



City of San Bernardino Municipal Water Department
Local Hazard Mitigation Plan Update
2024



TABLE OF CONTENTS

SECTION 1. INTRODUCTION	5
1.1 PURPOSE OF THE PLAN	5
1.2 AUTHORITY	6
1.3 WHAT'S NEW.....	6
1.4 NEW RISK ASSESSMENT.....	7
1.5 SUCCESSFUL MITIGATION IMPLEMENTATION.....	8
1.6 COMMUNITY PROFILE	8
<i>Physical Setting</i>	8
<i>History</i>	11
1.7 CLIMATE	14
1.8 DEMOGRAPHICS	15
1.9 EXISTING LAND USE.....	16
1.10 DEVELOPMENT TRENDS	16
SECTION 2. PLAN ADOPTION.....	17
2.1 ADOPTION BY LOCAL GOVERNING BODY	17
2.2 PROMULGATION AUTHORITY	17
2.3 PRIMARY POINT OF CONTACT	17
SECTION 3. PLANNING PROCESS	19
3.1 PREPARING FOR THE PLAN	19
3.2 PLANNING TEAM	21
3.3 COORDINATION WITH OTHER EXTERNAL JURISDICTIONS, AGENCIES, AND ORGANIZATIONS	22
3.4 PUBLIC INVOLVEMENT/OUTREACH.....	23
3.5 ASSESS THE HAZARD	24
3.6 SET GOALS	24
3.7 REVIEW AND PROPOSE MITIGATION MEASURES	24
3.8 DRAFT THE HAZARD MITIGATION PLAN	26
3.9 ADOPT THE PLAN	27
SECTION 4. RISK ASSESSMENT	28
4.1 HAZARD IDENTIFICATION.....	28
4.2 HAZARD SCREENING CRITERIA	28
4.3 HAZARD PROFILES.....	30
4.3.1 EARTHQUAKE	31
4.3.2 CLIMATE CHANGE – INDUCED DROUGHT.....	39
4.3.3 FLOOD	48



4.3.4	WINDSTORMS	55
4.3.5	WILDFIRE	64
4.3.6	CYBER SECURITY	70
SECTION 5. COMMUNITY CAPABILITY ASSESSMENT		72
5.1	INTRODUCTIONS	72
5.2	EMERGENCY MANAGEMENT	72
5.3	PLANNING AND REGULATORY CAPABILITY	74
5.4	EXISTING PLANS	75
5.5	MITIGATION PROGRAMS	75
5.6	FISCAL RESOURCES.....	76
5.7	CAPABILITIES ASSESSMENT	77
SECTION 6. MITIGATION STRATEGIES		78
6.1	OVERVIEW	78
6.2	MITIGATION GOALS, OBJECTIVES, AND PROJECTS	78
6.3	EARTHQUAKE	82
6.4	CLIMATE CHANGE – INDUCED DROUGHT.....	82
6.5	FLOOD	83
6.6	WILDFIRE	84
6.7	WINDSTORM.....	84
6.8	CYBER SECURITY	85
6.9	MITIGATION PRIORITIES.....	86
6.10	IMPLEMENTATION STRATEGY	87
SECTION 7. PLAN MAINTENANCE.....		88
7.1	MONITORING, EVALUATING, AND UPDATING THE PLAN	88
7.2	IMPLEMENTATION THROUGH EXISTING PROGRAMS.....	88
7.3	CONTINUED PUBLIC INVOLVEMENT	89
 TABLES AND FIGURES		
Table 1. SBMWD Critical Facilities		12
Table 2. Average Max and Min Temp and Total Precipitation for the City of San Bernardino		14
Table 3. Percentage of the Population at Risk from Identified Hazards within SBMWD		15
Table 4. Plans Used.....		20
Table 5. Hazard Risk Rankings		29
Table 6. Screening Assessment Matrix		30
Table 7. Earthquake Magnitude Replacement Costs.....		33



Table 8. Significant Earthquakes (4.0+ M_w) within 100 miles of San Bernardino County.....	36
Table 9. Drought Severity Replacement Costs	41
Table 10. U.S. Drought Monitor	45
Table 11. Drought History in Southern California	46
Table 12. City of San Bernardino Dam Inundation - Seven Oaks Dam from SBLHMP	50
Table 13. Flood Zone Replacement Cost.....	51
Table 14. History of Flooding in San Bernardino.....	52
Table 15. Windstorm Replacement Costs	57
Table 16. Beaufort Wind Scale	59
Table 17. Windstorm History From NOAA 2019-2024 San Bernardino County	59
Table 18. Wildfire History in San Bernardino County	68
Table 19. Mitigation Actions from 2019 LHMP	79
Figure 1. SBMWD Service Map.....	10
Figure 2. SBMWD Critical Facilities.....	13
Figure 3 . SBMWD Earthquake Fault Lines.....	34
Figure 4. San Bernardino Municipal Water Department, USGS ShakeOut Map	35
Figure 5. USGS Modified Mercalli Intensity Scale	35
Figure 6. United States Earthquake Hazard Map.....	36
Figure 7. How Ground Displacement Can Severe Pipes	38
Figure 8. Drought Monitor January 2019	43
Figure 9. Drought Monitor January 2024	44
Figure 10. Drought History (2000-2023).....	46
Figure 11. Flood Zones within the SBMWD Service Area.....	53
Figure 12. Wind Zones in the United States.....	56
Figure 13. Wildfire Map with SBMWD Boundaries	67



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 City of San Bernardino Municipal Water Department (SBMWD) Hazard Mitigation Plan under review by FEMA.

1.1 Purpose of the Plan

Hazard mitigation intends to reduce and/or 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 a plan for reducing and/or eliminating risk within the City of San Bernardino Municipal Water Department service area. The LHMP process encourages communities to develop goals and projects that will reduce 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 simply restore to pre-disaster conditions. 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 SBMWD infrastructure development and the natural environment safer and more disaster resilient. Mitigation generally involves altering physical environments, significantly reducing risks and vulnerability to hazards by altering the built environment to avoid or reduce life and property losses. Mitigation also makes responding to and recovering from disasters easier and less expensive.

With an approved (and adopted) LHMP, the City of San Bernardino Municipal Water Department is eligible for federal disaster mitigation funds/grants (Hazard Mitigation Grant Program, Pre-Disaster Mitigation, and Flood Management Assistance) aimed to reduce and/or eliminate risk.



1.2 Authority

In 2000, FEMA adopted revisions to the Code of Federal Regulations. This revision is known as "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 local 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.

Created as a municipal utility under Article 9 of the City of San Bernardino Charter, SBMWD was established on January 6, 1905. SBMWD is governed by a Water Board appointed by the mayor and subject to confirmation by the City Council. The first Water Board was appointed in May 1905, and the initial water distribution system covered approximately one square mile and served a population of only about 6,000 people. Since then, the service area has experienced years of steady population growth and has expanded quickly to provide service to most of the City of San Bernardino and portions of the unincorporated area of San Bernardino County. SBMWD also provides services to the City of Loma Linda.

The Department is governed by a five (5) member Water Board, appointed by the City of San Bernardino Mayor. The General Manager administers the department's day-to-day operations in accordance with policies and procedures established by the Water Board. The Water Board employs a General Manager. There are 263 full-time and three part-time employees at SBMWD.

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

1.3 What's New

The 2019 City of San Bernardino Municipal Water Department Local Hazard Mitigation Plan contained a detailed description of the planning process, a risk assessment of identified hazards for the service area, and an overall mitigation strategy for reducing the risk and vulnerability from these hazards. Since FEMA's approval of the plan, progress has been made by SBMWD on the mitigation strategy. As part of this 2024 LHMP update, a thorough review and update of the 2019 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 includes a summary of new hazard and risk assessment data related to the 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 2024 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.

2019 Mitigation Strategy Status and Successes. This section describes the status of mitigation actions from the 2019 plan and indicates whether a project is no longer relevant or is recommended for inclusion in the updated 2024 mitigation strategy.

This *What's New* section provides documentation of the SBMWD service area's progress or changes in their risk and vulnerability to hazards and their overall hazard mitigation program. Completing this 2024 LHMP update further provides documentation of the 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, SBMWD recognized that updated data, if available, would enhance the analysis presented in the risk assessment and be utilized in developing the updated mitigation strategy. Highlights of new data used for this plan update are identified below in this section and are also 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 SBMWD service area was completed, adding additional hazards to planning documents. The new hazards include cyber security.
- An entire rework of the risk assessment for each identified hazard. This included reworking the hazard profile and adding new hazard event occurrences, rebuilding vulnerability as the whole analysis to add items identified below, and updating the vulnerability assessment based on more recent hazard data.



- An update of the flood hazard analysis to include an updated analysis of the 100-year flood and an analysis of the 500-year flood, including the use of the new and updated DFIRMs.
- An enhanced vulnerability assessment.

Incorporation and analysis of the new 2020 Census data were utilized for this LHMP update. Census data was used in an intersect analysis to determine how much of the population is exposed to flood, drought, earthquake, windstorm, and wildfire hazards.

1.5 Successful Mitigation Implementation

SBMWD has completed a review of past seismic retrofit studies and has applied studies to current and future projects. They also participate annually with Great California Shakeout to prepare and train employees for earthquakes.

- Six steel and concrete reservoirs have been strategically retrofitted since 2020, and there is a plan to retrofit seven more over the next four years, 2024-2028.

1.6 Community Profile

Physical Setting

The City of San Bernardino lies at the base of the San Bernardino Mountains and is approximately 60 miles east of the City of Los Angeles. The city has three major freeways that run through it: Interstate 10, Interstate 215, and Interstate 210. The city is also home to California State University, San Bernardino, and San Bernardino International Airport.

The SBMWD's service area is bounded on the north by the San Bernardino National Forest, on the east by the East Valley Water District and Redlands Municipal Utilities, on the south by the cities of Loma Linda and Colton, and on the west by the West Valley Water District, the City of Rialto, and the Muscoy Mutual Water Company. Elevations within the SBMWD's service area range from approximately 1,000 feet above sea level at the southern boundary to more than 2,300 feet above sea level at its northernmost boundary.

The geographical features include the San Bernardino National Forest, located north of the city's boundaries. Cajon Pass is in the northwest section of the city. The Arrowhead Springs are located within the city boundaries. City Creek, San Timoteo Creek, Twin Creek, and Warm Creek feed into the Santa Ana River, encompassing most of the city's southern border.

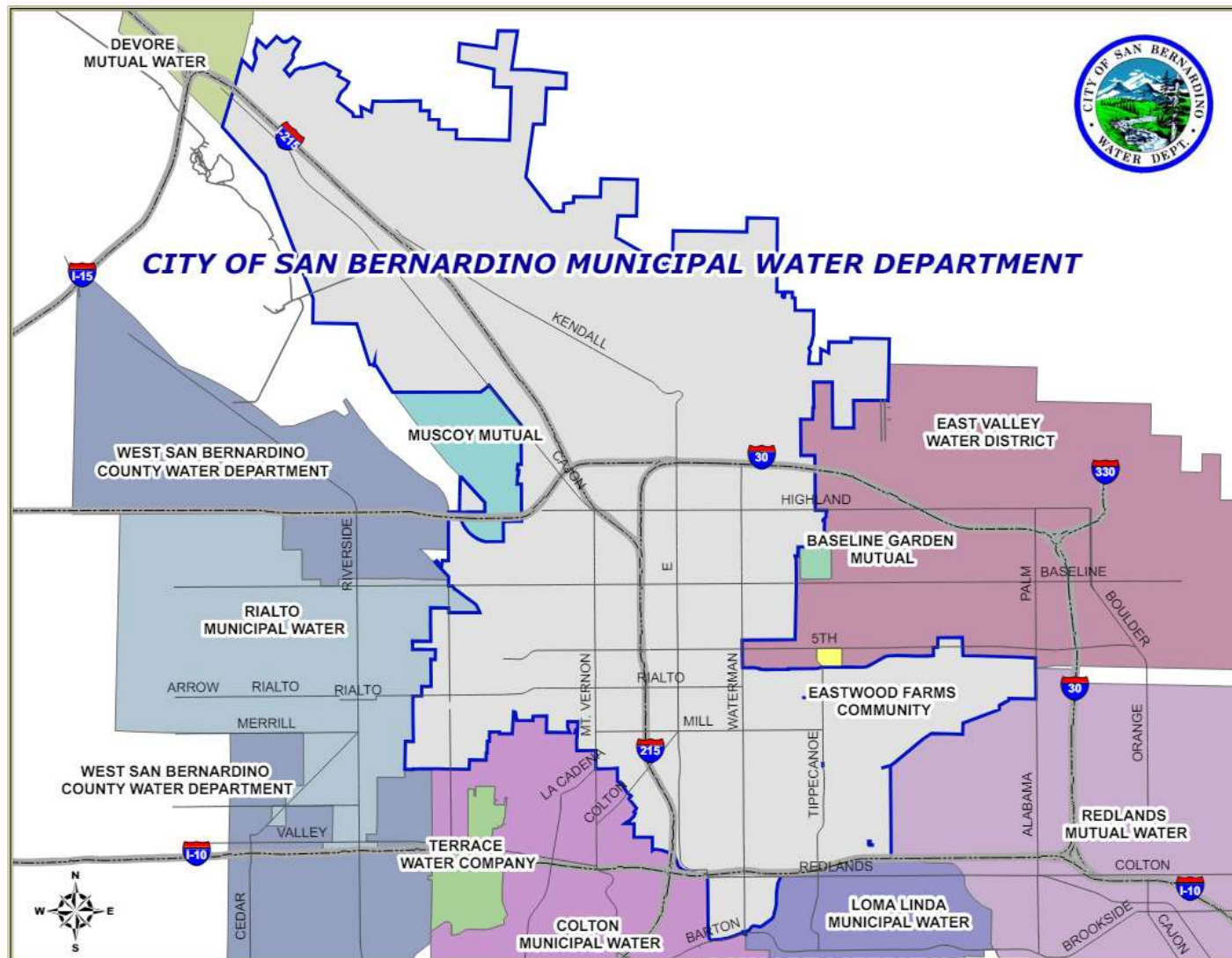
San Bernardino is unique from most Southern California cities because of the vast amounts of water found in the basin. Most of the city sits on the underground aquifer



named the Bunker Hill Basin. The city's downtown area was built on top of the Bunker Hill Basin. The downtown area still rests in that location. This accounts for the historical high-water table in the city. In past years, the water table was so high the city installed super wells to pump water from the basin into the Santa Ana River in an attempt to lower the water table and stop the flooding of the United States Central Post Office basement as well as basements of other government offices and businesses located in the southwestern and western sides of the city. Pumping water out of the basin was also an attempt to lower the danger of liquefaction during earthquakes. These wells were turned off during the recent drought as the water table was well below levels that interfered with buildings.



Figure 1. SBMWD Service Map





History

The City of San Bernardino Municipal Water Department and the Water Board were established on May 8, 1905, by the Mayor and Common Council of San Bernardino in accordance with the provisions specified in the City Charter. "The Water Board assembled for the first time on May 16, 1905, to meet the community's water supply needs by providing trusted, quality service to our customers." This service has grown through the years to include water supply, water reclamation, geothermal heating supply, and administrative support for our growing community.

