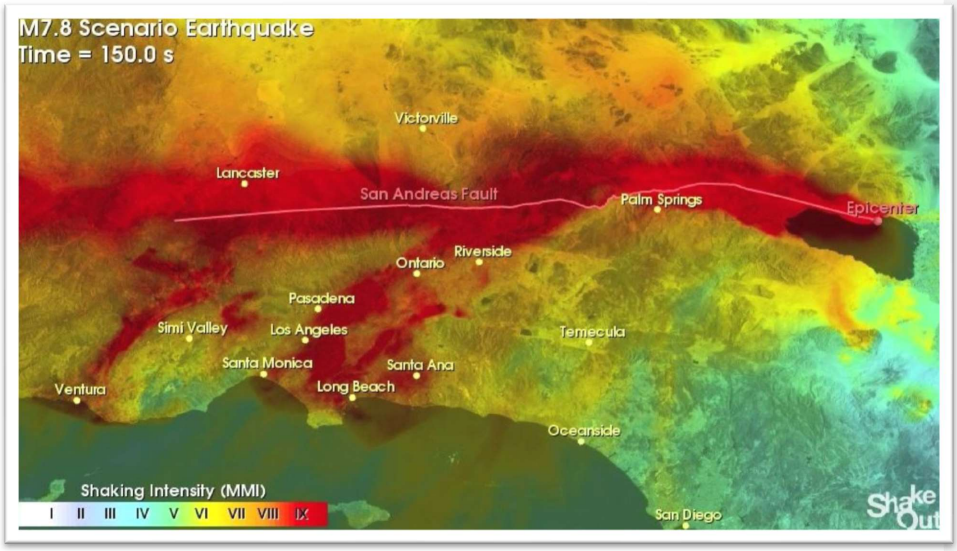


Figure 4 USGS Modified Mercalli Intensity Scale

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines in the central and western states; however, the Eastern United States faces a moderate risk of less frequent, less intense earthquake events.

Figure 5 United States Earthquake Hazard Map

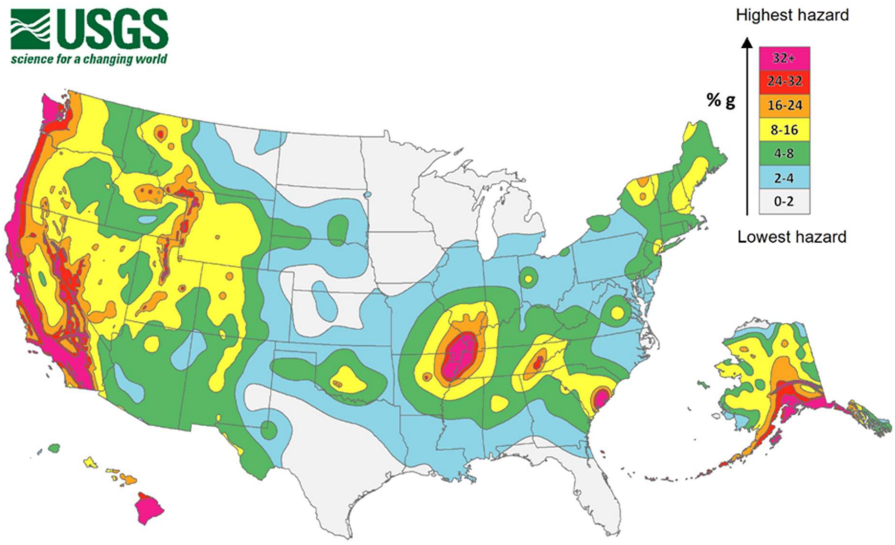


Table 8 Significant Earthquakes within San Bernardino County

Date	Area	Mag (M_w)	Total damage/notes
7/29/2008	Chino Hills	5.4	No damage to TPWD
1/15/2014	La Habra	5.1	No damage to TPWD
3/29/2014	La Verne	4.4	No damage to TPWD
7/5/2014	Borrego Springs	5.4	No damage to TPWD
1/25/2018	Trabuco Canyon	4.0	No damage to TPWD
7/4/2019	Ridgecrest	6.4	No damage to TPWD
7/6/2019	Ridgecrest/Trona	7.1	No damage to TPWD
9/10/2019	Wildomar	4.0	No damage to TPWD

Within the 2018-2023 timeframe, a federal and state declaration was declared for earthquakes within the TPWD service area. On July 8, 2019, The President issued an emergency declaration (EM-3415-CA) under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5121-5207 (The Stafford Act), as follows:

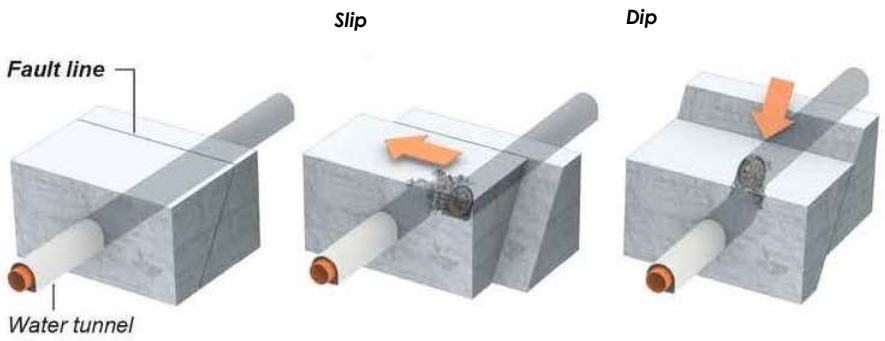
"I have determined that the emergency conditions in certain areas of the State of California resulting from earthquakes beginning on July 4, 2019, and continuing, are of sufficient severity and magnitude to warrant an emergency declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5121 ET SEQ. ("the Stafford Act"). Therefore, I declare that such an emergency exists in California…"

Impact Statement: A significant earthquake could devastate TPWD and its assets. Shaking during earthquakes can cause structural failures, while ground displacement and liquefaction can cause infrastructure to sink, sag, float, rupture, or sever completely. Access to all assets may be impeded if the roads needed to access them are damaged and impassable. An extended loss of power or widespread damage to a system could significantly impair the District's ability to provide service if generators are compromised. This could, in turn, lead to a loss of service and revenue for a time while costly repairs are being made. Fires following earthquakes are also a significant concern and could impact operations. Direct impacts to employees are possible,

including injury, death, and an impeded ability of essential personnel to report for duty may also hinder operations.

There is no increase in the impact of earthquakes that climate change can cause. Earthquakes can cause displacement, changing population patterns throughout their service area. TPWD has no jurisdiction over land use, development, and zoning of socially vulnerable populations and land development within their service area, especially post-earthquake disasters.

Figure 6 How Ground Displacement Can Severe Pipes



Liquefaction may cause buried domestic water pipes to sink, impacting gravity-fed systems. Once liquefied soils re-solidify after a quake, they must be dug up and repaired. Lateral spreading may damage wells and percolation ponds. TPWD could experience a loss of water from damaged systems.

State Water Project assets like water pipelines, ground shaking, displacement, and liquefaction may cause canals and laterals to crack, sever, and otherwise fail.

