SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

BOARD OF DIRECTORS WORKSHOP - POLICY/ADMINISTRATION
2:00 pm Thursday, June 6, 2024

In Person:
380 East Vanderbilt Way
San Bernardino, CA 92408

Online via Zoom:
https://sbvmwd.zoom.us/s/89386241472
Meeting ID: 893 8624 1472
PASSCODE: 3802020

By Telephone:
Dial-in Info: (877) 853 5247 US Toll-free
Meeting ID: 893 8624 1472
PASSCODE:3802020

If you are unable to participate online or by telephone, you may also submit your comments and questions in writing for the District's consideration by sending them to comments@sbvmwd.com with the subject line "Public Comment Item #" (insert the agenda item number relevant to your comment) or "Public Comment Non-Agenda Item". Submit your written comments by 6:00 p.m. on Wednesday, June 5, 2024. All public comments will be provided to the Board President and may be read into the record or compiled as part of the record.

IMPORTANT PRIVACY NOTE: Online participants MUST log in with a Zoom account. The Zoom app is a free download. Please keep in mind: (1) This is a public meeting; as such, the virtual meeting information is published on the World Wide Web and available to everyone. (2) Should you participate remotely via telephone, your telephone number will be your "identifier" during the meeting and available to all meeting participants; there is no way to protect your privacy if you elect to call in to the meeting.

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AGENDA

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
380 E. Vanderbilt Way, San Bernardino, CA 92408

BOARD OF DIRECTORS' WORKSHOP - POLICY/ADMINISTRATION
2:00 PM Thursday, June 6, 2024

CALL TO ORDER

1) INTRODUCTIONS

2) PUBLIC COMMENT
Members of the public may address the Board regarding any item within the subject matter jurisdiction of the Board; however, no action may be taken on off-agenda items except as authorized by law. Each speaker is limited to a maximum of three (3) minutes.

3) DISCUSSION AND POSSIBLE ACTION ITEMS

3.1 Consider Updates to the Climate Adaptation and Resilience Plan (CARP) and provide additional feedback, if desired (60 min) - Page 2
Staff Memo - Consider Updates to the Climate Adaptation and Resilience Plan
Summary of Public Comments
Revised Climate Adaptation and Resilience Plan (Clean)
Revised Climate Adaptation and Resilience Plan (Tracked Changes)

4) FUTURE BUSINESS

5) ADJOURNMENT

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

DATE: June 6, 2024

TO: Board of Directors' Workshop – Policy/Administration

FROM: Wen Huang, Assistant General Manager/Chief Operating Officer
Greg Woodside, Chief of Planning and Watershed Resilience
Adekunle Ojo, Manager of Water Resources

SUBJECT: Consider updates to the Climate Adaptation and Resilience Plan (CARP) and provide additional feedback, if desired.

Staff Recommendation

Consider new updates to the Climate Adaptation and Resilience Plan (CARP) and provide additional feedback, if necessary.

Summary

Staff presented the Draft Climate Adaptation and Resilience Plan at the May 14th Board of Directors' Workshop – Resources/Engineering. At the workshop, the Board provided feedback to staff and noted that additional time was needed for the Board members to provide comments. The public comment period for the Draft CARP was open through May 21 and two comments were received, one from CAL FIRE and the other from the Inland Empire Waterkeeper; the comments and how they are addressed in the revised document are detailed in the first attachment (Summary of Public Comments).

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Staff has addressed the following feedback provided at the May 14th meeting namely:

- **Aridification and Earthquakes:** Aridity and aridification have been added to the Glossary of Terms and additional text was added to the Drought part of Section 3 (Climate Risks and Vulnerabilities); the existing measures and actions capture the impacts of aridity and aridification. Additional text was added to the Methodology part of Section I (Introduction) on earthquakes and how it is further addressed in Measure 3-G (Operational Contingencies), Action 3-G-86 (Local Hazard Mitigation Plan).
- **Investments:** The last statement in the Rationale portion of the Executive Summary has been removed from the Draft CARP to address the concern voiced by the Board that the statement reads like a policy. Measure 3-I provides more clarity "*that the District could update or revise its Investment Policy and procurement practices to identify opportunities*

to increase sustainability and reduce greenhouse gas emissions without introducing undesired risk."

- **How the Plan will be used:** The Implementation portion of the Executive Summary has been renamed to "How the Plan will be Used" and additional text has been added to indicate that the Plan would be used to inform the decision of the current and future Boards on where to focus investments, partnerships, and initiatives to reduce climate risks to the District. In addition, the text was updated to emphasize that the implementation process is adaptive in nature, as many of the actions align or overlap with other plans and partners.

The CARP is a strategic planning-level document, aimed at providing proactive consideration of the risks from changing climate conditions to our water portfolio, assets, and many habitat, infrastructure, and water resource investments throughout the state. The plan will be used when deciding how to best mitigate those risks or adaptively manage in reaction to climate-related factors that may arise over the coming decades. The adoption of the CARP will provide the Board and the District with a collection of tools and options to guide current and future decisions, investments, and improvements in all aspects of our work to deliver our mission in a changed climate. The CARP will serve as an adaptive management document to evaluate decisions and measure progress towards resilience. For example, in updating the Integrated Regional Urban Water Management Plan (IRUWMP) in 2025, staff and IRUWMP participants would utilize the CARP as a guide to ensure that the needs, goals and objectives, demand and supply analysis, and the suite of projects in the IRUWMP are consistent with the CARP and helps to build regional climate resilience. The document will also support various outside funding applications for opportunities that are likely to be available in the near future. These potential grants or other sources of funding will offset the costs of projects that make our agency more climate resilient.

Background

One of the strategies within the San Bernardino Valley Strategic Plan is to achieve climate resilience through prioritized adaptation and mitigation. The development of the Climate Adaptation and Resilience Plan started in late 2021, providing a comprehensive planning framework for the District to identify and prioritize adaptation and mitigation measures that would protect our water resources, assets, investments, and provide overall resistance and resilience to conditions influenced by climate change such as extreme heat, cold, hydrologic cycles, wildlife and more. The Board of Directors established the Climate Resilience Committee (CRC) comprised of Director Hayes and Director Longville to engage with staff and the District's consultant Rincon; the Committee has since met nine (9) times to guide the CARP development process on behalf of the full Board.

On September 21, 2021, the San Bernardino Valley Board of Directors approved a professional services agreement with Rincon Consultants, Inc. for the development of a CARP; in addition to Rincon, the consulting team included BluePoint Planning for stakeholder engagement and RAND for climate modeling. The first stage of the project included preparing a Communications Plan, conducting stakeholder interviews, and listening sessions, and preparing a Vulnerability Assessment and a Greenhouse Gas Inventory & Forecast; this stage was largely completed by the summer of 2022. The next stage of developing climate adaptation and resilience strategies started in the fall of 2022 and the process has included several small group discussions with stakeholders, and two (2) virtual community workshops in addition to several department/staff sessions and meetings of the Climate Resilience Committee. The project is in the final stages of review by the public and Board prior to adoption by the Board, which is tentatively scheduled for June 2024.

At the March 7, 2024, Board of Directors' Workshop – Policy/Administration, staff provided a CARP development update; one of the highlights was that the draft would be reviewed by the Climate Resilience Committee in April prior to its Board review in May. The review by the Committee was completed and subsequently on May 6, 2024, the Draft CARP was posted on the District's website and sent electronically to stakeholders who participated in the CARP development to provide a longer review and comment window than is typical for agenda items for meetings of the Board of Directors. CAL FIRE and Inland Empire Waterkeeper provided comments, which have been summarized in an attachment.

District Strategic Plan Application

This item is consistent with being a trusted partner and working collaboratively to provide a reliable, resilient, and sustainable water supply to the region's people and environment. This item implements the strategy identified in the Strategic Plan to '*Achieve climate resilience through prioritized adaptation and mitigation*.'

Fiscal Impact

None

Attachment

1) Summary of Public Comments
2) Revised Climate Adaptation and Resilience Plan (Clean)
3) Revised Climate Adaptation and Resilience Plan (Tracked Changes)

Revised Climate Adaptation and Resilience Plan (CARP)

Summary of Public Comments

COMMENTOR	COMMENT(S)	RESPONSE TO COMMENT
CAL FIRE	Preferred spelling is CAL FIRE	Revised the two references to the agency that previously referred to Cal FIRE
Inland Empire Waterkeeper	Two (2) weeks for review and comment is too short; suggest allowing a month	Comment noted.
Inland Empire Waterkeeper	Document was comprehensive and understandable, and the graphics were helpful; recommend increase font size	Comment noted.
Inland Empire Waterkeeper	Figure 2 needs a better map of the district that includes significant cities and features	An updated version of Figure 2 will be included in the final report.
Inland Empire Waterkeeper	On page 21 under Rationale, ineffective water efficiency measures are mentioned. What are examples of those?	The text on Page 21 regards potential future water efficiency measures that could come from legislative or regulatory mandates. In this context, an ineffective water efficiency method would be one that is less effective than other available measures, does not provide a sufficient benefit relative to the cost, or has significant adverse impacts. Text revised for clarity
Inland Empire Waterkeeper	We like seeing the recreational use of SBVMWD water resources included as an aspect of the plan. This is a very important concept to consider with increasing heat in the area.	Comment noted
Inland Empire Waterkeeper	Space needed between the words - priorities and of - on page 30.	Text updated accordingly.
Inland Empire Waterkeeper	The financial focus on the Sites reservoir seems odd for an inland Empire Water District. Is this through the MWD or directly with the Sites Water Authority?	San Bernardino Valley is one of the 29 State Water Contractors and a likely investor in the future Sites Reservoir Project. Sites Reservoir will capture wet-year water to be delivered in dry years, which is a critical strategy to achieve climate resilience within our water portfolio due to the highly variable hydrologic cycles.

Summary of Public Comments

Inland Empire Waterkeeper	Overall Inland Empire Waterkeeper is pleased to see the forward planning for Climate Change by the SBVMWD and the focus on the community and environment as an integral part of that plan. Inland Empire Waterkeeper is looking forward to working with SBVMWD to educate the public on water resilience issues and to develop public access to SBVMWD water resources for recreation and cooling during the increasing heat events we are experiencing.	Comment noted.

San Bernardino Valley Municipal Water District

Draft Climate Adaptation and Resilience Plan

June 2024

Prepared by:

San Bernardino Valley Municipal Water District
380 East Vanderbilt Way
San Bernardino, California 92408

Prepared in Collaboration with:

RINCON CONSULTANTS, INC.
Environmental Scientists | Planners | Engineers

Note from the Board of Directors

[Board Statement to be included later]

Forward from the CEO/General Manager

Since 1954, San Bernardino Valley has been working towards a resilient water supply and has evolved into a holistic watershed agency working collaboratively with a multitude of partners on water and ecosystem solutions for the region's people and environment. Much like the natural systems of our service area, the agencies and the people within our watershed are integrally connected and we all contribute to solutions that will support a sustainable future for our people and our shared environment.

Climate change is altering climatic patterns in our service area and California. Changes in temperature, precipitation, and other climatic changes challenge San Bernardino Valley operations in numerous ways. Water supply reliability will be impacted by changes to local and imported water supplies. Extreme heat and precipitation events are likely to increase in frequency. Our service area may also experience more frequent and severe droughts, increased risk of catastropic wildfire in our headwaters, and increased threats to water quality. California's snowpack, a source of our imported water supply, is expected to decline or swing dramatically as a result of climate change. Increasing storm intensity will complicate flood protection and stormwater capture efforts. Local ecosystems and habitat investments may degrade in response to more intense droughts, drier and compacted soils, warmer water, and other possible climate change impacts. This may threaten the success of our water resilience, watershed stewardship, and habitat conservation efforts.

This Climate Adaptation and Resilience Plan (Plan) is our adaptive guide to delivering our mission in a changing climate. The Plan provides goals and strategies for San Bernardino Valley to be resilient to climate change impacts, reduce greenhouse gas emissions, and adapt operations to climate change. The Plan also proposes an ongoing, adaptive implementation to mainstream climate change actions in all San Bernardino Valley's functions and operations. Specific actions identifed in the Plan will be reviewed and approved by the San Bernardino Valley Board of Directors as part of the District's annual budget and future approval of District projects and programs.

OUR *mission* IS TO...

Work **collaboratively** to provide a **reliable** and **sustainable** water supply to support the changing needs of our region's **people** and **environment.**

San Bernardino Valley Municipal Water District was formed in 1954 as a regional agency to sustain long-range water supply for the San Bernardino Valley's people and environment. SBVMWD's service area covers about 353 square miles in southwestern San Bernardino County with a population of about 710,000 (2020 Census). Its service area spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, Mentone, Grand Terrace, and Yucaipa. SBVMWD is a wholesale water supplier, delivering water directly or indirectly to 15 retail water agencies that provide water to end users and works collaboratively with neighboring wholesale suppliers on shared supplies, conveyance, and other regional solutions. Like many other water agencies in Southern California, SBVMWD's service area relies on imported water from the State Water Project (SWP) to supplement its local water supply, which is primarily groundwater. *In all, more than 1 million residents of the Greater Riverside-San Bernardino area depend on the water resources within the San Bernardino Valley for their water.*

Table of Contents

Executive Summary

Rationale

Climate change is a global issue caused by the cumulative warming effects of greenhouse gas (GHG) emissions. Global temperatures have unequivocally risen in response to the increased levels of carbon dioxide and other GHGs in the atmosphere. Observations and research indicate that climate change has already made extreme events, including heat waves, drought, atmospheric river events, and wildfires, more likely, more intense, longer lasting, or larger in scale. Persistent drought conditions across the Western United States since 2000, coinciding with record warmth, have led to record low snowpack in the Sierras, causing severe water supply limitations statewide. In 2023, record to near-record precipitation occurred in many parts of California, highlighting the variability in weather patterns. Precipitation patterns are shifting as well, with more precipitation falling during severe events with longer dry spells between them. These shifts in climate and weather extremes can impact the natural resources, infrastructure, and operations of water providers throughout the state including San Bernardino Valler Water District (SBVMWD)

Recent local experiences with persistent drought conditions and aridification, extreme weather events, and weather whiplash have prompted SBVMWD to incorporate climate change considerations into its plans and programs. Shifts in climate and weather extremes are leading the District to consider changes in the way water resources, operations, and water conservation activities are managed. SBVMWD has witnessed and responded to impactful climate extremes in recent years, including precipitation extremes, wildfire events and extreme heat. These events have underscored the need to develop a long-term water supply strategy to protect the water supply from a climate-changed future. In recognition of this global reality, SBVMWD is working to strengthen water reliability and proactively address existing and future climate change impacts by developing this Climate Adaptation and Resilience Plan (CARP) consistent with the Priorities laid out in its Strategic Plan. The overarching goal of the CARP is to better equip SBVMWD with the strategies it needs to proactively manage the effects of climate change. The CARP is a planning-level document, aimed at providing proactive consideration of the risks from changing climate conditions to our water portfolio, assets, and many habitat, infrastructure, and water resource investments throughout the state. The plan will be used when deciding how to best mitigate those risks or adaptively manage in reaction to climate-related factors that may arise over the coming decades. The CARP serves as a programmatic policy and strategy document for addressing the undesirable impacts of climate change on the District and will identify targeted policies, programs, and projects that will both mitigate the District's contribution to GHGs and increase the District's adaptive capacity. By defining specific climate goals, measures, and actions, SBVMWD will track progress towards increased resilience, measure the success of its strategies, and adjust these approaches as new information becomes available.

By evaluating the associated risks and impacts, SBVMWD, affiliated water agencies and partners can proactively prepare, maintain, and invest in a manner that prevents greater costs stemming from unforeseen climate-related impacts. Despite the potentially high initial investment costs, the economic benefits of the CARP to water users and the local economy are intended to outweigh the associated expenditures. In the absence of action, SBVMWD and affiliated agencies are likely to be pushed to consistently repair impacted infrastructure, risking potential service interruptions or resorting to purchasing water from more costly alternative sources. With proactive planning in place, SBVMWD can focus on maximizing local water resources, thereby increasing the region's flexibility to leverage available imported water supply for reliability and other investment opportunities such as conjunctive use and sale of surplus water. This approach

reduces vulnerability to drought and regulatory restrictions that curtail water deliveries from the SWP, while concurrently investing infrastructural dollars within the local/regional economy. This strategy effectively prepares for, protects the integrity of, and maintains SBVMWD's mission of working collaboratively to provide a reliable and sustainable water supply to support the changing needs of the region's people and environment.

Key Climate Risks

The SBVMWD service area and its imported water supplies are expected to experience a wide variety of climate change impacts by the end of the century.

Drought duration and intensity is expected to increase in the future, limiting supply, increasing water demand and straining local groundwater resources and ecosystems.

Extreme heat events are projected to become more prevalent, which will lead to more frequent regional power disruptions, increased wildfire risk, increased evapotranspiration and higher water demand, and degraded ecosystems.

Wildfire events are expected to become more likely in the coming decades, which will increase the risk of damaged infrastructure, operational disruptions, power outages, and damaged ecosystems, particularly in the upper Santa Ana River Watershed.

Extreme precipitation and flood events are projected to become more likely, which will increase landslides, soil erosion and mudflow, and liquefaction risk in certain locations.

Climate impacts to the SWP, including wildfire, reduced snowpack, sea-level rise, and increased temperatures, may disrupt SWP operations and infrastructure and will increase the variability and risk of imported water deliveries.

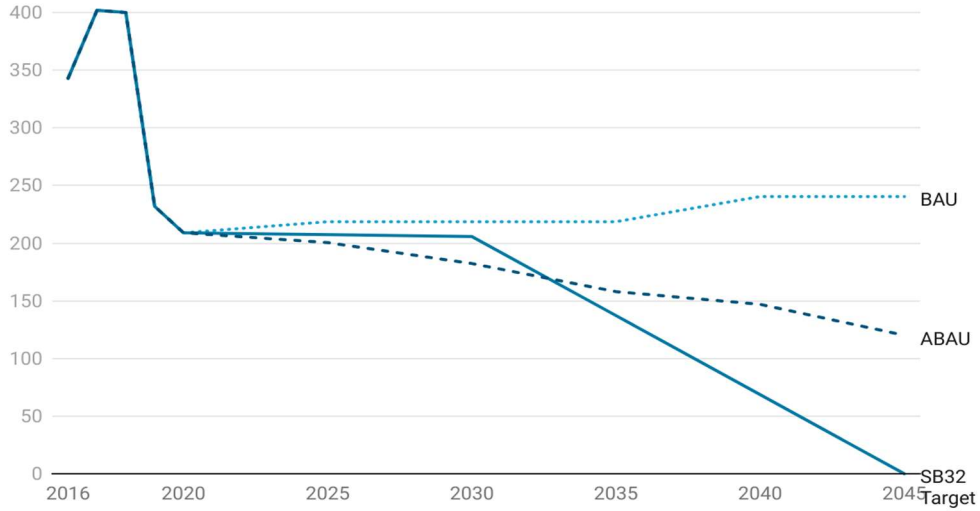
Landslides can be triggered by an increase in the number and severity of wildfire and heavy precipitation events that threatens assets and infrastructure situated on or near slopes, particularly at the hills and valley interface.

GHG Emissions Footprint

California has legislation committing the state on a path to carbon neutrality by 2045. The 2006 California Global Warming Solutions Act (Assembly Bill 32) established a near-term target to return GHG emissions to 1990 levels by 2020. California surpassed this target 4 years early in 2016. California's next climate target is set to reduce emissions by 40 percent below 1990 levels by 2030. Water districts like SBVMWD play a fundamental role supporting state climate change resilience and mitigation goals, particularly by contributing to reducing local GHG emissions. California's water sector accounts for 10 percent of the state's GHG emissions, which is largely related to the energy required to move water across the state.[1] Water agencies account for approximately 5 percent of California's electricity consumption.[2] However, water utilities are positioned to reduce their emissions dramatically, through the identification of energy efficiency opportunities and conversion to carbon free energy sources.

SBVMWD's GHG emissions fluctuate year to year depending on the source of water and the extent of water demand and services provided. SBVMWD's emissions are primarily driven by electricity consumption at offices and pump stations. Other major sources of emissions include employee commute and the vehicle fleet. SBVMWD exercises direct control over its GHG emissions-generating activities. For example, SBVMWD can exceed the state GHG reduction targets and make a major move towards neutrality simply by using 100% renewable power.

Figure 1 SBVMWD GHG Emissions Forecast and Targets



1 Hanak et al. 2018. California's Water: Energy and Water. https://www.ppic.org/wp-content/uploads/californias-water-energy-and-water-november-2018.pdf

2 Martinez-Morales et al., 2020. Water Sector Energy Efficiency Through an Integrated Energy Management System. California Energy Commission. https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-003.pdf

Resilience Strategy

SBVMWD's Strategic Plan recognizes that the long-term viability of the region's water supply must include the reduction of GHG emissions and adaptation to the impacts of climate change among other priorities. The CARPs strategy framework includes measures and actions that primarily support SBVMWD's adaptation and resilience strategic priorities, while also supporting other aspects of its strategic plan, including its core values. The CARP Framework is organized into four Guiding Principles (shown below) that support Strategy 1 (Achieve climate resilience through prioritized adaptation and mitigation) in the SBVMWD Strategic Plan. The CARP includes 37 measures, which it intends to implement in phases through 139 actions. Implementation of the CARP will be monitored and evaluated using Adaptive Capacity metrics which track the implementation of measures and actions; Performance metrics, which track the functional changes elicited by measures and actions; and Signpost metrics, which track the factors that influence future planning decisions that include setting performance targets. Together, the four Guiding Principles represent a holistic approach to increasing the District's resilience across its water sources, the ecosystems that its water resources rely on, its infrastructure and operations, and water use in the communities it serves.

Maintain a Diverse Water Portfolio: Diversity in the supply mix increases reliability and sustainability by minimizing overreliance on any one water source, and helping cope with increasing climatic extremes at the local or state scale. Measures supporting this guiding principle will result in increased recycled water production, stormwater capture, aquifer recharge and support hardening imported water infrastructure, piloting precipitation enhancement, and implementing adaptive planning and management.

Protect the Water Portfolio: Protecting the portfolio with sustainable management of existing supplies and natural resources will help maintain the District's investments and the benefits provided by our infrastructure and the natural environment thereby allowing SBVMWD to meet the needs of a changing and dynamic population of customers and the environment. Measures supporting this guiding principle will protect the water portfolio through conjunctive use planning, watershed conservation and restoration initiatives, sediment and water quality management, and strategic aquifer recharge.

Improve Operational and Infrastrcture Resilience: Strategic investments in crucial operations and infrastructure create reliability and continuity of service in an uncertain climate future prone to disruptions and assist in long-term regulatory compliance. Measures that support this guiding principle will improve operational and infrastructure resilience by creating redundant systems where necessary, increasing onsite renewable and backup power, developing operational contingencies for weather extremes, exploring water transfer options, reducing GHG emissions, and incorporating resilient design criteria in capital improvement projects.

Connect People to Water and Climate: Community members and groups that understand and engage with the complex water system and changing climate make essential allies in sustainable water management and regional climate resilience. Measures that support this guiding principle seek to engage and further connect communities to water and climate issues by leading public awareness campaigns and engagement programs, planning for equitable and sustainable growth, and supporting educational use of applicable District's facilities and resources.

How the Plan will be Used

to inform decisions of the current and future Boards on where to focus investments, partnerships, and initiatives to reduce climate risks to the District

Following the Board's adoption, San Bernardino Valley staff will develop an implementation program to coordinate the execution of prioritized CARP measures and actions. While the implementation program will evolve to reflect changing circumstances, it will have key elements such as finalizing and a performing a set of actions to achieve climate resilience, finalizing the success metrics for completed projects and actions, and having a clear system of progress reporting and outreach. The CARP as well as its accompanying implementation program will assist the District and partners in competing for state and federal climate resilience investments as well as ongoing stakeholder involvement. Furthermore, the implementation of the CARP will engage internal stakeholders extensively, as many of these actions align or overlap with other San Bernardino Valley's plans.

In addition to the measures and actions included in the Plan, the CARP provides an adaptive management process to plan for changes in climate projections and adjusting measures and actions based on real-world conditions. Real-world conditions and Board actions will ultimately inform the implementation process. Because projects often take years to plan and implement, there will be ample time to reassess decisions in the face of a changing climate and new assumptions to reduce the potential for overinvestment if a project is not ultimately needed and under preparedness if a project is needed.

To facilitate effective implementation, SBVMWD will implement CARP actions in four phases recognizing that flexibility is needed as conditions change and more information is collected about climate change and the efficacy of implemented actions:

Phase 1 represents measures and activities that are complete, ongoing, or already approved.

Phase 2A represents measures and activities that are planned to begin in FY24-25 through FY29-30.

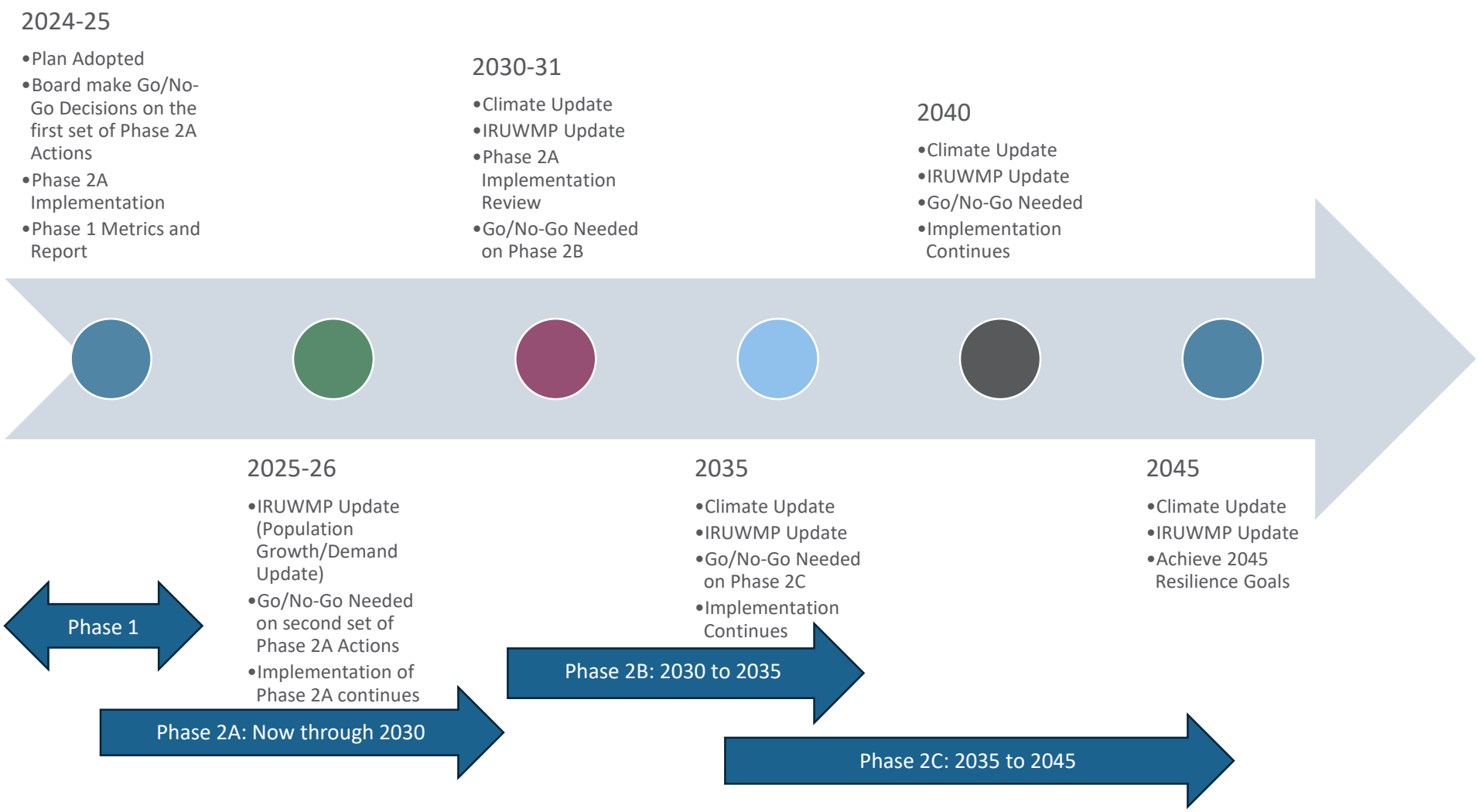
Phase 2B represents measures and activities that will take place between FY 30-31 and FY34-35.

Phase 2C represents measures and activities that will take place between FY35 and FY45 to help SBVMWD achieve 2045 goals.

Phase 1 activities are generally those related to SBVMWD's water supply portfolio, as well as operational and infrastructure resilience. Phase 2A expands the focus on climate adaptation and mitigation to include efforts related to resilient design, reservoir operations and multi-benefit projects, and a greater expansion of measures that mitigate GHG emissions. Importantly, both watershed protection and community engagement measures span across both phases, with a nearer-term focus on wildfire abatement and management, water quality management, water demand management and community education around climate risk. Phase 2B actions are those that are intended to build on Phase 1 and 2A investments. Phase 2C actions are those that are intended to enable SBVMWD to complete its 2045 goals.

Each measure will be implemented as a set of actions that contribute to the goals set forth by a given measure. Each of the 37 measures has actions that are intended to be implemented in Phase 1 and 2. This means that while a measure may begin in Phase 1, the implementation of actions within it may extend further into the future, including Phases 2B and 2C. Activities that need to be funded will be reviewed with the SBVMWD Board of Directors through the annual budget approval process or through separate items reviewed with the Board of Directors.

Below is an adaptive management graphic depicting the tentative phased implementation:


2024-25
•Plan Adopted
•Board make Go/No-Go Decisions on the first set of Phase 2A Actions
•Phase 2A Implementation
•Phase 1 Metrics and Report
2025-26
•IRUWMP Update (Population Growth/Demand Update)
•Go/No-Go Needed on second set of Phase 2A Actions
•Implementation of Phase 2A continues
2030-31
•Climate Update
•IRUWMP Update
•Phase 2A Implementation Review
•Go/No-Go Needed on Phase 2B
2035
•Climate Update
•IRUWMP Update
•Go/No-Go Needed on Phase 2C
•Implementation Continues
2040
•Climate Update
•IRUWMP Update
•Go/No-Go Needed
•Implementation Continues
2045
•Climate Update
•IRUWMP Update
•Achieve 2045 Resilience Goals
Phase 1
Phase 2A: Now through 2030
Phase 2B: 2030 to 2035
Phase 2C: 2035 to 2045

CARP Structure

The CARP is organized into six sections:

Section 1: Introduction – Discusses the policy and planning context to the CARP development and identifies SBVMWD's interests in prioritizing climate resilience.

Section 2: Roles and responsibilities – Details SBVMWD's role in the Santa Ana River Watershed and its core functions.

Section 3: Climate Risks – Identifies climate hazards and risks predicted by existing models and future scenarios, including extreme heat, fire, drought, aridification, and atmospheric river events.

Section 4: GHG Emissions Footprint – Assesses the districts operational GHG emissions in 2016, 2017, 2018, 2019, and 2020 and business as usual and adjusted forecast of GHG emissions for SBVMWD's operations, based on projected growth trends in water deliveries, operational changes, and known project activity over time.

Section 5: Resilience Strategies – Defines a range of solutions that will reduce vulnerabilities and mitigate GHG emissions that align with SBVMWD's principles of maintaining a diverse water portfolio, protecting existing supplies, improving flexibility, and connecting the SBVMWD community to its watershed.

Section 6: Implementation and Phasing – Establishes implementation phases and identifies key performance indicators for mitigation and adaptation solutions.

Glossary of Terms

A list of acronyms, abbreviations, and glossary terms used in the CARP.

A

AB – Assembly Bill

Actions – The discrete, measurable projects, programs, procedures, or partnership formations that carry out the implementation of a measure

Adaptation – The process of adjustment to actual or expected climate and its effects, either to minimize harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate.

Anthropogenic – Made by people or resulting from human activities.

Aridity – A condition of being dry or extremely dry.

Aridification - The process or condition of increasing aridity.

Atmosphere – The envelope of gases surrounding the earth. These gases include nitrogen (78.1 percent), oxygen (20.9 percent), and argon, helium, GHGs, ozone, and water vapor in trace amounts.

Atmospheric River – A are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. While atmospheric rivers can vary greatly in size and strength, the average atmospheric river carries an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. Exceptionally strong atmospheric rivers can transport up to 15 times that amount. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow.

B

BAU – Business-as-Usual Forecast. This forecast estimates emissions into the future if no additional actions are taken.

Biofuels – A renewable fuel source derived from biomass such as algae or animal waste.

BTAC – Basin Technical Advisory Committee

C

CARP – Climate Adaptation and Resilience Plan

CARB – California Air Resources Board

Carbon dioxide (CO_2) – A gas produced by burning organic compounds containing carbon and by respiration.

Carbon dioxide equivalent (CO_2e) – A metric measure used to directly compare emissions from various GHGs based on their global warming potential conversion factor.

Carbon footprint – The total emissions caused in a year by an individual, event, organization, or product, expressed in carbon dioxide equivalent.

Carbon Neutrality – Achieving a balance between emitting carbon and atmospheric carbon removal.

Cascading Impact – Climate hazard-caused impacts that compromise infrastructure or disrupt critical services (i.e., power supply or water conveyance) broadening the scope of impact past a singular subject to reliant subsystems and populations.

CEQA – California Environmental Quality Act

Climate – The usual condition of temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in an area of the earth's surface over a long period of time (typically 30 years or more).

Climate Change – A change in the average conditions – such as temperature and rainfall – in a region over a long period of time.

Climate Driver – An increase in the proportion of GHGs in the atmosphere is the primary human-caused driver source of change to the earth's climate.

Climate Hazard – A dangerous or potentially dangerous condition created by the effects of the local climate.

Co-benefit – The secondary benefits that occur due to implementation of a program, measure or policy.