The first water distribution system of San Bernardino included water supply for approximately six thousand citizens within a one-square-mile service area. In contrast, the water supply distribution network now encompasses over 45,000 service connections, including 750 miles of water mains, over 55 square miles. Although the number of connections has increased during the past one hundred years, the commitment to trusted, quality service remains intact.

The SBMWD's service area receives its water supply from an underground aquifer called Bunker Hill Groundwater Basin, concentrated at the city's northeastern end. The water contained in the Bunker Hill Groundwater Basin is replenished with rain and snowmelt that filters through the local San Bernardino Mountains. This local water supply ensures the customers of the San Bernardino Municipal Water Department receive high-quality, inexpensive water as compared to other communities. SBMWD also receives water from the State of California Water Project. State project water does not feed directly into the SBMWD water system and is only used to help replenish the Bunker Hill Basin. Many communities of Southern California must import their water supplies from remote locations via the Colorado River and Northern California pipelines and aqueducts. Certain man-made and natural contaminants can impact many water supplies imported from distant locations as the water is transported to the customer. SBMWD also operates two wastewater treatment plants.

In (YEAR), SBMWD obtained a FEMA grant to assist in reservoir seismic upgrades of four steel tanks, totaling 26.3 million gallons, enhancing water reliability throughout the service area.

The SBMWD operates and maintains 38 storage tanks and 53 water wells. In addition, the SBMWD has ownership of the City of San Bernardino's wastewater collection system. The SBMWD has owned and operated the wastewater treatment system for over 60 years but didn't own or operate the wastewater collection system. The City of San Bernardino Public Works Department owned and operated the collection system. As the city emerged



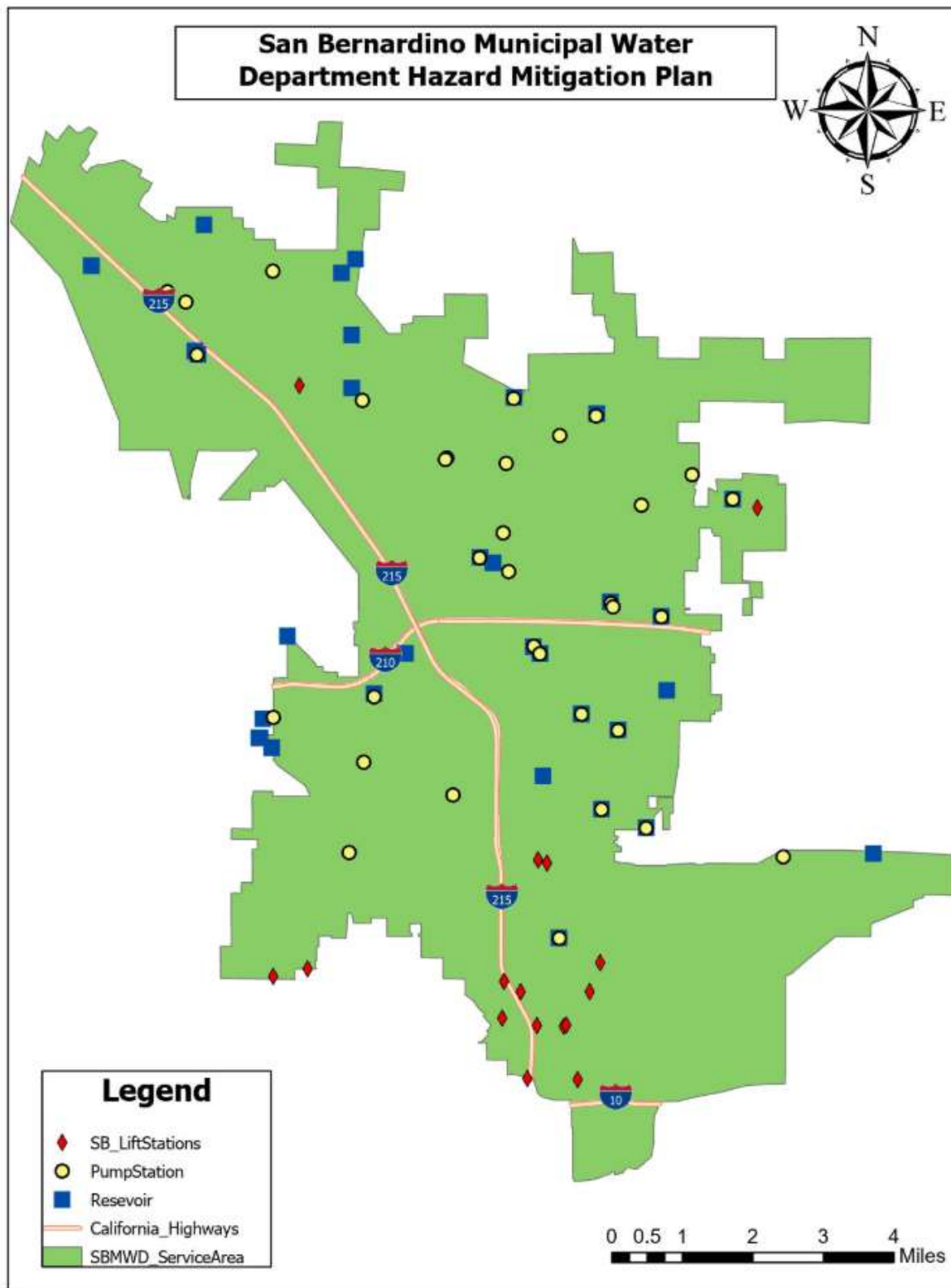
from bankruptcy in 2017, the city turned over ownership, maintenance, and control of the collections system. The collection system had not been updated in many years. The SBMWD now operates 466 miles of wastewater pipelines and has 64,342 customer wastewater laterals within the city and county areas. The wastewater system treats, on average, 22 million gallons of wastewater daily, all of which are prone and at risk from the effects of each identified hazard in **Section 4.3**.

Table 1. SBMWD Critical Facilities

Critical Facilities	Hazard Vulnerability
Water Reclamation Plant	Earthquake
RIX	Earthquake, drought, flood, windstorm, wildfire
19th Street Plant	Earthquake, flood
Newmark Plant	Earthquake, flood
Perris Hill Dam	Earthquake, flood
Waterman Plant	Earthquake, flood
17th Street Plant	Earthquake, flood
Ogden Plant	Earthquake, flood, wildfire
Medical Center Plant	Earthquake, flood
Lythe Creek Plant	Earthquake, wildfire, flood
Electric Drive Plant	Earthquake, wildfire
E Street Lift Station	Earthquake, drought, flood, wildfire



Figure 2. SBMWD Critical Facilities





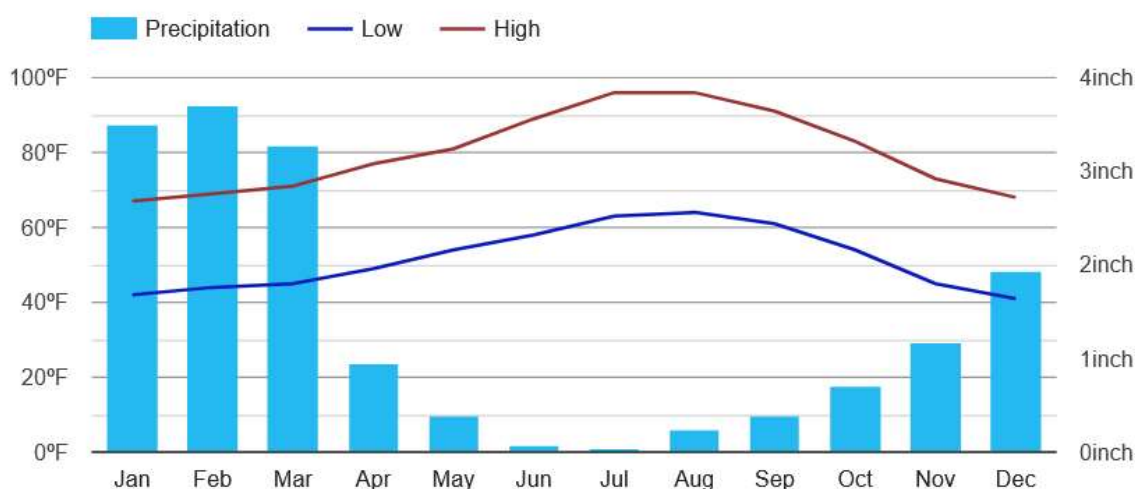
1.7 Climate

The average rainfall¹ The City of San Bernardino, where our Main Headquarters is located, has an average temperature of 1.1 of an inch, ranging from 55.5 to 80.3 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 San Bernardino

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max. Temp (F)	68	70	75	77	79	89	93	95	92	83	73	69	80.3
Avg. Min. Temp (F)	45	47	51	53	57	62	67	67	66	58	49	44	55.5
Avg. Total Precipitation	2.61	1.93	1.27	.73	.31	0	.23	.20	.53	.83	1.31	2.99	1.1

San Bernardino Climate Graph - California Climate Chart



¹ Average weather San Bernardino 2023 normal US Climate Data <https://www.usclimatedata.com/>



1.8 Demographics

Demographics for our service area are based on Census 2020². SBMWD delivers more than 47,676 acre-feet per year (15.5 billion gallons) of water to its service area for both commercial and residential use and serves a population of over 200,000 residents. In emergencies, the County of San Bernardino and the City of San Bernardino and the City of San Bernardino handle underserved communities and socially vulnerable populations. SBMWD serves a severely economically disadvantaged community based on the 2020 Federal Census.

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

% of Population at Risk from Identified Hazards	SBMWD	Population Total
Population within Service Area	215,000	215,000
Earthquake	100%	215,000
Drought	10%	21,500
Flooding	35%	75,250
Windstorm	15%	32,250
Wildfire	25%	53,750
Cyber Security	0%	215,000

² Service area population from <http://datausa.io>



1.9 Existing Land Use

The existing land used is for housing, commercial, and light industry. The City of San Bernardino is responsible for designating land use. The City of San Bernardino and the County of San Bernardino regulate incorporated areas. The SBMWD does not have the authority to regulate land use.

1.10 Development Trends

Development in the City of San Bernardino was reduced significantly during the housing industry crash in 2008. San Bernardino is seeing some new housing developments that started in 2015, 2017, and 2018. The area is expected to see an increase in the housing market, which will increase the number of water and wastewater service connections to the SBMWD's water and wastewater systems. The biggest developing areas in the city are warehouses, redevelopment, and housing. This development means there are more pipelines, pumping stations, hydroelectric generating stations, manual and automatic control valves, fire hydrants, water meters, sewer mains, storage reservoirs, and wells needed to supply services to the area. This area is also in a high-fire area and is vulnerable to earthquakes and intense high winds during the Santa Ana events.

All future development that will take place is planned to occur in accordance with the General Plan Land Use Zones and will consider all potential hazards identified within this 2024 LHMP. Additionally, all developments will comply with all the county and state Fire, Flood, and Seismic codes at the time of development. No development changes since the 2019 LHMP affected the jurisdiction's overall vulnerability. There have been no changes to the community's priorities since the 2019 LHMP.



SECTION 2. PLAN ADOPTION

2.1 Adoption by Local Governing Body

According to the mitigation planning regulations, SBMWD LHMP will be submitted to the California Office of Emergency Services (Cal EOS) for review and approval. Cal OES will conduct a review of the Plan in accordance with the Code of Federal Regulations; once this review is complete and any revisions are made, CalOES will forward the plan to FEMA for another review and revisions, as FEMA requires. CalOES will notify SBMWD when FEMA has approved the final LHMP. The final approval letter will be pending adoption by the Water Board. The Water Board's 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 Local Hazard Mitigation Plan was reviewed and approved by the Board of Water Commissioners of the City of San Bernardino Municipal Water Department's Water Board:

Toni Callicott - President

Wayne Hendrix P.E. - Vice President

David E. Mlynarski – Water Board Member

Thomas Brickley - Water Board Member

Rikke V Johnson - Water Board Member

2.3 Primary Point of Contact

The Point of Contact for information regarding this LHMP is:

Francisco Salazar – Safety Manager

City of San Bernardino

Municipal Water Department

1350 South E Street

San Bernardino, CA 92408

(909) 384-5141



City of San Bernardino Municipal Water Department
DRAFT Local Hazard Mitigation Plan

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

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

Internally, SBMWD has a wealth of experienced and resourceful employees who provide benefits to the program. The SBMWD team participated in regular discussions, staff meetings, and health and safety committee meetings supporting the plan update. The internal planning team was invited to the meeting through emails and Microsoft Outlook calendar invites. This team also participated in community outreach events such as fairs and local city functions.

In addition to participating in the 2022 county-level update, SBMWD participated in plan updates with local agencies undergoing plan updates in 2023. Additionally, members from local government agencies who were asked to be a part of the SBMWD LHMP Update Planning team to assist in document review included staff from the City of San Bernardino, San Bernardino County Fire District, San Bernardino County OES, and the San Bernardino Police Department. This team also participated in 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 and events. Organizations within the service boundaries that conduct outreach and assistance for vulnerable populations include the Inland Empire American Red Cross Chapter and Mary's Mercy Kitchen. SBMWD also has collaborative conservation messages with local water districts regarding water waste. 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.

SBMWD's approach in updating the plan consisted of:

- 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 their 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 service area's hazards and mitigation goals for SBMWD. Relevant information from each of the following plans, including local City and County Government priorities, was included when aligned with SBMWD strategies and projects and incorporated into this update. There have not been any changes in priorities since the approval of the 2019 LHMP.

SBMWD Urban Water Master Plan 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 agree to water shortages, replenishment, and effects of climate change on our water. The following plans were used:

Table 4 Plans Used

Study Plan	Key Information
IRUWMP Urban Water Management Plan	Land Use Trends
2015 Water Master Plan	Water Systems
2019 Sewer Master Plan	Sewer Systems
2019 SBMWD LHMP	Hazard Identification, Mitigation Measures
2020 Water Reclamation Plant Facility Master Plan	WRP Systems
2020 San Bernardino County LHMP	Land Use For Area, Future Projects
2024 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 S.B. 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 Planning Team:

Internal Team:

Miguel J. Guerrero, P.E. - General Manager

Francisco Salazar – Safety Manager

Karl Wendt – Safety Coordinator

Daniel Rios – Environmental Analyst

Ashleigh Torres – Risk Management Analyst

Marissa Flores - Acosta – Environmental Manager

External Team:



Michele Mahan – San Bernardino Police Department

David Davis - San Bernardino County OES

Dan Flores - Mary's Mercy Kitchen

Stephanie McMahon - American Redcross

3.3 Coordination with Other External Jurisdictions, Agencies, and Organizations

The Internal and External Planning Teams include five people from the City of San Bernardino Municipal Water Department and four people from local agencies. The County of San Bernardino OES, San Bernardino Police Department, Mary's Mercy Kitchen, and American Red Cross were invited to be on the Planning Team, but American Redcross was unable to attend. The meeting matrix outlining the subjects covered and the attendees is in Appendix A.

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. SBMWD facilitated the LHMP process and provided information that follows FEMA requirements for the program. The tools, resource materials, and other project-related information are maintained on a project portal on SBMWD's website <https://ca-sbmwd.civicplus.com/>, which allows access to the information by all participants and the public; screenshots are located under Appendix B.