Building Facilities: Shaking, ground displacement, and liquefaction can cause structural failure in buildings, including the office buildings at the District's administrative buildings. Less catastrophic events may cause unanchored furniture and items on shelves to fall. If an event was to occur during working hours, failure may result in employee and customer deaths and injuries. Further, crews out in the field may also be injured or killed.

Energy Storage and Power Failure: An adequate energy supply is critical for TPWD to maintain its daily processes and functions. Power failures occur when the reliable, uninterrupted energy supply to all or part of the service area is disrupted, affecting TPWD's ability to provide service. In summary, the entire District, including all current and future assets (infrastructure, buildings, critical facilities, and population), is considered at risk of earthquake events.

4.3.2 CLIMATE CHANGE INDUCED DROUGHT

Probability: (75-100%) Highly likely – Historical drought data for TPWD and its region indicate at least five multi-year significant droughts within the last 47 years. This equates to an average drought every 9.4 years or a 10.63 percent chance of a drought in any given year. Based on this data and given the multi-year length of droughts and future climate change effects, TPWD determined that future drought occurrence within their boundaries continues to be highly likely. TPWD is consistently in a stage 2 drought.

Impact: Critical

Priority: Highly Likely

* This section looks at all the hazards affecting the District within its boundaries that the Planning Team identified.

General Definition: A drought is a period of below-average precipitation in a given region resulting in prolonged shortages in its water supply, surface water, or groundwater. Climatic factors such as high temperatures, high wind, and low relative humidity are often associated with drought. Drought occurs in virtually all climatic zones, varying significantly from one region to another. Droughts occur when there are extended periods of inadequate rainfall. Droughts and wet periods are often part of El Niño and La Niña weather cycles.

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. It is generally difficult to pinpoint a drought's beginning and end. In California, a few dry months do not typically constitute a drought. Because the impacts of a drought accumulate slowly at first, a drought may not be recognized until it has become well established. Even during a drought, there may be one or two months with above-average precipitation totals. These wet months do not necessarily signal the end of a drought and generally do not majorly impact moisture deficits. Droughts can persist for several years before regional climate conditions return to normal. While drought conditions can occur at any time throughout the year, the most apparent time is during the summer months.

Probability: The probability of damage to TPWD caused by climate change will increase. Drought's probability will increase in the southwestern United States, creating longer and hotter days with less rain, leading to long periods of drought. Research supports that climate change will significantly impact drought frequency and intensity, varying by region. Higher temperatures increase evaporation rates, including more moisture loss through plant leaves. Even in areas where precipitation does not decrease, increases in surface evaporation will lead to more rapid drying of soil if not offset by other changing factors, such as reduced wind speed or humidity. As soil dries out, more of the sun's incoming heat will go toward heating soil and adjacent air rather than evaporating moisture, resulting in hotter temperatures and drier conditions.

Measuring Droughts: There are several quantitative methods for measuring drought in the United States. The U.S. Drought Monitor is a relatively new index that combines quantitative measures with input from experts in the field.

In March 2022, California's Governor Newson implemented an executive order (Executive Order N-7-22) to address the impacts of the drought in California. This order required urban water suppliers, such as TPWD, to adopt more stringent water conservation efforts, including but not limited to banning irrigating "non-functional turf" and voluntarily activating a water shortage contingency planning Level 2.

Along with this executive order, and by the State Water Resources Control Board (SWRCB) and California Water Code (CWC) requirements as outlined in Sections 10632 and 10644, urban water supplies in California would have to prepare Annual Water Supply and Demand Assessments (AWSDA) for the next seven years and submit these assessments annually to the state to remain in compliance with water conservation efforts. TPWD submitted its 2023 AWSDA and is submitting its 2024 AWSDA before the July 1 deadline. TPWD promotes water conservation efforts to its customers through joint radio announcements with local water districts, public notifications on its website, and conservation messages on monthly billing invoices. The current permanent water conservation requirements are posted online to continue efforts to conserve water to prepare for California's drought conditions.

Climate Change Impacts:

The following summarizes changes in exposure and vulnerability to the drought hazard resulting from climate change:

Population—Due to climate change, Population exposure and vulnerability to drought will likely increase. As water and electricity costs rise and more stringent conservation measures are implemented, swamp coolers may become too expensive to operate, resulting in the population suffering from heat exposure.

Critical facilities – All critical facilities' exposure and vulnerability will likely increase due to climate change.

Vulnerability &Impacts: Underserved and vulnerable populations they serve include socioeconomically disadvantaged people; people with limited English proficiency; geographically isolated or educationally disenfranchised people; people of color as well as those of ethnic and national origin minorities; women and children; individuals with disabilities and others with access and functional needs; and seniors—those who may live under bridges, in tents or makeshift housing along waterways. The socially vulnerable populations are most susceptible based on many factors, including how the people respond to financial ability to purchase supplies. Food, clothing, and safe housing may be manageable for only short periods and then fall into extreme poverty, with a lack of resources and the ability to navigate special needs in an emergency or to obtain adequate food, housing, clothing, or medical treatment.

In drought conditions, vulnerable populations may be unable to find adequate, safe, potable water supplies for drinking, cooking, or hygiene needs.

The following table is a replacement cost estimate for all TPWD-owned critical facilities.

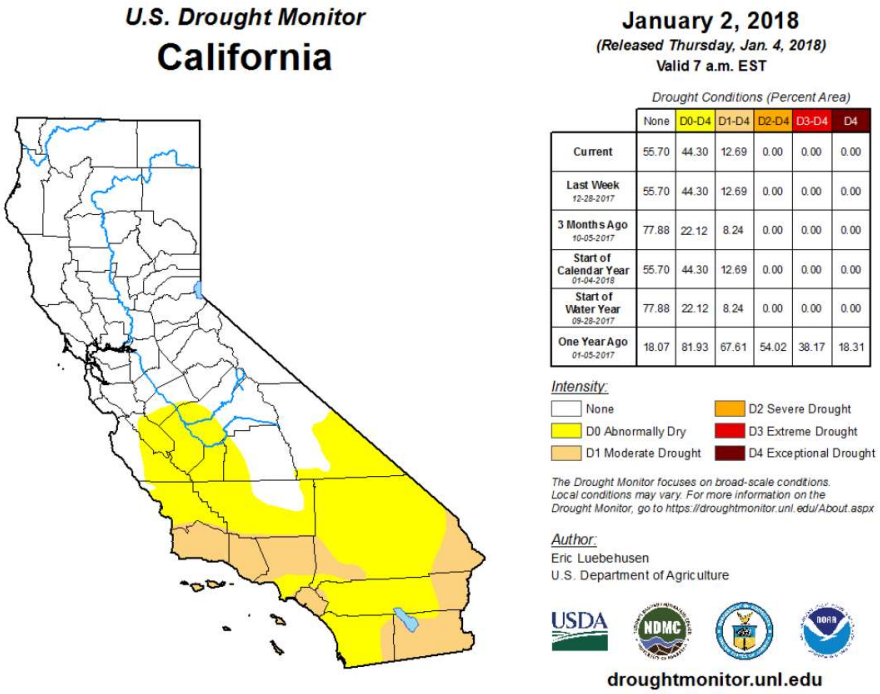
Table 9 Drought Severity Replacement Costs

TPWD / Drought D0-D4 Severity	Replacement Value
D4 (Exceptional Drought)	
TPWD - All Critical Assets	$300 Million
D3 (Extreme Drought)	
TPWD - All Critical Assets	$250 Million
D2 (Severe Drought)	
TPWD - All Critical Assets	$5 Million
D1 (Moderate Drought)	
TPWD - All Critical Assets	$100,000
D0 (Abnormally Dry)	
TPWD - All Critical Assets	$50,000

U.S. Drought Monitor: The U.S. Drought Monitor is designed to provide the general public, media, government officials, and others with an easily understandable overview of weekly drought conditions across a county throughout the United States. The U.S. Drought Monitor is unique because it assesses multiple numeric drought measures, including the PDSI and three other indices and experts' interpretations, to create a weekly map depicting drought conditions across the United States. The U.S. Drought Monitor uses five drought intensity categories, D0 through D4, to identify areas of drought.