Conjunctive Use – Coordinated use of surface water and groundwater to maximize sufficient yield.

CWS – California Water Strategy

D

Decarbonization – The reduction or removal of carbon dioxide.

DCP – Delta Conveyance Project

DWR – California Department of Water Resources

E

EF – Emissions Factor

EO – Executive Order

Electrification – The process of generating power from electricity, and in many contexts, the transition to such power from an earlier power source.

Emissions – The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

Emissions Scope – Scopes differentiate between GHG emissions from different sources that fall under varying levels of control of the emitting entity. Scope 1 emissions are direct GHG emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that indirectly impact its value chain.

EV(s) – Electric Vehicle(s)

EVWD – Eastern Valley Water District

Extreme Heat – periods that are much hotter than usual for the time and place where they happen. For California climate data this translates to temperatures above the 98th percentile of a baseline historical average.

F

FIRO – Forecast-informed reservoir operations

FEMA – Federal Emergency Management Agency

Fossil fuel – A general term for fuel formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust.

G

GCM – Global circulation models, representing physical processes in the atmosphere, ocean, cryosphere, and land surface, are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations.

GHG – A gas that absorbs infrared radiation, traps heat in the atmosphere, and contributes to the greenhouse effect.

Global Warming – the phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries.

Greenhouse Effect – A process that occurs when gases in Earth's atmosphere traps the Sun's heat.

GWP – Global Warming Potential – total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.

H

HCP – Habitat conservation plan

HVAC – Heating, ventilation, and air conditioning

I

Impact – Effects on natural and human systems including effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate hazards and the vulnerabilities of the system or asset effected.

IPCC – United Nations Intergovernmental Panel on Climate Change – prepares comprehensive Assessment Reports about the stat of scientific, technical and socio-eco nomic knowledge on climate change, its impact and future risks, and options for reducing the rate at which climate change is taking place.

IRUWMP – Integrated regional urban water management plan

J

K

L

LED – Light-emitting diode

M

Measures – A specific statement that guides decision-making. It indicates the commitment of the organization to a particular course of action. A measure is based on and helps implement a plan's vision and principles and is carried out by implementation actions.

Methane (CH_4) – A hydrocarbon that is a GHG that is produced through anaerobic (without oxygen) decomposition of waste in landfills, wastewater treatment plants, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

MT – Metric Ton, a common international measurement for the quantity of GHG emissions – 1 metric ton is equal to 2,204.6 pounds or 1.1 short tons.

MT CO_2e – Metric tons of carbon dioxide equivalent is the standard units to measure GHG emissions.

MWD – The Metropolitan Water District of Southern California

N

Nitrous oxide (N_2O) – A powerful GHG with a high global warming potential; major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

O

Offroad Equipment – Any non-stationary device powered by an internal combustion engine or electric motor used primarily off roadways such as agricultural, landscaping or construction equipment.

OPR – California Governor's Office of Planning and Research

One Water – is the emphasis that all water has value, encouraging those in the water industry to work together to solve water challenges, whether these challenges encompass storm water, residential water, commercial water, industrial water, municipal water, wastewater, drinking water, etc. The One Water Movement takes a planning and implementation approach to managing finite water resources for long-term resilience and reliability in order to meet both community and ecosystem needs. The definition of One Water itself varies somewhat depending on the needs of the community in question.

P

PERC – Program for Enhanced Recharge Capability

PFAS – Per- and polyfluoroalkyl substances, a class of widely used, long lasting chemicals, components of which break down very slowly over time. PFAS are found in water, air, fish, and soil at locations across the nation and the globe. Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals.

PSPS – Power Safety Power Shutoffs

Pumpers – Individual well operators

PV – Photovoltaic (solar energy)

Q

R

Renewable Diesel – Direct substitute for diesel fuel refined from lower carbon and renewable source material.

RCP – Representative Concentration Pathway

Resilience – The capacity of an entity (an individual a community, an organization, or a natural system) to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.

S

Santa Ana RWQCB – Santa Ana Regional Water Quality Control Board

SARCCUP – Santa Ana River Conservation and Conjunctive Use Program

SAWPA – Santa Ana Watershed Project Authority

SB – Senate Bill

SBVMWD – San Bernardino Valley Municipal Water District

SCAQMD – South Coast Air Quality Management District

SCE – Southern California Edison

SCG – The Southern California Gas Company

Scope – Categorization of GHG-generating activities based on the level of the entity's operational control of the source.

Service population – Residents receiving services.

SGPWA – San Georgino Pass Water Agency

SWC – State Water Contractors

SWP – State Water Project

T

U

USACE – U.S. Army Corps of Engineers

USEPA – United States Environmental Protection Agency

USGS – United States Geological Survey

UWMP – Urban Water Management Plan

V

VMT – Vehicle Miles Traveled

Vulnerability – The propensity or predisposition to be adversely affected.

W

WBCSD – World Business Council for Sustainable Development

WIFIA – Water Infrastructure Finance and Innovation Act

WMWD – Western Municipal Water District

Y

YVWD – Yucaipa Valley Water District

Z

ZEV – Zero-emission vehicle

1. Introduction

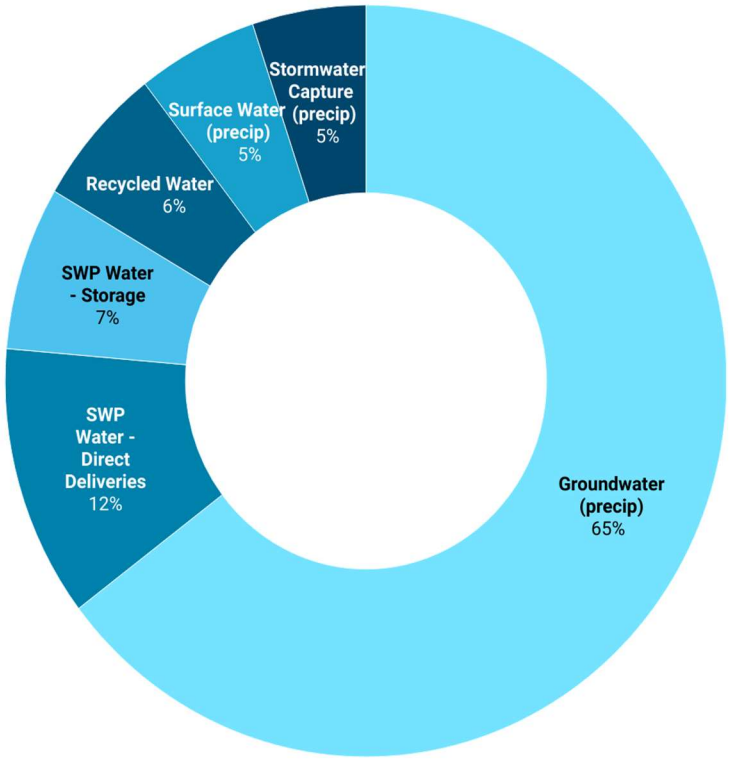
Southern California faces significant challenges in maintaining a reliable water supply due to its arid climate and rapidly growing population. The region relies on a complex network of water resources and infrastructure to meet its needs. SBVMWD was formed in 1954 as a regional agency to sustain long-range water supply for the San Bernardino Valley's people and environment. SBVMWD's service area covers about 353 square miles in southwestern San Bernardino County with a population of about 710,000 per the 2020 Census. Its service area spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, East Highland, Mentone, Grand Terrace, and Yucaipa. See Figure 2 for the location of the SBVMWD service area in California. Water resources from the San Bernardino Valley are also vital to the people and environment downstream of the service area, especially for communities such as the City of Riverside.

Regional collaboration is critically important in the Santa Ana River Watershed because of its surface and groundwater resources, and the role of imported water. SBVMWD leads and participates in several regional partnerships that protect and enhance local ecosystems and develop infrastructure that supports the region's water needs. SBVMWD is one of five (5) members of the Santa Ana Watershed Project Authority (SAWPA), which serves as a platform for promoting inter-agency understanding, addressing regional water issues, and supporting the development of long-term integrated water resource planning through multi-agency agreements and partnerships within the Watershed.

Figure 2 SBVMWD Service Area in California

SBVMWD is responsible for ensuring the sustainable use and recharge of the local groundwater basins in its service area. Sustainable management of groundwater resources is crucial to meeting the region's water demands while addressing long-term water security and resilience challenges (See Figure 3). In addition to the 710,000 people within the SBVMWD service area, over 300,000 people in Riverside County located outside of the SBVMWD service boundary rely on groundwater pumped from the San Bernardino Valley. Accounting for water users outside of the SBVMWD service boundary, an estimated one million people rely on SBVMWD's services and stewardship of the region's water resources. SBVMWD also provides leadership in supporting the improved health and function of the region's forest headwaters and endangered species habitats, which are critical to its water supply. SBVMWD also supports a wide range of water conservation measures and programs to maximize regional water use efficiency.

Figure 3 Regional Water Supply



Groundwater storage has declined in recent decades due to recurring instances of below average precipitation. Like many other water agencies in Southern California, SBVMWD is contracted to deliver imported water from the State Water Project (SWP) to supplement the region's local water supplies and maintain groundwater levels. The SWP delivers water from Northern California to water agencies across Southern California through a system of aqueducts and reservoirs. SBVMWD imports water into its service area primarily for recharging groundwater but also for direct use at water treatment or filtration plants operated by retail agencies.

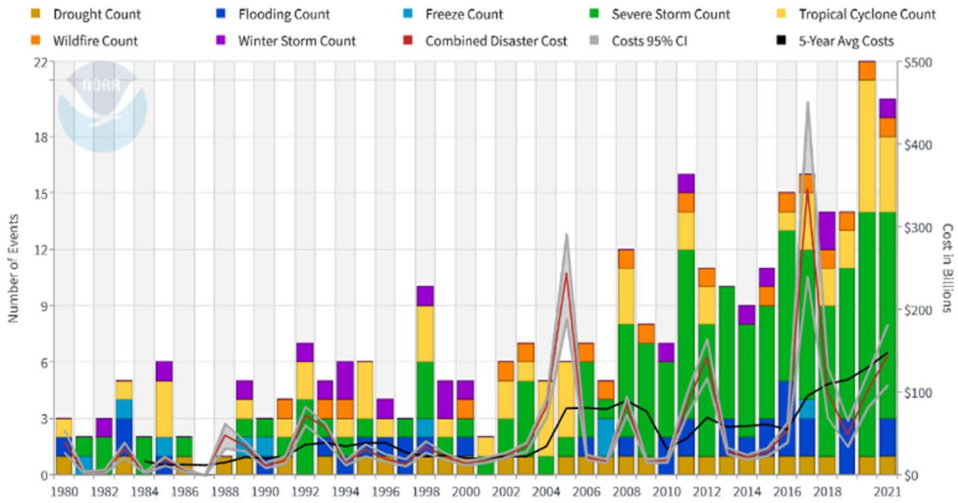
SBVMWD obtains water from the SWP through the East Branch of the State Aqueduct via Lake Silverwood. While SBVMWD's State Contract Entitlement is 102,600 acre-feet of water from the SWP per year, the amount of water actually available (allocated) each year varies as a result of climatic conditions throughout the state. While the SWP is the SBVMWD's primary source of supplemental water, SBVMWD also works to secure additional sources of water. For example, it secured two water rights permits along with Western Municipal Water District from the State Water Resources Control Board (SWRCB) in 2009 to divert water from the Santa Ana River. In recent years, SBVMWD has also invested in a regional recycled water pipeline, recharge basins to percolate recycled water (a drought proof supply) and provided financial incentives to make recycled water investments cost-effective within the region.

Rationale

Climate change is a global issue caused by the cumulative warming effects of GHG emissions. Global temperatures have unequivocally risen in response to the increased levels of carbon dioxide (CO_2) and other GHGs.[3] Observations and research indicate that climate change has already made extreme events, including heat waves, drought, atmospheric river events, and wildfires, more likely, more intense, longer-lasting, or larger in scale.[4] Climate change is a key contributing factor to the increase in the number of billion-dollar climate events across the United States (see Figure 4), particularly severe storm events and extended drought. Climate models indicate that extreme climate events, and the risks that climate change poses to SBVMWD water supply, infrastructure, and supported water uses will continue to intensify in the coming decades.

Governments, agencies, and private businesses across the globe are acting to mitigate GHG emissions and adapt to climate change to reduce and avoid the most catastrophic effects of climate change. Recent local experiences with persistent drought conditions, aridification, extreme weather events, and weather whiplash have prompted SBVMWD to incorporate climate change considerations into plans and programs. Persistent drought conditions across the Western U.S. since 2000, coinciding with record warmth, have led to record low snowpack in the Sierras, causing severe water supply limitations statewide. Precipitation patterns are shifting as well. More precipitation is expected from more severe events with longer dry spells between them. For example, California received historic rainfall in 2023 despite experiencing severe to exceptional drought conditions in 15 of the past 22 years.

Figure 4 U.S. Billion-Dollar Disaster Events 1980-2021



https://www.climate.gov/news-features/blogs/beyond-data/2021-us-billion-dollar-weather-and-climate-disasters-historical

Shifts in weather extremes can lead to the increased importance of imported water from other parts of the state or more expensive sources such as water recycling. It can also result in state legislative and regulatory interventions mandating water efficiency measures that are less effective than other available measures, lack a sufficient benefit relative to the cost, or have significant adverse impacts. All of these changes potentially impact the area's resilience to drought. The availability of imported water is also influenced by increased variability and (wet and dry) weather extremes. The variability of SWP deliveries has increased while average annual deliveries have decreased in recent decades. In the last ten years annual

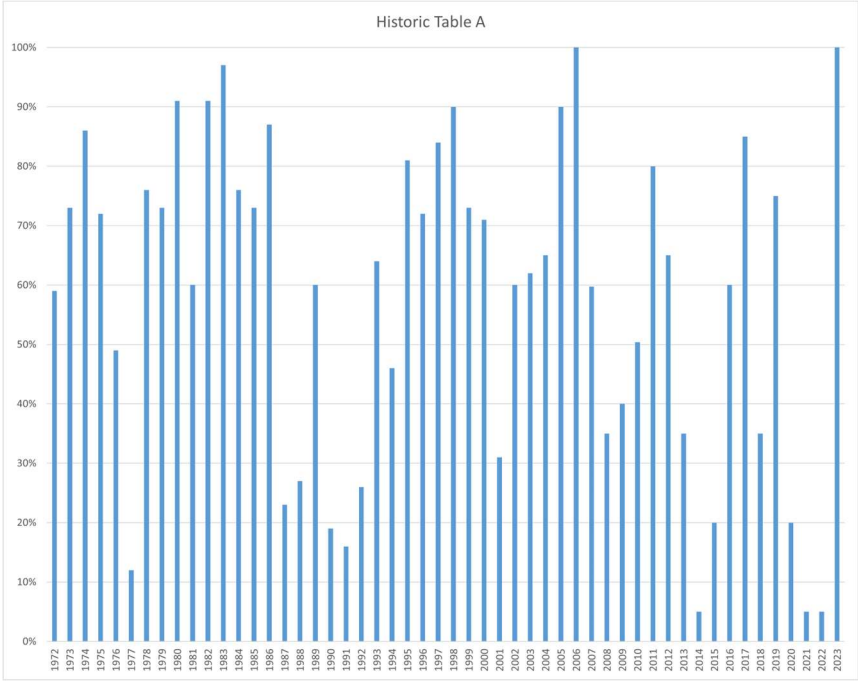
[3] United States Global Change Research Program. 2023: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023

[4] National Oceanic and Atmospheric Administration. 2020. What is an extreme event? Is there evidence that global warming has caused or contributed to any extreme event? Climate.gov. Retrieved Month Day, Year, from https://www.climate.gov/news-features/climate-qa/what-extreme-event-there-evidence-global-warming-has-caused-or-contributed

deliveries have ranged between 5% and 100% of the District's Annual Table A allocation (see Figure 5).[5]

Adaptive management can enhance regional response to water-related climate extremes in various ways.[6] By consolidating timely and accurate information on climate patterns, proactive measures can be taken to ensure that gaps undesirable impacts are prevented. Through continuous assessment and adjustment of strategies based on changing climate conditions, resources are more efficiently allocated, communities are better prepared for extremes, and resilience principles can more effectively be incorporated throughout the District's operations, assets, and practices. SBVMWD has witnessed and responded to impactful climate extremes in recent years, including precipitation extremes, wildfire events, and extreme heat. These events underscore the need for SBVMWD to build long-term water supply plans for a climate-changed future. In recognition of this global reality, SBVMWD has embarked on a journey toward sustainability, preparedness, and innovation through the formulation of a comprehensive CARP consistent with its Strategic Plan.

Figure 5 Historical SWP Table A Allocations



SWP Historical Table A Allocations, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Management/SWP-Water-Contractors/Files/Historical-SWP-allocations-1996-2024-022124.pdf

[5] California Department of Water Resources. 2022. The State Water Project Final Delivery Capability Report 2021. https://www.yourscvwater.com/sites/default/files/SCVWA/your-water/watershed-planning/water-supply-assessments/State-Water-Project_2021-Final-Delivery-Capability-Report_Sept2022.pdf

6 Climate-Safe Infrastructure Working Group to the California State Legislature and the Strategic Growth Council. 2018. Paying it Forward: The Path Toward Climate-Safe Infrastructure in California. https://resources.ca.gov/CNRALegacyFiles/docs/climate/ab2800/AB2800_Climate-SafeInfrastructure_FinalWithAppendices.pdf

SBVMWD takes an integrated and cost-effective (One Water) approach to water resources management, which incorporates multiple types of water resources (e.g. surface water, groundwater, imported surface water, new stormwater capture for recharge and potentially direct delivery, and recycled water), stewardship (e.g. habitat conservation, improved water quality, and enhanced ecosystem health), and demand management (see Figure 6).

By building off existing efforts, the CARP lays the groundwork for long-term coordinated partnerships, consistency, and continuity in planning efforts, aligned policy incentives and data continuity across public, private, and nonprofit sectors in the SBVMWD region (Appendix A). Key SBVMWD studies and plans integrated into this CARP include the 2020 Upper Santa Ana River Watershed Integrated Regional Urban Water Management Plan (2020 IRUWMP), and Water Demand and Supply Studies conducted by RAND, and the Santa Ana Watershed Project Authority's One Water One Watershed Plan. The 2020 IRUWMP serves as a roadmap for regional water resource planning and incorporates climate change into the water demand projections. The SAWPA's One Water One Watershed Plan outlines several objectives related to management of the Santa Ana River watershed such as achieving resilient water resources through innovation and optimization. [7]

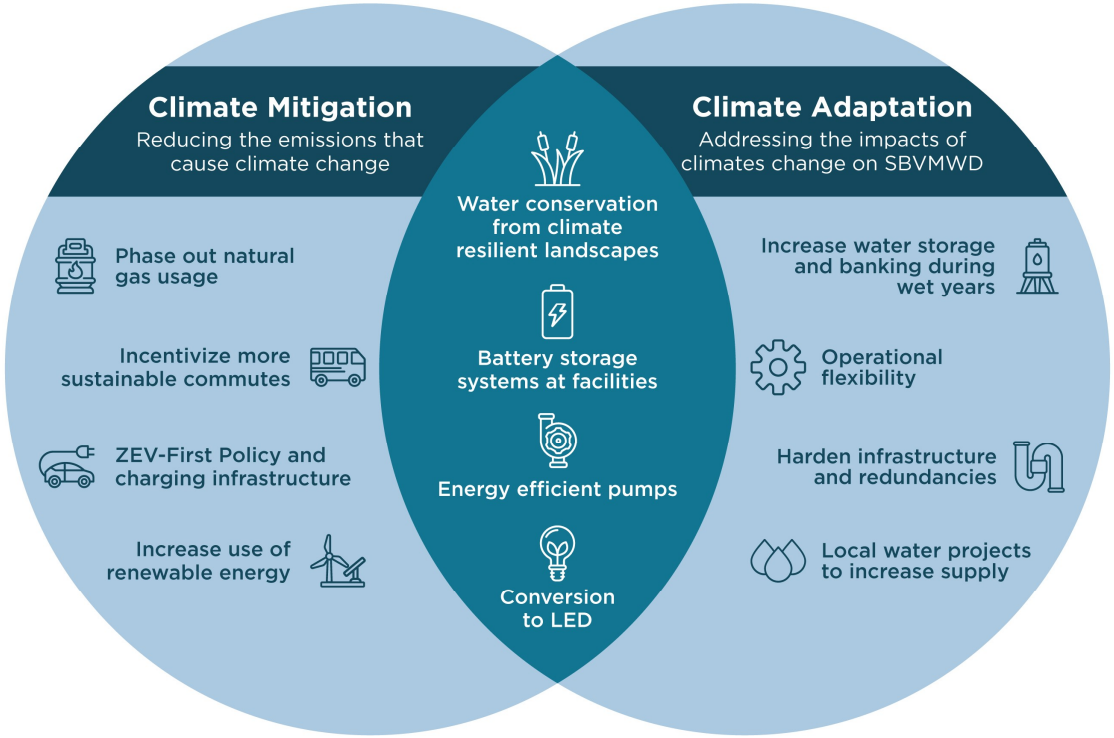
Figure 6 One Water Concept

Kennedy Jenks, https://www.kennedyjenks.com/2019/06/05/integrated-one-water-management/

7 https://www.sawpa.org/wp-content/uploads/2019/02/OWOW-Plan-Update-2018-1.pdf

SBVMWD also provides regional leadership in supporting the resilience of local water supplies. The Upper Santa Ana River Watershed forest and riverine ecosystems play an essential role in supplying, cleansing, and protecting local water resources. SBVMWD is one of 12 partners on the Upper Santa Ana River Habitat Conservation Plan (HCP). The HCP will specify how species and their habitats will be protected and managed in the future and will streamline the permitting required by the water resource agencies under the federal and State-endangered species acts to maintain, operate, and improve regional water resources infrastructure. SBVMWD is also leading the Headwaters Resiliency Partnership, which will identify innovative ways to fund proactive investments in the long-term health of the San Bernardino National Forest which supports local water resources within the Upper Santa Ana River Watershed.

Figure 7 Climate Mitigation versus Adaptation



Responding to climate change requires a two-pronged approach: 1) reducing or "mitigating" the levels of GHG emissions released into the atmosphere to reduce the effects of climate change and 2) adjusting or "adapting" to the changes that have already taken or will continue to take place. In an ideal scenario, strategies are developed that do both, which is the most efficient way to proceed, as shown in Figure 7.

The CARP supports State adaptation goals associated with the California Water Strategy (CWS), the California Water Resilience Portfolio, and the California Climate Adaptation Strategy. [8,9] The CARP also advances State GHG mitigation goals as defined in California's 2022 Scoping Plan for Achieving Carbon Neutrality, Assembly Bill (AB) 32, and Senate Bill (SB) 1279.[10]

8 California Natural Resources Agency.2022. *California Water Supply Strategy.* https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/CA-Water-Supply-Strategy.pdf

9 California Department of Water Resources. California Water Resilience Portfolio. 2020. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/Final_California-Water-Resilience-Portfolio-2020_ADA3_v2_ay11-opt.pdf

10 California Air Resources Board. 2022. 2022 Scoping Plan, Local Measures. https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-d-local-actions.pdf

Purpose

SBVMWD is working to strengthen water reliability and proactively address existing and future climate change impacts by developing a CARP. The overarching goal of the CARP is to prepare SBVMWD's water management, including operations, natural resources, infrastructure, and community, for the effects of climate change.

The CARP serves as a programmatic roadmap to increase resilience and reduce contributions to climate change. By defining specific climate goals, measures, and actions, SBVMWD will track progress towards increased resilience, measure the success of its strategies, and adjust these approaches as new information becomes available. The measures and actions will be implemented using a phased approach.

SBVMWD is committed to developing new data-driven measures and strategies, leveraging emerging technologies and products, and updating its CARP on an ongoing basis to meaningfully adapt to emerging climate threats and maintain progress. For additional detail on the phased approach to the measures and actions, as well as the development of new strategies and measures in the future, please refer to the Phasing and Implementation section.

The CARP supports SBVMWD's Strategic Plan and aligns with the State Water Resilience Portfolio through the CARP's four Guiding Principles:

1. **Maintain a Diverse Water Portfolio** through recycled water production, stormwater capture, aquifer recharge and strategic water imports to provide multiple-benefit resilience outcomes for the regional water supply. By relying on a diversified mix of imported and local water sources, SBVMWD can help the region better cope with future climate extremes as they occur at a local and statewide scale. Diversification additionally provides a more reliable and sustainable water supply, particularly in the Southern California region that is prone to water supply volatility and relies on imported water.

2. **Protect the Water Portfolio** through conjunctive use planning, watershed restoration initiatives and strategic aquifer recharge. Sustainable management of existing supplies and natural resources will help maintain SBVMWD's investments and the benefits provided by our infrastructure and the natural environment, allowing SBVMWD to meet the needs of a changing and dynamic population of customers and the environment.

3. **Improve Operational and Infrastructure Resilience** by making strategic investments in crucial operations and infrastructure to create reliability and continuity of service and assist in long-term regulatory compliance. By creating redundant systems where necessary, exploring water transfer options, and incorporating resilient design criteria in capital improvement projects, SBVMWD is setting itself up for providing reliable service in an uncertain climate future prone to disruptions. Prioritizing resilience in operations and infrastructure, while requiring initial investments up front, will prevent more extensive and expensive damages that might occur in vulnerable or outdated systems.

4. **Connect People and Water to Climate** so that the community SBVMWD serves understands and engages meaningfully with the complex water systems that sustains it and the changing climate that affects water resources and the environment. By leading public awareness campaigns and engagement programs and supporting healthy use of the region's natural resources, SBVMWD will embrace community members and groups as allies in sustainable water management and regional climate resilience.

Methodology

The CARP was developed with cross-departmental and partner agency input and with support from the SBVMWD Board of Directors. The process was consistent with State plans and guidance, including the Office of Planning and Research, Intergovernmental Panel on Climate Change Assessment Report 5 (IPCC AR5), California Adaptation Planning Guide, California Water Resilience Portfolio, California Water Plan, and California's Fourth Climate Assessment. The engagement process, guided by an engagement plan and communications strategy, included online workshops for interested parties and several workshops for SBVMWD's Climate Resilience Committee and the Board of Directors. The goal of this process was to collaboratively form an actionable CARP that best fits the needs of the service area. Through a collaborative approach, SBVMWD staff and community members were meaningfully engaged and provided tangible feedback and support for regional climate action and resilience planning. This approach leveraged existing relationships and outreach networks at SBVMWD, to develop and implement a plan that is innovative, insightful, equitable and authentic. The development of the CARP included the following steps.

Step 1: A comprehensive literature review, which catalogued existing local planning efforts, initiatives and gaps related to climate change planning and implementation (Appendix A).

Step 2: A climate vulnerability assessment that identified climate vulnerabilities to SBVMWD infrastructure and operations under four future climate change scenarios (Appendix B). Natural hazards that are not impacted by climate change, such as earthquakes, have not been included in the climate vulnerability assessment or this plan. Climate change impacts on earthquakes are currently unknown. Though research has shown that relatively small stress changes can affect microseismicity, there is no evidence that climate processes could trigger a large earthquake.[11] However, impacts from earthquakes in addition to climate change can cause compounding risks to water supply which are addressed in the District's Local Hazard Mitigation Plan (Action 3-G-86). For example, landslides triggered by earthquakes could be more extensive due to more moisture in slopes from extreme precipitation, thereby increasing the potential scale of damage to water infrastructure.

Step 3: A GHG inventory and GHG forecast for SBVMWD's various assets and operations. The GHG inventory was in accordance with established GHG accounting protocols and state and includes Scope 1, 2, and 3 emission sources (Appendix C).

Step 4: A resilience strategy development process that articulates guiding principles, tangible measures, and actions for increasing resilience.

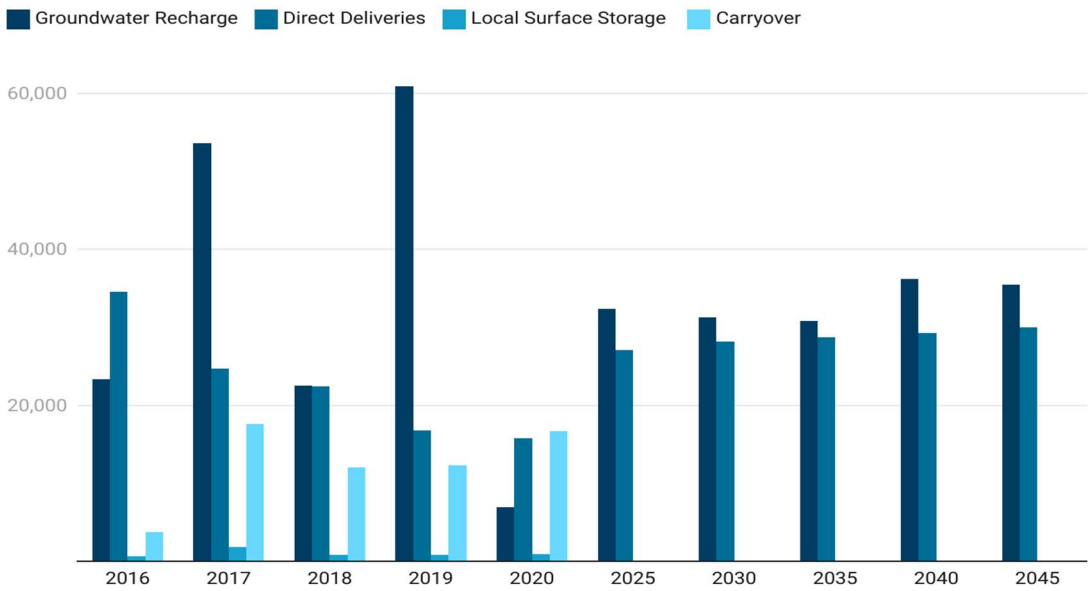
Step 5: A phased implementation strategy designed to articulate the priorities, specific opportunities, and various considerations associated with CARP measures and strategies, in addition to a timeframe for implementation.

11 The National Aeronautics and Space Administration. 2019. Can Climate Affect Earthquakes, or are the Connections Shaky? https://science.nasa.gov/earth/climate-change/can-climate-affect-earthquakes-or-are-the-connections-shaky/

2. Responsibilities

SBVMWD supports long-range water supply management for the San Bernardino Valley and Upper Santa Ana River Watershed alongside dozens of water districts, mutual water companies, flood control districts, and other local water management agencies (see Figure 8). SBVMWD is responsible for groundwater management within their jurisdictional boundaries on behalf of the groundwater producers, in collaboration with WMWD. Under the 1969 legal settlement (which resolved the disputes on the sharing of the water resources), SBVMWD supports the administration of specific regional groundwater management objectives resulting from the Orange County Judgment (Santa Ana River flow obligations) and the Western-San Bernardino Judgment (physical solution to meet surface and groundwater requirements). The Orange County Judgment requires a specific amount of baseflow in the Santa Ana River to Orange County while the Western Judgment provides a tracking and sustainability framework for surface water and groundwater in the San Bernardino Basin Area. If the court-specified conditions are not met by the natural water supply, then supplemental water can be used to offset the deficiency.