Mr. Gary Sturdivan's contact information was on each document for questions and concerns. 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 then 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

The City of San Bernardino Municipal Water Department Planning Team participated in each of the scheduled Planning Team meetings and conference calls facilitated by SEMC related to the update project. Meeting agendas discussing LHMP updates are in Appendix A.

3.4 Public Involvement/Outreach

In support of the City of San Bernardino Municipal Water Department LHMP update, SBMWD solicited information from members of the public through various methods. SBMWD conducted their outreach through various social media, including Facebook and Instagram, to distribute a questionnaire, along with posting sections of the draft LHMP onto the City of San Bernardino Municipal Water Department website. Outreach to nonprofit organizations, including community-based organizations and the agencies listed in **Section 3.1**, was conducted to allow those representing vulnerable populations to be involved in the planning process. SBMWD outreach included a solicitation for comment through phone calls and emails to the organizations in Section 3.1 on numerous occasions but could not elicit feedback.

These methods consist of:

- Community Outreach events
- Local Emergency Coordination meetings
- Plan/Project inclusion in the City of San Bernardino Municipal Water Department's Programs includes mitigation actions that require public involvement and are open for public comment. (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 provided the opportunity to be involved. **No comments were made at this time.**

October 2023, The Great ShakeOut

The City of San Bernardino Municipal Water Department participated in The Great ShakeOut. Through this plan, we provide information on disaster response related to business and water. This information includes steps SBMWD has taken to respond to earthquake emergencies that impact SBMWD and the surrounding community.



3.5 Assess the Hazard

A critical component of the LHMP process is assessing the likely hazards that may impact SBMWD facilities and operations. It is important to have a thorough understanding of these hazards without overanalyzing remote or highly unlikely hazards.

This LHMP has been developed through an extensive review of available information on hazards SBMWD has faced in the past and most likely will face in the future. The Planning Team reviewed and discussed items that have happened in the State of California and disasters that have happened in the 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 Planning Team then 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 information.*

3.6 Set Goals

The goal-setting process for the 2024 Local 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 potential risk the community is facing, the Planning Team then re-evaluated the 2019 Hazard Mitigation Plan Goals and Objectives, assessed their status and effectiveness in meeting the 2019 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 City of San Bernardino Municipal Water Department 2019 Local 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 for the hazards that influence SBMWD. This analysis assisted in developing an implementation strategy for prioritizing 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 - Detention 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 input from members. The STAPLEE method was applied to prioritizing 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. Be 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 had the ability to identify the higher priority projects.

3.8 Draft the Hazard Mitigation Plan

The LHMP update was drafted by SEMC, the Project Lead, based on input and comments from the Planning Team. As indicated previously, the Planning Team used the 2019 LHMP as a starting point but revised it to reflect updated information.

SBMWD 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 Water Board. All draft documents were posted on the City of San Bernardino Municipal Water Department website. Notices were sent to all water customers in the service area. billing statements and public updates on social media that SBMWD has at its disposal. All LHMP documents were posted on the website, and comments were asked for.

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

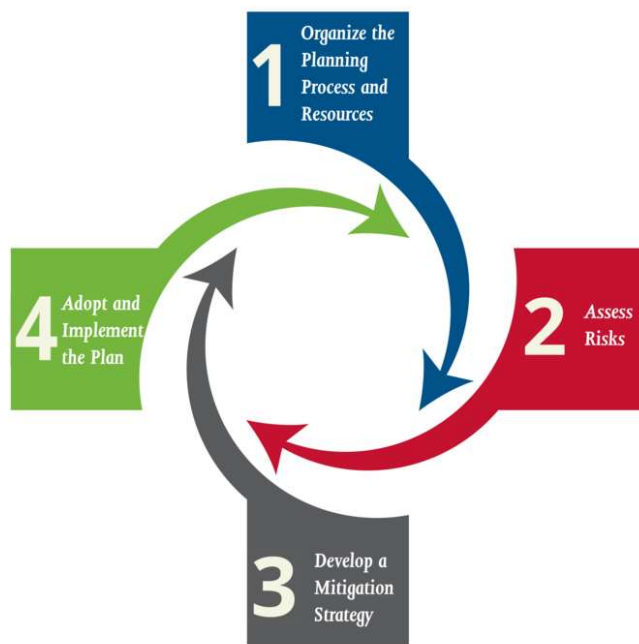
After the public review, the draft plan will be submitted to the State of California OES. Once the State has approved the LHMP, the document will be sent to FEMA. FEMA will provide the City of San Bernardino Municipal Water Department with an "Approval Letter" when the Hazard Mitigation Plan update meets all federal requirements. A copy of the resolution and original LHMP 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 future impacts of a hazard, 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 with respect to the anticipated damages caused by such an event.

This section aims to understand the hazards and their risks in the San Bernardino Municipal 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 greatest concern for SBMWD. 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 STAPLEE (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 pertaining to 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
Wildfire	2
Climate Change – Induced Drought	3
Windstorm	3
Cyber Security	2

The natural hazards considered not to affect or be a risk to the District were ranked 4, “Least Likely,” and not considered applicable to SBMWD for mitigation.

Hazard Assessment Matrix

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

Probability Ratings: Highly Likely (1), Likely (2), or Somewhat Likely (3)

Impact Ratings: Catastrophic, Critical, or Limited



Screening Assessment Matrix

The screening assessment matrix was used to assess SBMWD’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

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

4.3 Hazard Profiles

This section looks at all the hazards identified by the Planning Team that may impact SBMWD 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 SBMWD’s service and/or service area using observed hazards in SBMWD’s service area, the hazards identified in the FEMA website, and the FEMA software program known as HAZUS (Hazards United States). HAZUS contains models of natural disasters and the effects the disasters can have on a region.



4.3.1 Earthquake

Probability: (75-100%) Highly likely – Historical earthquake data for SBMWD and its region indicate 11 significant earthquakes within the last 5 years. However, some earthquakes in southern California occur daily but are insignificant to SBMWD. This equates to a significant earthquake every .45 years on average of a significant earthquake in any given year. Based on this data, SBMWD determined that future earthquake occurrence within their boundaries continues to be highly likely. This section looks at all the hazards affecting the district within its boundaries, which the Planning Team identified.

Impact: *Catastrophic*

Priority: *Highly Likely*

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/or extensive property damage.

Earthquakes strike suddenly and without warning at any time of year. On a yearly basis, 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 greatest 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) most likely faults to cause major damage in the United States by 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 facility's exposure and vulnerability are unlikely to increase due to climate change.

Vulnerability: The socially vulnerable population comprises individuals such as children, the elderly, individuals with mental health challenges, and those facing financial hardship. These individuals may reside in unconventional living situations, such as under bridges, in tents, or in makeshift shelters 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 not be able to find adequate shelter as the landscape streets and shelters are not available in the short term. Shelter must be developed and put in place by the affected cities, counties, States, or FEMA.



Table 7 below is a replacement cost estimate for all SBMWD critical facilities.

Table 7. Earthquake Magnitude Replacement Costs

SBMWD / Earthquake Magnitude		Replacement Value
Magnitude 7.0 or Above (Very High Impact)		
SBMWD – All Critical Assets		\$800 Million
Magnitude 5.0 or 6.9 (Moderate Impact)		
SBMWD – All Critical Assets		\$300 Million
Magnitude 1.0 or 4.9 (Low Impact)		
SBMWD – All Critical Assets		\$5 Million

Description: The area around SBMWD facilities are seismically active since it is situated on the boundary between two fault lines. There have been many earthquakes in and around the Department's service area.



Figure 3 . SBMWD Earthquake Fault Lines

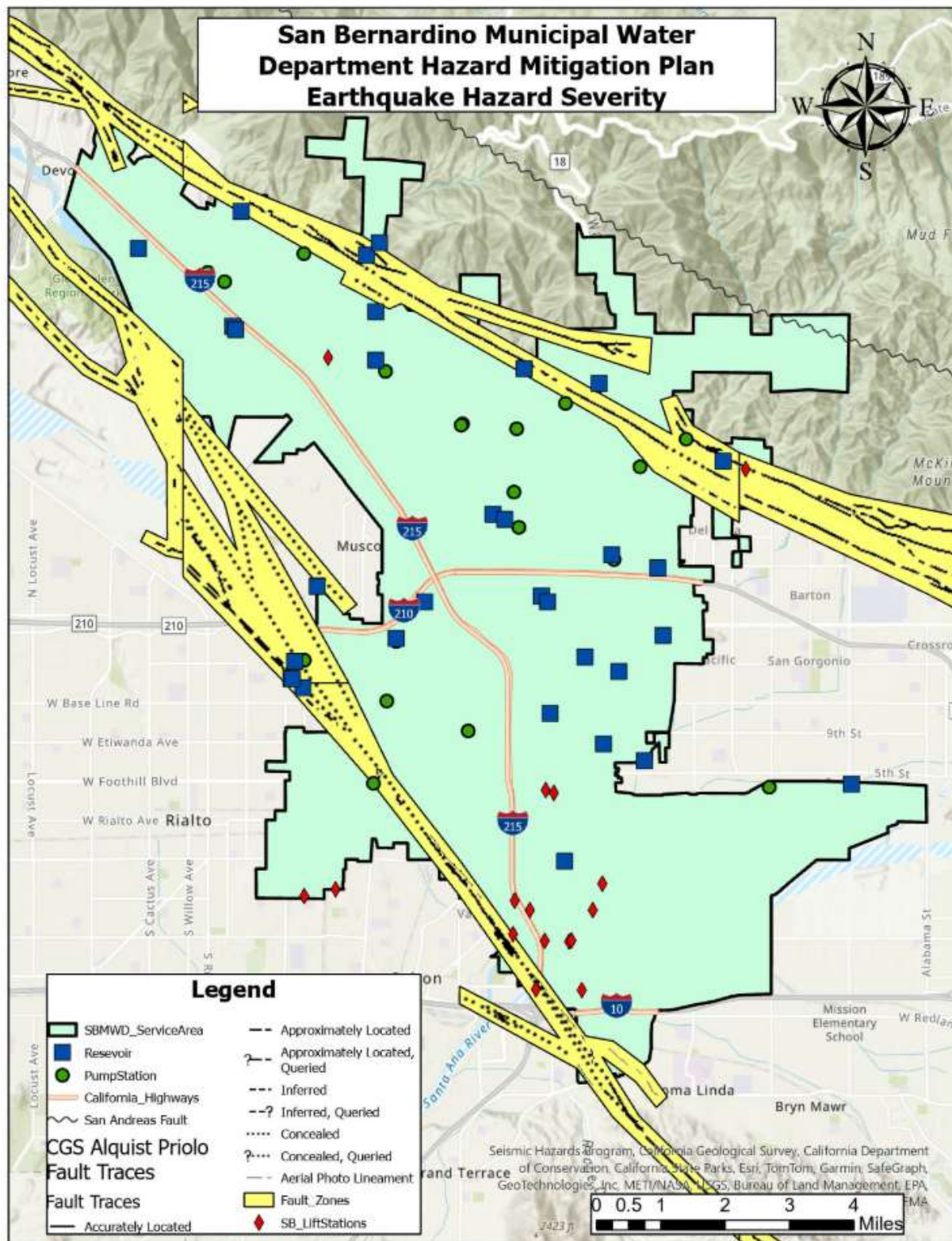




Figure 4. San Bernardino Municipal Water Department, USGS ShakeOut Map

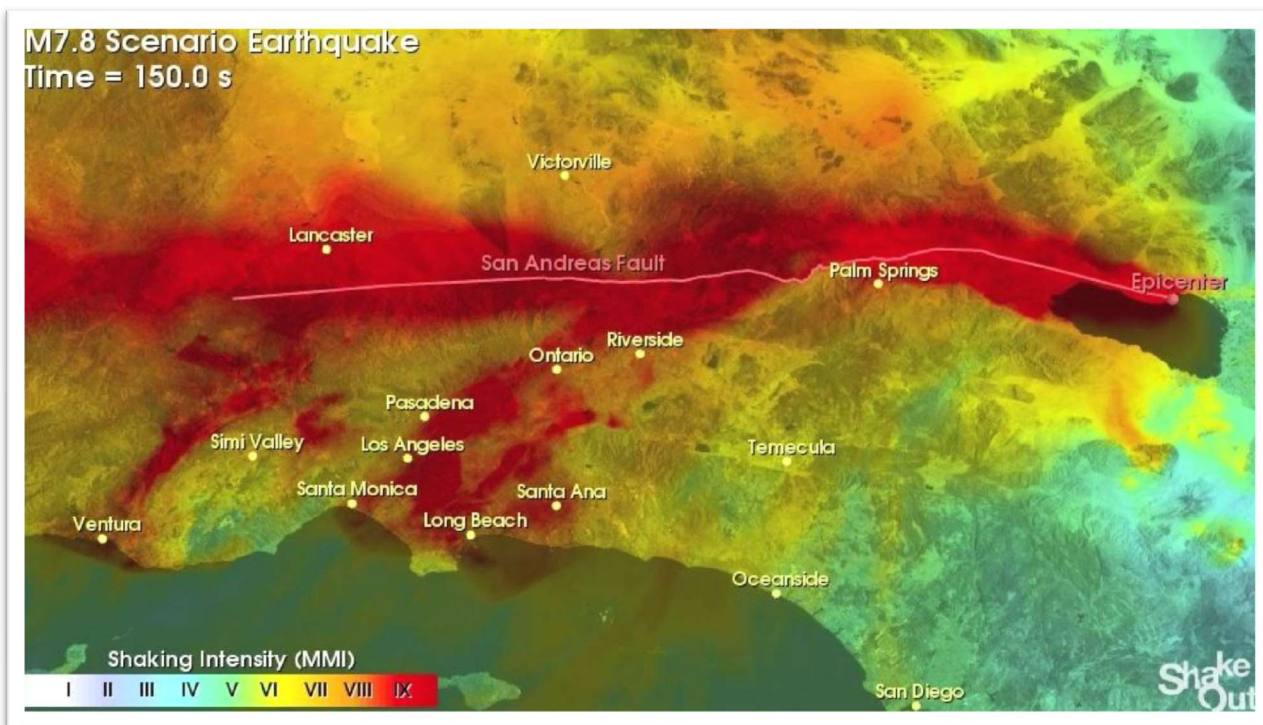


Figure 5. USGS Modified Mercalli Intensity Scale

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 6. United States Earthquake Hazard Map