The maps below are taken from https://droughtmonitor.unl.edu/Maps/MapArchive.aspx and show the drought differences between January 2023 and October 2023. Note the drastic difference between the two drought maps.

Figure 7 Drought Monitor January 2023



TPWD Facility

Figure 8 Drought Monitor October 2023

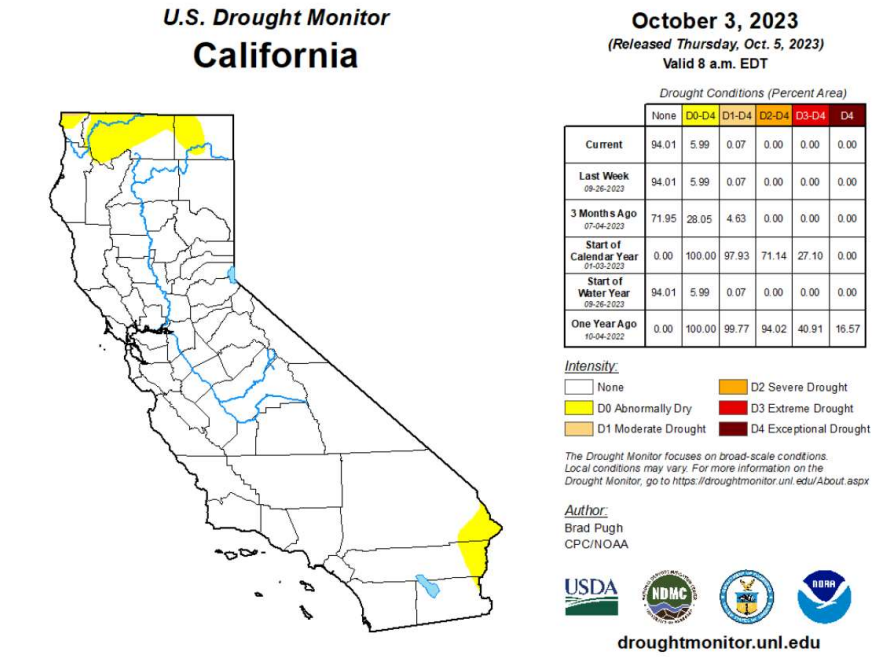


Table 10. U.S. Drought Monitor

D0	**Abnormally Dry**	Going into drought: short-term dryness slowing planting and growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	**Moderate Drought**	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	**Severe Drought**	Crop or pasture losses likely; water shortages expected; water restrictions imposed
D3	**Extreme Drought**	Major crop/pasture losses; widespread water shortages or restrictions
D4	**Exceptional Drought**	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

A drought is a regional event not confined to geographic or political boundaries; it can affect several areas simultaneously. It can also range in severity across those areas. Drought is now one of the main concerns in California, as the State has been in a drought period for the last eight years. Northern California experienced some relief in the winter of 2016; however, the El Niño effect expected to relieve the statewide drought did not materialize in Southern California. The lack of rain and, most importantly, the lack of snowfall in the Sierra Nevada Mountain range severely impacted most residents of California. TPWD's service area is at risk of drought occurrence and impacts.

Description: Climate change can be expected to increase drought frequency and severity in the service area—warmer temperatures cause drought conditions by reducing soil moisture. Increased evapotranspiration and reduced snowpack projected with warmer temperatures will reduce flows.

Table 11 Drought History

Year	Drought History
1841	The drought was so bad that "a dry Sonoma was declared entirely unsuitable for agriculture."
1864	This drought was preceded by the torrential floods of 1861-1862, which shows the fluctuation in climate in the 1800s.
1924	This drought encouraged farmers to start using irrigation more regularly because of the fluctuation in California weather. Consistent water availability was crucial for farmers.

1929–1934	This drought was during the infamous Dust Bowl period that ripped across the plains of the United States in the 1920s and 1930s. The Central Valley Project was started in the 1930s in response to drought.
1950s	The 1950s drought contributed to the creation of the State Water Project.
1976–1977	1977 had been the driest year in state history to date. According to the *Los Angeles Times*, "Drought in the 1970s spurred efforts at urban conservation, and the state's Drought Emergency Water Bank came out of the drought in the 1980s."
1986–1992	California endured one of the most prolonged droughts from late 1986 through early 1992. Drought worsened in 1988, and much of the United States suffered severe drought. In California, the six-year drought ended in late 1992 as a significant El Niño event in the Pacific Ocean (and the eruption of Mount Pinatubo in June 1991) most likely caused unusually persistent heavy rains.
2007–2009	2007–2009 saw three years of drought conditions, the 12th worst drought period in the state's history, and the first drought for which a statewide emergency proclamation was issued. The drought of 2007–2009 also saw significantly reduced water diversions from the State Water Project. The summer of 2007 saw some of the worst wildfires in Southern California history.
2011-2017	From December 2011 to March 2017, California experienced one of the worst droughts in the region on record. The period between late 2011 and 2014 was the driest in California history since record-keeping began.
2020 - 2022	January and February 2020 were dry to record dry in several areas (central CA and Northern CA-NV). The past three combined water years were California's driest period on record.

Between late 2011 and 2021, the driest in California history since record-keeping began. In May 2015, a state resident poll conducted by Field Poll found that two out of three respondents agreed that water agencies should be mandated to reduce water consumption by 25%.

The 2015 prediction of El Niño to bring rain to California raised hopes of ending the drought. In the spring of 2015, the National Oceanic and Atmospheric Administration (NOAA) named the probability of the presence of El Niño conditions until the end of 2015 at 80%. Historically, sixteen winters between 1951 and 2015 had created El Niño. Six had below-average rainfall, five had average rainfall, and five had above-average rain. However, as of May 2015, drought conditions had worsened, and above-average ocean temperatures had not resulted in large storms. The drought led to Governor Jerry Brown's instituting mandatory 25% water restrictions in June 2015.

Approximately 102 million trees in California died from the 2011 – 2016 drought, of which 62 million died in 2016 alone. By the end of 2016, 30% of California had emerged from the drought, mainly in the state's northern half, while 40% remained in the extreme or exceptional

drought levels. Heavy rains in January 2017 were expected to significantly benefit the State's north water reserves despite widespread power outages and erosional damage during the deluge.