Figure 8 Water Use Trends (2016-2019) and Projections (2025-2045)



Data source: 2020 IRWMP - Table 5-4 Regional Water Budget Summary for a Normal Year (AFY)

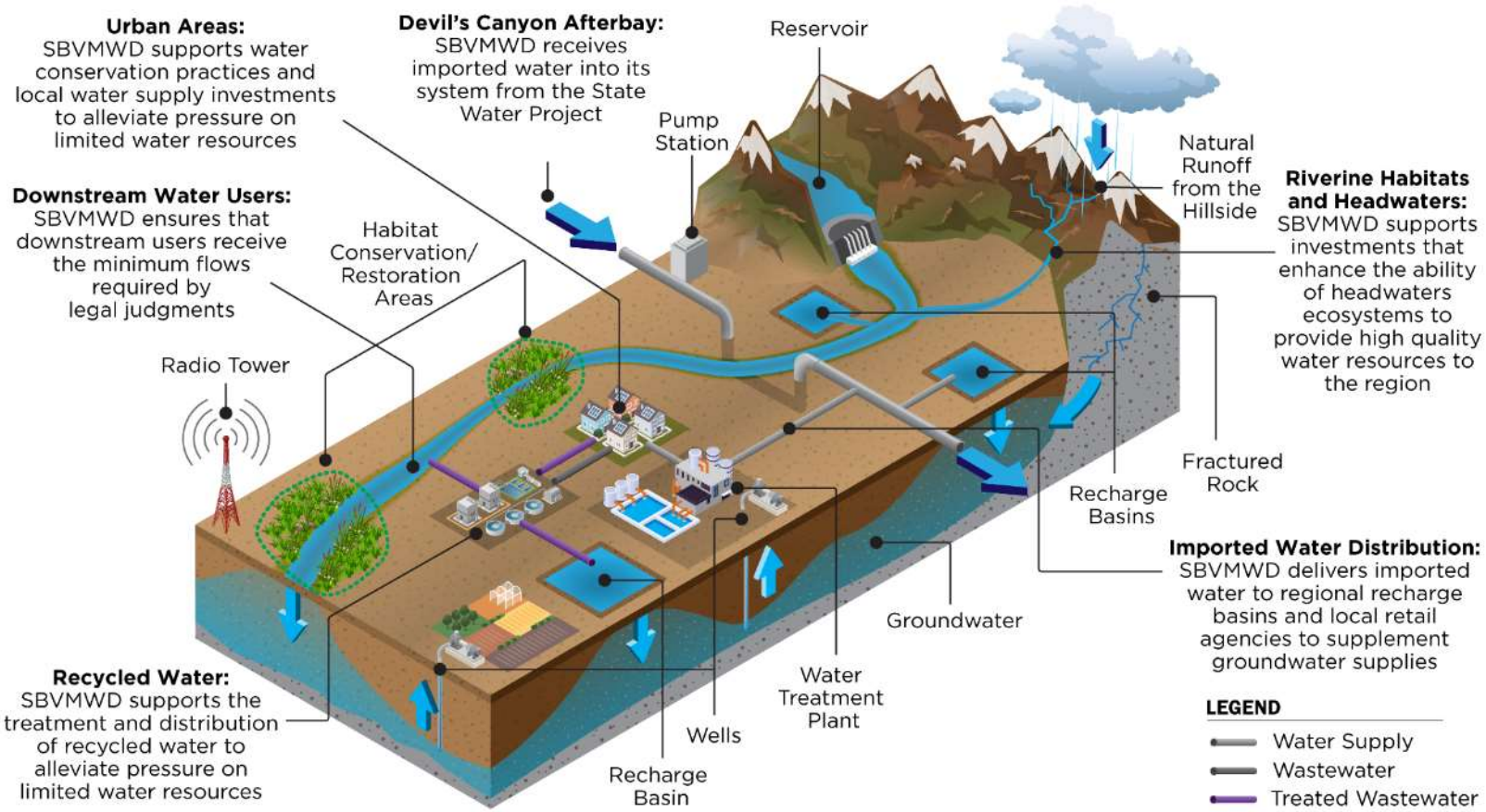
As a court-appointed Watermaster, SBVMWD has responsibilities that include tracking and reporting annually on water supplies in the San Bernardino Basin Area, Colton Basin Area, and Riverside Basin Area within San Bernardino County and maintaining the base flow requirements at the Riverside Narrows on the Santa Ana River on behalf of the San Bernardino Entities. These responsibilities are filled in a variety of ways, including through data collection and analysis and providing the means for supplemental water to be delivered for direct use or for groundwater recharge. SBVMWD has rights to water imported water through the State Water Project and stormwater capture through projects such as the Enhanced Recharge Basins below Seven Oaks Dam. SBVMWD has also invested in projects to support increased utilization of recycled water within the District. Supplemental water, largely imported raw water, is delivered to retail agencies and regional groundwater recharge basins via 42 miles of 12-inch to 78-inch diameter pipelines; a recycled water pipeline was completed in 2023. SBVMWD has a history of working with partners to avoid building duplicative facilities including but not limited to pipelines, pump stations, and groundwater recharge basins; such partners have included The Metropolitan Water District of Southern California, San Gorgonio Pass Water Agency, San Gabriel Valley Municipal Water District, the San Bernardino Valley Water Conservation District, and the San Bernardino County Flood Control District just to name a few. SBVMWD also supports a variety of activities that promote both the reliability of local water resources and efficient water use through conservation activities. The Upper Santa Ana River Wash HCP (Wash Plan HCP) and the Upper Santa Ana River HCP (River HCP) are distinct yet coordinated regional conservation and compliance initiatives that aim to strike a balance between safeguarding local natural resources and effectively managing critical water supply activities. Both plans outline specific measures for protecting, enhancing, restoring, and managing species and their habitats in the future. Through their efforts tied to the Santa Ana River HCP, the region is projected to develop over 4 million acre-feet of water for local use, or approximately 87,000 acre-feet per year over the lifetime of the HCP Permits.[12] The water management sectors in SBVMWD's jurisdiction explored in the CARP include Operations, Natural Resources, Infrastructure and Community, and are explored in detail below.

12 SBVMWD. 2020. Upper Santa Ana River Habitat Conservation Plan, Page ES-1

Operations

SBVMWD takes a holistic approach to its role in long-range water supply management across the region's environmental, built, and social context. The District engages in a wide variety of operational activities such as maintaining and building regional water conveyance and recharge facilities to maintain a reliable water supply for residential, industrial, agricultural, and environmental use. Additionally, SBVMWD supports and facilitates regional water conservation efforts, regional water infrastructure investments and addressing water quality issues that may impact regional water reliability. As shown in Figure 9, this integrated approach allows for delivery on SBVMWD's Strategic Priorities of being resilient, restorative, science-based, and providing cost-effective climate change mitigation and adaptation solutions. Working across this holistic context enables SBVMWD to identify and prioritize the most efficient and effective water supply management options.

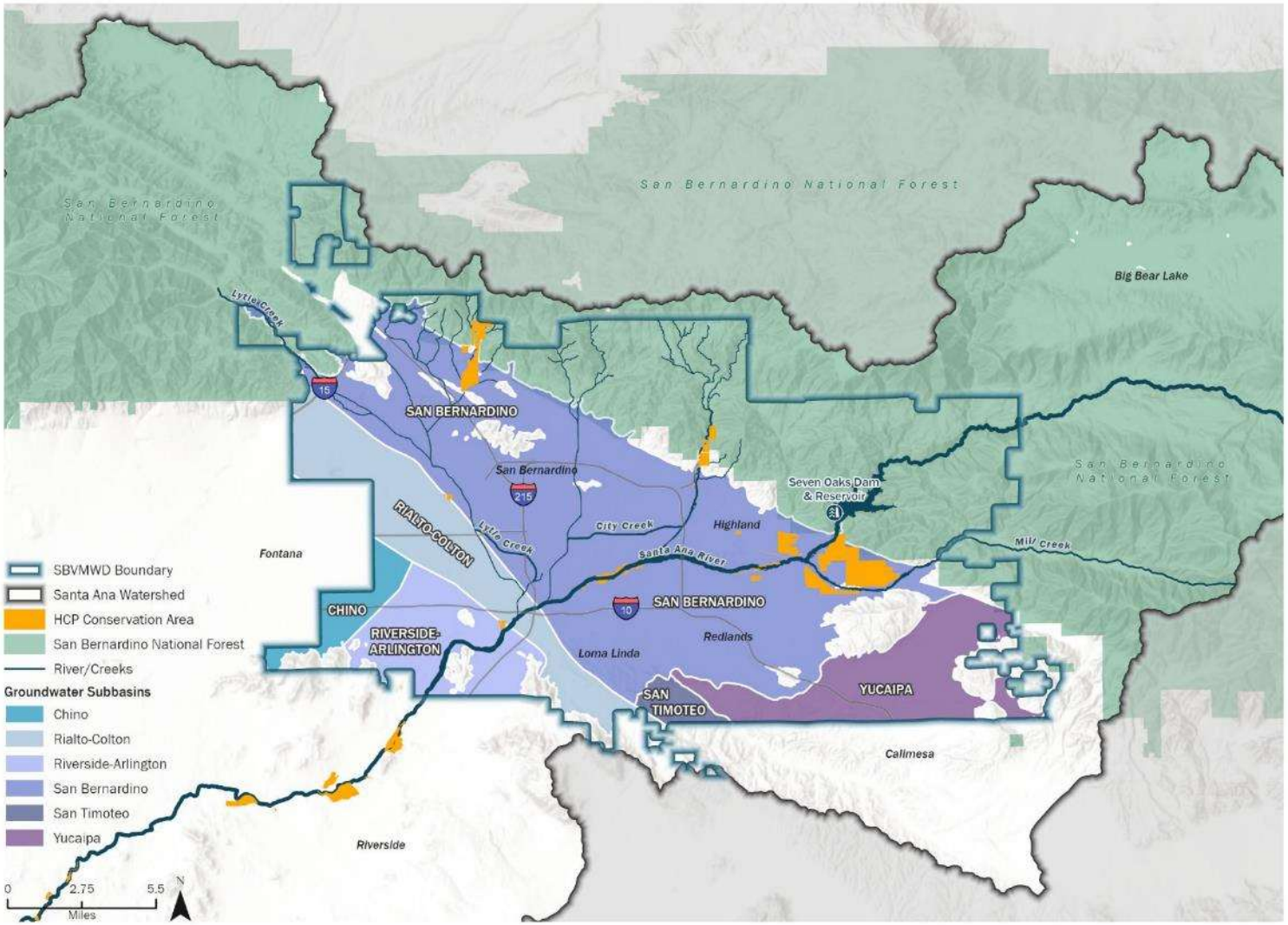
Figure 9 Overview of SBVMWD Water System and Operations



Natural Resources

In addition to maintaining sustainable groundwater resources, SBVMWD supports investments in the natural resources that are essential to the region's water supply. Forest and riverine ecosystems in the Upper Santa Ana River Watershed play an essential role in the supplying, purifying, and protecting local water resources. When these ecosystems and water resources (shown in Figure 10) function better, there is more and higher quality water available for all uses, and more water can recharge local groundwater aquifers that are the region's primary water resource.

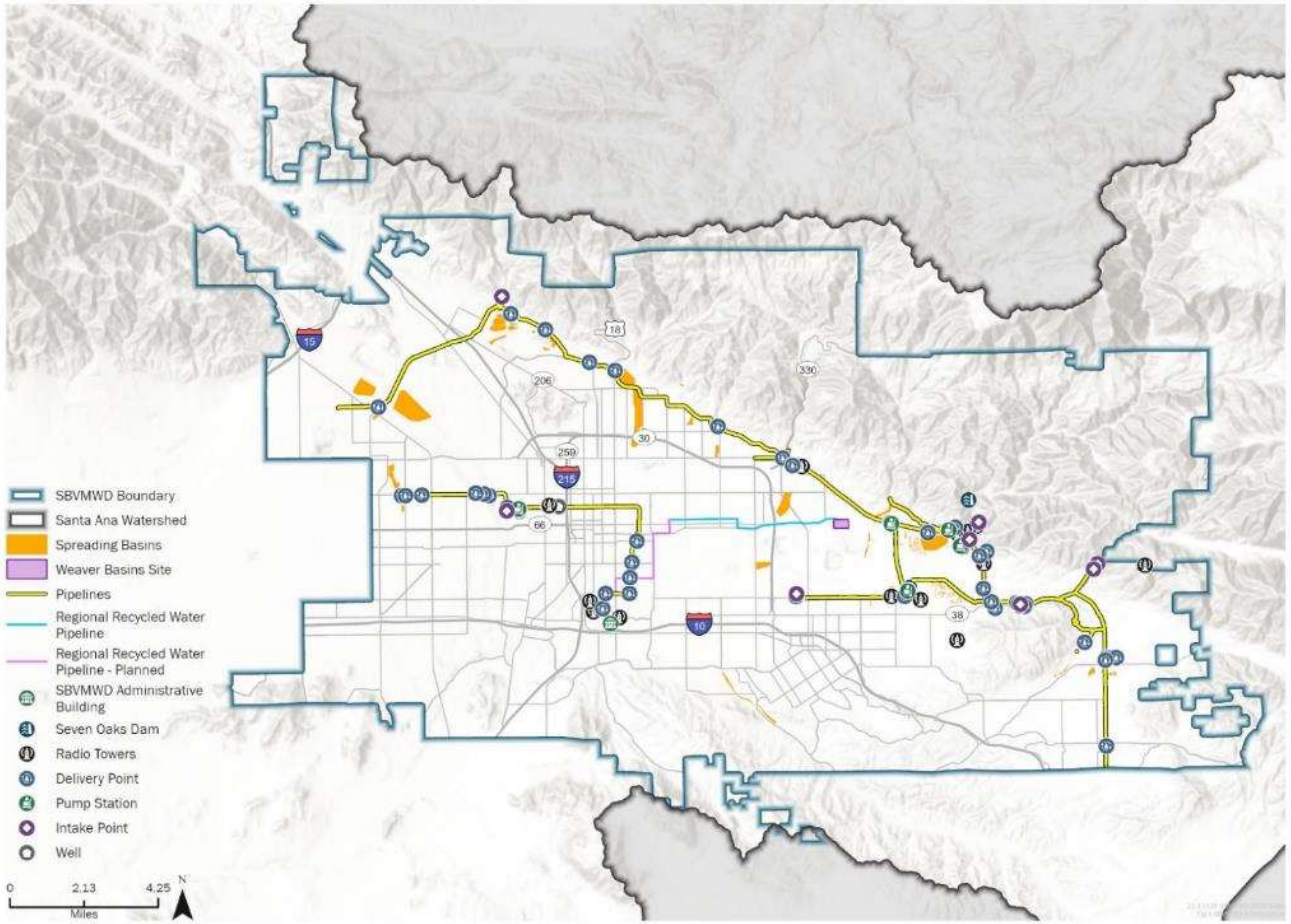
Figure 10 Map of Natural Resources Related to SBVMWD Operations



Infrastructure

SBVMWD plays a key role in supporting the regional water infrastructure (e.g., treatment, storage, flood protection, and conveyance) that enables different types of water supply (e.g., imported, local surface water, groundwater, recycled water) to be efficiently distributed. As shown in Figure 13, SBVMWD manages the distribution of imported and local water to multiple retail agencies and for recharging groundwater through regional spreading basins.

Figure 11 Map of SBVMWD's Infrastructure

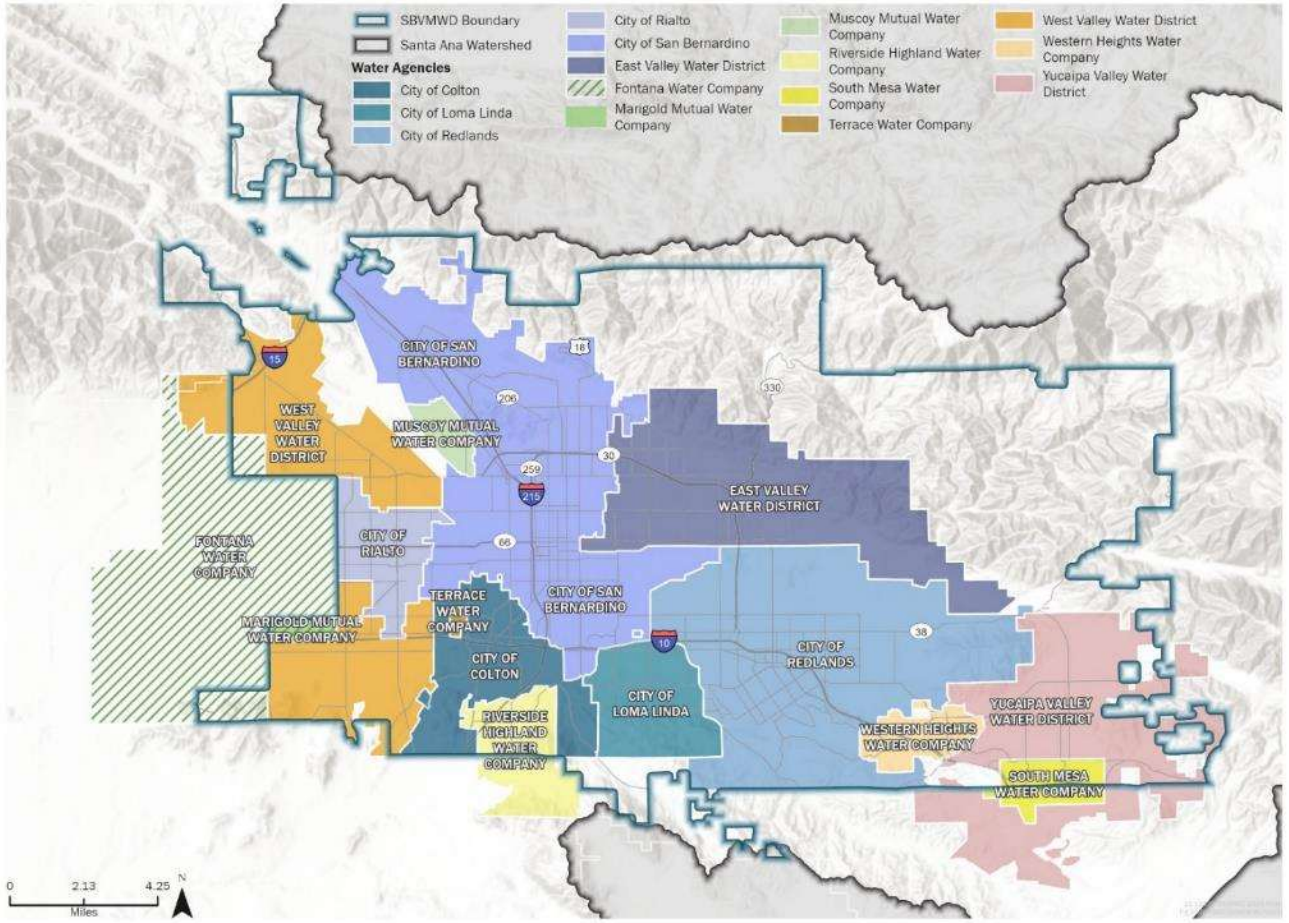


13 Not all infrastructure shown in Figure 10 is owned by SBVMWD. Some infrastructure and facilities are owned by San Bernardino County or other agencies and is used by or managed by SBVMWD.

Community

As shown in Figure 12, SBVMWD supports the distribution of water for household, commercial, industrial, and agricultural predominantly for fifteen retail water agencies within its service area. There are also individual well owners (pumpers) who rely on local groundwater and indirectly on recharged imported water. Some users directly rely on imported SWP deliveries and surface water, but the majority depend primarily on groundwater. SBVMWD also works with regional retail agencies to manage demand through the implementation of water conservation strategies and developing additional local sources of supply.

Figure 12 Map of Water Agencies Served by SBVMWD



3. Climate Risks and Vulnerabilities

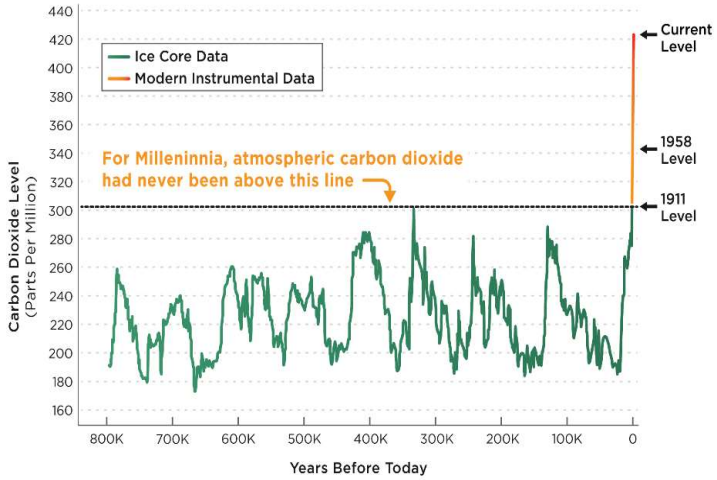
Mainstream scientific research has shown that the excess presence of GHGs in the atmosphere trap heat near the earth's surface and raises global average temperatures (See Figure 13). This is referred to as the greenhouse effect.[14] The levels of GHGs in the atmosphere far surpass anything observed in the historical record (See Figure 14). The increase in average air and sea temperatures across the globe has wide-ranging effects on sea level, the severity of wildfires, the prevalence of extreme weather patterns, and changes in water supply conditions.[15] Governments, agencies, and businesses are taking action to mitigate GHG emissions to reduce or avoid the effects of climate change.

Figure 13 Greenhouse Gas Effect Overview

Data from California's Fourth Climate Assessment was used to identify and assess SBVMWD's climate change vulnerabilities. Daily temperature and precipitation projections from global climate models (GCM) were employed after the data was scaled to the regional level. The dataset includes a historical period of 1950-2005 and then two future projections spanning 2006-2100 based on two GHG emissions level scenarios – Representative Concentration Pathways (RCP) 4.5 and 8.5. RCP4.5 represents a mitigation scenario where global CO_2e emissions peak by 2040, while RCP8.5 represents a business-as-usual (BAU) scenario where CO_2e emissions continue to consistently rise throughout the twenty-first century.[16]

These data predict that the SBVMWD service area and state water supplies are expected to experience a wide variety of climate change impacts by the end of the century (See Figure 15). Other reports, including the California Department of Water Resources' (DWR) Climate Change Vulnerability Assessment, provide information regarding climate change projections and impacts to the SWP and supporting watersheds. Projections throughout this section are consistent with the OPR's use of RCP 8.5 as a conservative approach to assessing and adapting to climate change. Additionally, projections are forecasted to mid-century (2035-2064) and end-of-century (2070-2099) as 30-year averages and are compared to a modeled historical baseline (1961-1990).

Figure 14 Global Change in Atmospheric CO_2

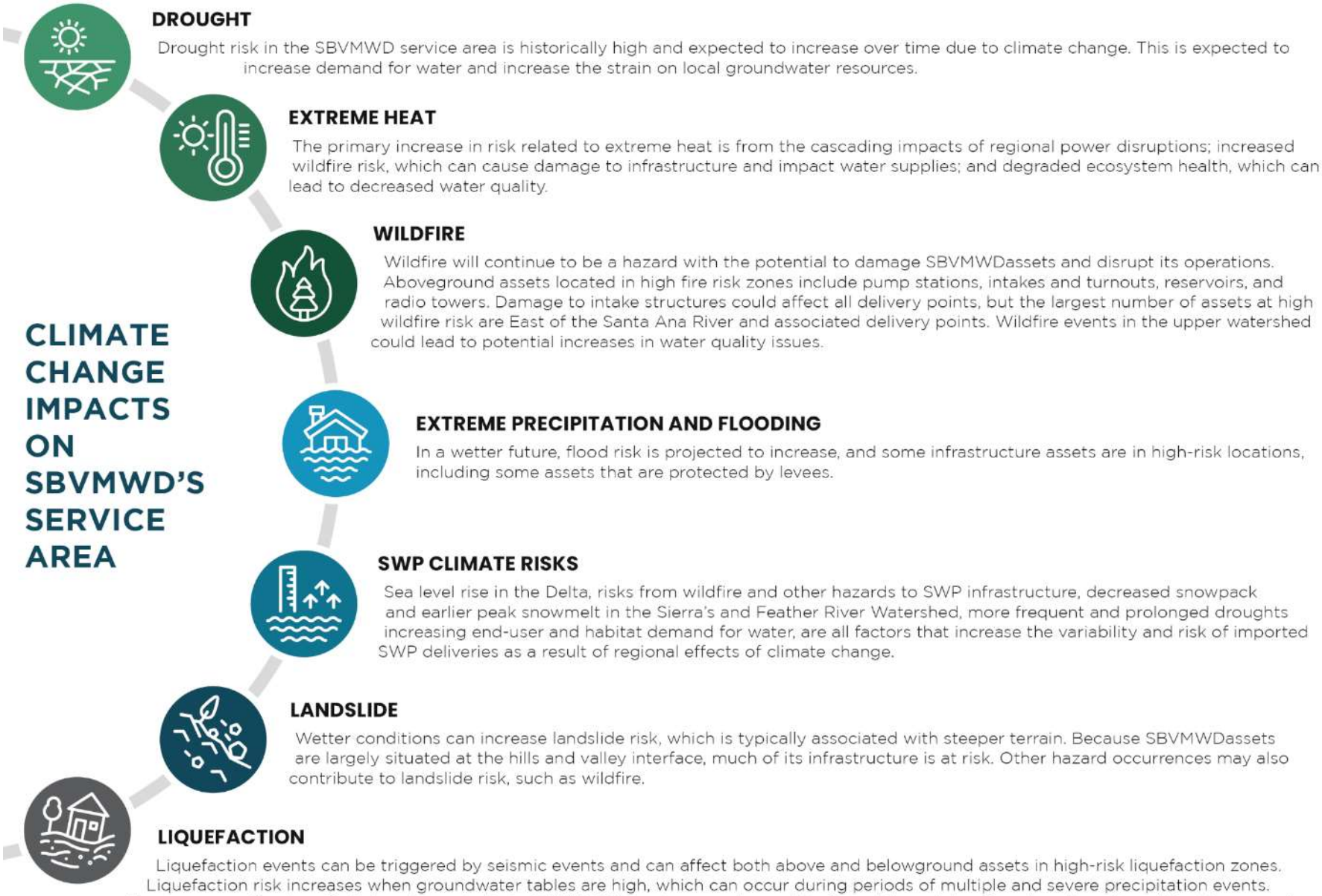


14 Intergovernmental Panel on Climate Change. 2021. The Physical Science Basis. https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/

15 Intergovernmental Panel on Climate Change. 2022. Sixth Assessment Report, https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/

16 Van Vuuren et. al. 2011. The Representative Concentration Pathways: An Overview. https://link.springer.com/article/10.1007/s10584-011-0148-z

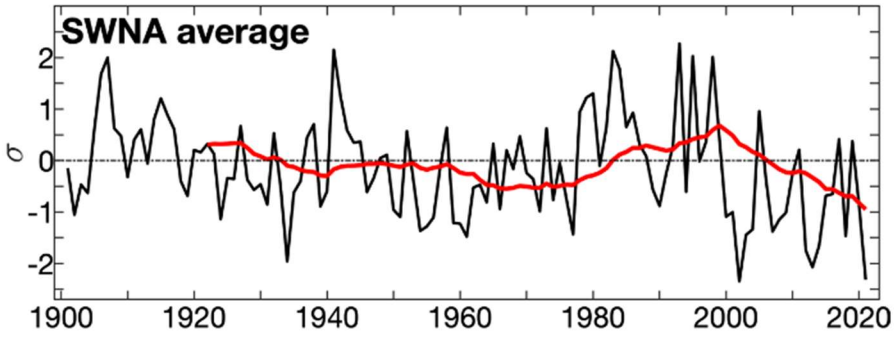
Figure 15 SBVMWD Climate Vulnerabilities



Drought

A drought is an extended period of abnormally low rainfall that can lead to water supply shortages, reduced soil moisture, and negative impacts on biodiversity, agricultural production and human communities. Intensified by climate change, the western U.S. is currently experiencing its driest stretch since A.D. 800, and drought conditions intensified rapidly in 2020-2021 (See Figure 16). Climate models project increasing temperatures and variability in annual precipitation will lead to an increase in the frequency and severity of multi-year drought events. SBVMWD relies on a mix of imported and local water supplies, both of which are vulnerable to local and statewide drought conditions. As localized droughts become more common and local supplies become more limited, reliance on imported SWP water from Northern California will increase. As statewide droughts become more common, and snowpack in the Sierra mountains become less reliable, deliveries of SWP water will become less reliable and potentially increase groundwater use. Potential impacts to SBVMWD related to drought are listed below in Figure 17.

Figure 16 Southwestern North American Soil Moisture Deficit



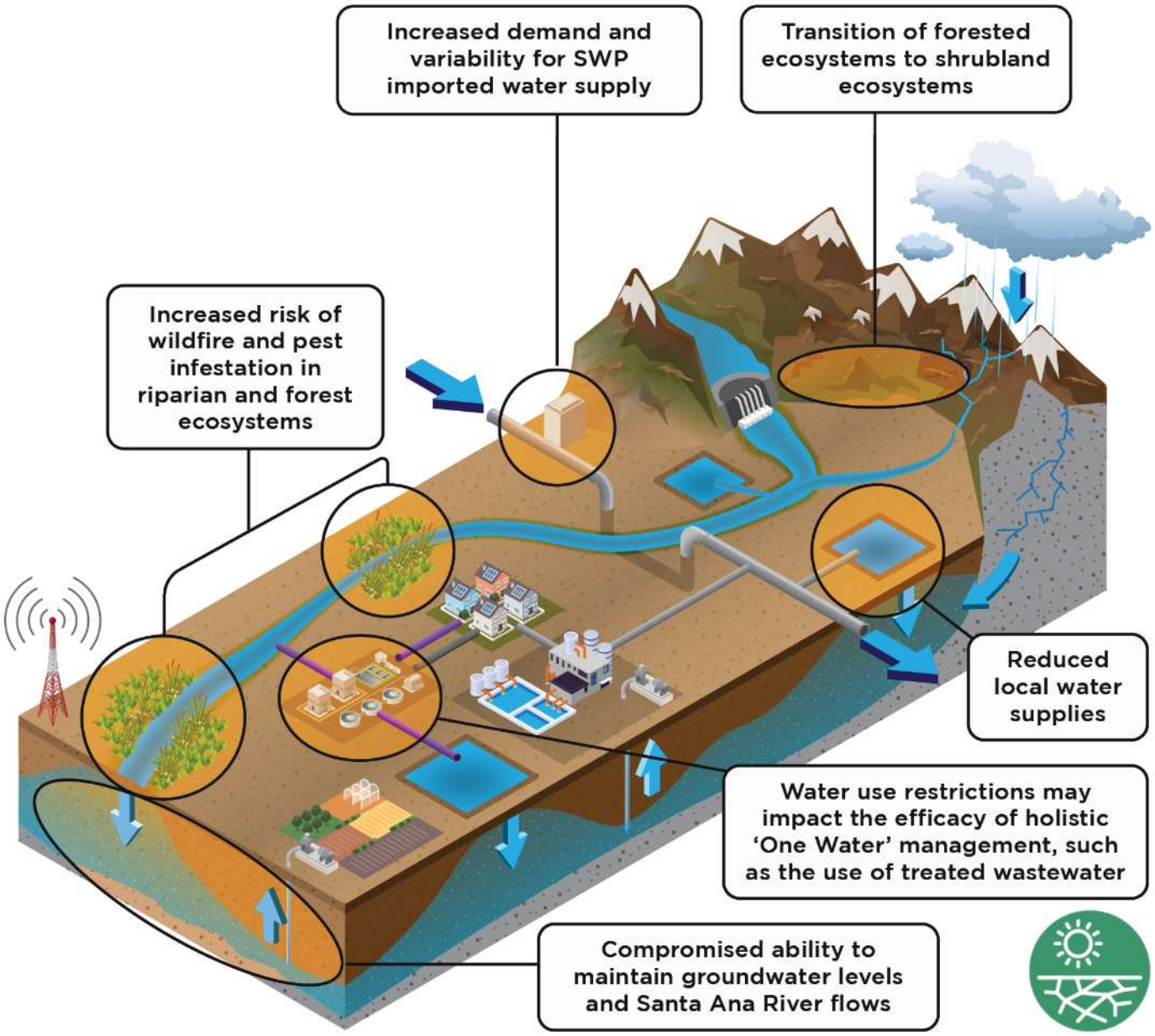
Williams, A., Cook, B., & Smerdon, J. (2022). Rapid intensification of the emerging southwestern North American megadrought in 2020–2021. Nature Climate Change, 12(3), 232-234. http://dx.doi.org/10.1038/s41558-022-01290-z Retrieved from https://escholars

Aridity generally refers to the condition of being dry or extremely dry. Aridity can be associated with a lack of rainfall or increasing air temperature. As the air temperature increases, evaporation of water from the earth increases and plants transpire greater amounts of water to the atmosphere. The valley and lowland areas of the Santa Ana Watershed are generally referred to as a semi-arid region.

Climate change is anticipated to increase the aridity of many portions of the southwestern United States and California.[17] The process or condition of increasing aridity is generally referred to as 'aridification'. Although it has not been quantified, it is anticipated that the Santa Ana Watershed is likely susceptible to aridification due to climate change. Aridification of the Santa Ana Watershed would result in decreased streamflow rates, decreased soil moisture levels, and decreased natural groundwater recharge. Aridification will affect the supplies of water available for human use and natural systems.

17 Overpeck and Udall. 2020. Climate change and the aridification of North America. https://www.pnas.org/doi/full/10.1073/pnas.2006323117

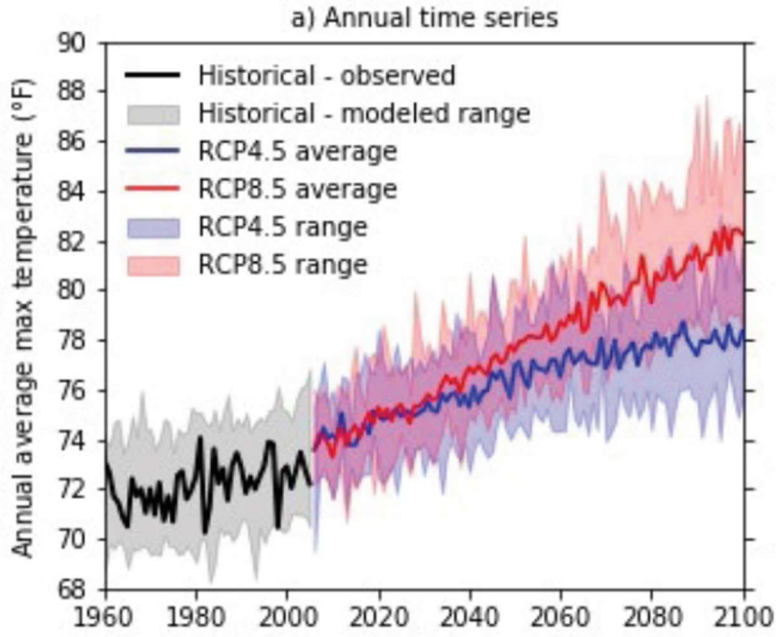
Figure 17 Potential Drought Impacts



Extreme Heat

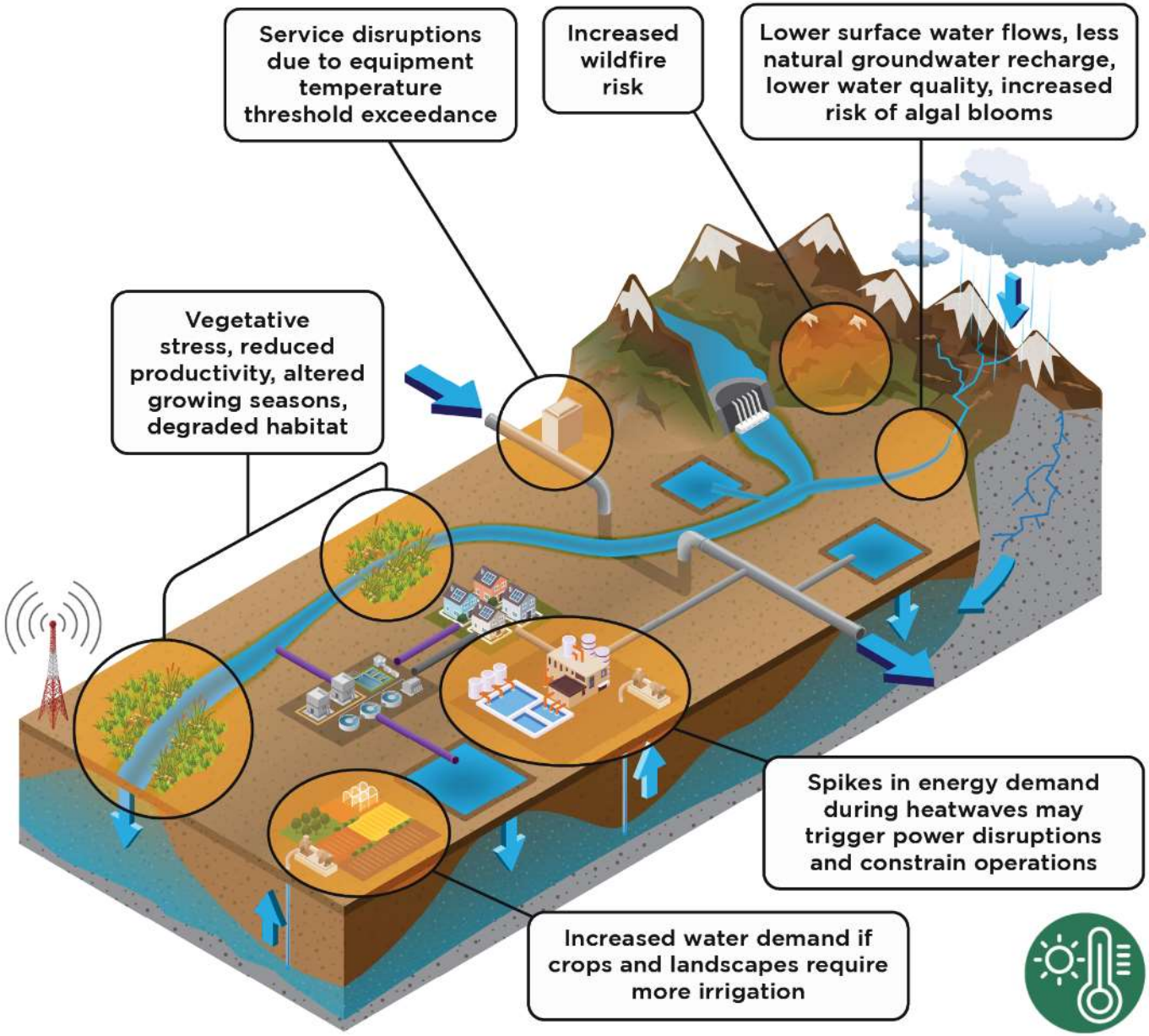
Extreme heat events are defined in the SBVMWD service area as days of the year when daily maximum temperatures exceed 100 degrees Fahrenheit. Observations over the past century indicate that temperature has increased across Southern California. This warming trend is projected to increase across the region in the coming decades with a high degree of certainty (See Figure 18).[18] Inland regions, like the SBVMWD service area, are expected to experience the highest amounts of warming. The intensity and frequency of extreme heat events are also projected to increase over the region and the largest changes in extremes are found in inland regions such as the Inland Empire, Central Valley, and the Coachella Valley. The number of extreme heat days in the SBVMWD service area is projected to increase by 24 to 51 days per year by mid-century (the historical average was 5-6 days per year). Potential impacts to SBVMWD related to extreme heat are listed below in Figure 19.