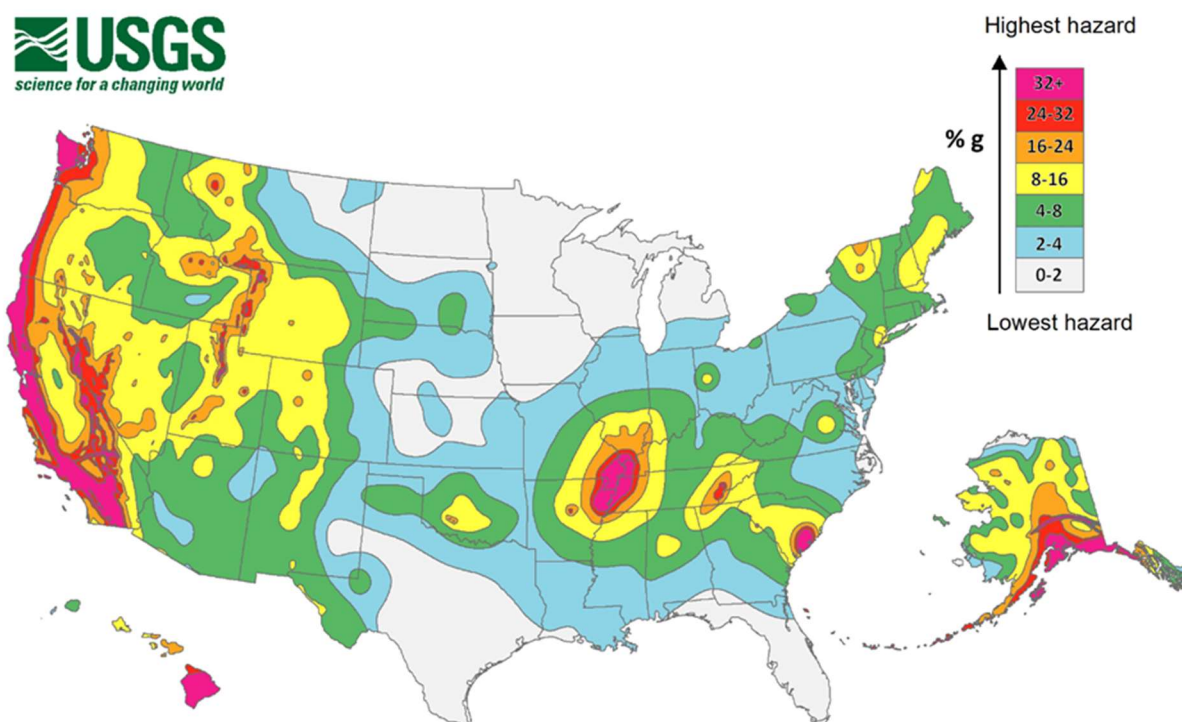


Table 8. Significant Earthquakes (4.0+ M_w) within 100 miles of San Bernardino County

Date	Area	Mag (M_w)	Total damage/notes
02/07/2019	Ludlow	4.0	No damage to SBMWD
7/4/2019	Ridgecrest	6.4	No damage to SBMWD
7/6/2019	Ridgecrest/Trona	7.1	No damage to SBMWD



9/10/2019	Wildomar	4.0	No damage to SBMWD
11/28/2019	Boron	3.5	No damage to SBMWD
01/25/2020	Barstow	4.6	No damage to SBMWD
08/18/2021	Lytle Creek	3.6	No damage to SBMWD
09/03/2022	Loma	3.6	No damage to SBMWD
01/25/2024	San Bernardino	4.2	No damage to SBMWD
02/19/2024	Ontario	3.6	No damage to SBMWD
5/19/2024	Ridgecrest	3.3	No damage to SBMWD

Within the 2019 - 2024 timeframe, a federal and/or state declaration was declared for earthquakes within the SBMWD 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 U.S.C. 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 U.S.C. 5121 ET SEQ.](#) ("the Stafford Act"). Therefore, I declare that such an emergency exists in the State of California..."

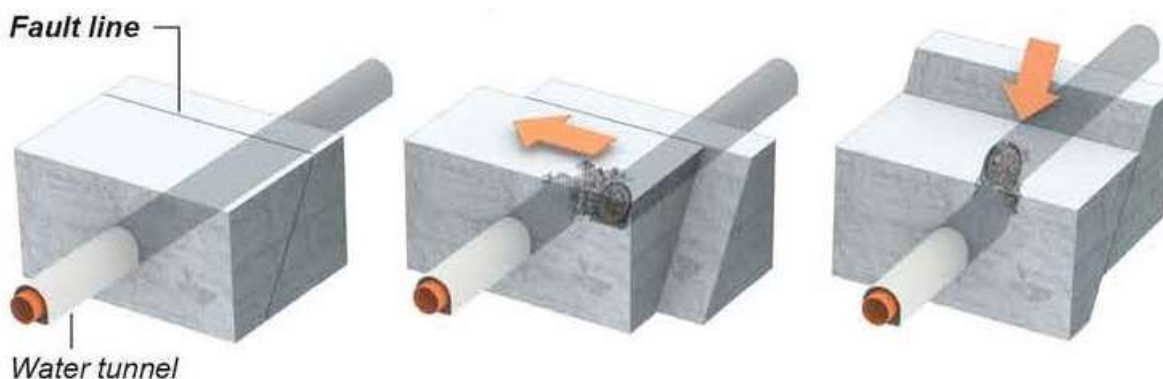
Impact Statement: A significant earthquake could have devastating impacts on SBMWD and its assets. Shaking during earthquakes can cause structural failures, while ground displacement and liquefaction can cause infrastructure to sink, sag, float, rupture, or sever completely. Access to all assets may be restricted if the roads necessary for accessing them are in a state of disrepair and unable to be traversed. An extended loss of power or widespread damage to a system could impair the District's ability to provide service, especially 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.

No increase in impact from earthquakes can be caused by climate change. Earthquakes can cause displacement, changing population patterns throughout their service area. SBMWD has no jurisdiction over land use, development and zoning, socially vulnerable populations, and/or land development within their service area, especially post-earthquake disasters. Water districts nationwide follow the standards set by the American Water Works Association and USEPA governing public water systems.

Figure 7. 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 will have to be dug up and repaired. Lateral spreading may damage wells and percolation ponds. SBMWD 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.

Climate change is expected to alter the typical precipitation patterns in Southern California. Both rainy and drought periods are predicted to become more intense and frequent. As a result, more precipitation is likely to occur during rainy seasons, while droughts are expected to persist for longer durations. This shift could cause the groundwater aquifer beneath San Bernardino and San Bernardino County to rise during periods of heavy rainfall. Conversely, prolonged drought conditions may increase groundwater withdrawal, lowering groundwater levels. Consequently, climate change



could increase or decrease the risk of liquefaction in San Bernardino depending on these circumstances.

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

Energy Storage and Power Failure: An adequate energy supply is critical for SBMWD to maintain its daily processes and functions. Power failures occur when the reliable, uninterrupted supply of energy to all or part of the service area is disrupted, affecting SBMWD'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 SBMWD and its region indicate at least 5 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, SBMWD determined that future drought occurrence within their boundaries continues to be highly likely. This section looks at all the hazards affecting the District within its boundaries that the Planning Team identified.

Impact: *Critical*

Priority: *Highly Likely*

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. The cycle of droughts and wet periods is 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.

Climate Change Probability: The probability of damage to SBMWD 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 regions 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 Newsom 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 SBMWD, 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 in accordance with 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) and submit these assessments annually to the state to remain in compliance with water conservation efforts. SBMWD submitted its 2022 AWSDA and is submitting its 2023 AWSDA before the July 1 deadline. SBMWD promotes its water conservation efforts to its customers by actively making public notifications on its website and sending reminders. The current water schedule for all SBMWD customers is posted online, as well as its permanent water conservation requirements to continue its 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 – Population exposure and vulnerability to drought are unlikely to increase due to climate change.

Critical facilities—Climate change is likely to increase the exposure and vulnerability of all critical facilities.

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 in 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 of time 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, food, clothing, or medical treatment.

In drought conditions, vulnerable populations may not be able to find adequate, safe, potable water supplies for drinking, cooking, or hygiene needs.

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

Table 9. Drought Severity Replacement Costs

SBMWD / Drought D0-D4 Severity		Replacement Value
D4 (Exceptional Drought)		
SBMWD - All Critical Assets		\$0.00
D3 (Extreme Drought)		
SBMWD - All Critical Assets		\$0.00
D2 (Severe Drought)		



SBMWD - All Critical Assets	\$0.00
D1 (Moderate Drought)	
SBMWD - All Critical Assets	\$0.00
D0 (Abnormally Dry)	
SBMWD - All Critical Assets	\$0.00

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 measures of drought, including the PDSI and three other indices, as well as 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 2019 and January 2024. Note the drastic difference between the two drought maps.



Figure 8. Drought Monitor January 2019

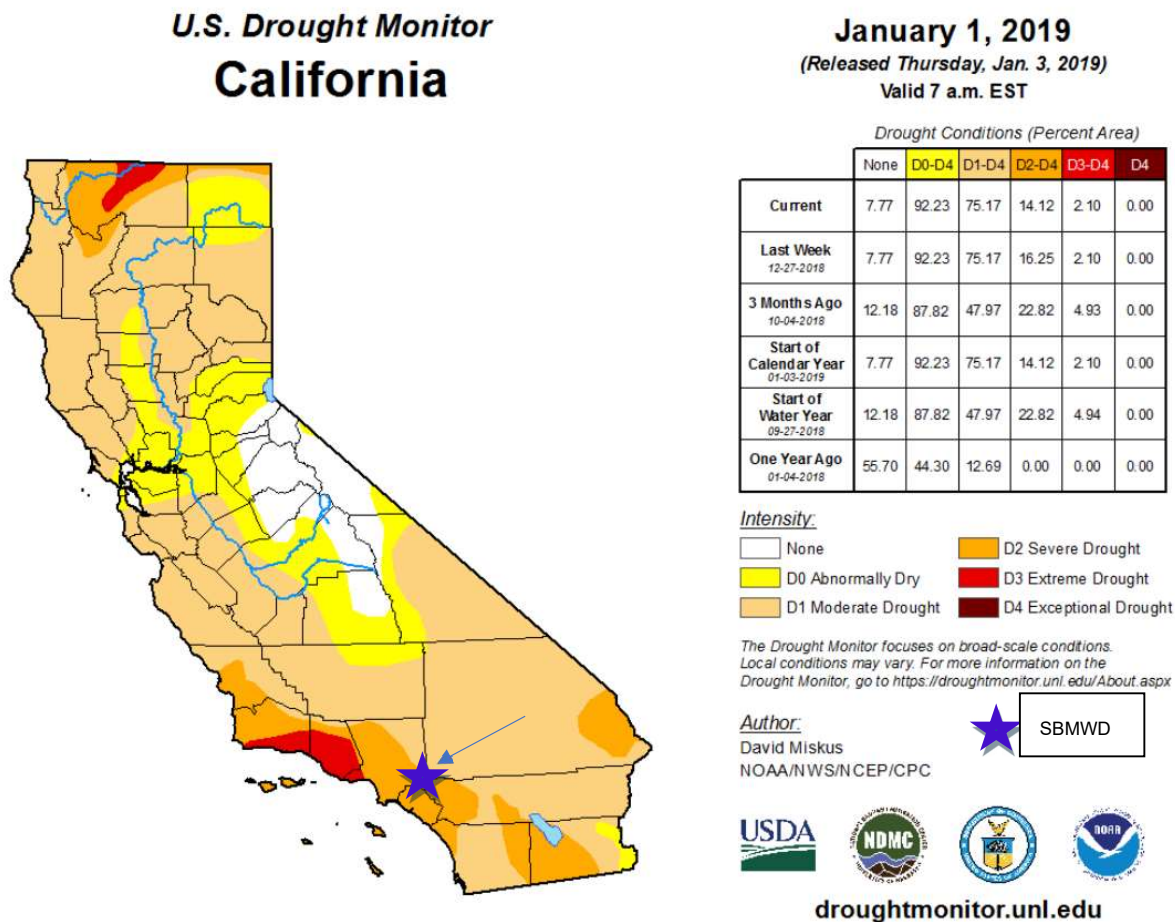
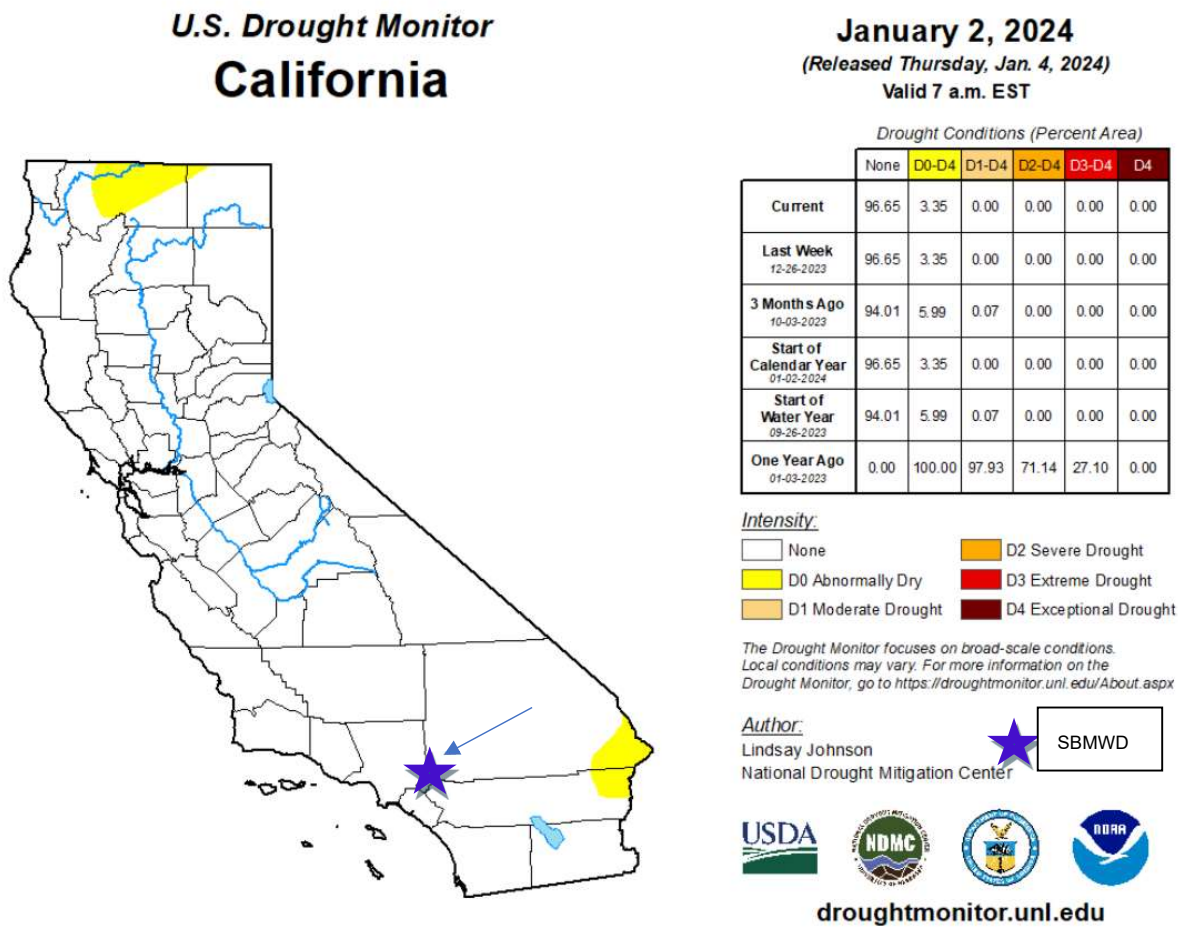




Figure 9. Drought Monitor January 2024



**Table 10. U.S. Drought Monitor**

D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, 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 common; 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. SBMWD'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 result in reduced flows.