The winter of 2022/2023 turned out to be the wettest on record in California, surpassing the previous record set in 1982–83. Governor Newsom declared an official end to the drought in April 2023. All 58 counties are listed in the governor's severe drought impact. The winter of 2022 has had more rainfall and snow in California than the last 20 years alone.

Between 2018 and 2023, no federal and state declarations were made for California Climate Change-Induced Drought within the TPWD service area.

Impact Statement: Water is also needed to manage structural and wildfires. A lack of, or limited, water supply presents wildfire management vulnerability. Substantial water is required to fight wildfires, which are more frequent in dry conditions. While water for firefighting is a priority and no restrictions are in place, a lack of availability could slow this capability.

The entire planning area is equally at risk of this hazard. The majority of drought impacts, however, are not structural but societal. A drought's impacts on society, and thus the TPWD's service area, result from the interplay between a natural event and people's demand for water supply. TPWD is in charge of supplying potable and non-potable water within its service area; therefore, it would be significantly impacted, both fiscally and politically, if it could not provide a reliable water supply due to drought conditions. Economically, water restrictions imposed during drought periods could result in lost revenue for TPWD.

4.3.3 FLOOD

Probability: (50-75%) Likely – Historical flood data for TPWD and its region indicate at least two significant floods within the last five years. This equates to an average flood every 2.5 years or a 40 percent chance of a flood in any given year. Based on this data, TPWD determined that future flood occurrence within their boundaries continues to be likely.

Impact: Critical

Priority: Likely

* This section looks at all the hazards affecting the district within its boundaries, which the Planning Team identified.

General Definition: A hefty rain in a concentrated area that collects on the ground in low land areas over a short or long period. Flooding occurs when significant rainfall occurs in areas where the water runs off to lower elevations. Flooding is a widespread, dangerous, and costly hazard. Globally, it accounts for 40 percent of all-natural disasters and results in an average of over 6,500 deaths annually. In the US, flooding results in an average of 86 deaths annually. Nearly 90 percent of all presidential disaster declarations result from natural events where flooding was a major component. On average, flooding causes more than $2 billion in property damage yearly in the United States. Floods cause utility and outages, infrastructure damage, structural damage to buildings, crop loss, decreased land values, and impeded travel.

Flooding is the most common environmental hazard due to the widespread geographical distribution of valleys and coastal areas and the population density in these areas. The severity of a flooding event is topography and physiography, precipitation and weather patterns, recent soil moisture conditions, and the degree of vegetative clearing and impervious surface. Flooding events can be brought on by severe (heavy) rain.

TPWD is not a member of NFIP. NFIP members are Cities and County Governments that enforce building codes and permits and have authority over construction, planning, zoning, and land use. In contrast, TPWD does not have authority over any of these.

Probability: Wildfires exacerbating flooding conditions are likely to increase the likelihood of increased flooding. Wildfires can exacerbate flooding conditions when infiltration is affected, and limited vegetation is in place. As wildfire probability rises, so will flooding due to dry conditions and dried foliage. While the recent drought conditions have resulted in a lack of rain events, the potential for future flooding still exists.

Flash Flooding: Flash floods occur within a few minutes or hours of heavy rainfall and can destroy buildings, uproot trees, and scour out new drainage channels. Heavy rains that produce flash floods can also trigger mudslides and landslides. Slow-moving thunderstorms, repeated thunderstorms in a local area, or heavy rains from hurricanes and tropical storms cause most flash flooding. Although flash flooding often occurs in mountainous regions, it is also common in urban centers where much of the ground is covered by impervious surfaces.

Climate Change Impacts:

The following summarizes changes in exposure and vulnerability to the flood hazard resulting from climate change:

Population– Population vulnerability may increase due to climate change's impact on flood hazards. Runoff patterns may change, resulting in flooding in areas where it has not previously occurred.

Critical facilities – All critical facility exposure and vulnerability may increase due to climate change impacting the flood hazard.

Vulnerability & Impact: Underserved and vulnerable populations they serve include socioeconomically disadvantaged people; people with limited English proficiency; geographically isolated or educationally disenfranchised people; people of color as well as those of ethnic and national origin minorities; women and children; individuals with disabilities and others with access and functional needs; and seniors—those who may live under bridges, in tents or makeshift housing along waterways. The socially vulnerable populations are most susceptible based on many factors, including how the people respond to the lack of financial ability to purchase supplies. Food, clothing, and safe housing may be manageable for only short periods and then fall into extreme poverty, with a lack of resources and the ability to navigate special needs in an emergency or to obtain adequate food, housing, food, clothing, or medical treatment.

In flooding conditions, vulnerable populations may be unable to find adequate, safe, potable water supplies for drinking, cooking, or hygiene needs. Flooding and dangers associated with the flood hazard can lead to vulnerable populations living in waterways, flood control channels, and adjacent creeks and waterways to lose possessions and further displacement. It can further isolate these vulnerable populations and limit access to local, state, and federal resources.

The following table is a replacement cost estimate for all TPWD-owned critical facilities.

Table 12. Flood Zone Replacement Cost

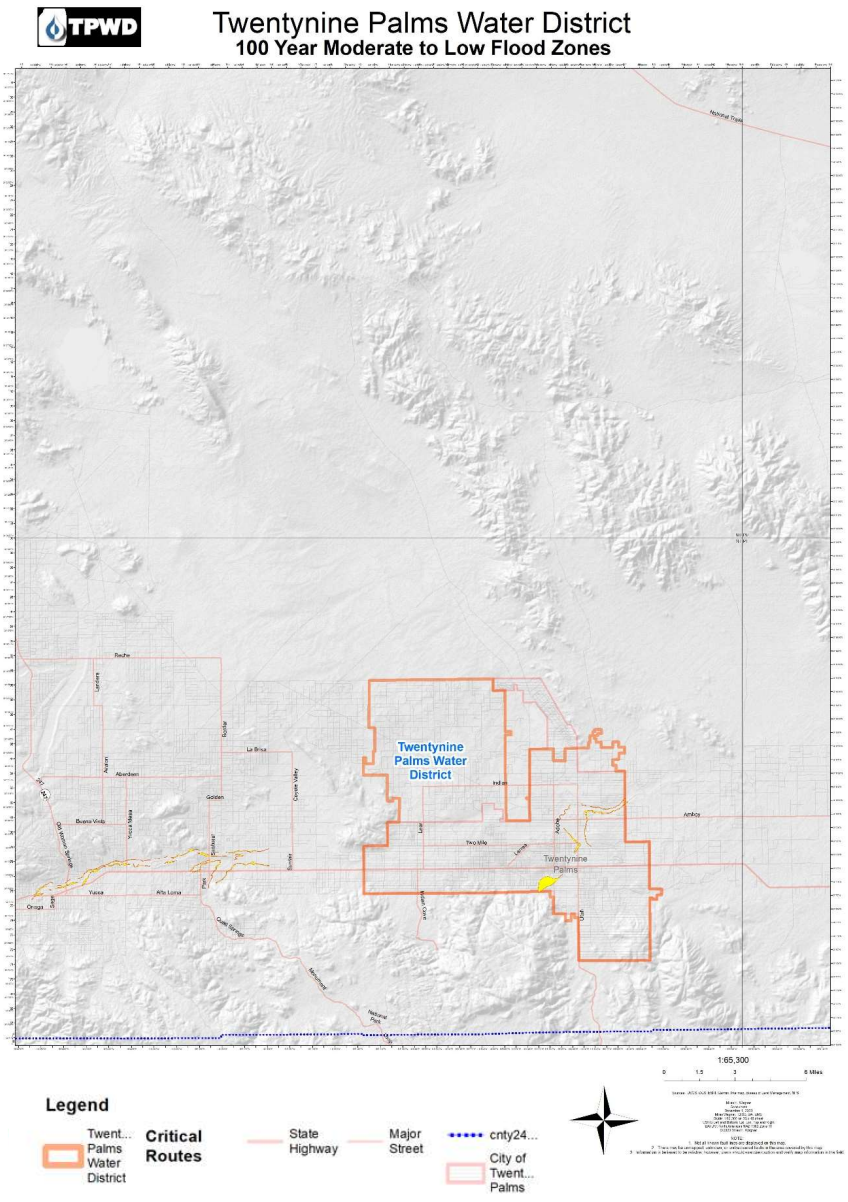
TPWD 100/500 Year Flood Zones	Replacement Value
500-Year Flood Zone	
TPWD - All Critical Assets	$100 Million
100 Year Flood Zone	
TPWD - All Critical Assets	$50 Million