Figure 18 Annual Average Maximum Temperature Projections



18 Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

Figure 19 Potential Extreme Heat Impacts



Wildfire

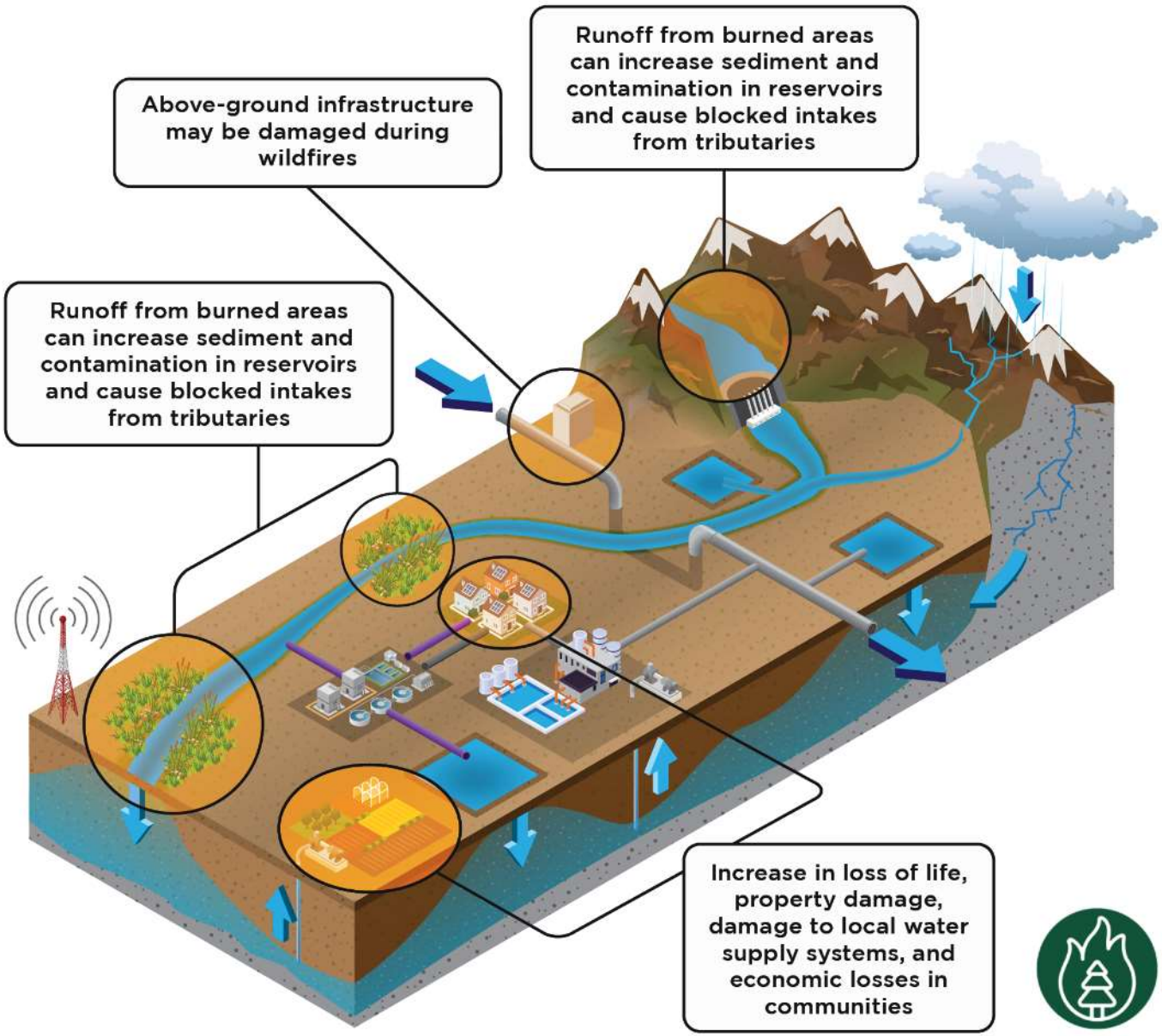
Wildfire events are characterized by uncontrolled and rapidly spreading fires that spread mainly in vegetated wildland or wildland-urban interface areas. The historical record of wildfire events in Southern California, including the Sterling Fire of 2018, Hillside Fire of 2019, El Dorado Fire of 2020, Apple Fire of 2020, Easton Fire of 2020, Mount R Fire of 2020, Nob Fire of 2023, and in nearby Los Angeles County the Woolsey Fire of 2018, and the Bobcat Fire of 2020, confirm that wildfires happen frequently in the SBVMWD region. Future projections indicate that the SBVMWD sphere of influence will be affected by a larger number of wildfires and burned area by the mid-twenty-first century, driven by climate-related factors such as low precipitation, hot temperatures, strong winds, and availability of dry vegetation[19] (See Figure 20). The probability of a wildfire occurring in the SBVMWD service area over a ten-year period is projected to increase by up to 20 percent by mid-century. Potential impacts to SBVMWD related to wildfire are shown in Figure 21.

Figure 20 How Climate Change Fuels Wildfires

https://www.ucsusa.org/sites/default/files/2020-09/wildfires-global-warming-united-states-infographic.pdf

19 Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

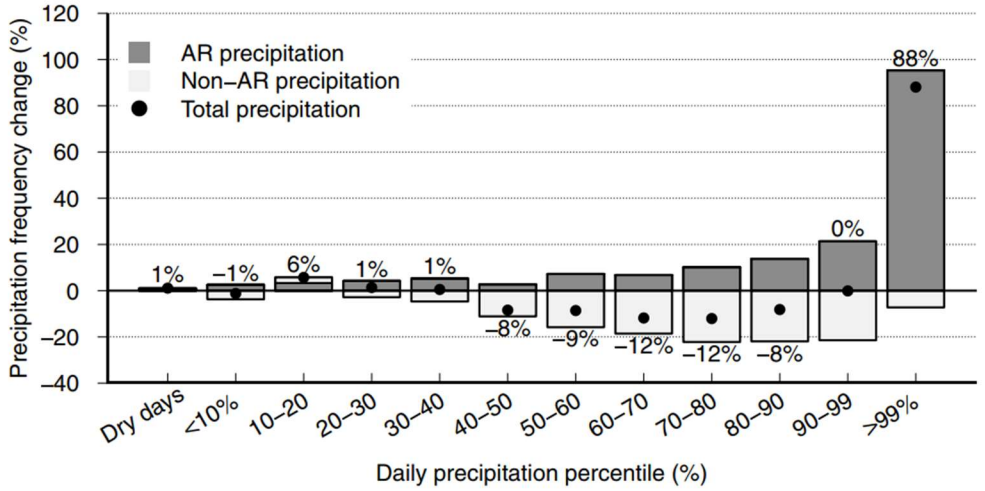
Figure 21 Potential Wildfire Impacts



Extreme Precipitation Events and Flooding

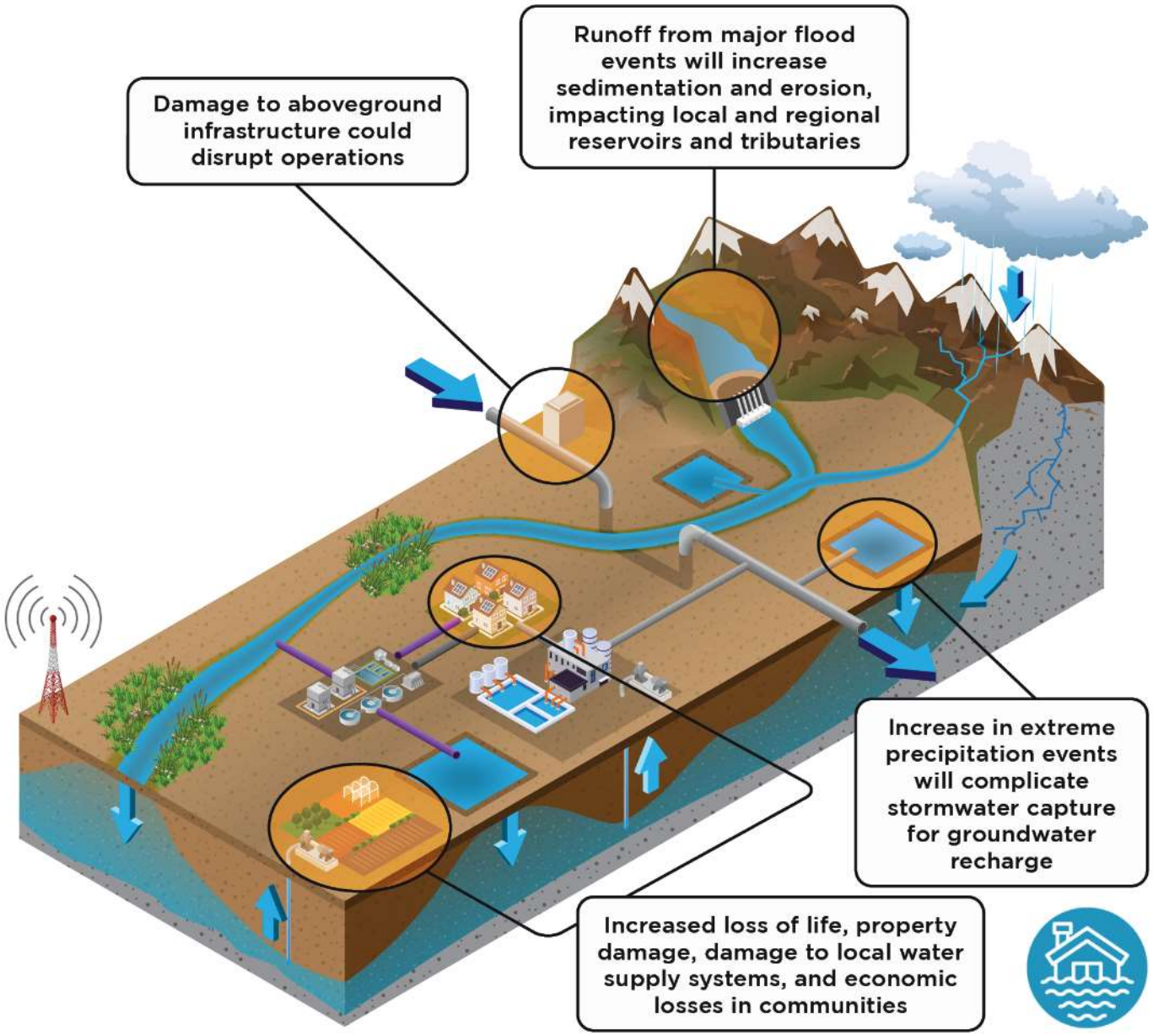
Flooding occurs when rivers and streams overflow due to heavy rainfall, or speedy snowmelt, and the capacity of stormwater infrastructure to move and discharge water cannot keep up with the rate of water inflow. Precipitation occurring during extreme events, known as atmospheric rivers (AR), is projected to increase in the future (See Figure 22). In a wetter future, flood risk is projected to increase in the SBVMWD region, and a significant number of critical infrastructures, like the Foothill Pipeline Crossing at City Creek, are exposed to increased flood and scour risk, per FEMA. The projected decrease in the frequency of precipitation from moderate size events and increase in precipitation frequency of extreme events will affect the region's ability to capture stormwater for groundwater recharge. Additionally, some of SBVMWD's assets and investments are located behind levees that could make them vulnerable to flooding and/or extreme weather events. Potential impacts to SBVMWD related to extreme precipitation and flooding are listed below in Figure 23.

Figure 22 Precipitation Regime Change in the SAR Basin



Gershunov, A., Shulgina, T., Clemesha, R.E.S. et al. Precipitation regime change in Western North America: The role of Atmospheric Rivers. Sci Rep 9, 9944 (2019). https://doi.org/10.1038/s41598-019-46169-w

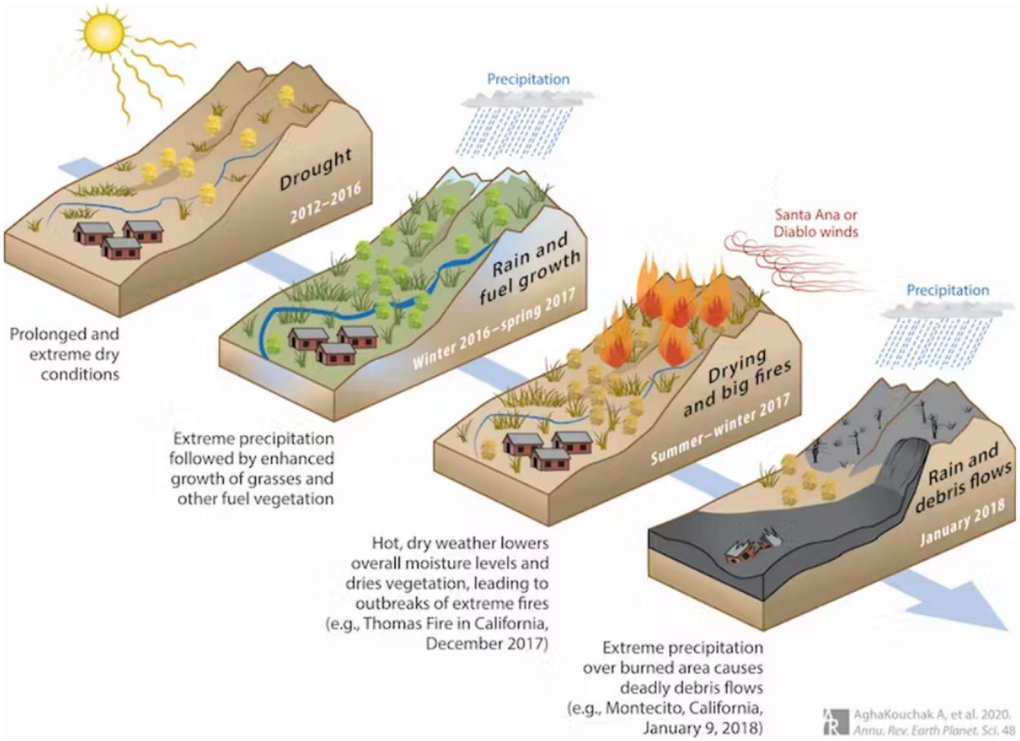
Figure 23 Potential Extreme Precipitation and Flooding Impacts



Landslide

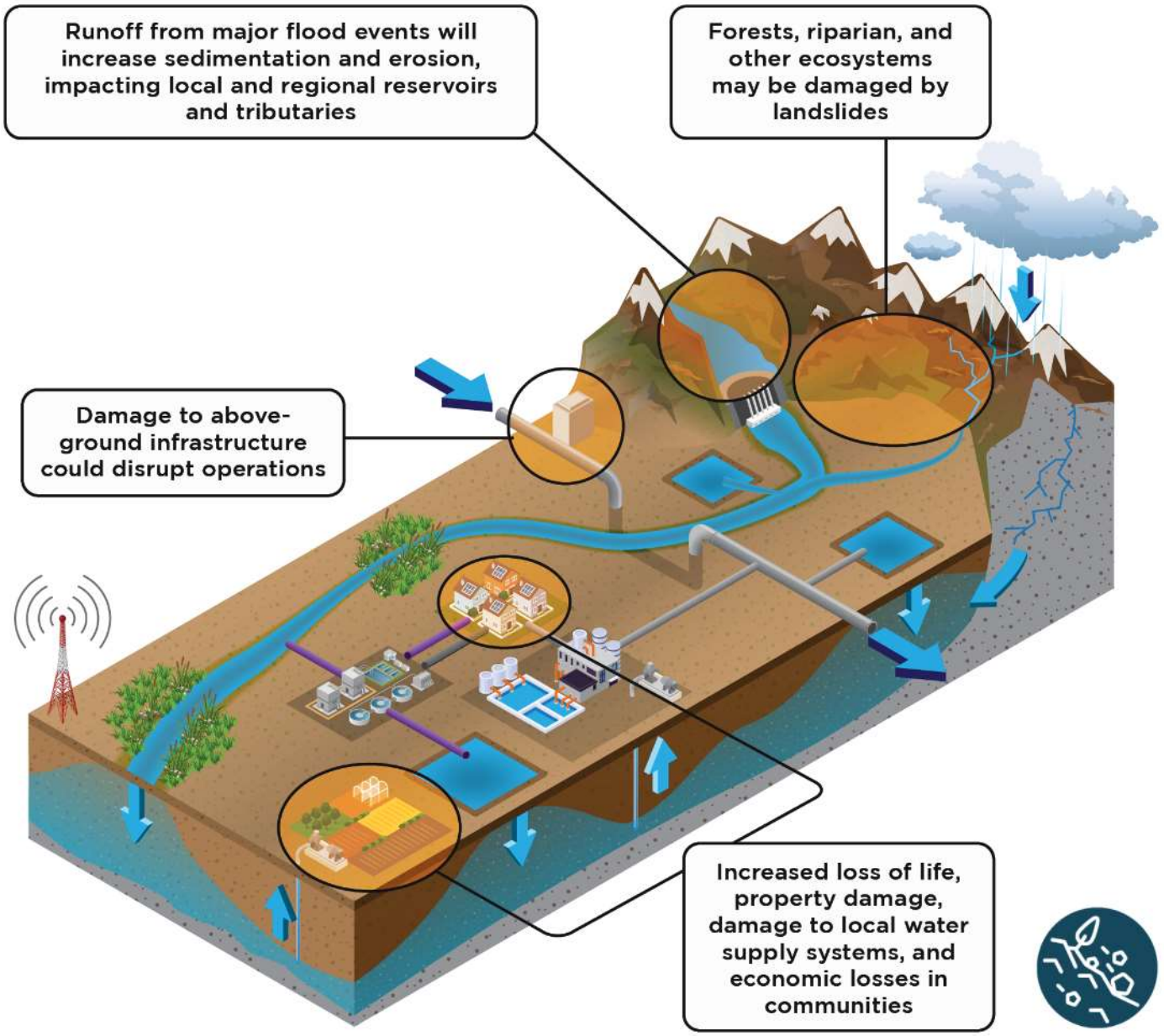
A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Debris flows (commonly referred to as mudflows or mudslides) and rock falls are examples of common landslide types on alluvial landforms, particularly at the urban-wildland interface. Almost every landslide has multiple causes. Slope movement occurs when forces acting down-slope (mainly gravity) exceed the strength of the earth materials that compose the slope. Landslides can be initiated in slopes already on the verge of movement by rainfall, snowmelt, changes in water level, stream erosion, changes in groundwater, earthquakes, disturbance by human activities, or any combination of these factors. Climate change is projected to increase landslide risk for two reasons. First, the projected increase in the frequency and severity of extreme precipitation events increases the likelihood that a landslide will be triggered. Secondly, landslides are even more likely to occur in areas affected by wildfires (See Figure 24). Potential impacts to SBVMWD related to landslides are shown below in Figure 25.

Figure 24 Climate Change Contributions to Landslide Risk



An example of the cascading effects of climate change for wildfires. AghaKouchak et al., Annual Review of Earth and Planetary Sciences, 2020

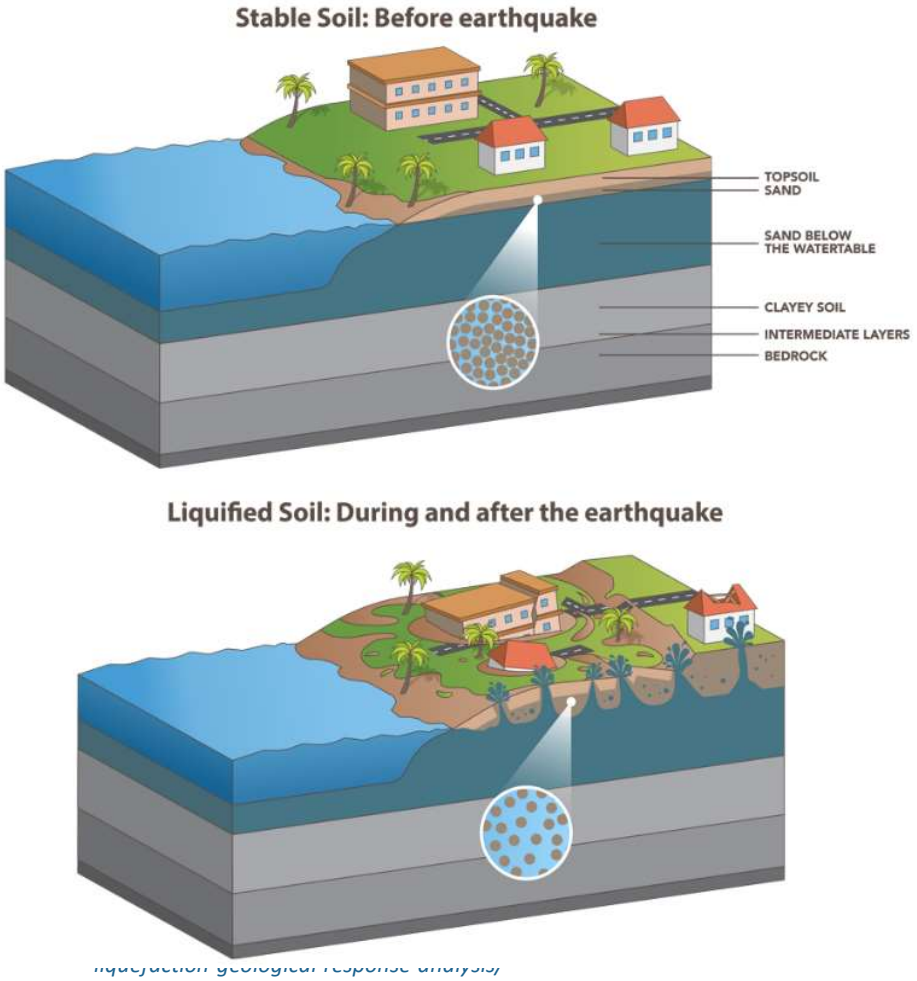
Figure 25 Potential Landslide Impacts



Liquefaction

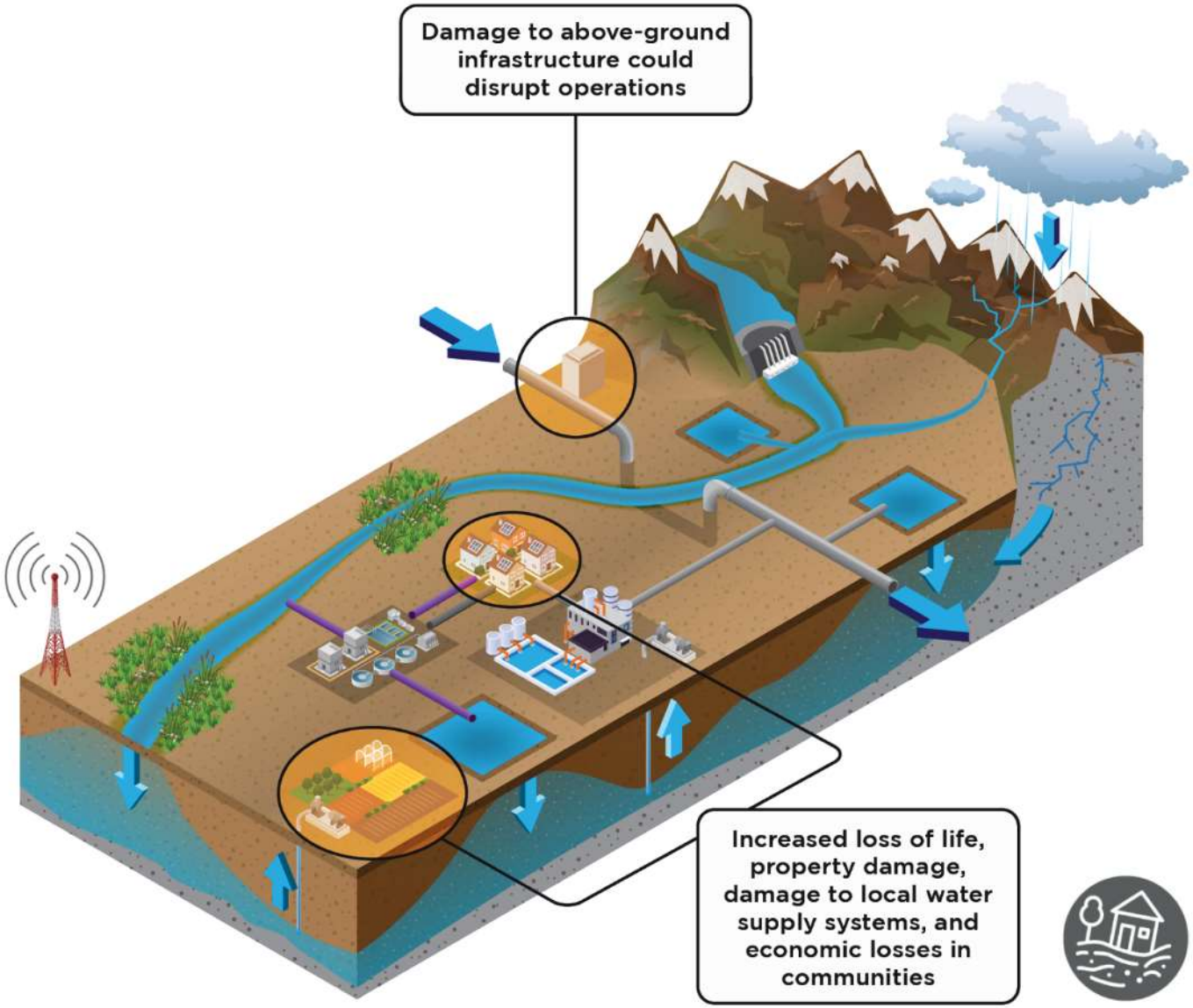
The presence of various fault lines in proximity to SBVMWD's service area, in combination with pockets of sandy soils and predicted increases in extreme rain events, presents liquefaction as an important hazard for consideration (See Figure 26). In the context of SBVMWD, the potential for liquefaction is connected to high groundwater levels, which can occur under extreme precipitation conditions. SBVMWD has a history of managing local groundwater-related liquefaction risk and it has management options for alleviating high-groundwater conditions, particularly in the Pressure Zone of the San Bernardino Basin. Potential impacts to SBVMWD related to liquefaction are listed below in Figure 27.

Figure 26 Liquefaction Overview



liquefaction geological response analysis)

Figure 27 Potential Liquefaction Impacts

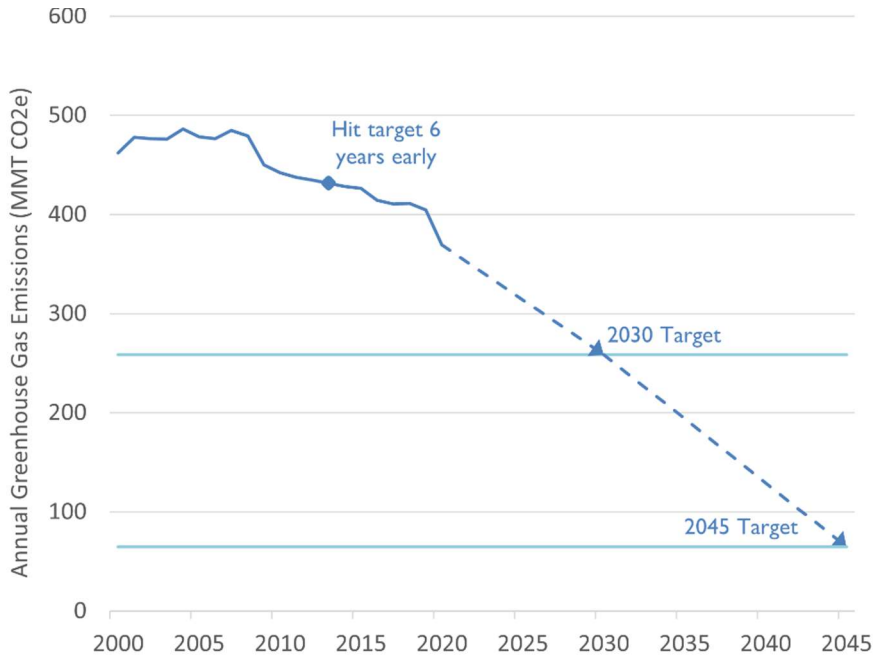


4. GHG Emissions Footprint

California has a sector-by-sector roadmap for carbon neutrality by 2045 (See Figure 28 a near-term target to return GHG emissions to 1990 levels by 2020. California surpassed this target 4 years early in 2016 (CARB). California's next climate target is set to reduce emissions by 40 percent below 1990 levels by 2030. The 2022 Scoping Plan lays out how California can surpass this target, estimating a 48 percent reduction by 2030. AB 1279 establishes California's long-term target to reduce anthropogenic emissions 85 percent below 1990 levels in 2045 and achieve carbon neutrality (the remaining 15 percent of emissions in 2045 will be addressed through carbon dioxide removal). For a comprehensive overview of related legislation, see Appendix B.

Water districts like SBVMWD play a fundamental role supporting state climate change resilience and mitigation goals, particularly by contributing to reducing local GHG emissions. California's water sector is a major source of GHG emissions; this is largely related to the energy required to move water across the state through systems such as the State Water Project, Central Valley Project, and the Colorado River Aqueduct. Water agencies account for approximately 5 percent of California's electricity consumption.[1] However, water utilities are positioned to reduce their emissions dramatically, through the identification of energy efficiency opportunities and conversion to carbon free energy sources.