Figure 10. Drought History (2000-2023)

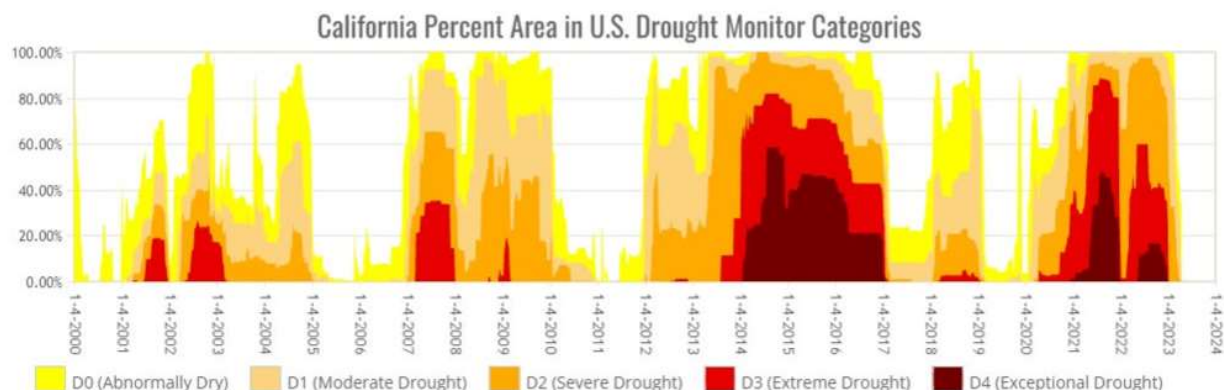


Table 11 Drought History in Southern California

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, showing the fluctuation in climate back in the 1800s.
1924	This drought encouraged farmers to start using irrigation more regularly because of the fluctuation in California weather; the need for 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 <i>Los Angeles Times</i> , “Drought in the 1970s spurred efforts at urban conservation, and the state’s Drought Emergency Water Bank came out of drought in the 1980s.”
1986–1992	California endured one of the longest droughts ever observed from late 1986 through early 1992. Drought worsened in 1988 as much of the United States also suffered from 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 proclamation of emergency was issued. The drought of 2007–2009 also saw greatly 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, the state of California experienced one of the worst droughts to occur 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 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 rainfall. 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 northern half of the state, while 40% remained in the extreme or exceptional drought levels. Heavy rains in January 2017 were expected to significantly benefit the State's northern water reserves despite widespread power outages and erosional damage in the wake of the deluge.

Winter 2022-23 was the wettest 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.

Within the 2019 - 2024 timeframe, no federal and/or state declarations were declared for California Climate Change-induced drought within the SBMWD 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 needed 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. Most drought impacts, however, are not structural but societal in nature. A drought's impact on society, and thus the SBMWD's service area, results from the interplay between a natural event and people's demand for water supply. SBMWD is in charge of supplying potable and non-potable water within its service area; therefore, it would be greatly 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 SBMWD. SBMWD has no jurisdiction over land use, development and zoning, socially vulnerable populations, and/or land development within their service area. Water districts nationwide follow the standards set by the American Water Works Association and USEPA governing public water systems.

4.3.3 Flood

Probability: (50-75%) Likely—Historical flood data for SBMWD and its region indicate at least 2 significant floods within the last 5 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, SBMWD determined that future flood occurrence within its boundaries continues to be likely. This section looks at all the hazards affecting the District within its boundaries and is identified by the Planning Team.

Impact: *Critical*

Priority: *Likely*

General Definition: An unusually heavy rain in a concentrated area, over a short or long period of time, which collects on the ground in low areas of the land. Flooding occurs when there are large amounts of rainfall in areas where the water runs off to lower elevations. Flooding is a very frequent, 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 U.S., 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 typically determined by a combination of several major factors, including stream and river basin 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.

SBMWD 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, SBMWD does not have authority over any of these. SBMWD has no properties that are repetitive loss structures.

Dam Inundation: Dam failures can be triggered by various factors, including earthquakes, quickly rising floodwaters, and flaws in structural design. These incidents can happen suddenly or gradually, depending on the underlying cause. The flooding that follows such events can lead to loss of life, property damage, the emergence of other hazards, and the displacement of individuals living in the flood zone. According to the California Division of Safety of Dams (DSOD), a dam is regulated by their authority if it is taller than 6 feet and holds more than 50 acre-feet of water or if it exceeds 25 feet in height and stores at least 15 acre-feet of water. As per these criteria, there are 1,537 dams under DSOD's jurisdiction, with 8 of them situated within the City of San Bernardino.

Various factors, such as the amount of water released, the distance between the dam failure site, and the topography of the surrounding land, will influence the extent to which physical assets in San Bernardino are threatened. The Seven Oaks Dam has large storage capacities that could cause widespread inundation in San Bernardino if the reservoir waters are released due to a dam breach. **Table 12 (Table 3-25)** identifies the physical assets in San Bernardino that are threatened by the potential failure of the Seven Oaks Dam. Based on this analysis, dam inundation would affect 11 CFs and 46 FOCs within the City of San Bernardino, with the potential to cause approximately \$98 million in damages, based on available information from the City of San Bernardino's Local Hazard Mitigation Plan.



Table 12. City of San Bernardino Dam Inundation - Seven Oaks Dam from SBLHMP

Table 3-25: Critical Facilities and Facilities of Concern (Dam Inundation-Seven Oaks Dam)			
Category	Number of Facilities		Potential Loss**
	Critical	Concern	
City Facilities	10	2	\$55,248,613
Schools	0	14	-
Park Facilities, Recreation Centers	0	8	\$21,596,372
Other Facilities	1	22	\$21,592,820
Total	11	46	\$98,437,805
*Potential loss data are estimates only, as replacement values for some facilities were not available. Actual losses may be greater than the estimate presented in this table. ** Based on the City of San Bernardino insured replacement values *** Fire Services to the City are provided by San Bernardino County Fire District			

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 or repeated thunderstorms cause the most flash flooding in a local area or by heavy rains from hurricanes and tropical storms. Although flash flooding often occurs in mountainous areas, it is also common in urban centers where much of the ground is covered by impervious surfaces.

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

Climate Change Impacts:

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

Population—Climate change impacts on flood hazards may increase population vulnerability. Runoff patterns may change, resulting in flooding in areas where it has not previously occurred.

Critical facilities—Climate change impacts on flood hazards may increase the exposure and vulnerability of all critical facilities.

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 in 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 of time 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, food, clothing, or medical treatment.

In flooding conditions, vulnerable populations may not be able 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 to creeks and waterways, losing 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 SBMWD-owned critical facilities.

Table 13. Flood Zone Replacement Cost

SBMWD 100/500 Year Flood Zones		Replacement Value
500-Year Flood Zone		
SBMWD - All Critical Assets		\$200 Million
100- Year Flood Zone		
SBMWD - All Critical Assets		\$100 Million

Description: Flooding is frequent within the District's service area, particularly during severe rainstorms, which have been known to inundate the surrounding areas. This has not affected operations; 100-year and 500-year flood maps show potential inundation in the area. There has been no recorded damage caused by flooding within the service area that has affected SBMWD infrastructure.

Within the 2019 - 2024 timeframe, four federal and/or state declarations were declared for flood within the SBMWD service area. Notice is hereby given that, in a letter dated January 9, 2023 (EM-3591-CA), later becoming (DR-4683), and March 16, 2023 (EM-



3592-CA), later becoming (DR-4699), the President issued an Emergency Declaration and a Major Disaster Declaration under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121-5207 (the Stafford Act), as follows:

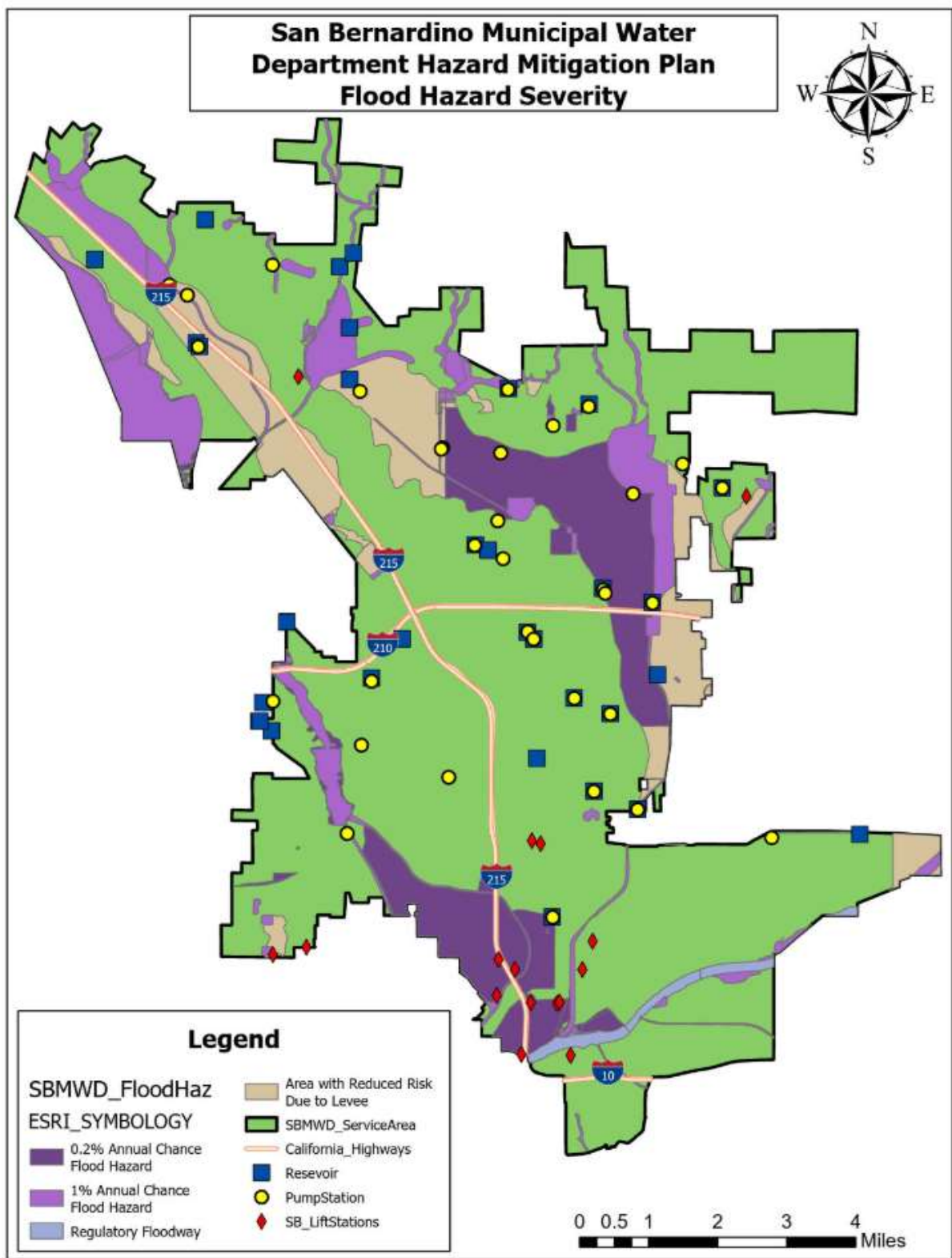
"I have determined that the emergency conditions in certain areas of the State of California resulting from severe winter storms, flooding, and mudslides beginning on January 8, 2023, and continuing are of sufficient severity and magnitude to warrant an emergency declaration under the Robert T. Stafford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

Table 14. History of Flooding in San Bernardino

Date	Description and Effect
12/23/2021	A series of storms paraded through the region, each bringing heavy rain. Two days total for this storm reached 6" in the mountains, but Lytle Creek alone achieved just over 8". The northern Inland Empire got 2-5", while most lower elevation stations received 0.75-3".
12/11/2022	An atmospheric river brought heavy rain to Southern California, ranging from 0.50-2" in the lowlands, generally 2-4" in the mountain's comma, except Lytle Creek with 5.03"
12/31/2022-1/1/2023	A potent storm moved in late on 12.31.2022 and continued into 1.1.2023. Many mountain locations recorded over 4" of participation, mostly rain. Lytle Creek recorded 5.85"



Figure 11. Flood Zones within the SBMWD Service Area





Impact Statement:

Climate change can increase flooding's impact. It increases the overall probability of flooding and can increase its impact on the service area. Flooding can cause displacement, which would lead to changes in population patterns throughout the service area. SBMWD has no jurisdiction over land use, development, and zoning, especially during a state and/or 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 contaminate water, resulting in boil water advisories or reduced service.
- Floodwater can prevent normal 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 vehicles. As little as six inches of floodwater can move a vehicle, 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 structures can be compromised by floodwater. Pressure from floodwater, especially as seepage through the soil, can damage foundations.
- Buildings exposed to floodwaters may develop mold or wood rot.



4.3.4 Windstorms

Probability: (50-75%) Likely – Historical windstorm data for SBMWD and its region indicate at least 118 significant windstorms within the last 0.4 years. This equates to a windstorm every month on average in any given year. Based on this data, SBMWD determined that future windstorm occurrence within their boundaries continues to be likely.

Impact: Limited

Priority: Likely

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

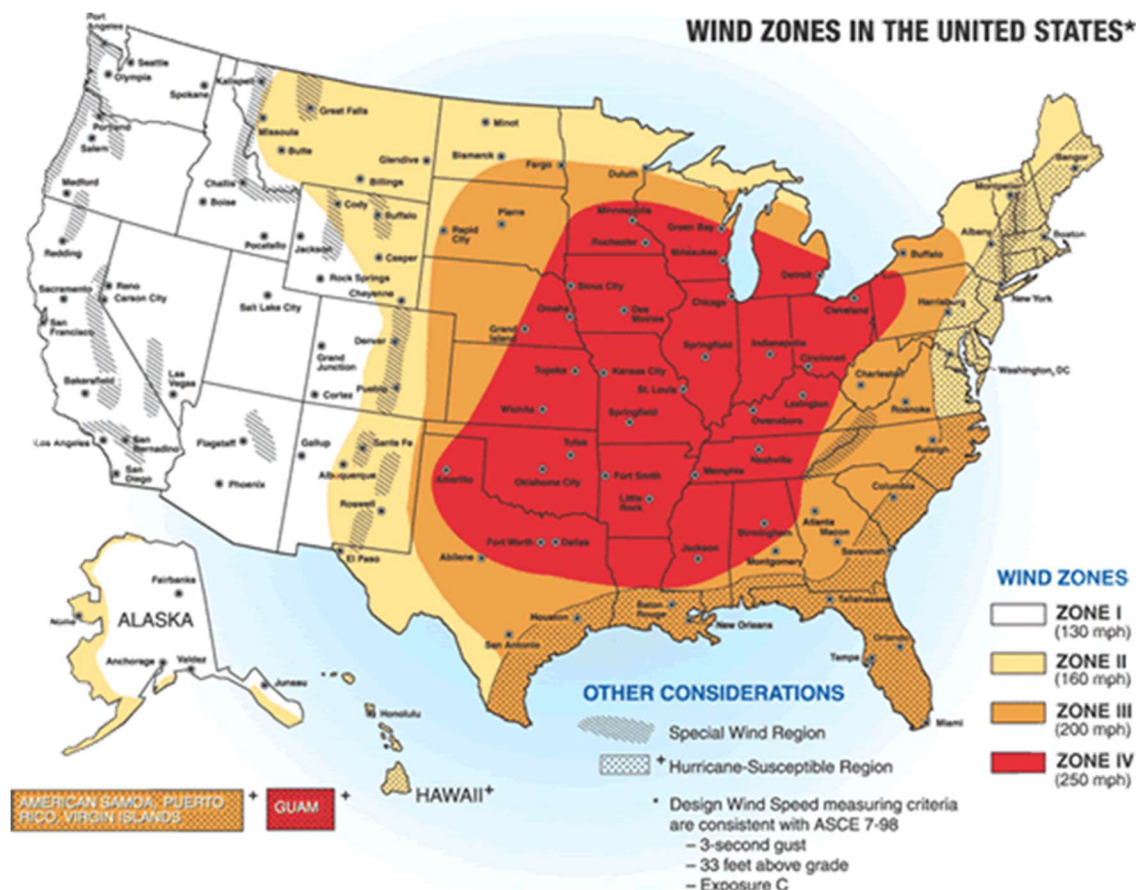
General Definition: Several types of wind hazards affect the planning area. These include high or strong wind events, typically associated with Santa Ana winds, and thunderstorm wind events (including straight-line winds and microbursts). High Wind definitions can vary by region. In general, high wind events are those events greater than normal averages and have damage potential. Wind events are common throughout the United States. However, the severity varies depending on location. Santa Ana Winds occur throughout September through November of each year.