Description: Flooding is expected in the District's service area; severe rainstorms have been known to flood surrounding areas. This has not affected operations; a 100-year flood map shows potential inundation in the area. There has been no recorded damage caused by flooding within the service area that has affected TPWD infrastructure.

Within the 2018-2023 timeframe, two federal and state declarations were declared for flood within the TPWD service area. Notice is at this moment given that, in a letter dated January 9, 2023 (EM-3591-CA) and March 16, 2023 (EM-3592-CA), the President issued an emergency declaration under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5121-5207 (the Stafford Act), as follows:

"I have determined that the emergency conditions in certain areas of the State of California resulting from severe winter storms, flooding, and mudslides beginning on January 8, 2023, and continuing are of sufficient severity and magnitude to warrant an emergency declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5121 et seq. ("the Stafford Act"). Therefore, I declare that such an emergency exists in California…"

Figure 9 Flood Zones within TPWD Service Area.



Impact Statement:

Climate change can increase the impact of flooding. It increases the probability of flooding overall and can increase its effect on the service area. Flooding can cause displacement, changing population patterns throughout the service area. TPWD has no jurisdiction over land use, development, and zoning, especially during a state and federal declared disaster.

Flooding can result in various impacts, such as death and injury, asset damage, inability to access facilities or assets, and road closures. Normal operations may be interrupted due to flooding. Some impacts from flooding include:

- Floodwater often contains bacteria and chemicals. Flooding of wells or reservoirs may result in water contamination, resulting in boil water advisories or reduced service;
- Floodwater can prevent regular access to assets and facilities. This presents a danger when motorists and pedestrians attempt to traverse floodwaters. Motor vehicles and pedestrians can get swept up in flood currents, increasing the risk of drowning. Even in shallow waters, fast-moving currents can carry individuals or vehicles into deeper waters, where pressure from flowing water can prevent drivers from escaping submerged cars. As little as six inches of floodwater can move a car, and as little as two inches can move a person;
- Replenishment facilities, including percolation ponds, may be washed out by flooding, resulting in damage;
- Assets with electrical parts or motors may be damaged by flooding if these parts are submerged;
- Structures exposed to flooding, including critical facilities, can be severely damaged. Building contents can be lost, damaged, or destroyed, and floodwaters can compromise structures. Pressure from floodwater, significantly as seepage through soil, can damage foundations;
- Buildings exposed to floodwaters may develop mold or wood rot.

4.3.4 CYBER SECURITY

Probability: (50-75%) Likely—Cyber data for TPWD and its region indicate several attempted attacks on the District within the last five years. This equates to a cyberattack every year on average or a 50 percent chance of a cyberattack in any given year. Based on this data, TPWD determined that future cyberattack occurrences within their boundaries continue to be likely.

Impact: Critical

Priority: Likely

* This section looks at all the hazards affecting the district within its boundaries, which the Planning Team identified.

General Definition: An attack via cyberspace, targeting an enterprise's use of cyberspace to disrupt, disable, destroy, or maliciously control a computing environment/infrastructure, destroying the integrity of the data or stealing controlled information.

Climate Change Impacts:

The following summarizes changes in exposure and vulnerability to the cyber security hazard resulting from climate change:

- **Population**– Population exposure and vulnerability to cyber security are unlikely to increase as a result of climate change;
- **Critical facilities –** All critical facilities' exposure and vulnerability will likely increase due to climate change.

Vulnerability: A cyber-attack on the water infrastructure does not affect the vulnerable population, as a water district can manually operate the water system if needed.

Description: Outside sources access electronic controls and processes to take over all electronic devices, controlling and gaining access to critical records, information, and confidential data.

Impact Statement: Several cyber-attacks in the district and water and wastewater control systems can occur. Listed below are a few threats that the District is susceptible to:

- Malware
- Denial-of-Service (DoS) Attacks
- Phishing
- Spoofing
- Identity-Based Attacks
- Code Injection Attacks
- Supply Chain Attacks
- Insider Threats

SECTION 5. COMMUNITY CAPABILITY ASSESSMENT

5.1 INTRODUCTIONS

The capability assessment aims to determine TPWD's ability to implement a comprehensive mitigation strategy and identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects.

The capability assessment has two components:

1. An inventory of the existing relevant plans, ordinances, or programs already in place and
2. An analysis of TPWD's capacity to bring them to fruition. A capability assessment highlights the positive mitigation activities within TPWD and will detect the potential gaps.

5.2 EMERGENCY MANAGEMENT

Twentynine Palms Water District (TPWD/District) is a water agency. Today, the District serves approximately 18,000 residents within an 87-square mile in San Bernardino County, just north of the Little San Bernardino and Pinto Mountains.

To help mitigate the potential impacts of disasters, TPWD joined CalWARN. The District has a mutual aid agreement with CalWARN covering most California water and wastewater agencies. As a government entity (Special District within California Law), the District can access the Emergency Managers Mutual Aid (EMMA) and the Emergency Management Assistance Compact (EMAC) for national mutual aid. In addition, the National WARN System can be accessed through the American Water Works Association.

CalWARN holds workshops twice a year for water agency members. It has also been planning public outreach so the public can better understand hazard mitigation planning in their communities. These workshops promote mitigation and how to prevent hazards' impacts on the utility's infrastructure. CalWARN has access to utility leaders, their experiences during emergencies, and lessons learned on what they should have done differently. Sharing ideas and experiences is critical to understanding mitigation in the future.

The District currently employs 24 full-time employees, and by joining CalWARN, it can have hundreds of mutual aid workers at its disposal within hours of an emergency. Twentynine Palms Water District facilities' pressure zones, reservoirs, wells, fluoride treatment, and maintenance work are operated by certified operators and maintained by various certified technical disciplines. In addition, the District agrees with other water districts to support each other during an emergency by offering labor and equipment for the incident.