Figure 28 California Carbon Neutrality Target



https://calepa.ca.gov/climate-dashboard/

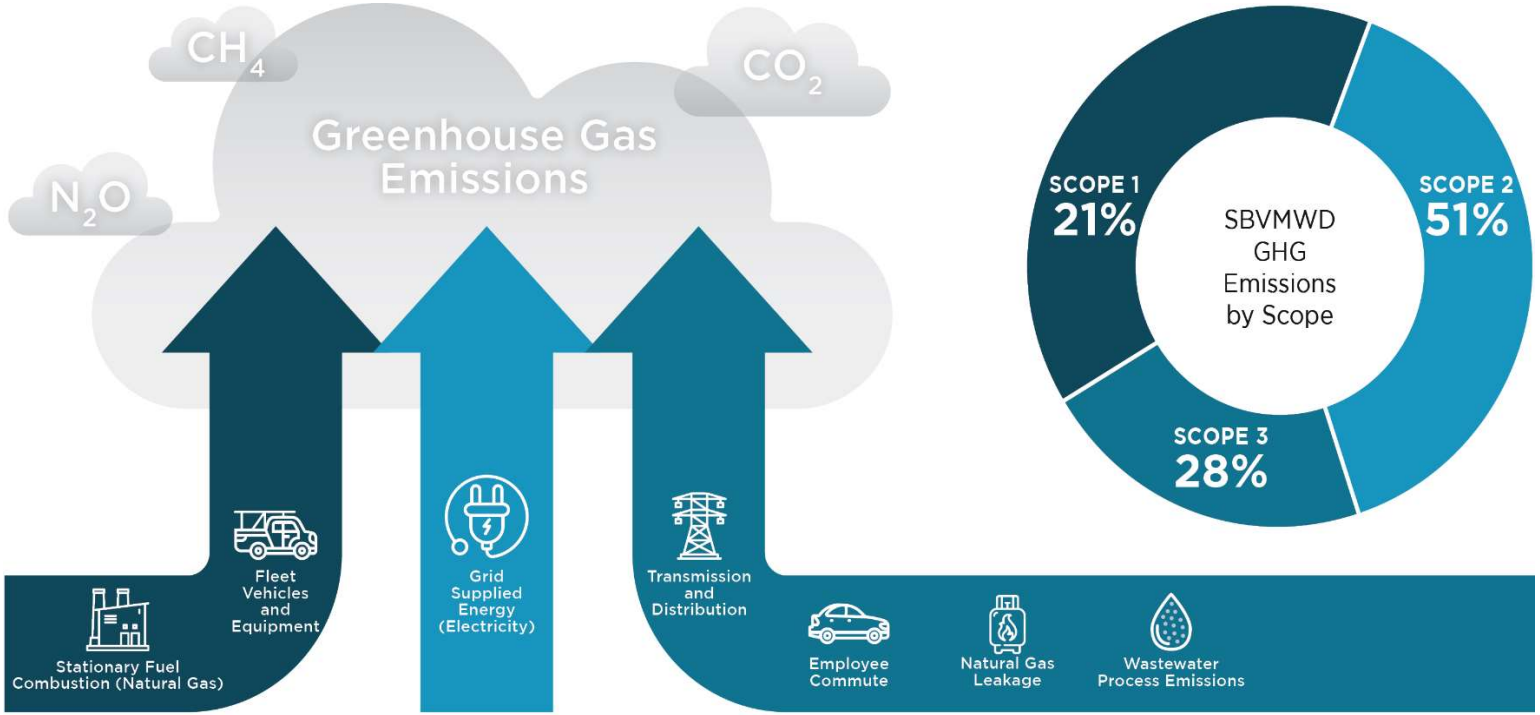
SBVMWD exercises direct and indirect control over its GHG emissions-generating activities (see

20 California Air Resource Board. 2022. 2022 Scoping Plan for Achieving Carbon Neutrality

GHG Emissions by Scope for definitions of GHG emissions by Scope). For example, SBVMWD can reduce or offset energy consumption with renewable energy in its buildings and facilities and reduce or mitigate consumption in its vehicle fleet. Estimating GHG emissions in an inventory enables SBVMWD to quantify the major sources of GHG emissions produced by its operations and programs and establish an emissions baseline for developing a forecast. The forecast allows SBVMWD to estimate future emissions trends and facilitates target setting for future reductions. These will be the first GHG inventory, forecast, and reduction targets established for SBVMWD.

Standard protocols for organization-focused inventories, such as the inventory for SBVMWD, commonly utilize a framework that categorizes GHG emissions by scope. The various scopes account for GHG emissions based on the level of operational control that the organization has over each GHG emissions source. The operational control methodology is well documented by established protocols, such as the Corporate Standard GHG Protocol developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) and has been used by other agencies to avoid double counting of GHG emissions and conservation efforts (WRI and WBCSD 2015). See Figure 29 for an overview of SBVMWD's GHG emissions share by scope and source.

Figure 29 SBVMWD GHG Emissions by Scope and Source



GHG Emissions by Scope

Scope 1 is defined as direct GHG emissions generated from sources that are owned or directly controlled by SBVMWD, including:

- Natural gas – emissions from natural gas delivered by Southern California Gas (SCG).
- Vehicle fleet and equipment (on- and off-road) – vehicle fleet emissions from diesel, gasoline, compressed natural gas, and propane usage.

Scope 2 refers to GHG emissions that are indirectly generated by SBVMWD due to its consumption of purchased electricity, steam, heating, or cooling, including:

- Emissions from electricity delivered by Southern California Edison (SCE).

Scope 3 refers to all other indirect GHG emissions not covered under Scope 2 that are associated with sources that are not directly owned or controlled by SBVMWD but are fundamental to the organization's operation, including:

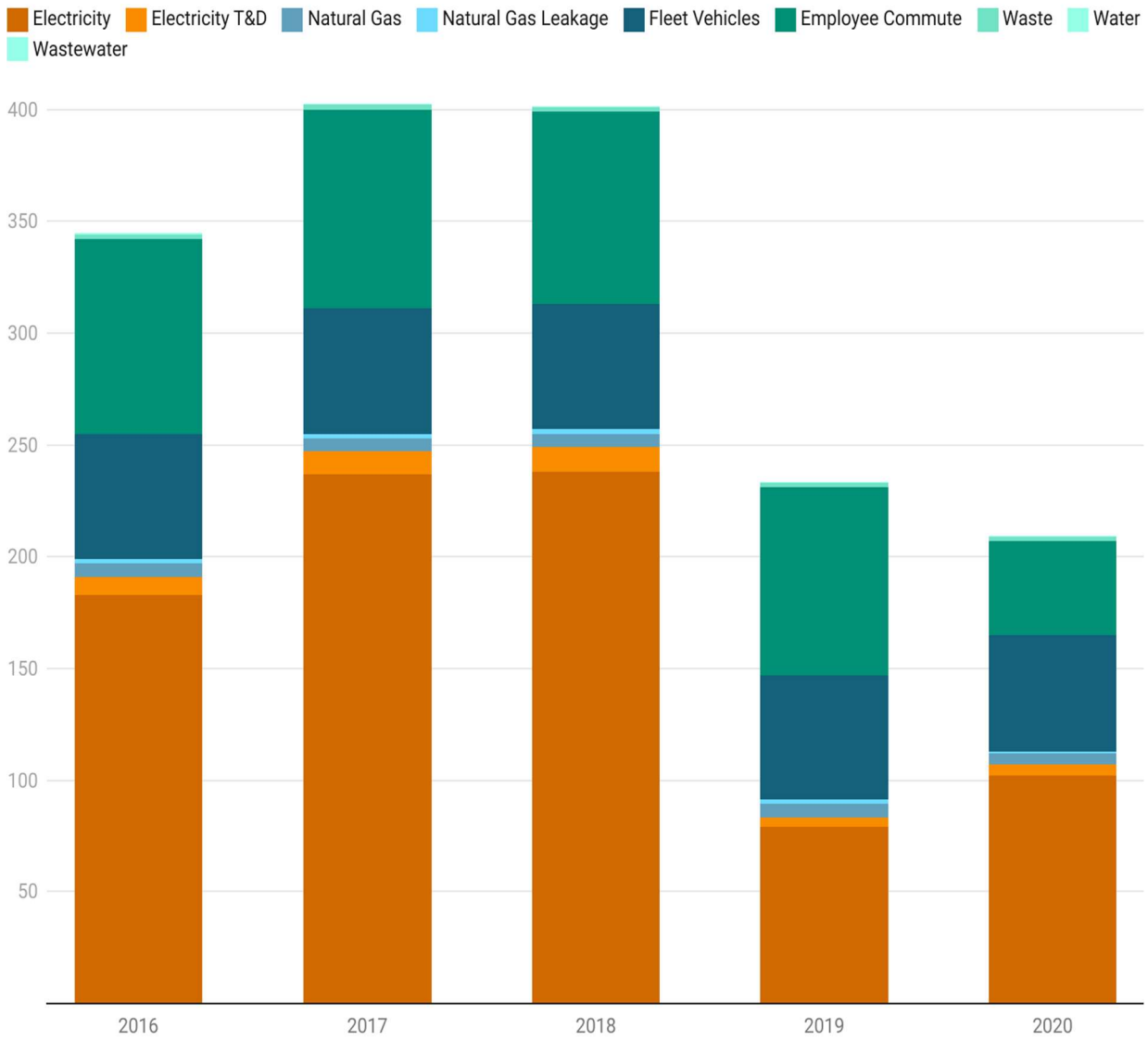
- Water –emissions associated with water use at SBVMWD facilities.
- Wastewater – process emissions associated with wastewater from SBVMWD facilities.
- Electricity transmission and distribution (T&D) losses– transmission and distribution losses associated with delivered electricity from SCE.
- Waste – emissions from waste generated by all SBVMWD office buildings and facilities.
- Employee commute – emissions from vehicles used by employees to commute to and from SBVMWD facilities.
- Construction – emissions associated with construction projects affecting SBVMWD facilities.

GHG Emissions Inventory

The methodology used to calculate SBVMWD's inventory is consistent with standard reporting protocols from the WRI, WBCSD, and the International Council for Local Environmental Initiatives (ICLEI). These protocols serve to guide the measurement and reporting of GHG emissions in a standardized way and have been used by other water agencies to support their own inventory and CARP development. They also include steps to evaluate the relevance, completeness, consistency, transparency, and accuracy of data used in the inventory and forecast.

Scope 1 makes up approximately 21 percent of SBVMWD emissions. Scope 2 makes up the largest share of emissions at approximately 51 percent of total emissions. Scope 3 emissions make up approximately 28 percent of total emissions. The largest emissions source driving SBVMWD's emissions is electricity consumption at offices and pump stations (Scope 2). Other major sources of emissions include employee commute and the vehicle fleet. SBVMWD's GHG emissions fluctuate year to year depending on the source of water and the extent of water demand and services provided. The inventory was therefore developed to include GHG emissions accounting for years 2016, 2017, 2018, 2019, and 2020, to capture and quantify some of this variability. See Figure 30 for a visual summary of SBVMWD emissions by source, scope 1 emissions are depicted in blue tones, scope 2 emissions are depicted in orange tones, and scope 3 emissions are depicted in green tones. The multi-year inventory, informed by an understanding of the variability drivers for each year, was then used to develop SBVMWD's GHG emissions forecast.

Figure 30 SBVMWD Annual Emissions by Source (2016-2020)



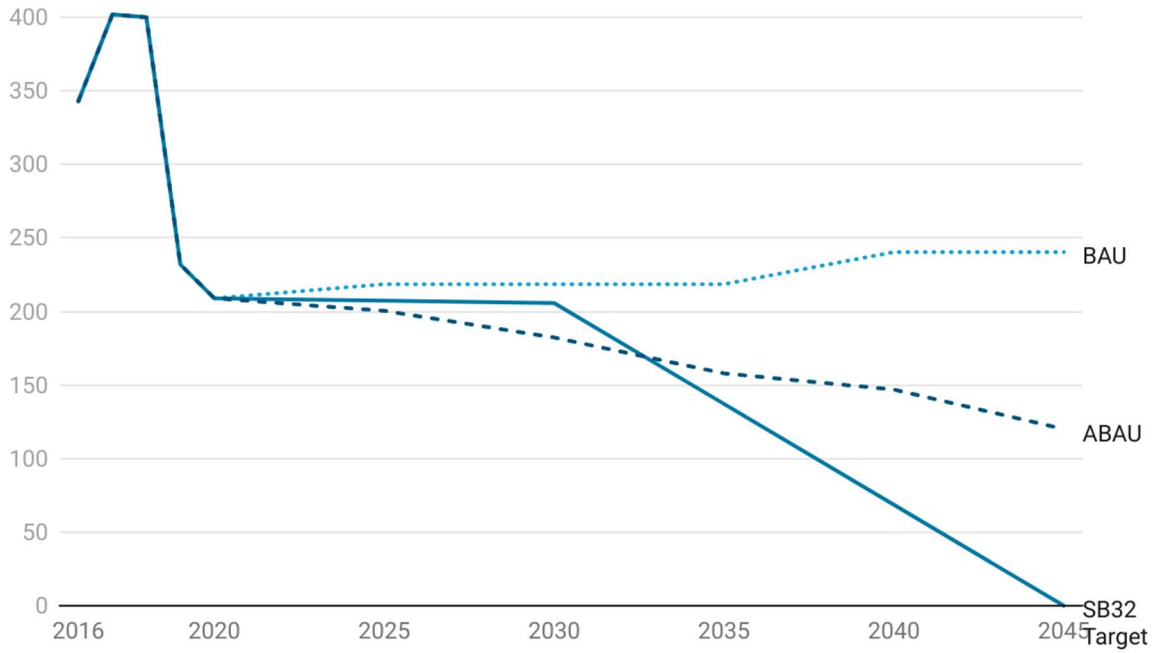
Forecast and Targets

SBVMWD's GHG emissions are expected to change over time due to expected changes in water demand and new projects. A GHG emissions forecast accounts for projected future changes using growth rates and extrapolates from the inventory an estimate of GHG emissions in future years, while also accounting for projected GHG emissions reduction impacts from state legislation. Calculating the difference between the forecasted GHG emissions and the reduction targets determines the gap to be closed through direct action taken by SBVMWD to reduce GHG emissions.

Two forecast scenarios are presented in Figure 30: a BAU (Business as Usual) forecast scenario and an adjusted forecast scenario. The BAU forecast scenario projects the expected growth for all GHG emissions sources based solely on SBVMWD's water service changes. The adjusted forecast accounts for water demand changes and additionally quantifies and incorporates State legislation that is expected to help reduce SBVMWD's future GHG emissions. The adjusted forecast, when compared to the BAU forecast, represents a more accurate picture of future GHG emissions inclusive of the anticipated effects of future State legislation. The adjusted forecast is therefore used to determine the gap between the forecast and the GHG reduction targets that will need to be bridged through actions taken by SBVMWD.

Figure 31 also shows SBVMWD's target emissions forecast needed to support the State's carbon neutrality goals as codified in SB 32 and AB 1279. SBVMWD is currently on track to meet SB 32 requirements of a 40 percent reduction below 1990 levels by 2030 based on State actions. However, it will need to take additional actions (approximately 120 MT CO_2e) to achieve carbon neutrality by 2045. It should be noted that this forecast does not include any significant operational changes (such as adding new pumps or other facilities) or construction projects. Measures and action that SBVMWD will take to eliminate the 120 MT CO_2e are described in Section 5 (Measures 3-I through 3-P).

Figure 31 SBVMWD GHG Emissions Forecast and Targets

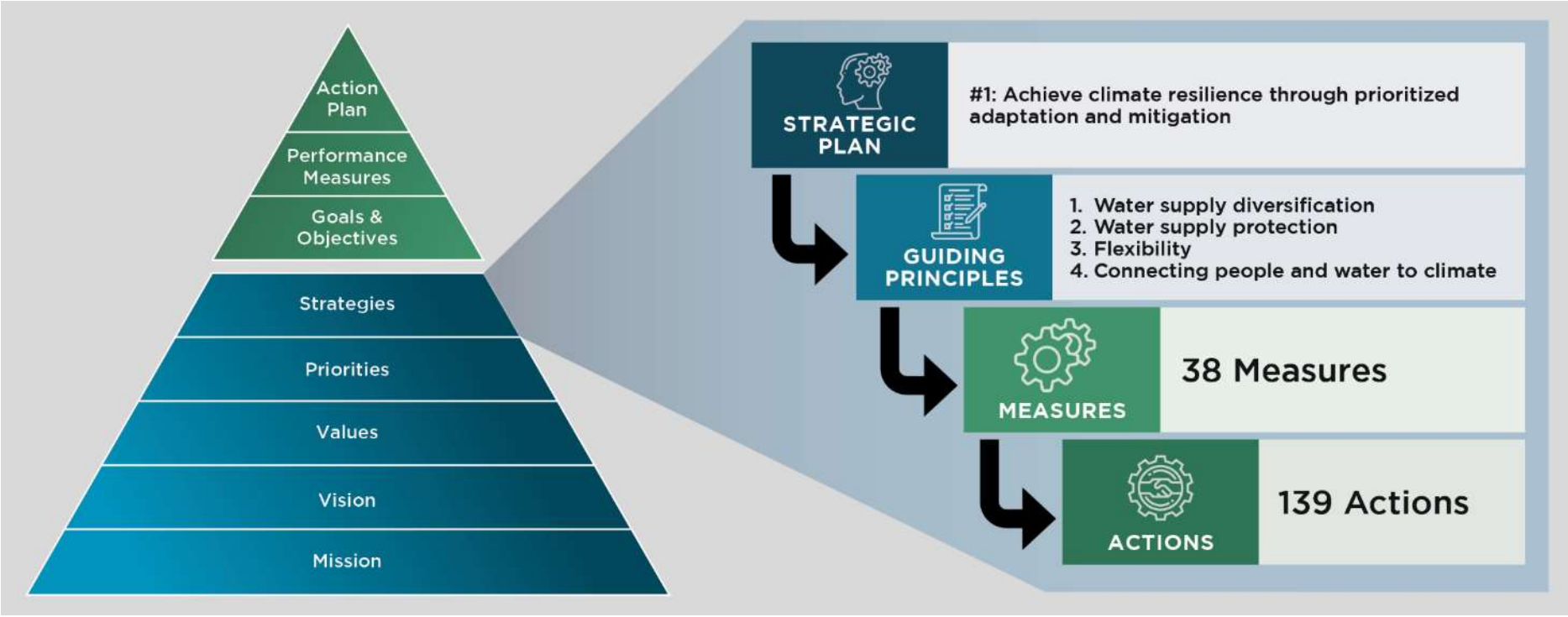


5. Resilience Strategies – Goals, Measures, and Actions

The CARP is designed to build on the strong foundation of climate action and adaptation already integrated into SBVMWD's operations and will provide a framework for updated policies and programs that work towards resilience. The CARP will incorporate the many programs that SBVMWD has in place and will include new guiding principles, measures, and actions that SBVMWD will develop based on climate vulnerabilities, the needs of the community, and the values of SBVMWD. CARP actions have been organized into two phases of implementation, which is described in Section 6.

As described in Section 1, SBVMWD's Strategic Plan recognizes that the long-term viability of the region's water supply must include the reduction of GHG emissions and adaptation to the impacts of climate change among other priorities. The CARPs strategy framework includes measures and actions that primarily support SBVMWD's adaptation and resilience strategic priorities, while also supporting other aspects of its strategic plan, including its core values. The CARP Framework begins with guiding principles. The guiding principles support Strategy 1 (Achieve climate resilience through prioritized adaptation and mitigation) in the SBVMWD Strategic Plan. Measures or strategies will then be developed to support CARP guiding principles. The measures are then implemented through a set of actions. Indicators for CARP guiding principles, measures, and actions to assist staff in tracking progress and evaluating efficacy. Included in Figure 32 below is a summary of the framework.

Figure 32 Overview of How the CARP Supports the SBVMWD Strategic Plan



The CARP supports SBVMWD's Strategic Plan and aligns with the State Water Resilience Portfolio through its four Guiding Principles:

1.  **Maintain a Diverse Water Portfolio** through recycled water production, stormwater capture, aquifer recharge and strategic water imports in order to provide multiple benefit resilience outcomes for the regional water supply. By relying on a diversified mix of imported and localized water sources, SBVMWD can help the region better cope with future climate extremes as they occur at a local and statewide scale. Diversification additionally maintains a reliable and sustainable water supply, particularly in the Southern California region that is prone to water supply volatility and relies on imported water.
2.  **Protect the Water Portfolio** through conjunctive use planning, watershed restoration initiatives and strategic aquifer recharge. Sustainable management of existing supplies and natural resources will help maintain SBVMWD's investments and the benefits provided by our infrastructure and the natural environment, allowing SBVMWD to meet the needs of a changing and dynamic population of customers and the environment.
3.  **Improve Operational and Infrastructure Resilience** by making strategic investments in crucial operations and infrastructure in order to create reliability and continuity of service and assist in long-term regulatory compliance. By creating redundant systems where necessary, exploring water transfer options, and incorporating resilient design criteria in capital improvement projects, SBVMWD is setting itself up for providing reliable service in an uncertain climate future prone to disruptions. Prioritizing resilience in operations and infrastructure, while requiring initial investments up front, will prevent more extensive and expensive damages that might occur in vulnerable or outdated systems.
4.  **Connect People and Water to Climate** By leading education and engagement programs and supporting familiarity and use of the Watershed. Support activities that enable the communities that SBVMWD serves to understand and meaningfully engage with the complex water systems that sustain it. SBVMWD will embrace community members and groups as allies in sustainable water management and regional climate resilience.

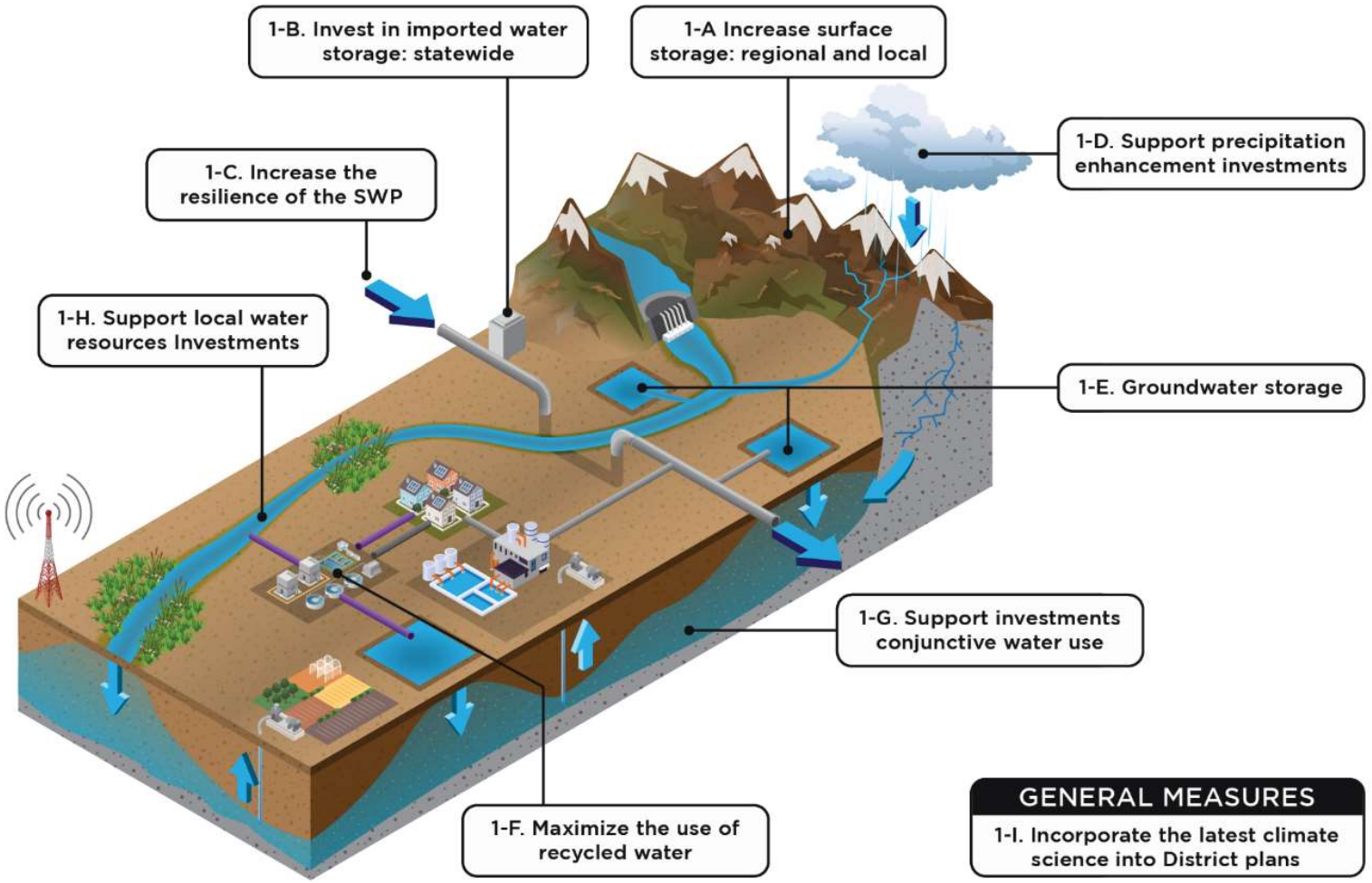
CARP Measure descriptions include the following elements.

- Adaptive Management Indicators outlining how efficacy will be assessed
- Climate vulnerabilities addressed by the measure
- Partners necessary for successful implementation
- Actions SBVMWD will take to implement the measure

1. Maintain a Diverse Water Portfolio

Figure 33 below depicts the CARP measures that support Guiding Principle 1: Maintain a Diverse Water Portfolio. The diagram illustrates how measures contribute to enhancing the resilience of SBVMWD's water portfolio within its operational context. SBVMWD is one of the 29 State Water Contractors and a likely investor in the future Sites Reservoir Project. This project will capture wet-year water to be delivered in dry years, which is a critical strategy to achieve climate resilience within our water portfolio due to the highly variable hydrologic cycles.

Figure 33 CARP Measures Supporting Guiding Principle 1: Maintain a Diverse Water Portfolio



1-A Surface Storage: Regional and Local

Description: Increase capacity to store and deliver local surface water or a blend to treatment plants.

Adaptive Capacity Indicator: Local Surface Water Storage Capacity (acre-feet)

Key Partners: Western Municipal Water District, Western Water, Scripps UC San Diego, U.S. Army Corps of Engineers, and other local and regional agencies

Actions:

1-A-1. Complete Master Plan for Sunrise Ranch to evaluate the potential for an on-site reservoir that can store local and imported water.

1-A-2 If feasible, design Sunrise Ranch Reservoir - including engineering, CEQA, and permits.

1-A-3 If feasible, construct the Sunrise Ranch Reservoir; action include financing, partnerships, and construction management.

1-A-4 Conduct a Viability Assessment for seasonal and temporary storage at Seven Oaks Dam through Forecast Informed Reservoir Operations (FIRO) Study.

1-B Surface Storage: Statewide

Description: Increase imported water storage capacity, such as through investment in the development of Sites Reservoir and other off-aqueduct storage.

Adaptive Capacity Indicator: Imported Surface Water Storage Capacity (acre-feet)

Key Partners: State Water Contractors (SWC), SWC Class 8 Contractors, Department of Water Resources, Sites Reservoir participating agencies

Actions:

1-B-5. Continue participation in Sites Reservoir Authority's design, planning, environmental documentation, and permitting for the Sites Reservoir Project.

1-B-6 Consider Board action to fund the construction of Sites Reservoir and determine the funding mechanism of SBV's share of the construction cost only. Future O & M cost not included.

1-B-7 Participate in the construction and delivery of the Sites Reservoir Project through the Sites Project Authority and ongoing operation and maintenance of the Reservoir.

1-B-8 Complete a Storage Feasibility Study with Class 8 State Water Contractors to evaluate storage needs and opportunities.

1-B-9 Identify or explore additional short-to-intermediate term storage programs with other partners such as the State Water Contractors Association and MWDSC (for example, storage in Diamond Valley Lake), Pass Agency, Antelope Valley-East Kern, Central Valley, Mojave Basin, etc. and local direct delivery customers.

1-C Delta Conveyance and California Aqueduct Resilience

Description: Continue support for reliability investments in the SWP system, such as the Delta Conveyance and California Aqueduct improvements.

Adaptive Capacity Indicator: Additional SWP imported water capacity (acre-feet)

Key Partners: California Department of Water Resources, Delta Conveyance Project Participating Agencies, and State Water Contractors

Actions:

1-C-10. Continue to participate in project planning and completion of environmental documentation and permitting through the Delta Conveyance Design and Construction Authority (DCA).

1-C-11 Consider Board action to fund the Delta Conveyance Project (DCP) and funding mechanism for SBV's share of the construction cost only. Future O & M cost not included.

1-C-12 Participate in the construction of the DCP by DCA, other DCP agreements and export of water through DCP.

1-C-13 Evaluate investments to optimize the operations and maintenance of the California Aqueduct and maximizing its conveyance capacity, especially on the East Branch.

1-D Precipitation Enhancement

Description: Implement and assess effectiveness of weather modification pilot program by SAWPA

Adaptive Capacity Indicator: Additional potential local precipitation per year (inches)

Key Partners: Santa Ana Watershed Project Authority (SAWPA) and SAWPA Member Agencies

Actions:

1-D-14. Participate and monitor the implementation of the SAWPA Cloud Seeding Pilot Program (2023-26), evaluate results, and make recommendation to the Board on next steps.

1-D-15 If the decision is to implement a Cloud Seeding Program, work with SAWPA and other partners on implementation, monitoring and evaluation.

1-E Groundwater Storage

Description: Develop and implement stormwater capture projects and SWP recharge in conjunction with demand management to increase groundwater volume and water levels

Adaptive Capacity Indicator: Additional regional annual stormwater capture capacity (acre-feet)

Key Partners: Western Water, Riverside Public Utilities, Fontana Water Company, West Valley Water District, Redlands, East Valley Water District, Yucaipa Valley Water District, San Bernardino Valley Water Conservation District, and San Bernardino County Flood Control District, and others.

Actions:

1-E-16 Complete Enhanced Recharge, Phase 1B to allow for the diversion and recharge of up to 80,000 acre-feet per year and maximizing the two water right permits held by San Bernardino Valley and Western Water.

1-E-17 Complete facilities' upgrades and agreements to recharge imported water at Cactus Basins, Weaver Basins, County Line Basins, and other feasible locations.

1-E-18 Evaluate the use of demand and supply management incentives to encourage retail agencies to maximize direct deliveries when recharge capacity is limited in order to reduce groundwater pumping; explore treated water delivery.

1-E-19 Develop a priority list for the Program for Enhanced Recharge Capability (PERC) and other active recharge projects, complete the pre-construction strategy, and develop a funding strategy.

1-E-20 Complete a change in point of diversion petition to the State Water Board (Umbrella Permit) and time extension to maximize Santa Ana River water rights.

1-E-21 If feasible, support the implementation of Phase 1 Project(s) of PERC and other active recharge projects outside of PERC; coordinate or provide necessary funding and resources.

1-E-22 Evaluate, identify, and utilize passive recharge opportunities using local streambeds while mitigating habitat and invasive species concerns.

1-F Recycled Water

Description: Support projects to sustainably increase production and use of recycled water

Adaptive Capacity Indicator: Additional annual recycled water production capacity (acre-feet)

Key Partners: East Valley Water District, City of San Bernadino Municipal Water Department, City of Redlands, Yucaipa Valley Water District, City of Colton, City of Rialto, Riverside Public Utilities, and others

Actions:

1-E-23 Complete the Regional Recycled Water System Phase 1 (Pipeline and Weaver Basins).

1-E-24 Complete Phase 2 of Regional Recycled Water Pipeline to connect City of San Bernardino Municipal Water Department Tertiary Treatment System to Weaver Basins.

1-E-25 Continue working with retail agencies to maximize their recycled water programs, evaluate dual plumbing where feasible and direct potable reuse while prioritizing findings from the Salt and Nutrient Management Plan and Regional Salt Mitigation Study.

1-G Conjunctive Use

Description: Secure up to 120,000 acre-feet in additional groundwater storage for dry year yield for local and regional partners

Adaptive Capacity Indicator: Annual conjunctive water use capacity (acre-feet)

Key Partners: Basin Technical Advisory Committee (BTAC), San Gorgonio Pass Water Agency, Yucaipa Valley Water Districts, Western Water, and others

Actions:

1-G-26 Engage with participating agencies and potential partners to finance the planning, development, and operation of conjunctive use projects such as the Bunker Hill Conjunctive Use Program (BHCUP) and the Santa Ana River Conservation and Conjunctive Use Program (SARCCUP); reevaluate the IRUWMP and BTAC Conjunctive Use Guidelines.

1-G-27 Update/revise the Surplus Water Policy (Ordinance No. 79).

1-G-28 Complete the modeling and conjunctive use proposal for the SARCCUP/BHCUP and related approvals from BTAC, Board, and Watermaster.

1-G-29 Finalize and implement conjunctive use investments for SARCCUP and Bunker Hill CUP, and related construction.

1-H Local Resource Investment

Description: Invest in local and regional water supply projects that reduce demand on imported water supplies and increase water supply reliability

Adaptive Capacity Indicator: Increase in annual local water availability (acre feet)

Key Partners: Retail Agencies

Actions:

1-H-30 Continue the implementation of a local resource investment program incentivizing local stormwater capture, groundwater replenishment and recovery, water conservation, and recycled water and onsite reuse, tree-planting in disadvantaged communities that lacks tree canopy, rainwater harvesting, and dual-plumbing investments.

1-I Adaptive Supply Planning and Portfolio Management

Description: Incorporate latest climate science and scenarios into plans for water resource development and management, emergency preparedness and response, and financial sustainability.

Adaptive Capacity Indicator: Number of plans that incorporate the latest climate science.