Probability: If winds increase due to climate change, the probability of affecting SBMWD is low due to the implementation of mitigation actions, such as generators and automatic transfer stations that can power the water distribution system.

As climate change progresses, more high-pressure zones develop in the plains in Arizona, Nevada, and Utah, and low-pressure zones develop in Southern Arizona and Mexico, causing the Santa Ana winds to develop more frequently. This will increase the chances of PSPS events and regional power outages.



Figure 12. Wind Zones in the United States



Climate Change Impacts:

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

Population—Population exposure and vulnerability to windstorms are unlikely to increase because of climate change, and significant life or health impacts are unlikely.

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

Vulnerability & Impact: Severe wind events can harm people throughout the SBMWD service area but have a greater effect on the safety of people experiencing homelessness and those working outdoors. Severe wind events may impact populations that work outside or have respiratory illnesses as they can generate dust and other contaminants that can affect the health of residents and workers. Lower-income residents, who may not have the financial resources to purchase homes (or are renting homes) that are not built



or retrofitted to withstand powerful winds, could also have difficulty recovering from wind events.

Southern California and SBMWD service area all suffer from seasonal Santa Ana Winds and will for the foreseeable future. Extreme wind events can worsen other risks, such as wildfires. It could affect the take-off and landing of small aircraft at nearby airports, leading to an increased risk of possible aircraft incidents. There are no direct planned development updates or land use changes occurring within the SBMWD service area that would directly increase the vulnerability of the SBMWD-identified assets to windstorms.

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

Table 15. Windstorm Replacement Costs

SBMWD / Wind Severity based on Beaufort scale		Replacement Value
Very High Wind Speeds (Scale 12-10)		
SBMWD – All Critical Assets		\$1.5 Million
High Wind Speeds (Scale 9-7)		
SBMWD – All Critical Assets		\$50,000
Moderate Wind Speeds (Scale 6-4)		
SBMWD – All Critical Assets		\$10,000
Low Wind Speeds (3-0)		
SBMWD – All Critical Assets		\$0

Description: Santa Ana Winds are a regional wind hazard specific to Southern California. Santa Ana Winds are known to cause large amounts of damage and increase the spread of wild and structural fires. Santa Ana winds are generally defined as warm, dry winds blowing east. The complex topography of Southern California and various atmospheric conditions create numerous scenarios that may cause widespread or isolated Santa Ana events. Winds are caused by a low-pressure system over the southern coastline and high pressure over the Great Basin in Nevada. When the high pressure turns counterclockwise, the warm, dry air is pulled to the low-pressure zone and out to the



Pacific Ocean. Santa Ana Winds are quick and effective at spreading wildfires. The combination of windstorm activity with the major fires every few years creates the greatest danger to the urban/wildland interface. Santa Ana winds spread the flames at even greater speed than in times of calm wind conditions.

The National Weather Service Center normally issues a high wind advisory or warning depending on the following criteria. A wind advisory is issued when conditions are favorable for developing high winds overall or in part of the forecast area, but the occurrence is still uncertain. The criteria of a wind advisory are sustained winds of 31 to 39 mph and/or gusts of 46 to 57 mph for any duration. A high wind warning is issued when sustained winds from 40 or higher are expected for at least one hour or any wind gusts are expected to reach 58 mph or more. Forecasters at the National Weather Service in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "Santa Ana" for winds greater than 25 knots (approximately 29 miles per hour). Table 11 is a Beaufort wind scale that shows the appearance of wind effects based on the knots of wind and its classification.



Table 16 Beaufort Wind Scale

Beaufort grade	Kind of wind	Knots		km/h		Effects		Height of waves (metre)
		Min	Max	Min	Max	Earth	Sea	
0	Calm	<1		<1		Smoke rises vertical	Flat sea	-
1	Very light	1	3	1	5	The wind bends smoke	Small ripples with no white foamy crests.	0.1
2	Light breeze	4	6	6	11	It can be felt on face	Small wavelets, with unbroken crests.	0.2 - 0.3
3	Gentle breeze	7	10	12	19	It shakes leaves	Very small crests; crests begin to break.	0.6 - 1
4	Moderate breeze	11	16	20	28	It lifts dust and papers	Small waves that begin to grow longer; spuma più frequente e più evidente.	1 - 1.5
5	Fresh breeze	17	21	29	38	It shakes branches	Moderate waves that grow longer in shape; possible spray.	2 - 2.5
6	Strong breeze	22	27	39	49	It shakes big branches	Bigger waves; white foamy crests are longer everywhere.	3 - 4
7	Near gale	28	33	50	61	It impedes walking	The sea swells up; white foam forms when waves break up.	4 - 5.5
8	Gale	34	40	62	74	It shakes big trees	Medium-high, longer waves; crests start to break up in sprays.	5.5 - 7.5
9	Strong gale	41	47	75	88	Chimney pots and slated removed	High waves; tight strips of foam form in the direction of the wind.	7 - 10
10	Storm	48	55	89	102	It uproots trees	Very high waves with long crests; the sea looks completely white; waves fall down violently, visibility is reduced.	9 - 12.5
11	Violent storm	56	63	103	117	Serious devastation	Exceptionally high waves (small and medium tonnage ships disappear for a few seconds); visibility is still more reduced.	11.5 - 16
12	Hurricane	>64		>118		Very serious catastrophes	Air is filled with foam and sprays; sea is completely white because of foam; visibility is greatly reduced.	>14

Table 17. Windstorm History From NOAA 2019-2024 San Bernardino County

Location Within San Bernardino County	Begin Date	Begin time	Event Type	Magnitude	Damage Property Num	Magnitude Type	End Date	End Time
APPLE AND LUCERNE VALLEYS (ZONE)	5/21/2019	1200	Strong Wind	48	5000	EG	5/21/2019	1500
EASTERN MOJAVE DESERT (ZONE)	11/25/2019	1324	Strong Wind	43	10000	EG	11/25/2019	1324



City of San Bernardino Municipal Water Department

DRAFT Local Hazard Mitigation Plan

SAN BERNARDINO COUNTY MOUNTAINS (ZONE)	12/30/2019	0	Strong Wind	43	10000	EG	12/31/2019	2359
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/29/2020	1000	Strong Wind	35	10000	EG	1/29/2020	1100
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/29/2020	1500	Strong Wind	35	10000	EG	1/29/2020	1600
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/29/2020	1800	Strong Wind	39	10000	EG	1/29/2020	1900
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	2/10/2020	500	Strong Wind	43	15000	EG	2/10/2020	1200
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	2/11/2020	200	Strong Wind	47	15000	EG	2/11/2020	400
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	2/11/2020	600	Strong Wind	40	15000	EG	2/11/2020	700
EASTERN MOJAVE DESERT (ZONE)	10/25/2020	1901	Strong Wind	39	15000	EG	10/25/2020	1901
APPLE AND LUCERNE VALLEYS (ZONE)	1/25/2021	2000	Strong Wind	22	0	EG	1/26/2021	600
EASTERN MOJAVE DESERT (ZONE)	2/24/2021	2039	Strong Wind	43	40000	EG	2/25/2021	155
APPLE AND LUCERNE VALLEYS (ZONE)	10/11/2021	1700	Strong Wind	30	0	EG	10/11/2021	2200



City of San Bernardino Municipal Water Department

DRAFT Local Hazard Mitigation Plan

SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/21/2022	2242	Strong Wind	35	0	EG	1/21/2022	2242
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/22/2022	24	Strong Wind	35	0	EG	1/22/2022	24
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/22/2022	158	Strong Wind	48	0	EG	1/22/2022	158
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/22/2022	213	Strong Wind	30	0	EG	1/22/2022	213
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/22/2022	925	Strong Wind	43	0	EG	1/22/2022	925
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/22/2022	1816	Strong Wind	43	0	EG	1/22/2022	1816
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	2/2/2022	1100	Strong Wind	39	5000	EG	2/2/2022	1300
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	2/2/2022	1200	Strong Wind	39	1000	EG	2/2/2022	1500
WESTERN MOJAVE DESERT (ZONE)	2/22/2022	1400	Strong Wind	43	100	EG	2/22/2022	1405
APPLE AND LUCERNE VALLEYS (ZONE)	3/19/2022	1400	Strong Wind	49	0	MG	3/19/2022	1400
SAN BERNARDINO COUNTY MOUNTAINS (ZONE)	3/19/2022	1500	Strong Wind	48	0	MG	3/19/2022	1500



City of San Bernardino Municipal Water Department

DRAFT Local Hazard Mitigation Plan

APPLE AND LUCERNE VALLEYS (ZONE)	3/19/2022	1500	Strong Wind	43	0	MG	3/19/2022	1500
SAN BERNARDINO COUNTY MOUNTAINS (ZONE)	3/19/2022	1500	Strong Wind	46	0	MG	3/19/2022	1500
SAN BERNARDINO COUNTY MOUNTAINS (ZONE)	3/20/2022	151	Strong Wind	43	0	MG	3/20/2022	151
SAN BERNARDINO COUNTY MOUNTAINS (ZONE)	3/21/2022	230	Strong Wind	46	0	MG	3/21/2022	230
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	3/28/2022	853	Strong Wind	40	1000	EG	3/28/2022	853
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	10/24/2022	446	Strong Wind	37	1000	MG	10/24/2022	446
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	10/24/2022	536	Strong Wind	33	1000	MG	10/24/2022	536
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	11/15/2022	0	Strong Wind	48	5000	MG	11/16/2022	2359
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/14/2023	2106	Strong Wind	38	0	MG	1/14/2023	2106
APPLE AND LUCERNE VALLEYS (ZONE)	1/16/2023	618	Strong Wind	26	0	EG	1/16/2023	618
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)	1/23/2023	1	Strong Wind	36	0	MG	1/23/2023	1



SAN BERNARDINO COUNTY (ZONE)	BERNARDINO MOUNTAINS	1/23/2023	229	Strong Wind	38	0	MG	1/23/2023	229
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)		1/23/2023	732	Strong Wind	48	0	EG	1/23/2023	732
SAN BERNARDINO AND RIVERSIDE COUNTY VALLEYS - THE INLAND EMPIRE (ZONE)		1/31/2023	1400	Strong Wind	35	1000	MG	1/31/2023	1500

Within the 2019-2024 timeframe, two federal and/or state declarations were declared for California's severe winter storms, straight-line winds, flooding, landslides, and mudslides within the SBMWD service area. Notice is hereby given that, in a letter dated January 11, 2023(EM-3591-CA), and (EM-3592-CA) dated March 16, 2023, the President issued a major disaster declaration under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121 et seq. (the "Stafford Act"), as follows:

"I have determined that the damage in certain areas of the State of California resulting from severe winter storms, straight-line winds, flooding, landslides, and mudslides beginning on February 21, 2023, and continuing is of sufficient severity and magnitude to warrant a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121 et seq. (the "Stafford Act"). Therefore, I declare that such a major disaster exists in California...."

Impact Statement: All the service areas within SBMWD have windstorm events; the entire planning area is equally at risk of this hazard. Severe wind has the potential to damage reservoirs, treatment plant facilities, and wells. Structures can also be damaged, including blown-off shingles, siding, awnings, and other features of buildings and overturning of trees. Objects picked up by the wind, including palm fronds and litter, can be hurled through the air, damaging assets and structures when contact is made. In some cases, structures may be blown off foundations, or infrastructure, such as reservoirs, may be blown off their base. In addition, mobile or modular units (such as those installed for temporary uses) are considered at a higher risk of severe wind. Severe winds can cause damage to communications infrastructure, utility poles, and above-ground power lines, resulting in loss of power. Falling trees also contribute to power line disruptions. When strong winds reach a force great enough to threaten above-ground facilities, power pole lines and power outages may be experienced. These events are



known as Public Safety Power Shutoffs (PSPS). PSPS are temporary and are meant to keep the community safe. PSPS events only happen during periods of high winds. There have not been any PSPS events in the last 5 years that have had a negative effect or loss of water in the SBMWD service area.

The entire service area, including all current and future assets (infrastructure, buildings, critical facilities, and population), is vulnerable to severe annual winds due to the topography and movement of weather fronts through the area. Exposed (e.g., above-ground) assets are considered most at risk of severe winds.

4.3.5 Wildfire

Probability: (25-50%) Somewhat Likely—Historical Wildfire data for SBMWD and its region indicate at least one significant wildfire within the last five years. This equates to wildfire within their service area every five years or a 20 percent chance of wildfire in any given year. Based on this data, SBMWD determined that future wildfire occurrence within their boundaries continues to be somewhat likely. This section looks at all the hazards affecting the district within its boundaries, which the Planning Team identified.

Impact: *Limited*

Priority: *Somewhat Likely*

General Definition: A wildfire is any fire occurring in a wildland area (i.e., grassland, forest, brushland) except for fire under prescription or control fire undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters. Wildfires are part of the natural management of forest ecosystems but may also be caused by human factors.

Nationally, over 80 percent of forest fires are started by negligent human behavior, such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause of wildfires is lightning. Downed utility poles or power lines are also a common cause of wildfires.

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around.



Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural hazards (such as tornadoes, severe winds, etc.) increase the probability of wildfires by producing fuel in urban and rural settings.

Cyclical climate events, such as El Niño-La Niña, can also have a dramatic effect on the risk of wildfires. Fewer fires are typically seen during El Niño (when more rain is present), and larger, more frequent fires are typical during La Niña events.

California is highly susceptible to wildfires, especially during the fall and summer. Southern California experiences Santa Ana winds that develop primarily in the late summer and fall seasons. These winds are known for their high speeds and drying effect, which turn the natural grasses brown and dry. These winds are also capable of blowing down power lines that can start fires in the mountains and hills. The high winds drive the fires and can become large events that destroy large areas, including towns and cities, and cause loss of life and millions of dollars in property damage. In the jurisdictional boundaries, brush fires are known to jump from place to place due to patches of vegetation and winds. The Santa Ana winds are known to cause or spread wildfires.