The General Manager has over 25 years of experience in water. He has been with TPWD for 17 years. Throughout his career with the District, he has been mitigating earthquake, flood, and drought impacts that face the utility.

Emergency Response Plan (ERP): An emergency response plan outlines responsibility and how resources are deployed during and following an emergency or disaster. The plan's primary objective is to guide the identification of potential emergencies, a timely and effective response, and the protection of the community's health and safety. The ERP guides the process when an emergency occurs, including blueprinting general operations during a disaster, distributing and managing responsibilities among authorities, and identifying liability.

TPWD Emergency Response Plan was last revised in January 2024 and details how the District will respond to various emergencies and disasters. TPWD must be prepared to respond to a variety of threats that require emergency actions, including:

- Operational incidents, such as power failure or bacteriological contamination of water;
- Outside or inside evil acts, such as threatened or intentional contamination of water, intentional damage/destruction of facilities, detection of an intruder or intruder alarm, bomb threat, cyber security, or suspicious mail.
- Natural disasters like earthquakes or floods result in downed power failures.
- Communications with critical users, media outreach, and public notification process

TPWD is also required to follow the Standard Emergency Management System (SEMS), the National Incident Management System (NIMS), and the Incident Command System (ICS) when responding to emergencies.

Emergency Operations Center (EOC): An EOC provides a location, on or off-site, from which an agency coordinates a disaster response operation. In times of non-disasters, EOCs typically offer a centralized hub for communication and security oversight. TPWD administrative building and operations yard have the potential for two EOCs, one being the primary event center and the secondary being the corporate yard.

Emergency Management Training and Staff: Dedicated emergency management staff and regular training help prepare an agency for events and guide effective response and recovery.

TPWD conducts regular emergency exercises, following their emergency training plan. This training trains staff across departments' divisions to assist with emergency response operations. Additionally, TPWD has a well-developed emergency notification process for critical staff.

5.3 PLANNING AND REGULATORY CAPABILITY

Planning and regulatory capability is based on implementing plans, policies, and programs that demonstrate TPWD’s commitment to guiding and managing growth while maintaining the general welfare of the community. It includes emergency response and mitigation planning, master planning, capital planning, and design and construction standards enforcement. Although conflicts can arise, these planning initiatives present significant opportunities to integrate hazard mitigation principles into TPWD’s decision-making process.

The Urban Water Management and Planning Act requires suppliers to estimate water demands and available water supplies. The TPWD updated the Urban Water Management Plan (UWMP),

completed in June 2021. UWMPs are required to evaluate the adequacy of water supplies, including projections of 5, 10, and 20 years. These plans must also include impacts of climate change and water shortage contingency planning for dealing with shortages, including a catastrophic supply interruption.

The Water Supply Reliability Assessment is a section of the plan that aims to understand the ability to satisfy the water demand during different years (e.g., years with average rainfall versus drier years).

UWMPs are intended to be integrated with other urban planning requirements and management plans. These plans include Water Master Plans, Recycled Water Master Plans, Integrated Resource Plans, Integrated Regional Water Management Plans, Groundwater Management Plans, Emergency Response Plans, and others.

Water Shortage Contingency Plan (WSCP)

Some aspects of the WSCP are required by the California Water Code (Water Code), including five specific response actions that align with six standard water shortage levels based on TPWD's water supply conditions and shortages resulting from catastrophic supply interruptions; TPWD WSCP was last updated 2021. The WSCP also contains TPWD procedures for conducting an annual water supply and demand assessment, the written decision-making process for determining supply reliability each year, and the data and methods used to evaluate reliability.

The WSCP is implemented through a series of ordinances of water use restriction in different stages. For instance, stage 1 requires a 10% water use restriction, and stage 5 requires greater than 50% water use restriction.

5.4 EXISTING PLANS

The following emergency-related plans apply as appropriate:

- CalWARN Emergency Operations Plan – Updated every ten years
- The District's Illness Injury Prevention Plan (IIPP) – Updated annually
- The District's Urban Water Management Plan – Updated every five years
- Water Shortage Contingency Plan (WSCP)– Updated every five years
- San Bernardino County Fire Management Plan- Updated annually
- San Bernardino County Flood Master Plan- Updated annually
- USEPA PSPS SOP for Public Water Systems - Updated every five years

5.5 MITIGATION PROGRAMS

This area is in the High Desert east of Joshua Tree. This is a severely disadvantaged community. Most residents do not have air conditioning in their homes. In the desert, homes are cooled with evaporative coolers, and 99 % do not have grass or high water uses. This area is always in

drought; therefore, water conservation is a way of life for this community. In addition to mitigating the effects of drought, the District has also implemented the following programs:

- The District participates in community events and speaking engagements, promoting conservation with educational material and explaining the uniqueness of relying solely on groundwater;
- The district stores disaster supply storage sheds in their corporate yard and the district office for employees during an emergency. The following items are stored in the old engineering offices in the Main building: cots, chairs, food bars, MREs, first aid kits, light sticks, batteries, blankets, personal sanitation kits, water, flashlights, etc.;
- Each employee is provided with an emergency survival backpack containing a three-day supply of food and water, first aid, and additional emergency supplies;
- The District maintains an Injury and Illness Prevention Plan;
- The District's SPCC Plan is updated annually for local and county fire hazardous materials departments.

5.6 FISCAL RESOURCES

The ability of TPWD to act is closely associated with the number of fiscal resources available to implement mitigation policies and projects. This may be outside grant funding awards or District-based revenue and financing. The cost of mitigation policy and project implementation vary widely. In some cases, mitigation actions are tied primarily to staff time or administrative costs associated with creating and monitoring a program. In other instances, direct expenses are linked to an actual project, such as installing backup power generators and sustainable energy resources, which can require a substantial commitment from TPWD and state and federal funding sources. TPWD has made fiscal commitments to mitigate hazards through its Capital Improvement Program (CIP).

The following is a summary of the District's fiscal capabilities. Several governmental funds and revenue-raising activities can be allocated for hazard mitigation, and included below is a potential source of discretionary general funding from local, state, and federal resources.

- State and Federal grants

Through the California Department of Water Resources, local grants and loans are available for water conservation, groundwater management, studies, and activities to enhance regional water supply quality and reliability. Project eligibility depends on the type of organization(s) applying and participating in the project and the specific type of project. More than one grant or loan may be appropriate for a proposed activity. Completing the LHMP will facilitate the acquisition of grant funding in the future—for instance, BRIC, HMGP, or FMA grants. Grant opportunities will be reviewed annually to ensure funding is available for specific mitigation items.