Key Partners: Retail Agencies, United States Geological Survey, California Department of Water Resources, Center for Western Weather and Water Extremes, Santa Ana Watershed Project Authority, California Data Collaborative, and technology solutions providers

Actions:

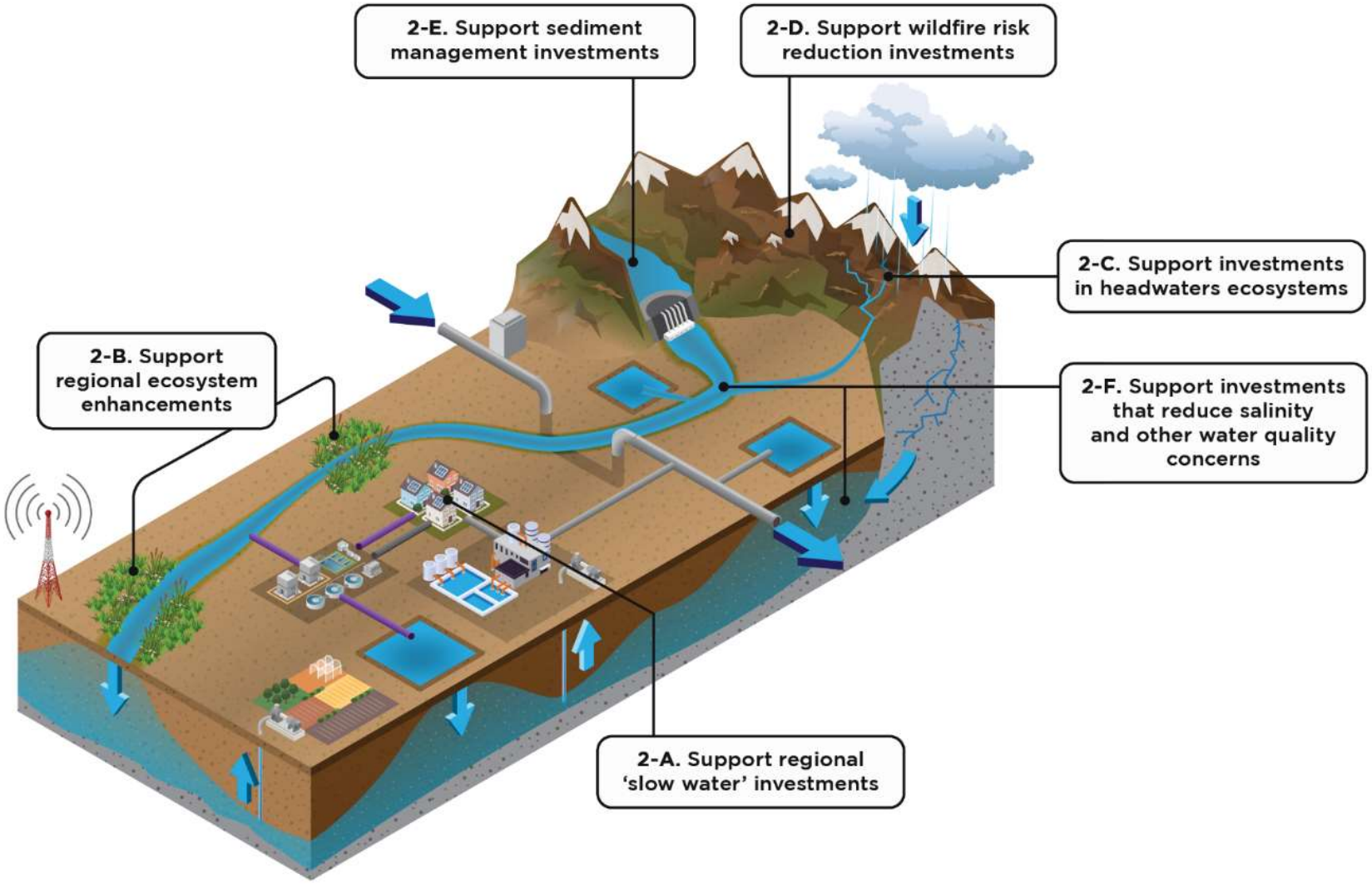
1-I-31 Periodically update models and plans with the latest data and forecast; invest in high-quality science and enhanced data management to better understand Basin's trends and response to management actions; and conduct climate sensitive analysis (back-end solutions).

1-I-32 Identify and implement water portfolio tool(s), dashboards and decision-support and engagement portals necessary to adapt to a variety of plausible futures successfully and agile enough to adjust the water portfolio to changing times (front-end solutions).

2. Protect the Water Portfolio

Figure 34 below depicts the CARP measures that support Guiding Principle 2: Protect the Water Portfolio. The diagram illustrates how measures contribute to enhancing the resilience of SBVMWD's water portfolio within its operational context.

Figure 34 CARP Measures Supporting Guiding Principle 2: Protect the Water Portfolio



2-A Nature-Based Solutions

Description: Support regional slow water initiatives or local efforts to attenuate runoff and increase permeable surfaces in urban areas

Adaptive Capacity Indicator: Additional aquifer recharge capacity from storm runoff per year (acre-feet)

Key Partners: Retail agencies, cities, flood control district, property owners, non-profits

Actions:

2-A-33 Engage with retail agencies, cities, and flood control district to identify urban areas affected by localized flooding, areas that are a significant source of pollutant loads, and ongoing efforts to increase urban habitats and open space.

2-A-34. Consider conducting a study to determine opportunities to attenuate runoff and to determine the extent to which these opportunities (tree canopy, rain gardens, rain-barrels, infiltration basins, check dams, ponds, wetlands, etc.) can improve recharge and water quality.

2-A-35 Identify funding opportunities to pool resources or develop a regional fund for financing these projects (e.g., grants, loans, bonds, fees).

2-A-36 In partnership with land use authorities such as cities, consider opportunities for direct use of local runoff in addition to infiltration as an offset to potable water or recycled water.

2-A-37 Evaluate additional recharge and infiltration opportunities through passive recharge in local waterways and flood plains, while providing multiple benefits and mitigating habitat issues.

2-B Ecosystem Enhancements

Description: Support the implementation of the HCP conservation and restoration activities

Adaptive Capacity Indicator: Annual additional restored/conserved area (acres)

Key Partners: City of Rialto, East Valley Water District, Inland Empire Utilities Agency, Metropolitan Water District of Southern California, Orange County Water District, Riverside Public Utilities, San Bernardino Municipal Water District, San Bernardino Valley Municipal Water District, San Bernardino Valley Municipal Water Conservation District, West Valley Water District, Western Municipal Water District of Riverside County

Actions:

2-B-38 Complete the ecosystem restoration and translocation projects identified in the HCP.

2-B-39. Evaluate additional enhancement opportunities within the HCP Preserve System (for example Sunrise Ranch), and if feasible, develop and implement.

2-C Headwaters Landscape Management

Description: Support the implementation of headwaters landscape management practices in the upper SAR watershed

Adaptive Capacity Indicator: Annual additional enhanced/ improved habitat (acres)

Key Partners: San Bernardino National Forest, US Forest Service, all members of the Headwaters Resilience Partnership

Actions:

2-C-40 Investigate, identify, and develop an investment and partnership plan for headwater health and restoration projects.

2-C-41 Develop and prioritize a web-based inventory of watershed and/or ecosystem services projects that feature nature-based solutions and enhanced ecosystem services to prioritize a list of projects for investment and implementation.

2-C-42 Develop a long-range financial plan to fund ecosystem investments that provide water quality, water supply, and resilience benefits.

2-C-43 Develop a monitoring and evaluation approach for headwaters/forest resources and align with regional, state, and federal monitoring efforts.

2-C-44 Consider conducting a study to determine headwaters landscape management opportunities to increase water storage capacity (e.g., meadows and mountain wetlands, catchment pools).

2-D Land Stewardship and Land Use Planning

Description: Develop and implement wildfire abatement and response program

Adaptive Capacity Indicator: Adopted document or policy

Key Partners: Inland Empire Fire Safe Alliance, USDA Forest Service, San Bernardino County Fire Protection District, Southern California Edison, CAL FIRE

Actions:

2-D-45 Partner with Inland Empire Fire Safe Alliance, USDA Forest Service, San Bernardino County Fire Protection District, Southern California Edison, CAL FIRE, and other agencies and partners with vegetation and fuel management programs to identify opportunities to reduce wildfire risks in the headwaters and urban-wildlands interface.

2-D-46 Engage with and educate public users, landowners, businesses, and resorts to encourage participation in vegetation and fuel management programs that reduce fire and erosion risks.

2-D-47 Partner with relevant authorities to plan, implement, maintain, and enhance wildfire risk reduction strategies in the headwaters that would additionally address risks to San Bernardino Valley's infrastructure, conservation investments, water supply, and water quality.

2-D-48 Leverage current and upcoming State and federal wildfire risk scenarios to develop appropriate response and restoration policies and strategies.

2-D-49 Develop and implement a long-range financial plan or strategy to conduct targeted vegetation management in the Upper SAR Watershed.

2-D-50 Partner to develop, implement, and maintain an Ignition Reduction Plan and Wildfire Early Detection in the areas of greatest risk, including the use of cameras and artificial intelligence.

2-E Sediment Management

Description: Support and implement a Sediment Management Plan for surface storage facilities and recharge basins that incorporates climate change extremes

Adaptive Capacity Indicator: Increased annual sediment capture capacity (cubic feet)

Key Partners: Water Conservation District, Flood Control District

Actions:

2-E-51 Conduct studies or synthesize existing studies to assess the risks due to climate change-driven increases in sediment and identify high-priority investments for implementation.

2-E-52 Scope potential enhancements to existing water infrastructure and/other projects and implement high-priority projects to reduce maintenance costs associated with increased sediment flow.

2-E-53 Partner with relevant agencies to develop and implement a Sediment Management Plan to reduce impacts and increase water supply, water quality, and habitat benefits.

2-F Salt and Water Quality Management

Description: In collaboration with partners, develop and implement a Water Quality Program

Adaptive Capacity Indicator(s): Adopted document or policy with salinity, blending quantities/requirements

Key Partners: Santa Ana Regional Water Quality Control Board, Santa Ana Watershed Project Authority

Actions:

2-F-54 Assess the salt and nutrient impacts of existing and new water supply projects and basin management activities under different climate change scenarios; update and maintain a Water Quality Model and continue collaboration with the Santa Ana Watershed Project Authority on Watershed water quality initiatives.

2-F-55 Evaluate the potential impacts to water supply reliability and water quality of State and federal water quality standards especially pertaining to PFAS, emerging constituents, recycled water, and stormwater in the context of climate change.

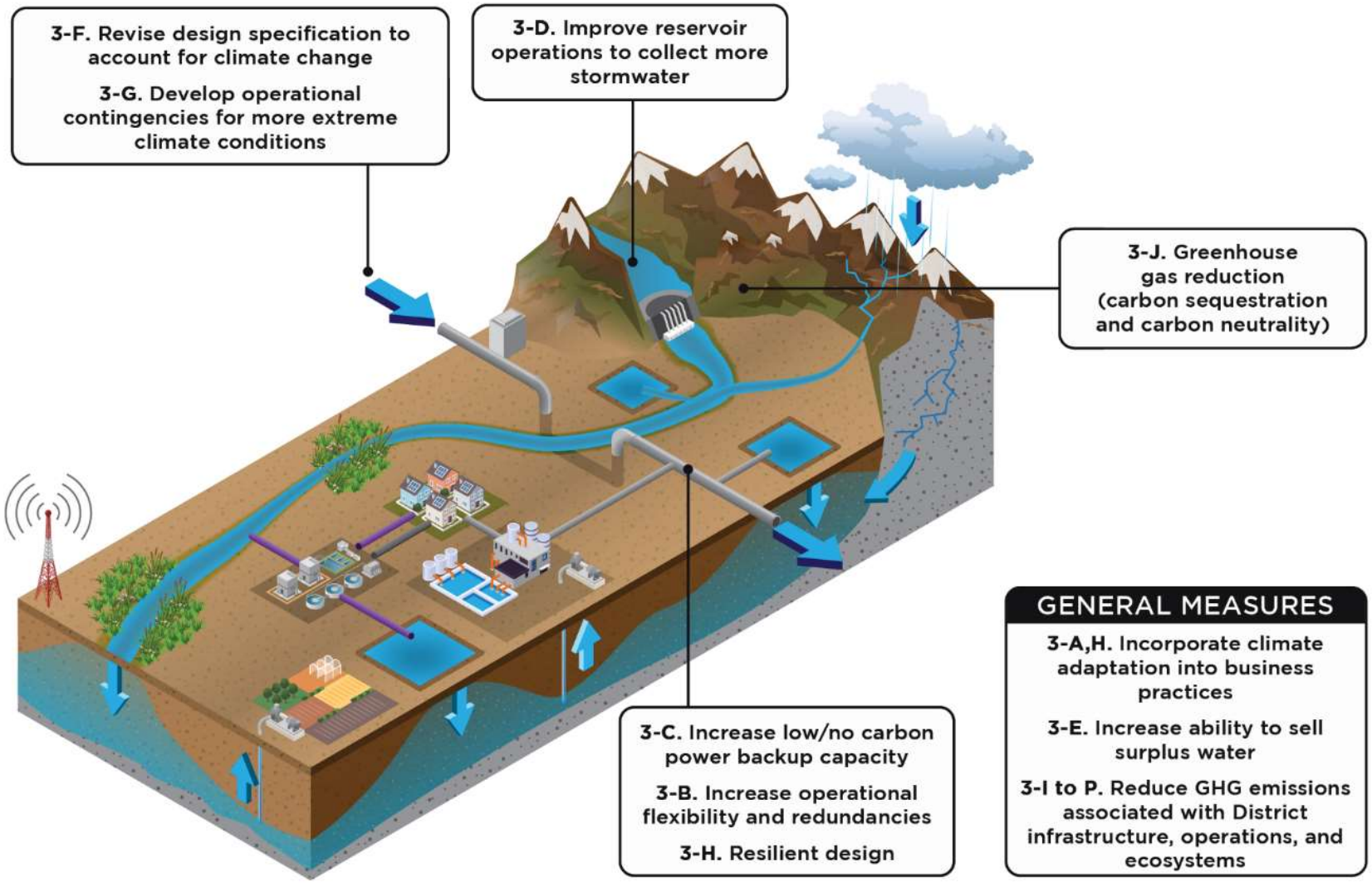
2-F-56 Complete the Salt and Nutrient Management Plan and continue collaboration with the Santa Ana Regional Water Quality Control Board and SAWPA on water quality.

2-F-57 Evaluate investments and programs to mitigate salt, manage contamination plumes, manage, and treat emerging contaminants, and provide equitable access to available supplies.

3. Improve Operational and Infrastructural Resilience

Figure 35 below depicts the CARP measures that support Guiding Principle 3: Improve Operational and Infrastructural Resilience. The diagram illustrates how measures contribute to enhancing SBVMWD's infrastructure resilience within its operational context.

Figure 35 CARP Measures Supporting Guiding Principle 3: Improve Operational and Infrastructural Resilience



3-A Climate Adaptable and Resilient Business Model

Description: Evaluate existing services and programs that may support climate adaptation and explore opportunities to innovate

Adaptive Capacity Indicator: Number of new/revised decision-making frameworks that incorporate climate change risks and opportunities

Key Partners: TBD

Actions:

3-A-58 Mainstream adaptation into decision-making by factoring climate risk and evaluating complex trade-offs and unintended consequences; this may involve more climate-centric extended financial costs and benefits, avoided losses and damage, extended returns on investment, etc.

3-A-59 Annually evaluate that climate resilience is being built in SBVWD's human, political, physical, financial, social, and natural systems to maintain holistically resilient operations, strategies, human resources, finances, and legal/compliance functions

3-A-60 Evaluate the formation of a Climate Resilience District (SB 852) with other entities for the purposes of raising and allocating funding for eligible projects

3-A-61 Utilize technology to reimagine both climate risks and opportunities e.g. artificial intelligence (AI) and machine learning to integrate real-time observations and simulations to determine the effects of extreme weather events and climate hazards, digital twins to provide insights into systems and processes, etc.

3-B Operational Flexibility and Redundancies

Description: Maximize operational flexibility and redundancies, including periodically reviewing and evaluating water transfer agreements, interties, flexible exchanges, additional system interconnections, points of delivery, etc.

Adaptive Capacity Indicator: Number of additional connections/interconnections developed

Key Partners: TBD

Actions:

3-B-62 Review all water transfer, exchange and cooperation agreements (e.g. CLAWA, MWDSC, SGPWA, and SARCCUP) to confirm their relevance to resilience, and repeal or update if necessary.

3-B-63 Annually evaluate and test interconnections and delivery points to maintain operability and ability to function at installed capacity; develop action report and perform any repairs and upgrade.

3-B-64 Evaluate and utilize the flexibility and redundancy provided by interties such as the Central Feeder-East Branch Extension Intertie, and the MWDSC Intertie at the Foothill Pump Station; complete any associated construction/improvements.

3-B-65 Consider utilizing storage and delivery partnerships to meet short and intermediate needs (e.g., Diamond Valley Lake with MWDSC and SARCCUP agencies, Class 8 Contractors, Sunrise Ranch Reservoir with other partners).

3-B-66 Develop programs to bridge infrastructural and contractual gaps through initiatives such as the San Bernardino Basin Optimization and Stewardship Program.

3-C Onsite Renewable, Backup Power & Grid Resilience

Description: Increase the availability of environment-friendly backup power or onsite renewable energy production at critical facilities

Adaptive Capacity Indicator: Number of additional redundancies added to system

Key Partners: TBD

Actions:

3-C-67 Use renewable energy and optimize battery storage at critical facilities to meet basic electrical needs and reduce grid dependence for heating and air-conditioning, lights and security, and communication and Board meetings; examples include rooftop solar at Headquarters and battery storage for the 9th Street Well (BLF).

3-C-68 Assess the reliability of renewable-based backup power and energy storage systems for continuity of business operations for facilities and field operations during power disruptions that may be caused by extreme weather (wind, heatwaves, floods, etc.).

3-C-69 Assess the need for additional backup power capacity to mitigate power outages, emergency water storage capacity to provide pumping flexibility, and the feasibility of pumped-storage hydroelectricity.

3-C-70 Maintain partnership with local and regional agencies to develop mutual aid agreements for standby power (e.g., Regional Standby Generator Fleet through ERNIE).

3-C-71 Incorporate on-site renewable generation and storage (wind, solar, small hydropower, hydrogen, battery, etc.) when feasible at new facilities (for example, future facilities at Sunrise Ranch).

3-C-72 Consider long-term leases, licenses, temporary easements, or other arrangements for the use of appropriate SBVMWD properties for energy developers and investors to develop renewable energy generation and storage projects, thereby increasing grid resilience

3-D System Reoperation (Parts 1 and 2)

Description: (3-D1) Forecast Informed Reservoir Operation (FIRO) at Seven Oaks Dam; and (3-D2) Prioritize multipurpose facilities over single-use facilities

Adaptive Capacity Indicator: Additional annual usable storage capacity in Seven Oaks Dam (acre-feet)

Key Partners: U.S. Army Corps of Engineers, Western Water Municipal District, Seven Oaks Dam Local Sponsors

Actions (3-D1):

3-D-73 Continue working with the USACE, relevant Flood Control Districts, and other interested parties to assess FIRO at Seven Oaks Dam.

3-D-74 Continue working with interested parties to determine the best use of seasonal storage across users, taking into account climate change.

3-D-75 Update or create an Optimization Model that maximizes the benefits of direct use, surface storage, water quality benefits, and groundwater storage of stormflow captured and diverted at the Dam; coordinate this effort with Sediment Management Plan.

Actions (3-D2):

3-D-76 Complete facilities' improvements to optimize local and imported water recharge at SAR and Mill Creek Spreading Basins, Cactus Basins, County Line Basin, and Weaver Basins.

3-D-77 Complete the next phase of facility improvements to optimize recharge, including Program for Expanded Recharge Capability (PERC) sites, Devil Canyon, Oak Creek Basins, and other feasible locations.

3-D-78 Evaluate and identify how to reoperate or maximize the use of local and regional facilities that can be shared to maximize resilient water and power grid resilience and resilient habitat and ecosystem (e.g., Foothill Pump Station, Greenspot Pump Station, Central Feeder).

3-D-79 Evaluate and identify how to reoperate or maximize hydropower facilities to aid regional water reliability.

3-E Water Sales and Transfers

Description: Develop principles to evaluate selling surplus water under certain conditions

Adaptive Capacity Indicator: Additional ability to sell or transfer excess water (acre-feet)

Key Partners: Western Water, Basin Technical Advisory Committee

Actions:

3-E-80 Review and update decision criteria and/or thresholds for sale of surplus water, ensuring that sale or transfer outside the service area is done strategically to maintain a diverse water portfolio.

3-E-81 Maintain a High Groundwater Mitigation and Liquefaction Reduction Plan (Dewatering Contingency Plan) to dewater areas of concern and pump additional water to beneficial users.

3-F Resilient Design

Description: Develop a policy and/or process to prioritize when to apply and implement climate change-informed design criteria for flooding, extreme heat, wildfire, liquefaction, and other climate extremes.

Adaptive Capacity Indicator: Number of assets designed based on resilient design criteria

Key Partners: San Georgino Pass Water Agency

Actions:

3-F-82 Review existing standards and guidelines for the design and operation of SBVMWD assets and habitat investments to identify potential weaknesses and climate risks, including where thresholds for resilience are missing or insufficient; update standards and specifications where necessary.

3-F-83 For new projects, perform a Climate Vulnerability Analysis and develop project designs that address those vulnerabilities using cutting-edge climate science and research into technical guidance (Climate Resilience Design Guidelines).

3-F-84 Create and implement a priority list of assets that need to be prepared for changing extreme weather decades into the future (e.g., City Creek Tunneling Project).

3-F-85 For new buildings, incorporate resilient design and construction sustainability elements such as fire-resistant building envelopes, geothermal energy, green roofs, high efficiency toilets, etc.; design buildings to meet LEED (Leadership in Energy and Environmental Design) certification, the nationally accepted benchmark of high performance, green buildings.

3-G Operational Contingencies

Description: Develop and implement operational contingencies for projected extreme weather conditions

Adaptive Capacity Indicator: Number of operational contingencies developed and incorporated into plans

Key Partners: TBD

Actions:

3-G-86 Review and update the Local Hazard Mitigation Plan every 5 years, which also helps receive state and federal grants.

3-G-87 Incorporate data and information from the United States Geological Survey, Center for Western Weather and Water Extremes, National Weather Service, and other credible sources to improve operational planning, emergency preparedness and response, and water deliveries.

3-H Climate Resilient Infrastructure and Operations

Description: Develop and implement adaptive management and processes, including monitoring, infrastructure planning, financing, and capacity building to maintain continuity of business.

Key Performance Indicator(s): Number of new adaptive management processes incorporated in existing business systems

Key Partners: TBD

Actions:

3-H-88 Develop a process or guidelines for routinely assessing climate vulnerabilities and risks, incorporating climate change into a clearly defined capital improvement program development, and determining the right investment mix to achieve climate adaptation and resilience targets.

3-H-89 Establish a climate monitoring and evaluation framework, as well as regular updates of climate adaptation and resilience planning that includes key climate indicators and progress toward desired outcomes; conduct climate adaptation analysis and planning for climate-informed financial and management decisions and program implementation.

3-H-90 Periodically educate and train San Bernardino Valley and key retail agencies' staff on adaptive water management approaches (e.g., Water Utility Climate Alliance (WUCA) Engagement, Training, and Best Practices); maintain awareness of best available science as new climate research, projections, and scenarios better constrain likely future climate risks.

3-H-91 Pursue more flexible and innovative financing strategies, including, but not limited to, Watershed Connect, WIFIA, Public-Public Partnerships, and Public-Private Partnerships just to mention a few to fund resilience projects.

3-H-92 Develop and use SBVMWD-wide information management systems and dashboards to track energy use/purchase and water deliveries.

3-H-93 Reform policies and programs that are maladaptive to climate change or that increase climate risks and vulnerabilities; develop and enhance tools that assess climate change impacts, and support climate adaptation planning and implementation.

3-H-94 Cultivate a culture of resilience throughout the organization by ensuring that planning and exercises are based on principles rather than processes; preparedness and resilience must become part of the DNA and be inclusive of everyone, from the staff all the way to the Board.

3-I Greenhouse Gas Reduction (Investments, Procurement and Supply Chain)

Description: Revise/update investment and purchasing policies and procedures to reduce the embedded carbon of purchased goods and services

Climate Mitigation Indicator: GHG Emissions associated with investments, procurement, and supply chain (tons CO_2e)

Key Partners: TBD

Actions:

3-I-95 Evaluate the District's Investment Policy and procurement practices to identify opportunities to increase sustainability and reduce GHG emissions without introducing undesired risk.

3-I-96 Consider updating procurement rules to prioritize vendors and contractors that can demonstrate progress in their own climate adaptation and resilience journey; explore a climate leadership preference similar to the Local Purchasing Preference (5 percent) under State law.

3-I-97 Maximize the procurement of sustainable products and services, including EnergyStar rated equipment; products that are bio-based, made from recycled content, water efficient, fuel-efficient, made with safer chemical ingredients, and non-ozone depleting; products that have earned third-party ecolabels and recommended by USEPA and avoid the procurement of products containing PFAS.

3-I-98 Set procurement specifications to quantify and reduce waste and emissions from procured goods and services (e.g., battery recycling, composting, comprehensive recycling program, electronics recycling, recycled and reusable service items).

3-J Greenhouse Gas Reduction (Carbon Sequestration and Carbon Neutrality)

Description: Neutralize emissions that cannot be reduced or eliminated

Climate Mitigation Indicator: Sequestered GHG Emissions (tons CO_2e)

Key Partners: TBD

Actions:

3-J-99 Develop a carbon neutrality hierarchy to SBVMWD projects and programs with Avoid being the highest priority followed by Reduce, Replace, Compensate/Offset; Neutralize/Remove should be the least used.

3-J-100 To achieve carbon neutrality by 2035, reduce emissions where feasible, sequester carbon from unavoidable emissions (such as essential flights), and when emissions are unavoidable (such as from construction), calculate the amount of emissions produced and then take appropriate actions to remove an equivalent or greater amount of carbon emissions from the atmosphere.

3-J-101 Develop and implement a Carbon Sequestration Plan to capture and store unavoidable carbon emissions through forest restoration, growing trees, or other forms of carbon capture that are directly controlled by SBVMWD or in active partnership; monitor and track the CO_2 captured; and consider developing a carbon offset program that can be sold to others.

3-K Greenhouse Gas Reduction (Buildings & Facilities)

Description: Phase out natural gas combustion at facilities to reduce natural gas use and associated GHG emissions by 50% before 2030

Climate Mitigation Indicator: GHG Emissions associated with natural gas use (tons CO_2e)

Key Partners: TBD

Actions:

3-K-102 Collect data on aging natural gas equipment due for replacement and identify operationally and financially viable electric alternatives.

3-K-103 Develop and establish guidelines for new HVAC equipment and appliances acquired by SBVMWD to be EnergyStar certification or have the highest level of efficiency available; guidelines should require any new building to be all-electric and use heat pumps for space and water heating.

3-K-104 Electrify equipment at the time of replacement to reduce natural gas consumption over time; if desirable, accelerate replacement before end of life by taking advantage of energy efficiency rebates, incentives, and financing.

3-L Greenhouse Gas Reduction (Energy Efficiency and Carbon Pollution-Free Electricity)

Description: Proactively reduce SBVMWD's electricity carbon footprint

Climate Mitigation Indicator: GHG Emissions associated with electricity use (tons CO_2e)

Key Partners: TBD

Actions:

3-L-105 Conduct an energy audit of SBVMWD's facilities and buildings and implement the findings/improvements especially for motors and pumps, lighting and lighting controls, and HVAC.

3-L-106 Consider offsetting grid power use by at least 25 percent by 2030 by installing solar power, energy storage (battery) system), and other renewable energy systems to lower carbon footprint, reduce fossil fuel use, and improve resilience to power outages.

3-L-107 Seek ways to pilot and accelerate promising carbon pollution-free electricity sources such as green hydrogen, fuel cells, and other innovative approaches.

3-M Greenhouse Gas Reduction (Light-Duty Vehicles)

Description: Reduce emissions associated with SBVMWD's light-duty fleet

Climate Mitigation Indicator: GHG Emissions associated with the light-duty fleet (tons CO_2e)

Key Partners: TBD

Actions:

3-M-108 Conduct a zero-emission vehicles assessment to determine which fleet vehicles can be converted to electric vehicles (EV) or alternative fuels, what chargers are required, and where they should be located.

3-M-109 Implement an "EV first" purchasing rule and fast-track the replacement of ICE vehicles. When vehicles are due for replacement, check for EV availability and purchase. If EV is not available, then buy the most environmentally-friendly option.

3-M-110 Install EV chargers, refueling infrastructure, energy storage technologies, and ancillary services to support zero-emission vehicles.

3-M-111 Expand the use of vehicle telematics and using fleet operational data to inform fleet planning and vehicle acquisition strategies; improve accounting and reporting of asset-level fleet data including fueling transactions, mileage, and acquisition and disposal costs.

3-N Greenhouse Gas Reduction (Heavy-Duty Vehicles and Construction)

Description: Reduce emissions from construction through decarbonization of construction machinery

Climate Mitigation Indicator: GHG Emissions associated with heavy-duty vehicles and construction equipment (tons CO_2e)

Key Partners: TBD

Actions:

3-N-112 Consider offsetting emissions from construction machinery by reducing embedded carbon through the use of low-carbon concrete and steel where feasible; consider preferences for such material in public works projects.

3-N-113 Improve collaboration with project partners to rethink design and construction processes to reduce emissions, minimize hauling and onsite waste, and tracking and reporting of construction-related emissions.

3-O Greenhouse Gas Reduction (Equipment and Tools)

Description: Replace gas-powered equipment with electrically powered equivalents

Climate Mitigation Indicator: GHG Emissions associated with equipment and tool fuel combustion (tons CO_2e)

Key Partners: TBD

Actions:

3-O-114 Create an inventory of gas-powered equipment including generators, pumps, landscaping equipment, etc.

3-O-115 Research appropriate electric and battery-powered replacements and develop a phased approach to replace (replacement schedule).

3-O-116 Implement a replacement program and explore applicable incentives from utility (e.g., SCE and SCG), regulatory (e.g. South Coast AQMD), state, and federal sources.

3-P Greenhouse Gas Reduction (Commuting and Business Travel)

Description: Reduce GHG emissions associated with commuting

Climate Mitigation Indicator: GHG Emissions associated with commuting (tons CO_2e)

Key Partners: TBD

Actions:

3-P-117 Evaluate the feasibility of workplace EV charging and install chargers if feasible; evaluate potential EV charging incentives.

3-P-118 Continue to encourage flexible working arrangement and virtual meetings where appropriate to reduce commute trips.

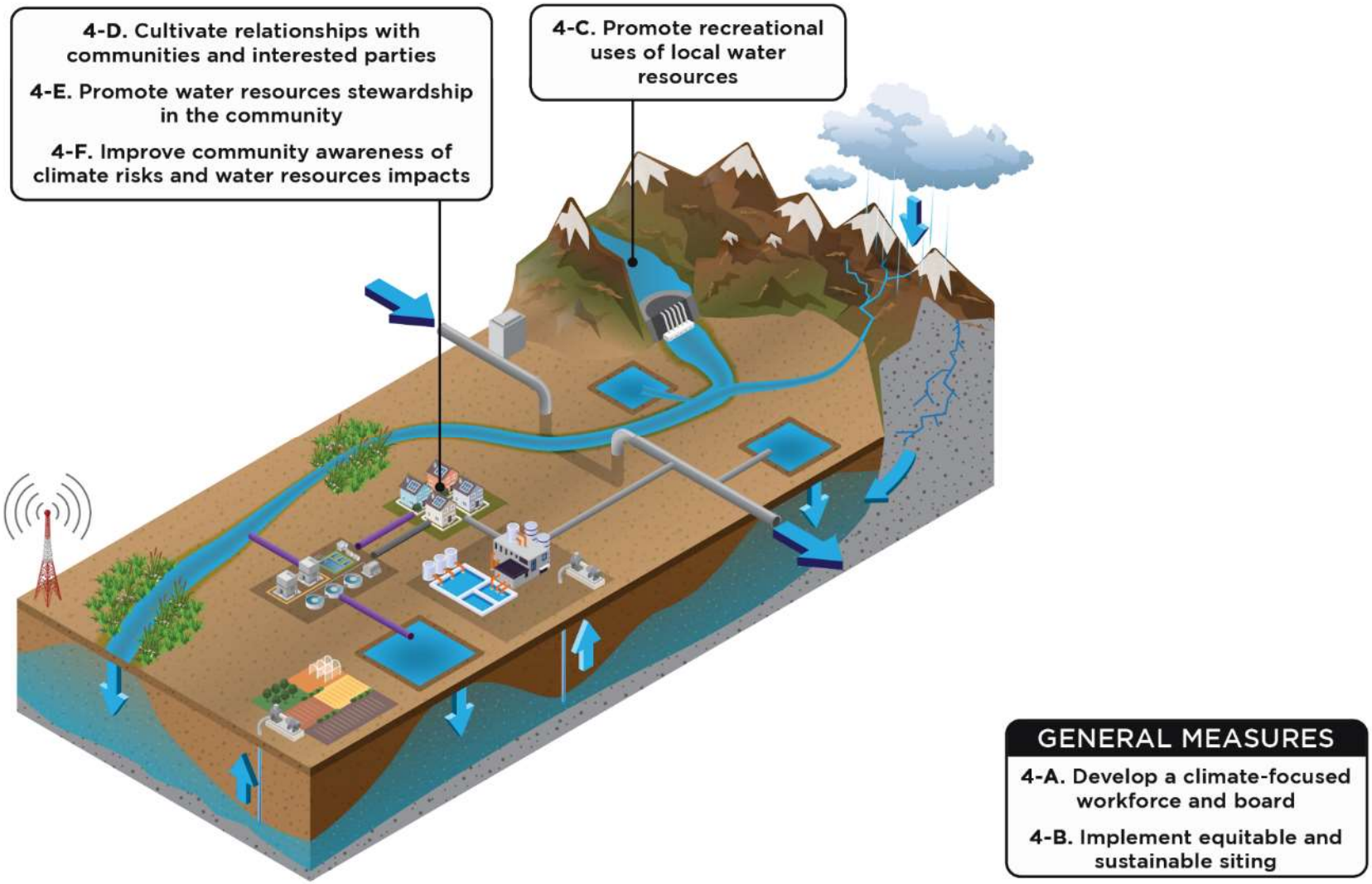
3-P-119 Increase awareness among Board members and staff on the impact of business travel, and update travel policy or guidelines to encourage low-carbon travel alternatives and sustainable practices where feasible (EV and hybrid car rentals, airlines with sustainable practices, eco-friendly hotel chains, rail and bus travel, and videoconferencing).

3-P-120 Improve accounting and reporting of business travel data, such as car rental miles, personal vehicles mileage reimbursement, air travel miles, etc., and their associated GHG emissions.

4. Connect People to Water and Climate

Figure 36 below depicts the CARP measures that support Guiding Principle 4: Connect People to Water and Climate. The diagram illustrates how measures support better connectivity between the services that SBVMWD provides and the communities it serves.

Figure 36 CARP Measures Supporting Guiding Principle 4: Connect People to Water and Climate



4-A Develop a Climate-Focused Workforce and Board

Description: Build internal capacity through engagement, education, and training on climate adaptation and resilience

Adaptive Capacity Indicator: Annual person-hours supporting implementation of the CARP

Key Partners: TBD

Actions:

4-A-121 Identify human resources requirements for effective implementation of climate adaptation and resilience goals and objectives so that SBVMWD has the necessary staff, training, and resources; develop workload/staff planning to implement the CARP.