Climate Change Probability: The probability of heightened wildfire activity resulting from climate change is significant, as drought conditions intensify dryness in the service area. Consequently, there is a higher risk of flooding as wildfires become more prevalent, with dry vegetation exacerbating the situation. It is well-documented that large wildfires can lead to substantial flooding, as the burning of vegetation removes natural barriers.

Climate Change Impacts:

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

Population—Climate change impacts on wildfire hazard may increase population vulnerability. Evacuations and displacement may occur due to wildfire risks and the safety of the public.

Critical facilities—Climate change impacts on the wildfire hazard may increase the exposure and vulnerability of all critical facilities.

Vulnerability & Impact: Wildfire events can harm people throughout the SBMWD service area but have a greater effect on the safety of people experiencing homelessness and those working outdoors. Severe wind events may impact populations that work outside or have respiratory illnesses as they can spread smoke, ash, and other contaminants that



can affect the health of residents and workers. Lower-income residents, who may not have the financial resources to purchase homes (or are renting homes) that are not built or retrofitted to withstand powerful winds, could also have difficulty protecting themselves from polluted air quality.

Description: Local facility fires are a significant concern. The District's office facilities, computer systems, SCADA system, and operating pump stations are susceptible to fire damage. The consequences include loss of life, buildings, equipment, and property damage.

California is very susceptible to wildfires, especially during the fall and summer. Southern California has Santa Anna winds that develop primarily in the late summer and fall. These winds are known for their high speeds and drying effect, which turn the natural grasses brown and dry the southwest natural vegetation. These winds can also blow down power lines known to start fires in the mountains and hills. The high winds drive the fires, and the fires become large events that destroy large areas within cities and towns and cause millions of dollars in damage to property and loss of life.

Wildfires affect the District in various ways. During large wildfires, firefighting personnel may draw large amounts of water and strain the water supply system. The fires also burn through electrical power lines, and the District can lose power in critical areas. Without power, the District cannot pump groundwater from the aquifer or pump additional water to needed areas.



Figure 13. Wildfire Map with SBMWD Boundaries

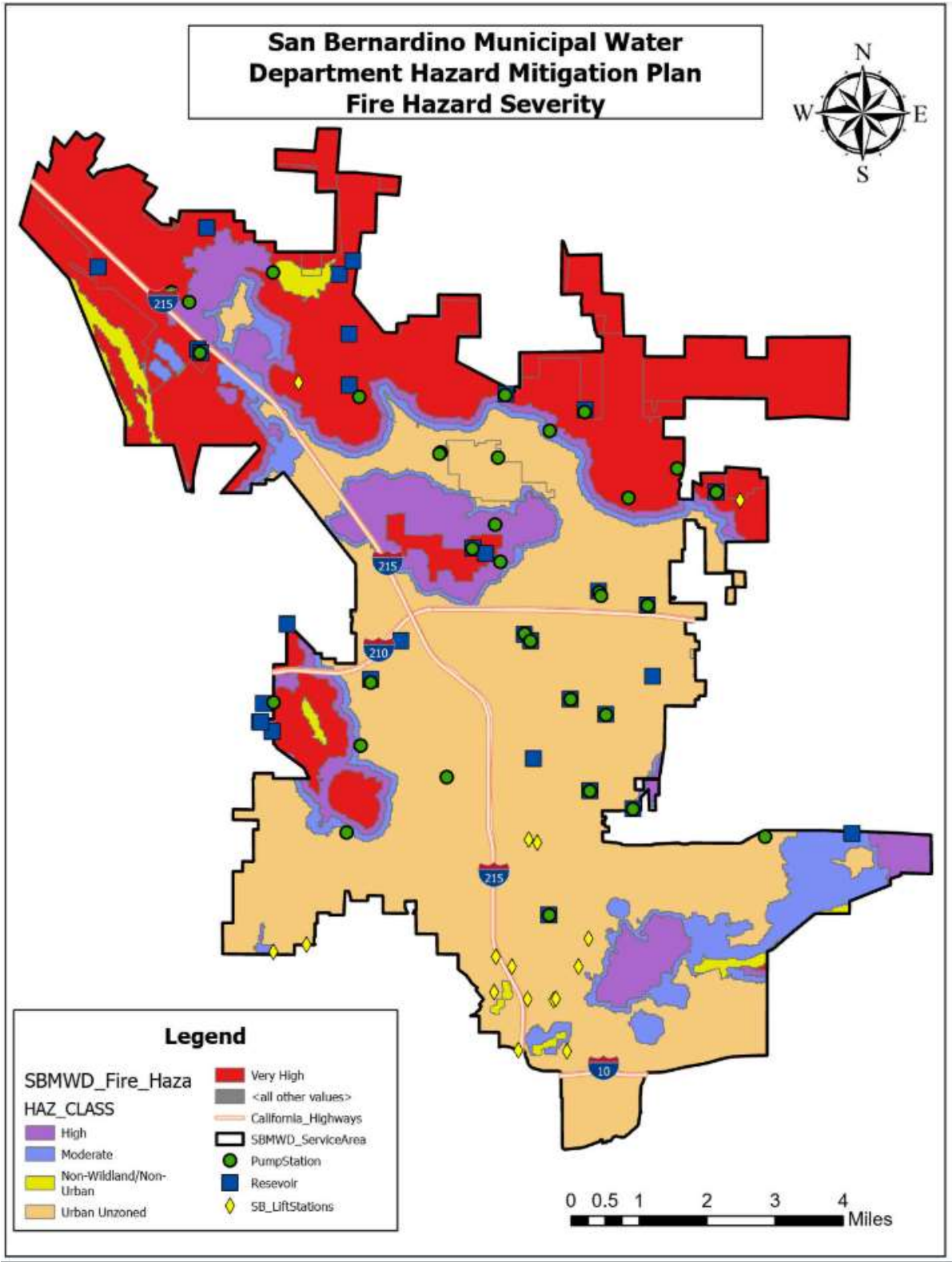




Table 18. Wildfire History in San Bernardino County

Fire Name	Date	Acres Burned
Mount R Fire	7/03/2020	62
Piltzer Fire	7/17/2020	119
Easton Fire	7/20/2020	71
Brook Fire	7/29/2020	185
Apple Fire	7/31/2020	33,424
El Dorado Fire	9/5/2020	22,744
Bruder Fire	10/15/2020	170
Farm Fire	6/09/2021	250
Peak Fire	6/28/2021	35
South Fire	8/25/2021	680
Roadside Fire	8/28/2021	50
Railroad Fire	8/29/2021	61
University Fire	9/22/2021	71
Heritage Fire	5/15/2022	500
Elk Trail Fire	5/26/2022	431
Hesperia Fire	6/06/2022	95
Sheep Fire	6/12/2022	865
Highway Fire	7/29/2022	28



Radford Fire	9/05/2022	1,079
Geology Fire	6/10/2023	1,088
Nice Fire	6/27/2023	90
Roundup Fire	7/04/2023	34
York Fire	8/01/2023	93,078
Hesperia Fire	6/15/2024	1,078
Vista Fire	7/07/2024	2,936
Line Fire	9/05/2024	43,978

Within the 2019 - 2024 timeframe, there was one federal and/or state declaration declared for California wildfires within the SBMWD service area. Notice is hereby given that, in a letter dated October 16, 2020 (DR-4569-CA) the President issued a major disaster declaration under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121 *et seq.* (the "Stafford Act"), as follows:

"I have determined that the damage in certain areas of the State of California resulting from wildfires beginning on September 4, 2020, and continuing, is of sufficient severity and magnitude to warrant a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121 et seq. (the "Stafford Act"). Therefore, I declare that such a major disaster exists in the State of California.

Impact Statement: Wildfire events have the potential to cause a variety of impacts on SBMWD and its assets. Wildfires could directly damage above-ground assets that are burned or melted by fires. In addition, wildfires have the potential to cause damage to underground pipes in domestic water systems, as demonstrated in Santa Rosa, where heat from a wildfire melts underground pipes, causing benzene to leech into the water supply. Wildfires may also impede access to assets that need maintenance or repair or pose life safety threats to employees. SBMWD will also need to supply water to fight fires, which could impact the available supply.



In addition, wildfires have the potential to result in indirect or cascading hazards to SBMWD. If utility lines are damaged, wildfires can cause power outages, and burned areas are much more susceptible to landslides.

A power outage has the potential to disrupt services provided in the service area. SBMWD relies on an adequate energy source to power many of its assets, including booster stations, lift stations, reclamation plants, water treatment plants, and any other asset that requires an electrical component. SBMWD has backup power supplies on many of its critical assets to minimize the impacts of power outages. However, long-term outages may exceed the fuel required to power backup generators. This could compromise nearly all the services, including domestic water delivery, water treatment, and irrigation. Administrative buildings also require an energy source, and disruptions could compromise operations, billing, and communications. A loss of power resulting in the inability of SBMWD to provide essential services could have direct impacts in terms of revenue loss and reputational impacts, in addition to far-reaching community impacts.

In summary, the entire service area, including all current and future assets (infrastructure, buildings, critical facilities, and population), is considered at risk of wildfire events. All current and future above-ground assets, drinking water systems, and populations (e.g., employees) are at most risk of wildfire. SBMWD has no jurisdiction over land use, development and zoning, socially vulnerable populations, and/or land development within their service area. Water districts nationwide follow the standards set by the American Water Works Association and USEPA governing public water systems.

4.3.6 Cyber Security

Probability: (50-75%) Likely—Cyber data for SBMWD and its region indicate several attempted attacks on the District within the last five years. This equates to a cyber-attack every year on average or a 50 percent chance of a cyber-attack in any given year. Based on this data, SBMWD determined that the future occurrence of a cyberattack within their boundaries continues to be likely. This section looks at all the hazards affecting the district within its boundaries, which were identified by the Planning Team.

Impact: *Critical*

Priority: *Likely*

General Definition: An attack via cyberspace, targeting an enterprise's use of cyberspace to disrupt, disable, destroy, or maliciously control a computing environment/infrastructure, destroy the integrity of the data, or steal 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 due to climate change.
- **Critical facilities** – All critical facilities' exposure and vulnerability are likely to increase due to climate change.

Vulnerability: A cyber-attack on the water infrastructure would 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—the ability to control and gain access to critical records, information, and confidential data.

SBMWD does have a comprehensive cyber security plan. However, this plan is private and not to be shared with the public or any public forum.

Impact Statement: Several cyberattacks can occur to the district, water, and wastewater control systems. 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 purpose of conducting the capability assessment is to determine SBMWD's ability to implement a comprehensive mitigation strategy and to 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 SBMWD's capacity to bring them to fruition. A capability assessment highlights the positive mitigation activities within SBMWD and will detect the potential gaps.

5.2 Emergency Management

To help mitigate the potential impacts of disasters, SBMWD joined CalWARN. The Department has a mutual aid agreement with CalWARN that covers most water and wastewater agencies in California. As a government entity (a Special Department within California Law), the Department 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 has a better understanding of 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 past experiences during emergencies, and lessons learned on what they should have done differently. Sharing ideas and experiences is key to understanding mitigation in the future.

SBMWD currently employs 263 full-time and three part-time employees, and by joining CalWARN, SBMWD has the potential to have hundreds of mutual aid water/wastewater workers at its disposal within hours of an emergency. The pressure zones, reservoirs, wells, and maintenance work done at the City of San Bernardino Municipal Water Department Reclamation Treatment Plant facility are all operated by certified operators and maintained by various certified technical disciplines. In addition, the SBMWD agrees with other water Agencies through CalWARN to support each other during an emergency by offering labor and equipment to the incident.



The General Manager has over 12 years of experience in water/wastewater. He has been with SBMWD for 12 years. Throughout his career with the Department, 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 primary objective of the plan 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.

SBMWD Emergency Response Plan was last revised in August 2021 and details how the Department will respond to various emergencies and disasters. SBMWD 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 malevolent 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.

SBMWD 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 provide a centralized hub for communication and security oversight. SBMWD's 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.

SBMWD conducts regular emergency exercises, following their emergency training plan. Through this training, the staff is trained across divisions within each department to assist



with emergency response operations. Additionally, SBMWD 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 SBMWD'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 enforcement of design and construction standards. Although conflicts can arise, these planning initiatives present significant opportunities to integrate hazard mitigation principles into SBMWD's decision-making process.

The Urban Water Management and Planning Act requires water suppliers to estimate water demands and available water supplies. SBMWD's updated Urban Water Management Plan (UWMP) was completed on June 30, 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 types of years (e.g., years with average rainfall versus drier years).

Water Shortage Contingency Plan (WSCP)

Certain elements 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 SBMWD's water supply conditions and shortages resulting from catastrophic supply interruptions; SBMWD WSCP was last updated June 2023. The WSCP also contains SBMWD 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 requiring water use restrictions in different stages. For instance, stage 1 requires a 10% water use restriction, and stage 5 requires a greater than 50% water use restriction. The main method of reducing water use is using water budget-based tiered rate structures and penalties for overuse.

UWMPs are intended to be integrated with other urban planning requirements and management plans. Some of 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.

5.4 Existing Plans

The following emergency-related plans apply as appropriate:

- CalWARN Emergency Operations Plan – Updated every 10 years
- The Department's Illness Injury Prevention Plan (IIPP) – Updated annually
- The Department's Urban Water Master Plan – Updated every 10 years
- Water Shortage Contingency Plan (WSCP)– Updated every 5 years
- San Bernardino County Fire Master Plan- Updated annually
- Perris Hills Emergency Action Plan – Updated every 5 years
- San Bernardino Municipal Water Department Emergency Response Plan – Updated every 5 years
- San Bernardino Municipal Water Department Cyber Security Response Plan – Updated every 5 years
- San Bernardino County Flood Master Plan – Updated annually
- City of San Bernardino Hazard Mitigation Plan – Updated every 5 years
- County of San Bernardino Hazard Mitigation Plan – Updated every 5 years
- USEPA PSPS SOP for Public Water Systems – Updated every 5 years

5.5 Mitigation Programs

SBMWD employees have experience with past hazard mitigation and hazard planning and can further enhance their hazard mitigation skills by participating in training offered by other agencies or regional governments.

The Department offers incentives to improve water use efficiency. These incentives include a high-efficiency hose nozzle, low-flow shower heads, conservation educational classes, and water surveys for leak detection. To promote voluntary conservation, the Department has initiated a public awareness and education plan consisting of the following:

- A citizens advisory committee is used to inform and educate constituents about water issues, including water supply conditions and water use efficiency.
- The Department stores disaster supply storage sheds at its corporate yard and Department office for employees during an emergency. The supply sheds are complete with cots, chairs, food bars, MREs, first aid kits, light sticks, batteries, blankets, personal sanitation kits, water, flashlights, etc.



- The Department's Human Resources Department develops and maintains safety manuals and emergency response manuals that are specific to the facility where each department works.
- The Department's Business Emergency Plan is updated annually for both local and county fire hazardous materials departments.
- The Department plans on starting mitigation outreach via a citizens advisory committee and using the Constant Contact platform.

5.6 Fiscal Resources

The ability of SBMWD to act is closely associated with the number of fiscal resources available to implement mitigation policies and projects. This may take the form of outside grant funding awards or Department-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 the creation and monitoring of a given program. In other cases, 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 SBMWD and state and federal funding sources. SBMWD has made fiscal commitments to mitigate hazards through its Capital Improvement Plan (CIP).