5.7 CAPABILITIES ASSESSMENT

A Capability Assessment examines TPWD's capabilities to detect any existing gaps or weaknesses within ongoing activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. The conclusions of the Risk Assessment and Capability Assessment serve as the foundation for developing a meaningful hazard mitigation strategy. The list below outlines key capabilities TPWD will consider in the Mitigation Strategy:

1. **Coordinate** with the San Bernardino County Emergency Management to achieve interoperability of Web EOC software and representations in appropriate EOCs;
2. **Provide** necessary staffing and software for ongoing maintenance of asset management program data;
3. **Add funding** for hazard mitigation actions to the District's Capital Improvement Program planning efforts;
4. **Incorporate** projects from the capital improvement program into the mitigation strategy (and vice versa);
5. **Expand** Public outreach and education on emergency management. This allows TPWD to form a plan to continually educate their customers regarding natural hazards and their effects on drinking water systems. They inform the residents of the importance of mitigating these hazards to build a more resilient community by providing educational materials to local schools and on the TPWD website.
6. **Broaden** staff training: TPWD employees have experience with past hazard mitigation and hazard planning and can improve their hazard mitigation skills by participating in training offered by other agencies or other regional governments.

SECTION 6. MITIGATION STRATEGIES

6.1 OVERVIEW

TPWD derived its mitigation strategy from the in-depth review of the existing vulnerabilities and capabilities outlined in previous sections of this plan, combined with a vision for creating a disaster-resistant and sustainable system for the future. This vision is based on informed assumptions that recognize mitigation challenges and opportunities and is demonstrated by the goals and objectives outlined below. The mitigation measures identified under each objective include an implementation plan for each measure. The measures were individually evaluated during discussions of mitigation alternatives, and the conclusions were used as inputs when priorities were decided. All priorities are based on the consensus of the Planning Team.

Mitigation measures are categorized generally for all hazards and specifically for the four high-risk hazards extensively examined in the risk assessment section. These hazards include earthquakes, climate change-induced drought, flooding, and cyber security.

6.2 MITIGATION GOALS, OBJECTIVES, AND PROJECTS

The process of identifying goals began with reviewing and validating the FEMA Hazard Maps for TPWD and surrounding cities in San Bernardino County. The team completed an assessment and discussion of whether each of the goals was valid. These discussions led to the opportunity to identify Goals and Objectives. In reviewing the mitigation objectives and actions, the Planning Team agreed that the following goals should be included in the LHMP.

Overall, the primary objective is to protect lives and prevent damage to infrastructure that disrupts water services. Global measures that apply across all hazards include:

- Continually improve the community's understanding of potential impacts due to hazards and the measures needed to protect lives and critical infrastructure;
- TPWD communications should provide public outreach to inform the public of the hazards identified to the drinking water system in emergencies - how to conserve water in the event of a disaster and how to obtain drinking water when water may not be available;
- Continually provide State and Local Agencies with updated information about hazards, vulnerabilities, and mitigation measures at TPWD;
- Review and verify that the District's owned and operated infrastructure meets the minimum standards for safety;
- Review the District's facilities and developments in high-risk areas to verify that these areas are appropriately protected from potential hazards;
- Identify and mitigate imminent threats to life safety and facility damage.
- The four high-profile hazards for TPWD are earthquakes, climate change-induced drought, flooding, and cyber security. While other hazards were profiled in previous sections, TPWD priority and focus for the mitigation projects will be on the four high-profile hazards.

From the 2018 LHMP, the table below shows the statuses of completed mitigation actions.

Table 13 Completed Mitigation Actions from 2018 LHMP

Title/Mitigation Action	Completed (Year)
Power Failure - Purchased generators with transfer switches	2024
Terrorist Events - Install video cameras at critical facilities	2023 - Ongoing
Power Failure - Standardized all emergency generator hook-ups	2022
Terrorist Events – Installed security glass at the front counter	2021

6.3 EARTHQUAKE

Goal: To protect life and property in Twentynine Palms Water District in the event of an earthquake.

Description: *The goal is to avoid injury, loss of life, and property damage*. Southern California is susceptible to earthquakes due to the numerous earthquake faults dissecting the state.

Mitigation Projects:

Below is the project's priority, the department responsible for this action, and the funding source. Further analysis will be required for each mitigation project to provide a more accurate cost estimate when ready to implement. All the actions listed for each hazard were the only actions considered by TPWD. The identified projects and current cost estimates include:

- Bolt down water reservoir facilities. Maintenance Superintendent or General Manager. (5 Years) $1.5 million. HMGP, BRIC, and CIP. High Priority.
- Seismic shut-off valves on all reservoirs. Maintenance Superintendent or General Manager. (5 Years) $1.5 million. HMGP, BRIC, and CIP. High Priority.
- Protect critical facilities and infrastructures by tying down equipment, strengthening buildings, training on following the emergency response plan, and opening an EOC. $1.5 Million. Maintenance Superintendent (5 Years). HMGP, BRIC, and CIP. High Priority.
- Conduct annual employee training on responding to an earthquake. This includes tabletop exercises, boots-on-the-ground exercises, and SIMS/NIMS training. $30,000 (annually) Safety. CIP. High Priority.

6.4 CLIMATE CHANGE INDUCED DROUGHT

Goal: To protect life and property in Twentynine Palms Water District in the event of a drought.

Description: *The goal is to avoid injury, loss of life, and property damage*. Due to Climate Change, there are more extremes in the weather, which means the summers can be hotter, the winters colder, and periods of rain can become less wet or wetter, which causes flooding. There are expected to be more significant fluctuations in weather patterns, including prolonged dry periods and drought hazards, which can be mitigated over the long term.

Mitigation Projects:

Below is the project's priority, the department responsible for this action, and the funding source. Further analysis will be required for each mitigation project to provide a more accurate cost estimate when ready to implement. All the actions listed for each hazard were the only actions considered by TPWD. The identified projects and current cost estimates include the following:

- Improve operational efficiency system leaks and increase water pumping capabilities by installing additional production wells. Collection systems and leak surveys. Looking for water loss in the system, etc. $7 Million (5 Years) Maintenance Superintendent. HMGP, BRIC, CIP. High Priority.

6.5 FLOOD

Goal: To protect life and property in Twentynine Palms Water District in the event of flooding.

TPWD does not participate in the National Flood Insurance Program (NFIP).

Description: *The goal is to avoid injury, loss of life, and property damage*. A localized flood of significant volume and short duration is typically caused by hefty rain in a semiarid area. Floods can reach their peak volume in a few minutes and often carry large loads of mud and rock fragments.

Mitigation Projects:

Below is the project's priority, the department responsible for this action, and the funding source. Further analysis will be required for each mitigation project to provide a more accurate cost estimate when ready to implement. All the actions listed for each hazard were the only actions considered by TPWD. The identified projects and current cost estimates include the following:

- Improve existing facilities and construct new facilities to mitigate flooding (*5 Years*) $2 Million. Maintenance Superintendent. BRIC, HMGP. Medium Priority.
- Install stormwater drainage. Assessment of access roadways and access points leading to facilities. Install diversion walls, block walls, and stem walls. (5 years). $3.5 Million.

BRIC, FMA, HMGP, CIP. Treatment/Production Maintenance Superintendent. High Priority.

6.6 CYBER SECURITY

Goal: To protect life and property in Twentynine Palms Water District in the event of a cyber security attack.

Description: *The goal is to avoid injury, loss of life, and property damage*. Cyber-attacks can take many forms, such as malware, phishing, and insider threats. It is up to the District to train and protect against external or internal infiltration. The district will not share its cyber security planning within this LHMP as an added security measure.