4-A-122 Incorporate sustainability and climate resilience into staffing, engagement and training, performance, etc., to foster a culture of climate competency and action throughout SBVMWD.

4-A-123 Incorporate sustainability and climate resilience content in Board's ongoing leadership development efforts and decision-making.

4-B Equitable and Sustainable Siting

Description: Strategically plan to construct SBVMWD's future assets in a manner that will reduce GHG emissions and reduce climate hazard risks. Work with local agencies to encourage regional planning for economic growth that is equitable and sustainable.

Adaptive Capacity Indicator: Number of assets developed with adaptive design features and/or low/no carbon footprints

Key Partners: TBD

Actions:

4-B-124 Develop and adopt climate adaptive and resilient policies, principles or guidelines that will be used to evaluate future development in all areas vulnerable to changing climate impacts.

4-B-125 Develop and adopt green infrastructure policies to protect, restore and mimic the natural water cycle (tree planting, wetlands, and sustainable urban drainage systems) so that the most vulnerable communities will benefit as evaluated by climate-equity guidelines and priority criteria.

4-B-126 Create clear guidelines to promote sustainable location of SBVMWD facilities and strengthen the community benefits of SBVMWD facilities; the guidelines may address topics such as strategically locating future SBVMWD facilities to promote efficient use of local infrastructure.

4-C Public Access and Sustainable Events

Description: Partner with local agencies, nonprofits, and other interested parties to support public use of applicable SBVMWD assets, including recreational uses

Adaptive Management Indicator: Educational and public use statistics per year (number of visits)

Key Partners: TBD

Actions:

4-C-127 Identify educational and recreational uses of District's water resources and assets that could be impacted by climate change and consider new or improved programs to offset impact.

4-C-128 Establish guidelines so that all events hosted by SBVMWD are eco-friendly, sustainable, and creates minimal waste with consideration being given to sustainability practices in communication and marketing, waste management, food and beverage, decorations, giveaways, transportation, and energy saving opportunities.

4-D Cultural and Community Issues (Environmental Equity & Justice)

Description: Develop and maintain relationships with community groups and other interested parties so that SBVMWD is aware of community needs

Adaptive Management Indicator: Survey data indicating awareness and support

Key Partners: Community groups, US Water Alliance Water Equity Network, and The Climate Center

Actions:

4-D-129 Identify community groups and neighborhoods that are likely to be impacted by measures and actions at SBVMWD's infrastructure investments and take actions to collaborate with impacted community members.

4-D-130 Assign staff responsible for responding to community groups and engaging in a thoughtful and impactful way that reflects San Bernardino Valley's commitments to connecting people to water and climate.

4-D-131 Consider collaborating with national organizations or efforts developing approaches to enhance equity and inclusion in water resources planning and management (e.g., U.S. Water Alliance Water Equity Network, The Climate Center).

4-E Educate the community we serve on Watershed Sustainability

Description: Support and amplify programming and investments in water stewardship

Adaptive Management Indicators: Number of people reached through outreach efforts or survey data indicating improved knowledge.

Key Partners: Retail Agencies

Actions:

4-E-132 Leverage findings from the Ultimate Demand Study to understand which retail agencies could drive risk of heightened demand, and advance water efficiency through assisting retail agencies to implement the Making Conservation a California Way of Life efficiency standards.

4-E-133 Partner with retail agencies to design strategic/high-priority programming, education, and investment programs to manage demand and empower customers to become water stewards.

4-E-134 Promote holistic legislative and regulatory understanding of the water resources complexity in the face of climate resilience and adaptability through a system approach.

4-E-135 Implement a tailored funding program to fund customer-side solutions such as stormwater capture, water efficiency and conservation, and on-site reuse and recycled water investment.

4-F Community Climate Risk Reduction

Description: Invest in programs that help community groups understand climate risks and how to mitigate impacts at the local level with a focus on partnerships with organizations already engaged in this work

Adaptive Management Indicators: Number of programs implemented with support from SBVMWD staff or survey data indicating improved knowledge

Key Partners: Local community groups

Actions:

4-F-136 Identify staff at San Bernardino Valley responsible for sustained community engagement and accelerating progress through partnerships.

4-F-136 Implement regular engagement with local community groups undertaking climate risk reduction activities to identify activities and opportunities that could be effective broadly or replicated in other communities.

4-F-136 Identify areas where San Bernardino Valley could directly support, provide expertise, or foster formal discussions about new programming and investments that could reduce climate risks and enhance community resilience.

4-F-136 Establish best practices for inclusive community engagement as appropriate for the community we serve (e.g., Groundwork USA's Best Practices for Meaningful Community Engagement).

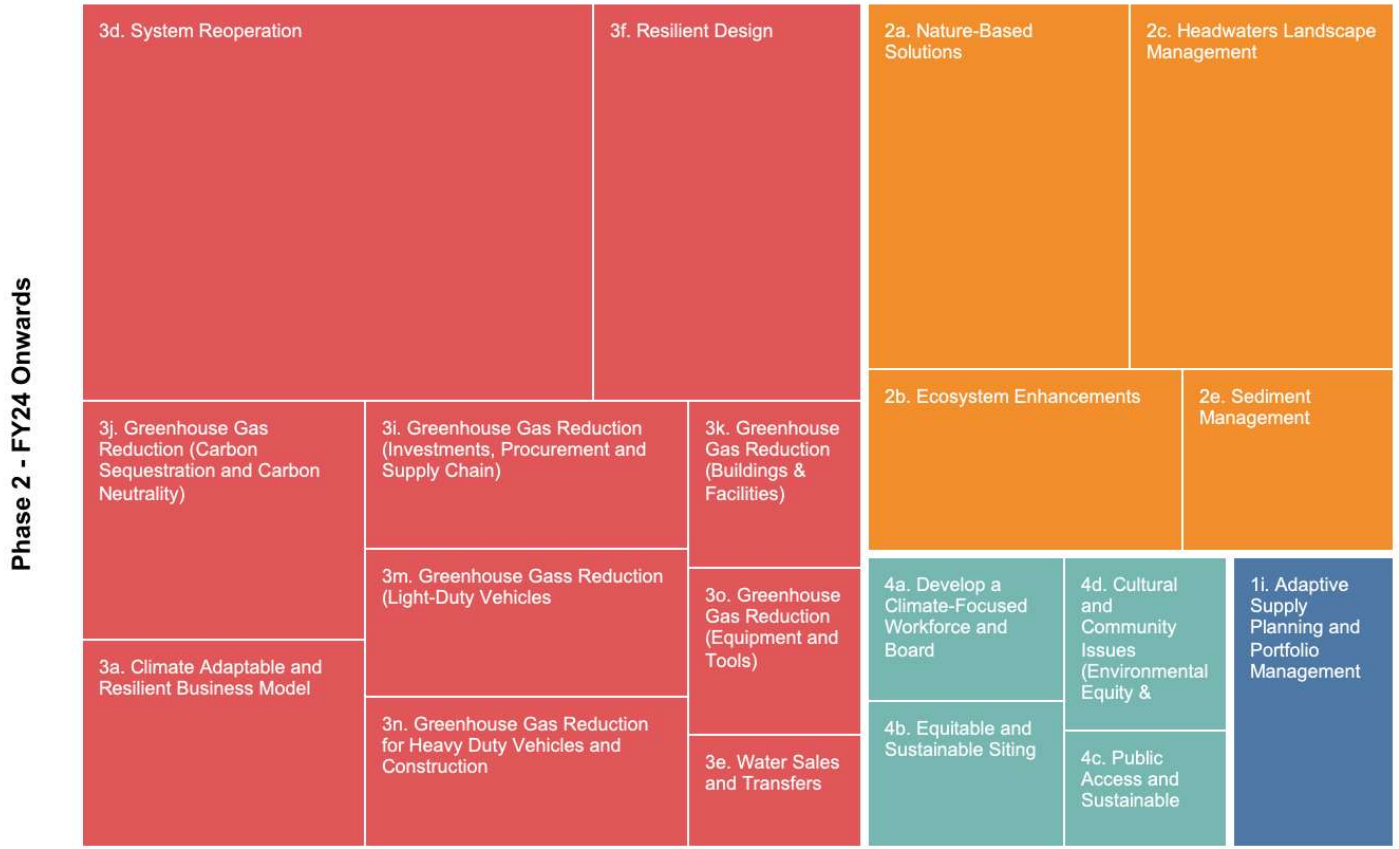
6. Phasing and Implementation

To effectively implement this plan, it is necessary to incorporate flexibility into its implementation as conditions change alongside a general phasing of planned measures to maintain continued progress. Section 5 identifies the planned measures and actions that support climate adaptation and mitigation for SBVMWD. Figure 37 and Figure 38 bring these together and show all planned measures separated into two proposed phases – Phase 1 which includes complete, ongoing, or already approved measures and Phase 2 which contains those measures planned to begin, from conceptualization or detailed planning to full implementation, in FY24 and beyond. The total size of all the boxes in each phase represents the relative approximate cost of the portfolio of measures, with the size of individual boxes indicating their cost relative to all other measures. As an example, 1e. Groundwater Storage is a relatively high-cost measure but one that is already in progress and addresses key water system vulnerabilities – namely, drought and extreme precipitation. Relatedly, most of the relatively higher cost measures are those related to securing and bolstering aspects of the water supply portfolio, a core mission of San Bernardino Valley.

Figure 37 Phase 1 Measures by Guiding Principle

Note: The size of all boxes for Phase 1 and Phase 2 depicts the relative anticipated costs of these portfolios. The size of individual boxes depicts their relative cost across all measures.

Figure 38 Phase 2 Measures by Guiding Principle



Note: The size of all boxes for Phase 1 and Phase 2 depicts the relative anticipated costs of these portfolios. The size of individual boxes depicts their relative cost across all measures.

Phase 1 measures are generally those related to SBVMWD's water supply portfolio, covering imported and local surface water, groundwater, recycled water, and precipitation enhancement. Operational and infrastructure resilience are also prioritized here, with a focus on climate resilience, operational redundancy and flexibility and greenhouse gas emissions mitigation efforts. Phase 2 expands this focus on adaptation and mitigation to include efforts related to resilient design, reservoir operations and multi-benefit projects, and a greater expansion of measures that mitigate greenhouse gas emissions. Importantly, both watershed protection and community engagement measures span across both phases, with a nearer-term focus on wildfire abatement and management, water quality management, water demand management and community education around climate risk.

Each measure will be implemented as a set of actions that contribute to the goals set forth by a given measure. For example, 1a. Surface Storage: Regional and Local includes a set of actions that build on one another – a master plan and feasibility study that evaluate local storage options followed by the design and construction of these storage options. This means that while a measure may begin in Phase 1, the implementation of actions within it may extend out further out into the future. Looking across planned actions, most actions related to assessing, studying or planning, such as assessing FIRO at Seven Oaks Dam, at anticipated to be implemented in Phase 1, meaning they have already begun or are already complete, or early in Phase 2. Actions related to monitoring, engagement, programming, and policy are generally spread across implementation horizons on an ongoing basis.

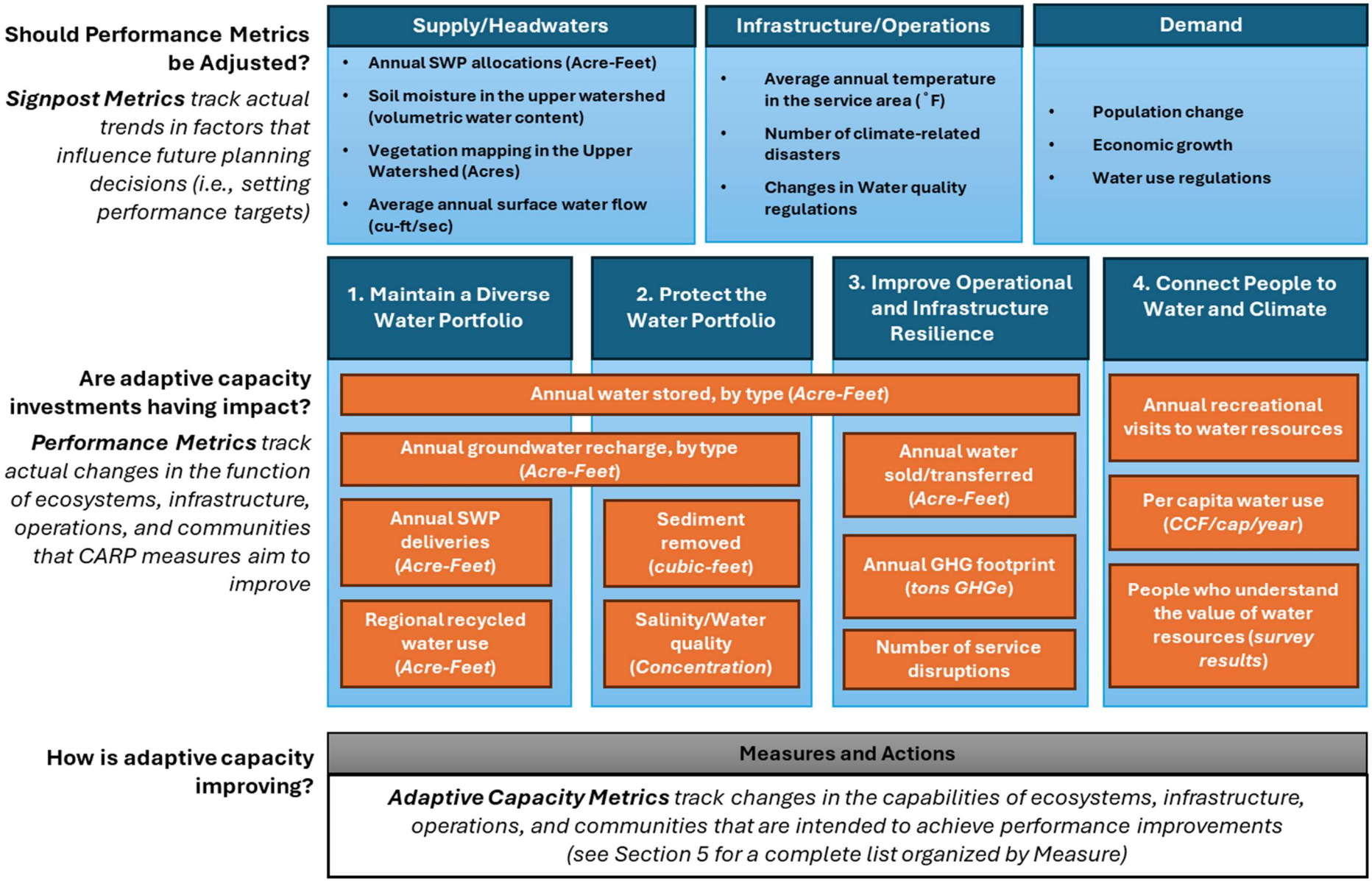
Adaptive Management

Adaptive management approaches seek to move from static plans to dynamic planning processes in which entities track metrics of consequence to their management decisions and adjust their decision-making over time. Adaptive management approaches have been increasingly used across California to respond to changing conditions due to climate change, human and ecological factors or other uncertainties present in a system during a given planning process. For San Bernardino Valley, the decision to adjust the phasing and implementation of measures or actions, potentially re-prioritizing them, could be triggered by a number of factors. These could include deeper droughts affecting water supply, more severe atmospheric rivers bringing the potential for local storage or contrastingly damaging the watershed's natural or built infrastructure, high rates of population growth or per capita water use, or many other climatic, demographic, and geographic variables that impact SBVMWD's short and long-term operations. From a management perspective, nearly all actions can be framed with an eye towards adaptive management.

This suggests that moving forward, San Bernardino Valley could utilize the metrics detailed in Figure 39 to set performance targets based on changing climate conditions, track both the performance of their investments over time, determine where performance is lower or higher than anticipated or where additional needs have emerged, and trigger the re-evaluation or implementation of additional actions or measures.

- **Signpost Metrics** describe factors that influence strategic planning decisions, such as if SWP allocations are trending downward or if local precipitation trends are changing. Signposts should be monitored and used to determine if SBVMWD should change its strategies and performance targets, such as changing its level of investment in local water resources or headwaters resilience. Signposts are intended to be reviewed on a five-year basis.
- **Performance Metrics** are intended to track changes in the function of water resources, infrastructure, operations, or demand. SBVMWD can use these metrics to evaluate the efficacy of its measures and actions. Performance measures are intended to be reviewed on an annual basis.
- **Adaptive Capacity Metrics** are intended to track the implementation of CARP Measures and Actions (see Section 5 for a complete list organized by Measure). Adaptive Capacity Metrics are intended to be reviewed on an annual basis to determine if implementation is taking place as expected.

Figure 39 Performance Metrics



San Bernardino Valley Municipal Water District

Draft Climate Adaptation and Resilience Plan

June 2024

Prepared by:

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380 East Vanderbilt Way
San Bernardino, California 92408

Prepared in Collaboration with:

RINCON CONSULTANTS, INC.
Environmental Scientists | Planners | Engineers

Note from the Board of Directors

[Board Statement to be included later]

Forward from the CEO/General Manager

Since 1954, San Bernardino Valley has been working towards a resilient water supply and has evolved into a holistic watershed agency working collaboratively with a multitude of partners on water and ecosystem solutions for the region's people and environment. Much like the natural systems of our service area, the agencies and the people within our watershed are integrally connected and we all contribute to solutions that will support a sustainable future for our people and our shared environment.

Climate change is altering climatic patterns in our service area and California. Changes in temperature, precipitation, and other climatic changes challenge San Bernardino Valley operations in numerous ways. Water supply reliability will be impacted by changes to local and imported water supplies. Extreme heat and precipitation events are likely to increase in frequency. Our service area may also experience more frequent and severe droughts, increased risk of catastropic wildfire in our headwaters, and increased threats to water quality. California's snowpack, a source of our imported water supply, is expected to decline or swing dramatically as a result of climate change. Increasing storm intensity will complicate flood protection and stormwater capture efforts. Local ecosystems and habitat investments may degrade in response to more intense droughts, drier and compacted soils, warmer water, and other possible climate change impacts. This may threaten the success of our water resilience, watershed stewardship, and habitat conservation efforts.

This Climate Adaptation and Resilience Plan (Plan) is our adaptive guide to delivering our mission in a changing climate. The Plan provides goals and strategies for San Bernardino Valley to be resilient to climate change impacts, reduce greenhouse gas emissions, and adapt operations to climate change. The Plan also proposes an ongoing, adaptive implementation to mainstream climate change actions in all San Bernardino Valley's functions and operations. Specific actions identifed in the Plan will be reviewed and approved by the San Bernardino Valley Board of Directors as part of the District's annual budget and future approval of District projects and programs.

OUR *mission* IS TO...

Work **collaboratively** to provide a **reliable** and **sustainable** water supply to support the changing needs of our region's **people** and **environment.**

San Bernardino Valley Municipal Water District was formed in 1954 as a regional agency to sustain long-range water supply for the San Bernardino Valley's people and environment. SBVMWD's service area covers about 353 square miles in southwestern San Bernardino County with a population of about 710,000 (2020 Census). Its service area spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, Mentone, Grand Terrace, and Yucaipa. SBVMWD is a wholesale water supplier, delivering water directly or indirectly to 15 retail water agencies that provide water to end users and works collaboratively with neighboring wholesale suppliers on shared supplies, conveyance, and other regional solutions. Like many other water agencies in Southern California, SBVMWD's service area relies on imported water from the State Water Project (SWP) to supplement its local water supply, which is primarily groundwater. *In all, more than 1 million residents of the Greater Riverside-San Bernardino area depend on the water resources within the San Bernardino Valley for their water.*

Table of Contents

Executive Summary

Rationale

Climate change is a global issue caused by the cumulative warming effects of greenhouse gas (GHG) emissions. Global temperatures have unequivocally risen in response to the increased levels of carbon dioxide and other GHGs in the atmosphere. Observations and research indicate that climate change has already made extreme events, including heat waves, drought, atmospheric river events, and wildfires, more likely, more intense, longer lasting, or larger in scale. Persistent drought conditions across the Western United States since 2000, coinciding with record warmth, have led to record low snowpack in the Sierras, causing severe water supply limitations statewide. In 2023, record to near-record precipitation occurred in many parts of California, highlighting the variability in weather patterns. Precipitation patterns are shifting as well, with more precipitation falling during severe events with longer dry spells between them. These shifts in climate and weather extremes can impact the natural resources, infrastructure, and operations of water providers throughout the state including San Bernardino Valler Water District (SBVMWD)

Recent local experiences with persistent drought conditions and aridification, extreme weather events, and weather whiplash have prompted SBVMWD to incorporate climate change considerations into its plans and programs. Shifts in climate and weather extremes are leading the District to consider changes in the way water resources, operations, and water conservation activities are managed. SBVMWD has witnessed and responded to impactful climate extremes in recent years, including precipitation extremes, wildfire events and extreme heat. These events have underscored the need to develop a long-term water supply strategy to protect the water supply from a climate-changed future. In recognition of this global reality, SBVMWD is working to strengthen water reliability and proactively address existing and future climate change impacts by developing this Climate Adaptation and Resilience Plan (CARP) consistent with the Priorities laid out in its Strategic Plan. The overarching goal of the CARP is to better equip SBVMWD with the strategies it needs to proactively manage the effects of climate change. The CARP is a planning-level document, aimed at providing proactive consideration of the risks from changing climate conditions to our water portfolio, assets, and many habitat, infrastructure, and water resource investments throughout the state. The plan will be used when deciding how to best mitigate those risks or adaptively manage in reaction to climate-related factors that may arise over the coming decades. The CARP serves as a programmatic policy and strategy document for addressing the undesirable impacts of climate change on the District and will identify targeted policies, programs, and projects that will both mitigate the District's contribution to GHGs and increase the District's adaptive capacity. By defining specific climate goals, measures, and actions, SBVMWD will track progress towards increased resilience, measure the success of its strategies, and adjust these approaches as new information becomes available.

By evaluating the associated risks and impacts, SBVMWD, affiliated water agencies and partners can proactively prepare, maintain, and invest in a manner that prevents greater costs stemming from unforeseen climate-related impacts. Despite the potentially high initial investment costs, the economic benefits of the CARP to water users and the local economy are intended to outweigh the associated expenditures. In the absence of action, SBVMWD and affiliated agencies are likely to be pushed to consistently repair impacted infrastructure, risking potential service interruptions or resorting to purchasing water from more costly alternative sources. With proactive planning in place, SBVMWD can focus on maximizing local water resources, thereby increasing the region's flexibility to leverage available imported water supply for reliability and other investment opportunities such as conjunctive use and sale of surplus water. This approach

Commented [AO1]: Another potential place to address aridification

Commented [CB2R1]: Addressed, putting the full description below in the drought section.

reduces vulnerability to drought and regulatory restrictions that curtail water deliveries from the SWP, while concurrently investing infrastructural dollars within the local/regional economy. This strategy effectively prepares for, protects the integrity of, and maintains SBVMWD's mission of working collaboratively to provide a reliable and sustainable water supply to support the changing needs of the region's people and environment.

~~To support this rationale within the Board's Investment Policy, the District's Investment Advisor will apply the Socially Responsible Investment ("SRI") Parameters excluding Fossil Fuel Industry/Subindustry Exclusions (1) Energy Services (2) Oil and Gas Producers (3) Refiners & Pipelines in future investments. If a previously purchased investment no longer satisfies the SRI Parameters set forth herein, the District may continue to hold that investment unless the District directs its Investment Advisor to sell that investment.~~

Key Climate Risks

The SBVMWD service area and its imported water supplies are expected to experience a wide variety of climate change impacts by the end of the century.

Drought duration and intensity is expected to increase in the future, limiting supply, increasing water demand and straining local groundwater resources and ecosystems.

Extreme heat events are projected to become more prevalent, which will lead to more frequent regional power disruptions, increased wildfire risk, increased evapotranspiration and higher water demand, and degraded ecosystems.

Wildfire events are expected to become more likely in the coming decades, which will increase the risk of damaged infrastructure, operational disruptions, power outages, and damaged ecosystems, particularly in the upper Santa Ana River Watershed.

Extreme precipitation and flood events are projected to become more likely, which will increase landslides, soil erosion and mudflow, and liquefaction risk in certain locations.

Climate impacts to the SWP, including wildfire, reduced snowpack, sea-level rise, and increased temperatures, may disrupt SWP operations and infrastructure and will increase the variability and risk of imported water deliveries.

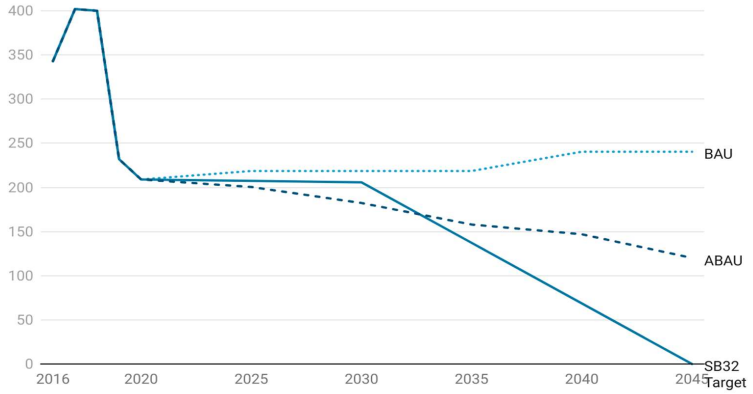
Landslides can be triggered by an increase in the number and severity of wildfire and heavy precipitation events that threatens assets and infrastructure situated on or near slopes, particularly at the hills and valley interface.

GHG Emissions Footprint

California has legislation committing the state on a path to carbon neutrality by 2045. The 2006 California Global Warming Solutions Act (Assembly Bill 32) established a near-term target to return GHG emissions to 1990 levels by 2020. California surpassed this target 4 years early in 2016. California's next climate target is set to reduce emissions by 40 percent below 1990 levels by 2030. Water districts like SBVMWD play a fundamental role supporting state climate change resilience and mitigation goals, particularly by contributing to reducing local GHG emissions. California's water sector accounts for 10 percent of the state's GHG emissions, which is largely related to the energy required to move water across the state.[1] Water agencies account for approximately 5 percent of California's electricity consumption.[2] However, water utilities are positioned to reduce their emissions dramatically, through the identification of energy efficiency opportunities and conversion to carbon free energy sources.

SBVMWD's GHG emissions fluctuate year to year depending on the source of water and the extent of water demand and services provided. SBVMWD's emissions are primarily driven by electricity consumption at offices and pump stations. Other major sources of emissions include employee commute and the vehicle fleet. SBVMWD exercises direct control over its GHG emissions-generating activities. For example, SBVMWD can exceed the state GHG reduction targets and make a major move towards neutrality simply by using 100% renewable power.

Figure 1 SBVMWD GHG Emissions Forecast and Targets



1 Hanak et al. 2018. California's Water: Energy and Water. https://www.ppic.org/wp-content/uploads/californias-water-energy-and-water-november-2018.pdf

2 Martinez-Morales et al., 2020. Water Sector Energy Efficiency Through an Integrated Energy Management System. California Energy Commission. https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-003.pdf

Resilience Strategy

SBVMWD's Strategic Plan recognizes that the long-term viability of the region's water supply must include the reduction of GHG emissions and adaptation to the impacts of climate change among other priorities. The CARPs strategy framework includes measures and actions that primarily support SBVMWD's adaptation and resilience strategic priorities, while also supporting other aspects of its strategic plan, including its core values. The CARP Framework is organized into four Guiding Principles (shown below) that support Strategy 1 (Achieve climate resilience through prioritized adaptation and mitigation) in the SBVMWD Strategic Plan. The CARP includes 37 measures, which it intends to implement in phases through 139 actions. Implementation of the CARP will be monitored and evaluated using Adaptive Capacity metrics which track the implementation of measures and actions; Performance metrics, which track the functional changes elicited by measures and actions; and Signpost metrics, which track the factors that influence future planning decisions that include setting performance targets. Together, the four Guiding Principles represent a holistic approach to increasing the District's resilience across its water sources, the ecosystems that its water resources rely on, its infrastructure and operations, and water use in the communities it serves.

Maintain a Diverse Water Portfolio: Diversity in the supply mix increases reliability and sustainability by minimizing overreliance on any one water source, and helping cope with increasing climatic extremes at the local or state scale. Measures supporting this guiding principle will result in increased recycled water production, stormwater capture, aquifer recharge and support hardening imported water infrastructure, piloting precipitation enhancement, and implementing adaptive planning and management.

Protect the Water Portfolio: Protecting the portfolio with sustainable management of existing supplies and natural resources will help maintain the District's investments and the benefits provided by our infrastructure and the natural environment thereby allowing SBVMWD to meet the needs of a changing and dynamic population of customers and the environment. Measures supporting this guiding principle will protect the water portfolio through conjunctive use planning, watershed conservation and restoration initiatives, sediment and water quality management, and strategic aquifer recharge.

Improve Operational and Infrastrcture Resilience: Strategic investments in crucial operations and infrastructure create reliability and continuity of service in an uncertain climate future prone to disruptions and assist in long-term regulatory compliance. Measures that support this guiding principle will improve operational and infrastructure resilience by creating redundant systems where necessary, increasing onsite renewable and backup power, developing operational contingencies for weather extremes, exploring water transfer options, reducing GHG emissions, and incorporating resilient design criteria in capital improvement projects.

Connect People to Water and Climate: Community members and groups that understand and engage with the complex water system and changing climate make essential allies in sustainable water management and regional climate resilience. Measures that support this guiding principle seek to engage and further connect communities to water and climate issues by leading public awareness campaigns and engagement programs, planning for equitable and sustainable growth, and supporting educational use of applicable District's facilities and resources.

How the Plan will be Used

to inform decisions of the current and future Boards on where to focus investments, partnerships, and initiatives to reduce climate risks to the District

Following the Board's adoption, San Bernardino Valley staff will develop an implementation program to coordinate the execution of prioritized CARP measures and actions. While the implementation program will evolve to reflect changing circumstances, it will have key elements such as finalizing and a performing a set of actions to achieve climate resilience, finalizing the success metrics for completed projects and actions, and having a clear system of progress reporting and outreach. The CARP as well as its accompanying implementation program will assist the District and partners in competing for state and federal climate resilience investments as well as ongoing stakeholder involvement. Furthermore, the implementation of the CARP will engage internal stakeholders extensively, as many of these actions align or overlap with other San Bernardino Valley's plans.

In addition to the measures and actions included in the Plan, the CARP provides an adaptive management process to plan for changes in climate projections and adjusting measures and actions based on real-world conditions. Real-world conditions and Board actions will ultimately inform the implementation process. Because projects often take years to plan and implement, there will be ample time to reassess decisions in the face of a changing climate and new assumptions to reduce the potential for overinvestment if a project is not ultimately needed and under preparedness if a project is needed.

To facilitate effective implementation, SBVMWD will implement CARP actions in four phases recognizing that flexibility is needed as conditions change and more information is collected about climate change and the efficacy of implemented actions:

Phase 1 represents measures and activities that are complete, ongoing, or already approved.

Phase 2A represents measures and activities that are planned to begin in FY24-25 through FY29-30.

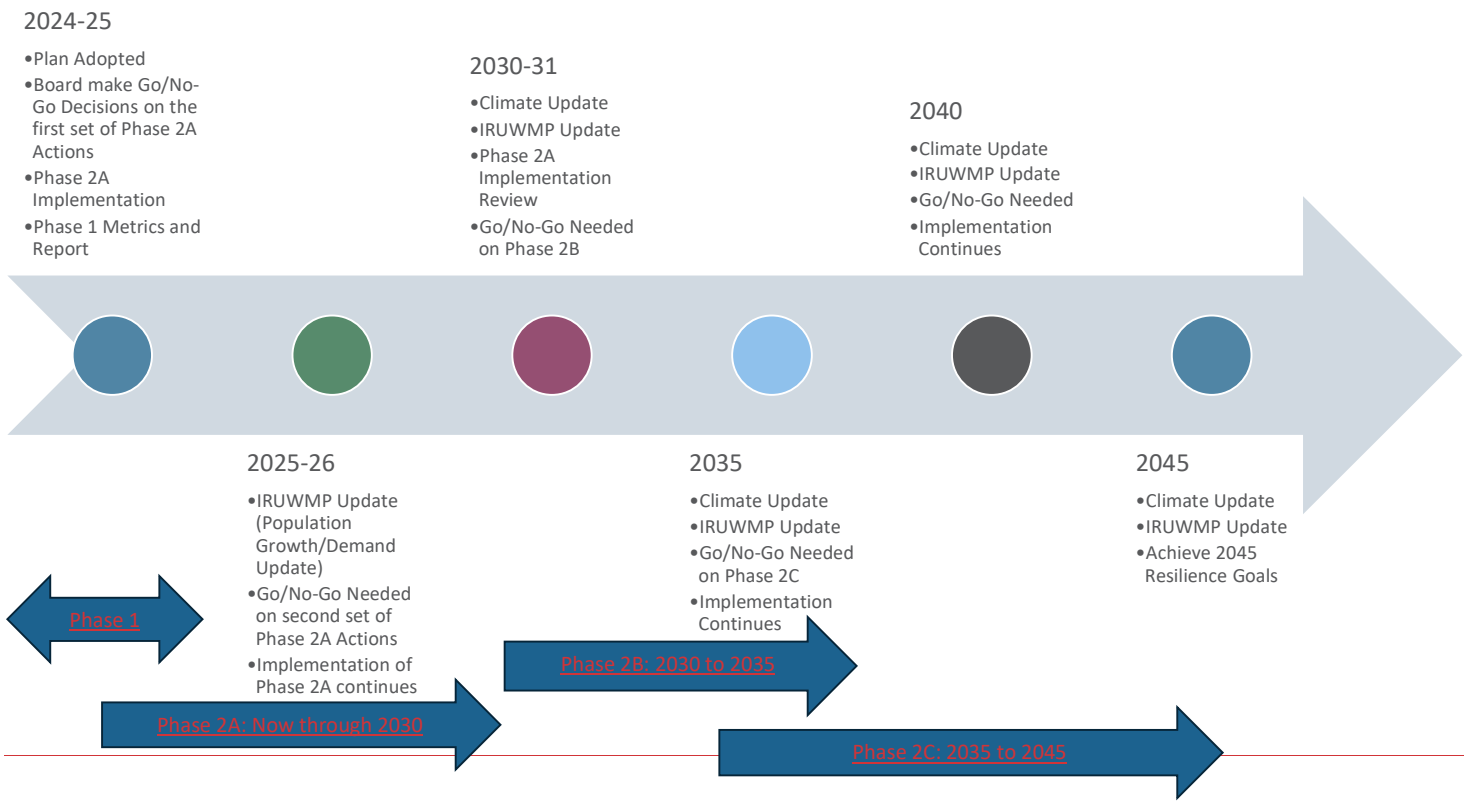
Phase 2B represents measures and activities that will take place between FY 30-31 and FY34-35.