The following is a summary of the Department's fiscal capabilities. A number of governmental funds and revenue-raising activities can be allocated for hazard mitigation activities. Included below are potential sources of discretionary general funding from local, state, and federal resources.

- New connection fees from industrial users
- State and Federal grants

Through the California Department of Water Resources, local grants and/or loans are available for water conservation, groundwater management, studies, and activities to enhance local water supply quality and reliability. Project eligibility depends on the type of organization(s) applying and participating in the project, as well as the specific type of project. More than one grant or loan may be appropriate for a proposed activity. Completing the LHMP will facilitate and obtain grant funding in the future. For instance, Building Resilient Infrastructure Communities (BRIC), Hazard Mitigation Grant Program (HMGP), or Flood Mitigation Assistance (FMA) grants. Grant opportunities will be reviewed each year to ensure there will be funding available for specific mitigation items.



5.7 Capabilities Assessment

A Capability Assessment examines SBMWD'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 the development of a meaningful hazard mitigation strategy. The list below outlines key capabilities SBMWD 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 Department's Capital Improvement Plan planning efforts.
4. **Incorporate** projects from the Capital Improvement Plan into the mitigation strategy (and vice versa).
5. **Expand** Public outreach and education on emergency management. This allows SBMWD to form a plan to continually educate their customers regarding natural hazards and the effects these hazards have on drinking water systems. They educate the residents on the importance of mitigating these hazards to build a more resilient community.
6. **Broaden** staff training: SBMWD 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. This plan should continue with educating grades K-12 in the local schools and on the SBMWD website.



SECTION 6. MITIGATION STRATEGIES

6.1 Overview

SBMWD 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 both mitigation challenges and opportunities and is demonstrated by the goals and objectives outlined below. Additionally, 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 six high-risk hazards that were extensively examined in the risk assessment section. These hazards include earthquakes, climate change–induced drought, flooding, wildfire, and cyber security.

6.2 Mitigation Goals, Objectives, and Projects

The process of identifying goals began with a review and validation of the FEMA Hazard Maps for SBMWD 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, it was the Planning Team’s consensus 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.
- SBMWD communications should provide public outreach to inform the public of the hazards identified to the drinking water system in emergencies, such as 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 SBMWD.
- Review and verify that the Department-owned and operated infrastructure meets the minimum standards for safety.
- Review the Department’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 six high-profile hazards for SBMWD are earthquakes, climate change–induced drought, flooding, wildfire, windstorms, and cyber security. While other hazards were profiled in previous sections, SBMWD’s priority and focus for the mitigation projects will be on the six high-profile hazards.

The table below shows the status of mitigation actions from the 2019 LHMP.

Table 19. Mitigation Actions from 2019 LHMP

Hazard	Title/Mitigation Action	Status
Earthquake	• Install flexible pipe joints at wellheads, pump stations, and reservoirs • Install additional booster pumps • Purchase and install generators and generator hook-ups • Tie down equipment • Bolt down reservoirs • Install seismic shut-off valves	Completed since 2019 LHMP: 1. Terrace No. 2 2. Cajon 3. Ridgeline 4. College 5. Perris Hill 6. Lytle Creek No. 2 Under Construction: 1. Terrace No. 3 (Start Date February 2024) 2. Sycamore No. 1 (Start Date February 2024) 3. Devore (Start Date November 2024) 4. Del Rosa No. 3 (Start Date October 2024)



Hazard	Title/Mitigation Action	Status
Flooding	Install block or concrete diversion walls	At designated locations (Ongoing as needed)
	Purchase portable booster pumps	Ongoing as needed
	Purchase generators and generator hook-ups	Ongoing as needed
	Protect pipelines running across bridges	All new construction is designed to meet current design practices and codes (Ongoing as needed)
	Install concrete protection of pipelines in washes, creeks, and rivers	Ongoing as needed
	Floodproof facilities that are in the flood plain: Raise well motors	Added Rip Rap around the wells as needed. Completed (2021 & 2022)
Wildfire	Purchase more portable generators	Ongoing- will be in 2024 LHMP mitigation projects
	Redundant SCADA and communications equipment	Ongoing- will be in 2024 LHMP mitigation projects
	Purchase additional stationary generators and generator hook-ups	Updated mitigation action to battery backup not generators. Completed (2020-2023)
	Purchase water booster pumps	Completed (2021)
	Keep brush and trees clear from facilities • Improve communication with local fire,	Ongoing as needed



Hazard	Title/Mitigation Action	Status
	police, and San Bernardino County OES	
Terrorist Event	Train the public in “if you see something, say something.”	Ongoing- will be in 2024 LHMP mitigation projects
	Improved SCADA controls: Install and improve video cameras at critical facilities	Ongoing- will be in 2024 LHMP mitigation projects
	Build block walls around critical facilities for additional security	Ongoing as needed
Climate Change/Drought	Increase public awareness of water conservation	Ongoing- will be in 2024 LHMP mitigation projects
	Monitor groundwater elevations and evaluate trends	Ongoing- will be in 2024 LHMP mitigation projects
	Increase water pumping capabilities	Ongoing as needed
	Increase groundwater supplies	Ongoing as needed
	Study system interties with other water systems in the area	Completed (2021)
Windstorm	Install redundant SCADA controls	Ongoing- will be in 2024 LHMP mitigation projects
	Purchase water booster pumps	Ongoing as needed



Hazard	Title/Mitigation Action	Status
	Replace roofs with wind resistant material	Ongoing as needed
	Remove trees and brush from around facilities	Ongoing

6.3 Earthquake

Goal: To protect life and property in San Bernardino Municipal Water Department in the event of an earthquake.

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

Mitigation Projects:

Below is the project's priority, the department responsible for this action, and the source of funding. 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 SBMWD. As SBMWD is a community facing economic challenges, the Department and its board are required to adhere to a stringent budget. Consequently, the Department must seek opportunities to save costs or secure grants to finance capital and mitigation initiatives. The identified projects and current cost estimates include:

- Seismic upgrades, including shear wall and roof diaphragm retrofits with fiber-reinforced polymer, topsoil weight removal, and wall footing expansion for Newmark No 2, No. 3, and No. 4. Director of Operations or General Manager. (5 Years) \$1.5 million. ARPA Grant Funding, CIP. High Priority.

6.4 Climate Change – Induced Drought

Goal: To protect life and property in San Bernardino Municipal Water Department in the event of a drought.

Description: *The goal is to avoid injury, loss of life, and damage to property.* 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. It is expected that there will be greater 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 SBMWD. As SBMWD is a community facing economic challenges, the Department and its board must adhere to a stringent budget. Consequently, the Department must seek opportunities to save costs or secure grants to finance capital and mitigation initiatives. The identified projects and current cost estimates include:

- Replace aging infrastructure prone to leaks. Improving pipelines, collection systems, and leak surveys. Looking for water loss in the system, etc. \$2 Million (5 Years) Director of Operations HMGP, BRIC, CIP. High.

6.5 Flood

Goal: To protect life and property in San Bernardino Municipal Water Department in the event of flooding.

SBMWD 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 great volume and short duration is typically caused by unusually heavy rain in a semiarid area. Floods can reach their peak volume in a matter of 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 SBMWD. As SBMWD is a community facing economic challenges, the Department and its board must adhere to a stringent budget. Consequently, the Department must seek opportunities to save costs or secure grants to finance capital and mitigation initiatives. The identified projects and current cost estimates include:



- Improve existing facilities and construct new facilities to mitigate flooding (5 Years) \$5 Million. Director of Operations. BRIC, HMGP.
- The following plants are under design for block walls and flood diversion Ogden Facility, Electric facility, and Shandin Hills booster station. This is to help mitigate flooding. (4 years). \$1.5 million. HMGP, BRIC, CIP. Engineering.

6.6 Wildfire

Goal: To protect life and property in San Bernardino Municipal Water Department in the event of a wildfire.

Description: *The goal is to avoid injury, loss of life, and property damage and to maintain water flow for firefighting efforts.* SBMWD knows it is a matter of time before the hills in the service area have a major fire. The only hope is that this fire does not happen during Santa Ana wind conditions, as this condition will drive the fire down the hills into the valley.

Mitigation Projects:

Below is 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 SBMWD. As SBMWD is a community facing economic challenges, the Department and its board must adhere to a stringent budget. Consequently, the Department must seek opportunities to save costs or secure grants to finance capital and mitigation initiatives. The identified projects and current cost estimates include:

- Remove brush and trees from around facilities. \$30,000 (Annual). High Priority. Director of Operations. CIP.
- Remove old wood electrical panels and install them into block buildings, increasing fire resiliency and security. \$2.5 Million. (5 Years). High Priority. Director of Operations. HMGP, CIP, and BRIC.

6.7 Windstorm

Goal: To protect life and property in San Bernardino Municipal Water Department in the event of windstorms.

Description: The goal is to avoid injury, loss of life, and property damage. The Santa Ana winds are notorious in Southern California for wreaking havoc during the fall and winter months each year. The winds are known for their hot, dry weather and bring the lowest relative humidity of the year. The Santa Ana winds easily reach over 40 miles per hour with a gust of over 60 miles per hour. These winds topple trees and power lines, start wildfires, and cause havoc throughout the region. This has caused Southern California



Edison and other power providers in California to cut power in regions during these wind events, which are called Public Safety Shutoff events.

Mitigation Projects:

Below, you will find the priority of the project department responsible for this action, as well as the source of funding. Further analysis will be required for each mitigation project to provide a more accurate cost estimate when ready to implement. The identified projects and current cost estimates include:

- Generator hookups and automatic transfer panels. Mitigation of loss of power allows wells, boosters, and pumps to keep water in the system. Completed in October of 2023. Ongoing for Sewer Lift stations \$500,000. (2 years) General Manager. High priority. BRIC, CIP, HMGP.

6.8 Cyber Security

Goal: To protect life and property in San Bernardino Municipal Water Department in the event of a cyber security attack.

Description: *The goal is to avoid injury, loss of life, and damage to property.* A cyber-attack can take many forms, such as malware, phishing, and insider threats. It is up to the Department to train and protect from external or internal infiltration. As an added security measure, the Department will not share its cyber security planning within this LHMP. SBMWD does have a comprehensive cyber security plan; however, this plan is private and not to be shared with the public or any public forum.

Mitigation Projects:

Below is 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 SBMWD. As SBMWD is a community facing economic challenges, the Department and its board must adhere to a stringent budget. Consequently, the Department must seek opportunities to save costs or secure grants to finance capital and mitigation initiatives. The identified projects and current cost estimates include:

- SCADA Standards Revision. Update and modernize the current SCADA system. \$1.6 million (2 Years). High Priority. Director of Operations. HMGP and BRIC, CIP.
- Department-wide Video Surveillance Improvement. Update, install, and modernize video cameras and recording devices. \$1 million. High Priority. (5 Years). IT Department. CIP.



6.9 Mitigation Priorities

During the development of the risk assessment for SBMWD, the Planning Team proposed and discussed alternative mitigation goals, objectives, and specific mitigation measures that SBMWD should undertake to reduce the risk from the six high-risk hazards facing the Department. Priorities from the 2019 LHMP have not changed for the 2024 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 Department functions and operability following a disaster
- Achievability in terms of residents' support and cost-effectiveness

All rankings were determined by the consensus of the Planning Team. As described in the previous section on hazard and risk assessment, earthquakes have the potential to affect the largest number of people, damage critical facilities and buildings, and cause the greatest economic losses. This fact, combined with the relatively high probability of an earthquake occurrence 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 SBMWD 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, wildfire, windstorm and cyber security mitigation actions are identified and assigned a priority 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).



6.10 Implementation Strategy

The implementation strategy is intended to successfully mitigate the hazards identified in this plan within a reasonable time. SBMWD is currently operating within its annual budget. SBMWD revenues and capital improvement projects have remained a priority. SBMWD staff will review the Hazard Mitigation Plan each year before developing the next year's fiscal budget. The plan will also be reviewed by the Water Board for items to be included in the new fiscal budget. The SBMWD staff will also actively explore opportunities to secure Hazard Mitigation Grants annually to mitigate the effects on the fiscal budget and provide some relief to the residents. The following equation is the cost-benefit analysis equation used to ensure that the cost-benefit to the Department is within FEMA guidelines. When completing a cost-benefit analysis with FEMA, the formula is all in electronic form but resembles the formula below.

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

Mitigation Projects Funding Source

There is currently no mitigation money in the Department's budget. The Department will include mitigation into the budgeting process when funding becomes available and look at what mitigation projects could be funded in future budget cycles.

Timeframe

Over the next five years, the Department will incorporate mitigation into all capital improvement projects that it undertakes. The previous 2019 LHMP was incorporated in the CIP and any other relevant planning mechanisms, including the Urban Water Management Plan, which incorporates LHMP mitigation projects.

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



SECTION 7. PLAN MAINTENANCE

7.1 Monitoring, Evaluating, and Updating the Plan

The General Manager or his/her assignee will evaluate the plan annually and consider whether new hazards have emerged, community vulnerability has changed, and goals are still relevant to current conditions. This will be done by evaluating and recording completed mitigation actions and adding mitigation projects to the current LHMP. The LHMP will be reviewed as part of the annual budget planning each year and whenever new infrastructure updates are made within SBMWD. The General Manager or his/her assignee will ensure the LHMP is reviewed annually, and any items that have been mitigated will be recorded within the plan. At that time, staff and the elected Water Board will review funding and capital improvement replacement projects in the next fiscal year's budget. Annually, the General Manager or his/her assignee and the Controller 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 his/her assignee will include the LHMP in all budget planning 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 his/her assignee leads a full review of the LHMP at a three-and-a-half-year interval like 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, using the new revised FEMA review tool, cross referencing hazards from the county, and development of new mitigation strategies and goals will be addressed by the Planning Team headed by the Operations Department that will include the General Manager or his/her assignee.

The consumers within SBMWD will be asked to participate in the LHMP update process. There has not been any substantial development within the service area in the last 5 years. In the 2019 LHMP, the plan was incorporated into planning documents for updates on water mains.

7.2 Implementation through Existing Programs

Once the State of California OES and FEMA approve the LHMP, SBMWD will incorporate the LHMP into capital improvement replacement projects, capital replacement programs, building design, and any updates or repairs to the water distribution system. Information gathered from hazard profiles, such as flood maps and facility vulnerabilities, will be used as a resource document and support the plans, projects, and programs that will benefit



the water system and building within the service area. SBMWD 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 water system. The General Manager or his/her assignee will be responsible for implementing the LHMP and working toward the LHMP-recommended goals and objectives that are met. The General Manager or his/her assignee will be responsible for placing the LHMP on the SBMWD website and incorporating the LHMP into the annual budget planning meetings. The General Manager or his/her assignee will verify that the LHMP is updated and rewritten over a 5-year cycle. SBMWD 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 SBMWD's Website. The General Manager or his/her assignee is responsible for ensuring the LHMP is brought before the Water Board each year 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 SBMWD, 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. It is the General Manager or his/her assignee's responsibility to ensure the LHMP is updated throughout the year and every 5 years.

The plan is reviewed annually. SBMWD. The General Manager or his/her assignee will conduct outreach with the nonprofit organizations, including community-based organizations, to represent the community's input into the updates. SBMWD 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.