Mitigation Projects:

Below, you will find the priority of the project department responsible for this action and the funding source. Further analysis will be required for each mitigation project to provide a more accurate cost estimate when ready to implement. All the actions listed for each hazard were the only actions considered by TPWD. The identified projects and current cost estimates include:

- SCADA Server Upgrade. Communication system upgrade. $1,000,000(5 Years). High Priority. Maintenance Superintendent and Treatment/Production Superintendent. HMGP and BRIC.
- District-wide Video Surveillance Improvement. Update, install, and modernize video cameras and recording devices. $1 million. High Priority. (5 Years). IT, Maintenance Superintendent, Treatment/Production Superintendent. HMGP and BRIC.

6.7 MITIGATION PRIORITIES

During the development of the risk assessment for TPWD, the Planning Team proposed and discussed alternative mitigation goals, objectives, and specific mitigation measures that TPWD should undertake to reduce the risk from the five high-risk hazards facing the District. Priorities from the 2018 LHMP have not changed for the 2023 plan.

The team considered multiple factors to establish the mitigation priorities included in this plan. It assigned the highest priority rankings to those mitigation measures that met three primary criteria:

- Greatest potential for protecting life and safety
- Greatest potential for maintaining critical District functions and operability following a disaster
- Achievability in terms of residents' support and cost-effectiveness

The consensus of the Planning Team determined all rankings. As described in the previous section on hazard and risk assessment, it is clear that earthquakes have the potential to affect the most significant number of people, damage critical facilities and buildings, and cause the most important economic losses. This fact, combined with the relatively high probability of an

earthquake in the next several decades, makes increasing disaster resistance and readiness for earthquakes a high priority. Given the extreme importance of maintaining critical functions in times of disaster and the large number of customers who depend and rely on TPWD services and infrastructure, those mitigation measures that improve disaster resistance, readiness, or recovery capacity are generally given higher priority.

Earthquakes, climate change-induced drought, flooding, and cyber security mitigation actions are prioritized according to their importance, cost, funding availability, the degree to which project planning has been completed, and the anticipated time to implement the measures.

Using the above rationale for establishing mitigation priorities, each mitigation measure is assigned a priority ranking as follows:

- High – Projects that will be the primary focus of implementation over the next five years
- Medium – Projects that may be implemented over the next five years
- Low – Projects that will not be implemented over the next five years unless conditions change (new program and funding source)

6.8 IMPLEMENTATION STRATEGY

The implementation strategy is intended to successfully mitigate the hazards identified in this plan within a reasonable time. TPWD is currently operating within its annual budget and has been fortunate that the past ten-year recession didn't cause significant issues with the budget or revenue. TPWD revenues have remained strong throughout the downturn, and capital improvement projects have remained a priority. TPWD staff will review the Mitigation Plan each year before developing the fiscal budget for the following year. The Board of Directors will also review the plan for items to be included in the new fiscal budget. TPWD staff will also look for ways to obtain Hazard Mitigation Grants each year to offset the budgetary budget's impact and show some relief for the residents. The following equations below are the cost-benefit analysis equations used to ensure that the cost-benefit to the District is within FEMA guidelines. When completing a cost-benefit analysis with FEMA, the formula is all electronic but resembles the formula below.

$$B/C = \left[\frac{B_0}{(1+i)^0} + \ldots + \frac{B_T}{(1+i)^T}\right] \div \left[\frac{C_0}{(1+i)^0} + \ldots + \frac{C_T}{(1+i)^T}\right]$$

Mitigation Projects Funding Source

There is currently no mitigation money in the District's budget. When funding becomes available, the District will include mitigation in the budgeting process and determine what mitigation projects could be funded in future budget cycles.

Timeframe

Over the next five years, the District will incorporate mitigation into all capital improvement projects that the District undertakes. The previous 2018 LHMP was incorporated into the CIP and other planning mechanisms.

The District will apply for mitigation grants each year as the opportunities become available in the State of California, County of San Bernardino. The District will consider all mitigation items during the Ten-Year Capital Improvement Plan review and the annual budget workshops.

SECTION 7. PLAN MAINTENANCE

7.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

The General Manager or their assignee will evaluate the plan annually and consider whether new hazards have emerged, community vulnerability has changed, and goals and objectives remain relevant to current conditions. This will be done by evaluating and removing completed mitigation actions and adding mitigation projects to the current LHMP. The LHMP will be reviewed as part of the Annual Budget Planning in the spring of each year and whenever there are new infrastructure updates within TPWD. The General Manager or their assignee will ensure the LHMP is reviewed annually, and any items that have been mitigated will be removed from the plan. At that time, staff and the elected Board of Directors will review funding and capital improvement projects in the next fiscal year's budget. Annually, the General Manager, their assignee, and the Chief Financial Officer will review funding and determine the projects to be included in the next fiscal year's Capital Improvement Plan (CIP) budget. The General Manager or their assignee will be the LHMP in all budget and grant planning meetings. This will allow open discussion, evaluation, and assessment of the LHMP to achieve goals, allowing the addition and removal of mitigated items.

The General Manager or their assignee leads a full review of the LHMP at a three-and-a-half-year interval in the same manner as the initial LHMP. At this time, the planning team headed by the operations department and including the general manager or their assignee will address progress in reaching mitigation goals, assessment of new and existing hazards, use of the latest revised FEMA review tool, cross-referencing hazards from the county, and development of new mitigation strategies and goals.

The consumers within Twentynine Palms Water District and the District's personnel will be asked to participate in the LHMP update process.

7.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS

Once the State of California OES and FEMA approve the LHMP, TPWD will incorporate the LHMP into capital improvement projects, capital replacement programs, building designs, and any updates or repairs to the water distribution system. TPWD will submit a Notice of Intent to the State of California to help facilitate opportunities to obtain FEMA and state funding to mitigate hazards within the service area. The General Manager or their assignee will be responsible for implementing the LHMP and working toward the LHMP recommended goals and objectives that are met. The General Manager or their assignee will place the LHMP on the District's website and incorporate the LHMP into the annual budget planning meetings. The General Manager or their assignee will verify that the LHMP is updated and rewritten over a 5-year cycle. TPWD will start the update process one and a half years before the expiration date on this document.

7.3 CONTINUED PUBLIC INVOLVEMENT

The approved LHMP will be continuously posted with contact information on the TPWD's Website. The General Manager or their assignee ensures the LHMP is brought annually before the Board of Directors during Budget Planning. Public comments will be taken regarding the LHMP when the plan is updated in 2029, and projects that could be included in next year's budget will be considered. As new facilities are incorporated into TPWD, the LHMP will be updated to include new facilities and new hazards, if warranted. When the LHMP is rewritten and updated, the public can review it and coincide with the document's changes. The General Manager or their assignee ensures the LHMP is updated annually and every five years.

The plan is reviewed annually; the TPWD Operations Department and General Manager will conduct outreach with the nonprofit organizations, including community-based organizations, to represent the community's input into the updates. TPWD can also learn how community priorities have changed since the last update by conducting outreach to the public on construction, infrastructure improvements, and overall abilities.