Phase 2C represents measures and activities that will take place between FY35 and FY45 to help SBVMWD achieve 2045 goals.

Phase 1 activities are generally those related to SBVMWD's water supply portfolio, as well as operational and infrastructure resilience. Phase 2A expands the focus on climate adaptation and mitigation to include efforts related to resilient design, reservoir operations and multi-benefit projects, and a greater expansion of measures that mitigate GHG emissions. Importantly, both watershed protection and community engagement measures span across both phases, with a nearer-term focus on wildfire abatement and management, water quality management, water demand management and community education around climate risk. Phase 2B actions are those that are intended to build on Phase 1 and 2A investments. Phase 2C actions are those that are intended to enable SBVMWD to complete its 2045 goals.

Each measure will be implemented as a set of actions that contribute to the goals set forth by a given measure. Each of the 37 measures has actions that are intended to be implemented in Phase 1 and 2. This means that while a measure may begin in Phase 1, the implementation of actions within it may extend further into the future, including Phases 2B and 2C. Activities that need to be funded will be reviewed with the SBVMWD Board of Directors through the annual budget approval process or through separate items reviewed with the Board of Directors.

Below is an adaptive management graphic depicting the tentative phased implementation:


2024-25
•Plan Adopted
•Board make Go/No-Go Decisions on the first set of Phase 2A Actions
•Phase 2A Implementation
•Phase 1 Metrics and Report
2025-26
•IRUWMP Update (Population Growth/Demand Update)
•Go/No-Go Needed on second set of Phase 2A Actions
•Implementation of Phase 2A continues
2030-31
•Climate Update
•IRUWMP Update
•Phase 2A Implementation Review
•Go/No-Go Needed on Phase 2B
2035
•Climate Update
•IRUWMP Update
•Go/No-Go Needed on Phase 2C
•Implementation Continues
2040
•Climate Update
•IRUWMP Update
•Go/No-Go Needed
•Implementation Continues
2045
•Climate Update
•IRUWMP Update
•Achieve 2045 Resilience Goals
Phase 1
Phase 2A: Now through 2030
Phase 2B: 2030 to 2035
Phase 2C: 2035 to 2045

CARP Structure

The CARP is organized into six sections:

Section 1: Introduction – Discusses the policy and planning context to the CARP development and identifies SBVMWD's interests in prioritizing climate resilience.

Section 2: Roles and responsibilities – Details SBVMWD's role in the Santa Ana River Watershed and its core functions.

Section 3: Climate Risks – Identifies climate hazards and risks predicted by existing models and future scenarios, including extreme heat, fire, drought, aridification, and atmospheric river events.

Section 4: GHG Emissions Footprint – Assesses the districts operational GHG emissions in 2016, 2017, 2018, 2019, and 2020 and business as usual and adjusted forecast of GHG emissions for SBVMWD's operations, based on projected growth trends in water deliveries, operational changes, and known project activity over time.

Section 5: Resilience Strategies – Defines a range of solutions that will reduce vulnerabilities and mitigate GHG emissions that align with SBVMWD's principles of maintaining a diverse water portfolio, protecting existing supplies, improving flexibility, and connecting the SBVMWD community to its watershed.

Section 6: Implementation and Phasing – Establishes implementation phases and identifies key performance indicators for mitigation and adaptation solutions.

Glossary of Terms

A list of acronyms, abbreviations, and glossary terms used in the CARP.

A

AB – Assembly Bill

Actions – The discrete, measurable projects, programs, procedures, or partnership formations that carry out the implementation of a measure

Adaptation – The process of adjustment to actual or expected climate and its effects, either to minimize harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate.

Anthropogenic – Made by people or resulting from human activities.

Aridity – A condition of being dry or extremely dry.

Aridification - The process or condition of increasing aridity.

Atmosphere – The envelope of gases surrounding the earth. These gases include nitrogen (78.1 percent), oxygen (20.9 percent), and argon, helium, GHGs, ozone, and water vapor in trace amounts.

Atmospheric River – A are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. While atmospheric rivers can vary greatly in size and strength, the average atmospheric river carries an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. Exceptionally strong atmospheric rivers can transport up to 15 times that amount. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow.

B

BAU – Business-as-Usual Forecast. This forecast estimates emissions into the future if no additional actions are taken.

Biofuels – A renewable fuel source derived from biomass such as algae or animal waste.

BTAC – Basin Technical Advisory Committee

C

CARP – Climate Adaptation and Resilience Plan

CARB – California Air Resources Board

Carbon dioxide (CO_2) – A gas produced by burning organic compounds containing carbon and by respiration.

Carbon dioxide equivalent (CO_2e) – A metric measure used to directly compare emissions from various GHGs based on their global warming potential conversion factor.

Carbon footprint – The total emissions caused in a year by an individual, event, organization, or product, expressed in carbon dioxide equivalent.

Carbon Neutrality – Achieving a balance between emitting carbon and atmospheric carbon removal.

Cascading Impact – Climate hazard-caused impacts that compromise infrastructure or disrupt critical services (i.e., power supply or water conveyance) broadening the scope of impact past a singular subject to reliant subsystems and populations.

CEQA – California Environmental Quality Act

Climate – The usual condition of temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in an area of the earth's surface over a long period of time (typically 30 years or more).

Climate Change – A change in the average conditions – such as temperature and rainfall – in a region over a long period of time.

Climate Driver – An increase in the proportion of GHGs in the atmosphere is the primary human-caused driver source of change to the earth's climate.

Climate Hazard – A dangerous or potentially dangerous condition created by the effects of the local climate.

Co-benefit – The secondary benefits that occur due to implementation of a program, measure or policy.

Conjunctive Use – Coordinated use of surface water and groundwater to maximize sufficient yield.

CWS – California Water Strategy

D

Decarbonization – The reduction or removal of carbon dioxide.

DCP – Delta Conveyance Project

DWR – California Department of Water Resources

E

EF – Emissions Factor

EO – Executive Order

Electrification – The process of generating power from electricity, and in many contexts, the transition to such power from an earlier power source.

Emissions – The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

Emissions Scope – Scopes differentiate between GHG emissions from different sources that fall under varying levels of control of the emitting entity. Scope 1 emissions are direct GHG emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that indirectly impact its value chain.

EV(s) – Electric Vehicle(s)

EVWD – Eastern Valley Water District

Extreme Heat – periods that are much hotter than usual for the time and place where they happen. For California climate data this translates to temperatures above the 98th percentile of a baseline historical average.

F

FIRO – Forecast-informed reservoir operations

FEMA – Federal Emergency Management Agency

Fossil fuel – A general term for fuel formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust.

G

GCM – Global circulation models, representing physical processes in the atmosphere, ocean, cryosphere, and land surface, are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations.

GHG – A gas that absorbs infrared radiation, traps heat in the atmosphere, and contributes to the greenhouse effect.

Global Warming – the phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries.

Greenhouse Effect – A process that occurs when gases in Earth's atmosphere traps the Sun's heat.

GWP – Global Warming Potential – total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.

H

HCP – Habitat conservation plan

HVAC – Heating, ventilation, and air conditioning

I

Impact – Effects on natural and human systems including effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate hazards and the vulnerabilities of the system or asset effected.

IPCC – United Nations Intergovernmental Panel on Climate Change – prepares comprehensive Assessment Reports about the stat of scientific, technical and socio-eco nomic knowledge on climate change, its impact and future risks, and options for reducing the rate at which climate change is taking place.

IRUWMP – Integrated regional urban water management plan

J

K

L

LED – Light-emitting diode

M

Measures – A specific statement that guides decision-making. It indicates the commitment of the organization to a particular course of action. A measure is based on and helps implement a plan's vision and principles and is carried out by implementation actions.

Methane (CH_4) – A hydrocarbon that is a GHG that is produced through anaerobic (without oxygen) decomposition of waste in landfills, wastewater treatment plants, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

MT – Metric Ton, a common international measurement for the quantity of GHG emissions – 1 metric ton is equal to 2,204.6 pounds or 1.1 short tons.

MT CO_2e – Metric tons of carbon dioxide equivalent is the standard units to measure GHG emissions.

MWD – The Metropolitan Water District of Southern California

N

Nitrous oxide (N_2O) – A powerful GHG with a high global warming potential; major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

O

Offroad Equipment – Any non-stationary device powered by an internal combustion engine or electric motor used primarily off roadways such as agricultural, landscaping or construction equipment.

OPR – California Governor's Office of Planning and Research

One Water – is the emphasis that all water has value, encouraging those in the water industry to work together to solve water challenges, whether these challenges encompass storm water, residential water, commercial water, industrial water, municipal water, wastewater, drinking water, etc. The One Water Movement takes a planning and implementation approach to managing finite water resources for long-term resilience and reliability in order to meet both community and ecosystem needs. The definition of One Water itself varies somewhat depending on the needs of the community in question.

P

PERC – Program for Enhanced Recharge Capability

PFAS – Per- and polyfluoroalkyl substances, a class of widely used, long lasting chemicals, components of which break down very slowly over time. PFAS are found in water, air, fish, and soil at locations across the nation and the globe. Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals.

PSPS – Power Safety Power Shutoffs

Pumpers – Individual well operators

PV – Photovoltaic (solar energy)

Q

R

Renewable Diesel – Direct substitute for diesel fuel refined from lower carbon and renewable source material.

RCP – Representative Concentration Pathway

Resilience – The capacity of an entity (an individual a community, an organization, or a natural system) to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.

S

Santa Ana RWQCB – Santa Ana Regional Water Quality Control Board

SARCCUP – Santa Ana River Conservation and Conjunctive Use Program

SAWPA – Santa Ana Watershed Project Authority

SB – Senate Bill

SBVMWD – San Bernardino Valley Municipal Water District

SCAQMD – South Coast Air Quality Management District

SCE – Southern California Edison

SCG – The Southern California Gas Company

Scope – Categorization of GHG-generating activities based on the level of the entity's operational control of the source.

Service population – Residents receiving services.

SGPWA – San Georgino Pass Water Agency

SWC – State Water Contractors

SWP – State Water Project

T

U

USACE – U.S. Army Corps of Engineers

USEPA – United States Environmental Protection Agency

USGS – United States Geological Survey

UWMP – Urban Water Management Plan

V

VMT – Vehicle Miles Traveled

Vulnerability – The propensity or predisposition to be adversely affected.

W

WBCSD – World Business Council for Sustainable Development

WIFIA – Water Infrastructure Finance and Innovation Act

WMWD – Western Municipal Water District

Y

YVWD – Yucaipa Valley Water District

Z

ZEV – Zero-emission vehicle

1. Introduction

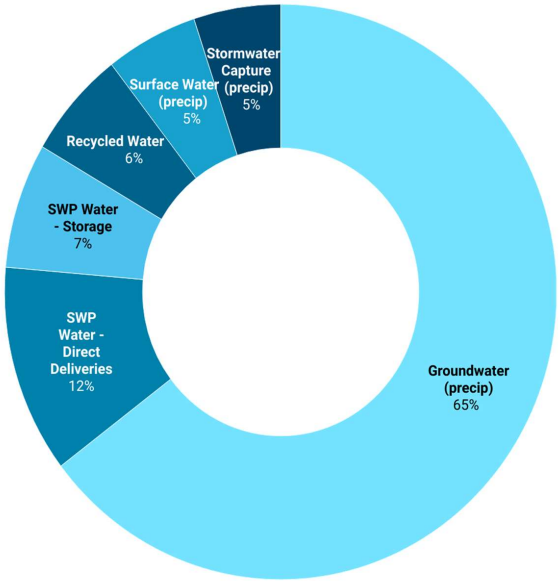
Southern California faces significant challenges in maintaining a reliable water supply due to its arid climate and rapidly growing population. The region relies on a complex network of water resources and infrastructure to meet its needs. SBVMWD was formed in 1954 as a regional agency to sustain long-range water supply for the San Bernardino Valley's people and environment. SBVMWD's service area covers about 353 square miles in southwestern San Bernardino County with a population of about 710,000 per the 2020 Census. Its service area spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, East Highland, Mentone, Grand Terrace, and Yucaipa. See Figure 2 for the location of the SBVMWD service area in California. Water resources from the San Bernardino Valley are also vital to the people and environment downstream of the service area, especially for communities such as the City of Riverside.

Regional collaboration is critically important in the Santa Ana River Watershed because of its surface and groundwater resources, and the role of imported water. SBVMWD leads and participates in several regional partnerships that protect and enhance local ecosystems and develop infrastructure that supports the region's water needs. SBVMWD is one of five (5) members of the Santa Ana Watershed Project Authority (SAWPA), which serves as a platform for promoting inter-agency understanding, addressing regional water issues, and supporting the development of long-term integrated water resource planning through multi-agency agreements and partnerships within the Watershed.

Figure 2 SBVMWD Service Area in California

SBVMWD is responsible for ensuring the sustainable use and recharge of the local groundwater basins in its service area. Sustainable management of groundwater resources is crucial to meeting the region's water demands while addressing long-term water security and resilience challenges (See Figure 3). In addition to the 710,000 people within the SBVMWD service area, over 300,000 people in Riverside County located outside of the SBVMWD service boundary rely on groundwater pumped from the San Bernardino Valley. Accounting for water users outside of the SBVMWD service boundary, an estimated one million people rely on SBVMWD's services and stewardship of the region's water resources. SBVMWD also provides leadership in supporting the improved health and function of the region's forest headwaters and endangered species habitats, which are critical to its water supply. SBVMWD also supports a wide range of water conservation measures and programs to maximize regional water use efficiency.

Figure 3 Regional Water Supply



Groundwater storage has declined in recent decades due to recurring instances of below average precipitation. Like many other water agencies in Southern California, SBVMWD is contracted to deliver imported water from the State Water Project (SWP) to supplement the region's local water supplies and maintain groundwater levels. The SWP delivers water from Northern California to water agencies across Southern California through a system of aqueducts and reservoirs. SBVMWD imports water into its service area primarily for recharging groundwater but also for direct use at water treatment or filtration plants operated by retail agencies.

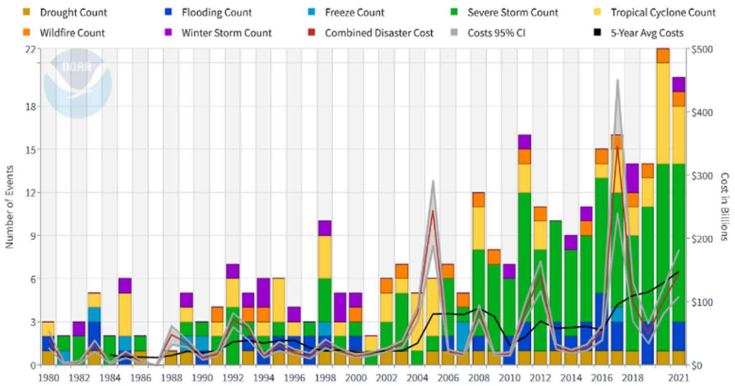
SBVMWD obtains water from the SWP through the East Branch of the State Aqueduct via Lake Silverwood. While SBVMWD's State Contract Entitlement is 102,600 acre-feet of water from the SWP per year, the amount of water actually available (allocated) each year varies as a result of climatic conditions throughout the state. While the SWP is the SBVMWD's primary source of supplemental water, SBVMWD also works to secure additional sources of water. For example, it secured two water rights permits along with Western Municipal Water District from the State Water Resources Control Board (SWRCB) in 2009 to divert water from the Santa Ana River. In recent years, SBVMWD has also invested in a regional recycled water pipeline, recharge basins to percolate recycled water (a drought proof supply) and provided financial incentives to make recycled water investments cost-effective within the region.

Rationale

Climate change is a global issue caused by the cumulative warming effects of GHG emissions. Global temperatures have unequivocally risen in response to the increased levels of carbon dioxide (CO_2) and other GHGs.[3] Observations and research indicate that climate change has already made extreme events, including heat waves, drought, atmospheric river events, and wildfires, more likely, more intense, longer-lasting, or larger in scale.[4] Climate change is a key contributing factor to the increase in the number of billion-dollar climate events across the United States (see Figure 4), particularly severe storm events and extended drought. Climate models indicate that extreme climate events, and the risks that climate change poses to SBVMWD water supply, infrastructure, and supported water uses will continue to intensify in the coming decades.

Governments, agencies, and private businesses across the globe are acting to mitigate GHG emissions and adapt to climate change to reduce and avoid the most catastrophic effects of climate change. Recent local experiences with persistent drought conditions, aridification, extreme weather events, and weather whiplash have prompted SBVMWD to incorporate climate change considerations into plans and programs. Persistent drought conditions across the Western U.S. since 2000, coinciding with record warmth, have led to record low snowpack in the Sierras, causing severe water supply limitations statewide. Precipitation patterns are shifting as well. More precipitation is expected from more severe events with longer dry spells between them. For example, California received historic rainfall in 2023 despite experiencing severe to exceptional drought conditions in 15 of the past 22 years.

Figure 4 U.S. Billion-Dollar Disaster Events 1980-2021



https://www.climate.gov/news-features/blogs/beyond-data/2021-us-billion-dollar-weather-and-climate-disasters-historical

Shifts in weather extremes can lead to the increased importance of imported water from other parts of the state or more expensive sources such as water recycling. It can also result in state legislative and regulatory interventions mandating water efficiency measures that are less effective than other available measures, lack a sufficient benefit relative to the cost, or have significant adverse impacts. All of these changes potentially impact the area's resilience to drought. The availability of imported water is also influenced by increased variability and (wet and dry) weather extremes. The variability of SWP deliveries has increased while average annual deliveries have decreased in recent decades. In the last ten years annual

Deleted: and ineffective

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Deleted: ensuing largely from state legislative and regulatory interventions

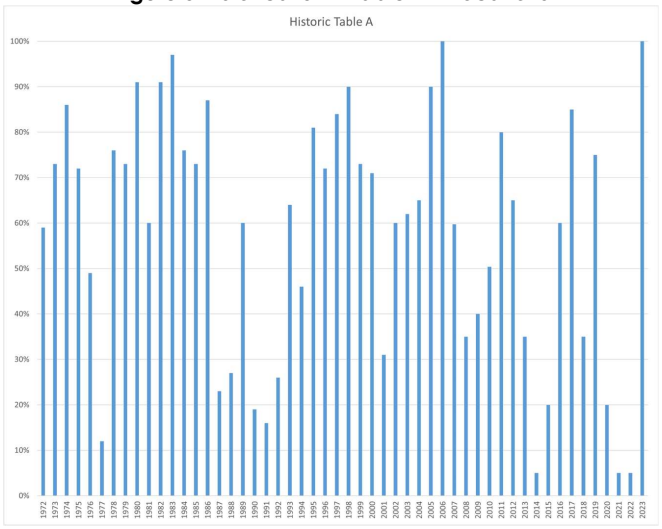
[3] United States Global Change Research Program. 2023: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023

[4] National Oceanic and Atmospheric Administration. 2020. What is an extreme event? Is there evidence that global warming has caused or contributed to any extreme event? Climate.gov. Retrieved Month Day, Year, from https://www.climate.gov/news-features/climate-qa/what-extreme-event-there-evidence-global-warming-has-caused-or-contributed

deliveries have ranged between 5% and 100% of the District's Annual Table A allocation (see Figure 5).[5]

Adaptive management can enhance regional response to water-related climate extremes in various ways.[6] By consolidating timely and accurate information on climate patterns, proactive measures can be taken to ensure that gaps undesirable impacts are prevented. Through continuous assessment and adjustment of strategies based on changing climate conditions, resources are more efficiently allocated, communities are better prepared for extremes, and resilience principles can more effectively be incorporated throughout the District's operations, assets, and practices. SBVMWD has witnessed and responded to impactful climate extremes in recent years, including precipitation extremes, wildfire events, and extreme heat. These events underscore the need for SBVMWD to build long-term water supply plans for a climate-changed future. In recognition of this global reality, SBVMWD has embarked on a journey toward sustainability, preparedness, and innovation through the formulation of a comprehensive CARP consistent with its Strategic Plan.

Figure 5 Historical SWP Table A Allocations



SWP Historical Table A Allocations, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Management/SWP-Water-Contractors/Files/Historical-SWP-allocations-1996-2024-022124.pdf

[5] California Department of Water Resources. 2022. The State Water Project Final Delivery Capability Report 2021. https://www.yourscvwater.com/sites/default/files/SCVWA/your-water/watershed-planning/water-supply-assessments/State-Water-Project_2021-Final-Delivery-Capability-Report_Sept2022.pdf

6 Climate-Safe Infrastructure Working Group to the California State Legislature and the Strategic Growth Council. 2018. Paying it Forward: The Path Toward Climate-Safe Infrastructure in California. https://resources.ca.gov/CNRALegacyFiles/docs/climate/ab2800/AB2800_Climate-SafeInfrastructure_FinalWithAppendices.pdf

SBVMWD takes an integrated and cost-effective (One Water) approach to water resources management, which incorporates multiple types of water resources (e.g. surface water, groundwater, imported surface water, new stormwater capture for recharge and potentially direct delivery, and recycled water), stewardship (e.g. habitat conservation, improved water quality, and enhanced ecosystem health), and demand management (see Figure 6).

By building off existing efforts, the CARP lays the groundwork for long-term coordinated partnerships, consistency, and continuity in planning efforts, aligned policy incentives and data continuity across public, private, and nonprofit sectors in the SBVMWD region (Appendix A). Key SBVMWD studies and plans integrated into this CARP include the 2020 Upper Santa Ana River Watershed Integrated Regional Urban Water Management Plan (2020 IRUWMP), and Water Demand and Supply Studies conducted by RAND, and the Santa Ana Watershed Project Authority's One Water One Watershed Plan. The 2020 IRUWMP serves as a roadmap for regional water resource planning and incorporates climate change into the water demand projections. The SAWPA's One Water One Watershed Plan outlines several objectives related to management of the Santa Ana River watershed such as achieving resilient water resources through innovation and optimization. [7]

Figure 6 One Water Concept

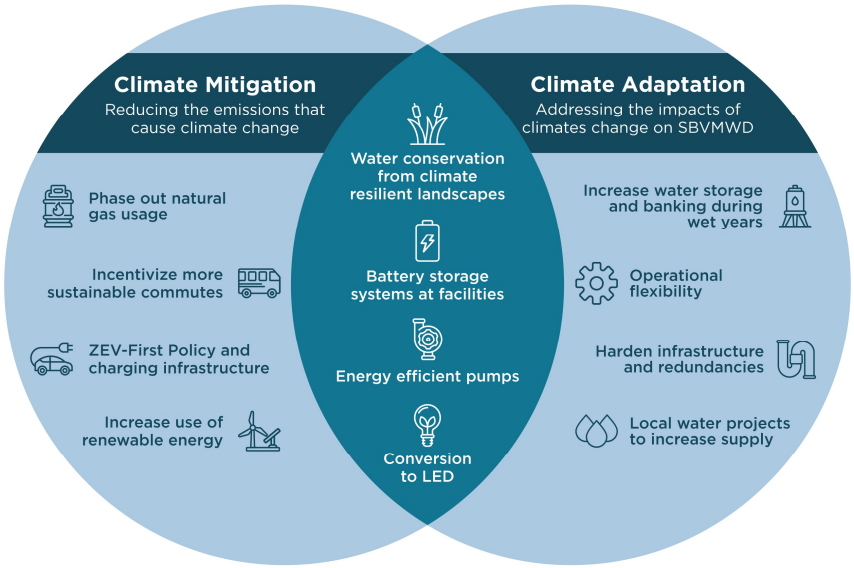
Kennedy Jenks, https://www.kennedyjenks.com/2019/06/05/integrated-one-water-management/

7 https://www.sawpa.org/wp-content/uploads/2019/02/OWOW-Plan-Update-2018-1.pdf

SBVMWD also provides regional leadership in supporting the resilience of local water supplies. The Upper Santa Ana River Watershed forest and riverine ecosystems play an essential role in supplying, cleansing, and protecting local water resources. SBVMWD is one of 12 partners on the Upper Santa Ana River Habitat Conservation Plan (HCP). The HCP will specify how species and their habitats will be protected and managed in the future and will streamline the permitting required by the water resource agencies under the federal and State-endangered species acts to maintain, operate, and improve regional water resources infrastructure. SBVMWD is also leading the Headwaters Resiliency Partnership, which will identify innovative ways to fund proactive investments in the long-term health of the San Bernardino National Forest which supports local water resources within the Upper Santa Ana River Watershed.

Responding to climate change requires a two-pronged approach: 1) reducing or "mitigating" the levels of GHG emissions released into the atmosphere to reduce the effects of climate change and 2) adjusting or "adapting" to the changes that have already taken or will continue to take place. In an ideal scenario, strategies are developed that do both, which is the most efficient way to proceed, as shown in Figure 7.

Figure 7 Climate Mitigation versus Adaptation



The CARP supports State adaptation goals associated with the California Water Strategy (CWS), the California Water Resilience Portfolio, and the California Climate Adaptation Strategy. [8,9] The CARP also advances State GHG mitigation goals as defined in California's 2022 Scoping Plan for Achieving Carbon Neutrality, Assembly Bill (AB) 32, and Senate Bill (SB) 1279.[10]

8 California Natural Resources Agency.2022. *California Water Supply Strategy.* https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/CA-Water-Supply-Strategy.pdf

9 California Department of Water Resources. California Water Resilience Portfolio. 2020. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/Final_California-Water-Resilience-Portfolio-2020_ADA3_v2_ay11-opt.pdf

10 California Air Resources Board. 2022. 2022 Scoping Plan, Local Measures. https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-d-local-actions.pdf

Purpose

SBVMWD is working to strengthen water reliability and proactively address existing and future climate change impacts by developing a CARP. The overarching goal of the CARP is to prepare SBVMWD's water management, including operations, natural resources, infrastructure, and community, for the effects of climate change.

The CARP serves as a programmatic roadmap to increase resilience and reduce contributions to climate change. By defining specific climate goals, measures, and actions, SBVMWD will track progress towards increased resilience, measure the success of its strategies, and adjust these approaches as new information becomes available. The measures and actions will be implemented using a phased approach.

SBVMWD is committed to developing new data-driven measures and strategies, leveraging emerging technologies and products, and updating its CARP on an ongoing basis to meaningfully adapt to emerging climate threats and maintain progress. For additional detail on the phased approach to the measures and actions, as well as the development of new strategies and measures in the future, please refer to the Phasing and Implementation section.

The CARP supports SBVMWD's Strategic Plan and aligns with the State Water Resilience Portfolio through the CARP's four Guiding Principles:

1. **Maintain a Diverse Water Portfolio** through recycled water production, stormwater capture, aquifer recharge and strategic water imports to provide multiple-benefit resilience outcomes for the regional water supply. By relying on a diversified mix of imported and local water sources, SBVMWD can help the region better cope with future climate extremes as they occur at a local and statewide scale. Diversification additionally provides a more reliable and sustainable water supply, particularly in the Southern California region that is prone to water supply volatility and relies on imported water.

2. **Protect the Water Portfolio** through conjunctive use planning, watershed restoration initiatives and strategic aquifer recharge. Sustainable management of existing supplies and natural resources will help maintain SBVMWD's investments and the benefits provided by our infrastructure and the natural environment, allowing SBVMWD to meet the needs of a changing and dynamic population of customers and the environment.

3. **Improve Operational and Infrastructure Resilience** by making strategic investments in crucial operations and infrastructure to create reliability and continuity of service and assist in long-term regulatory compliance. By creating redundant systems where necessary, exploring water transfer options, and incorporating resilient design criteria in capital improvement projects, SBVMWD is setting itself up for providing reliable service in an uncertain climate future prone to disruptions. Prioritizing resilience in operations and infrastructure, while requiring initial investments up front, will prevent more extensive and expensive damages that might occur in vulnerable or outdated systems.

4. **Connect People and Water to Climate** so that the community SBVMWD serves understands and engages meaningfully with the complex water systems that sustains it and the changing climate that affects water resources and the environment. By leading public awareness campaigns and engagement programs and supporting healthy use of the region's natural resources, SBVMWD will embrace community members and groups as allies in sustainable water management and regional climate resilience.

Methodology

The CARP was developed with cross-departmental and partner agency input and with support from the SBVMWD Board of Directors. The process was consistent with State plans and guidance, including the Office of Planning and Research, Intergovernmental Panel on Climate Change Assessment Report 5 (IPCC AR5), California Adaptation Planning Guide, California Water Resilience Portfolio, California Water Plan, and California's Fourth Climate Assessment. The engagement process, guided by an engagement plan and communications strategy, included online workshops for interested parties and several workshops for SBVMWD's Climate Resilience Committee and the Board of Directors. The goal of this process was to collaboratively form an actionable CARP that best fits the needs of the service area. Through a collaborative approach, SBVMWD staff and community members were meaningfully engaged and provided tangible feedback and support for regional climate action and resilience planning. This approach leveraged existing relationships and outreach networks at SBVMWD, to develop and implement a plan that is innovative, insightful, equitable and authentic. The development of the CARP included the following steps.

Step 1: A comprehensive literature review, which catalogued existing local planning efforts, initiatives and gaps related to climate change planning and implementation (Appendix A).

Step 2: A climate vulnerability assessment that identified climate vulnerabilities to SBVMWD infrastructure and operations under four future climate change scenarios (Appendix B). Natural hazards that are not impacted by climate change, such as earthquakes, have not been included in the climate vulnerability assessment or this plan. Climate change impacts on earthquakes are currently unknown. Though research has shown that relatively small stress changes can affect microseismicity, there is no evidence that climate processes could trigger a large earthquake.[11] However, impacts from earthquakes in addition to climate change can cause compounding risks to water supply which are addressed in the District's Local Hazard Mitigation Plan (Action 3-G-86). For example, landslides triggered by earthquakes could be more extensive due to more moisture in slopes from extreme precipitation, thereby increasing the potential scale of damage to water infrastructure.

Step 3: A GHG inventory and GHG forecast for SBVMWD's various assets and operations. The GHG inventory was in accordance with established GHG accounting protocols and state and includes Scope 1, 2, and 3 emission sources (Appendix C).

Step 4: A resilience strategy development process that articulates guiding principles, tangible measures, and actions for increasing resilience.

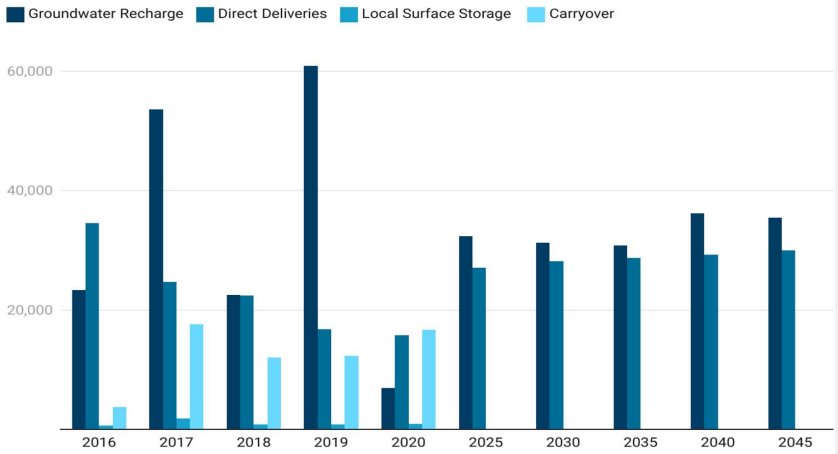
Step 5: A phased implementation strategy designed to articulate the priorities, specific opportunities, and various considerations associated with CARP measures and strategies, in addition to a timeframe for implementation.

11 The National Aeronautics and Space Administration. 2019. Can Climate Affect Earthquakes, or are the Connections Shaky? https://science.nasa.gov/earth/climate-change/can-climate-affect-earthquakes-or-are-the-connections-shaky/

2. Responsibilities

SBVMWD supports long-range water supply management for the San Bernardino Valley and Upper Santa Ana River Watershed alongside dozens of water districts, mutual water companies, flood control districts, and other local water management agencies (see Figure 8). SBVMWD is responsible for groundwater management within their jurisdictional boundaries on behalf of the groundwater producers, in collaboration with WMWD. Under the 1969 legal settlement (which resolved the disputes on the sharing of the water resources), SBVMWD supports the administration of specific regional groundwater management objectives resulting from the Orange County Judgment (Santa Ana River flow obligations) and the Western-San Bernardino Judgment (physical solution to meet surface and groundwater requirements). The Orange County Judgment requires a specific amount of baseflow in the Santa Ana River to Orange County while the Western Judgment provides a tracking and sustainability framework for surface water and groundwater in the San Bernardino Basin Area. If the court-specified conditions are not met by the natural water supply, then supplemental water can be used to offset the deficiency.

Figure 8 Water Use Trends (2016-2019) and Projections (2025-2045)



Data source: 2020 IRWMP - Table 5-4 Regional Water Budget Summary for a Normal Year (AFY)

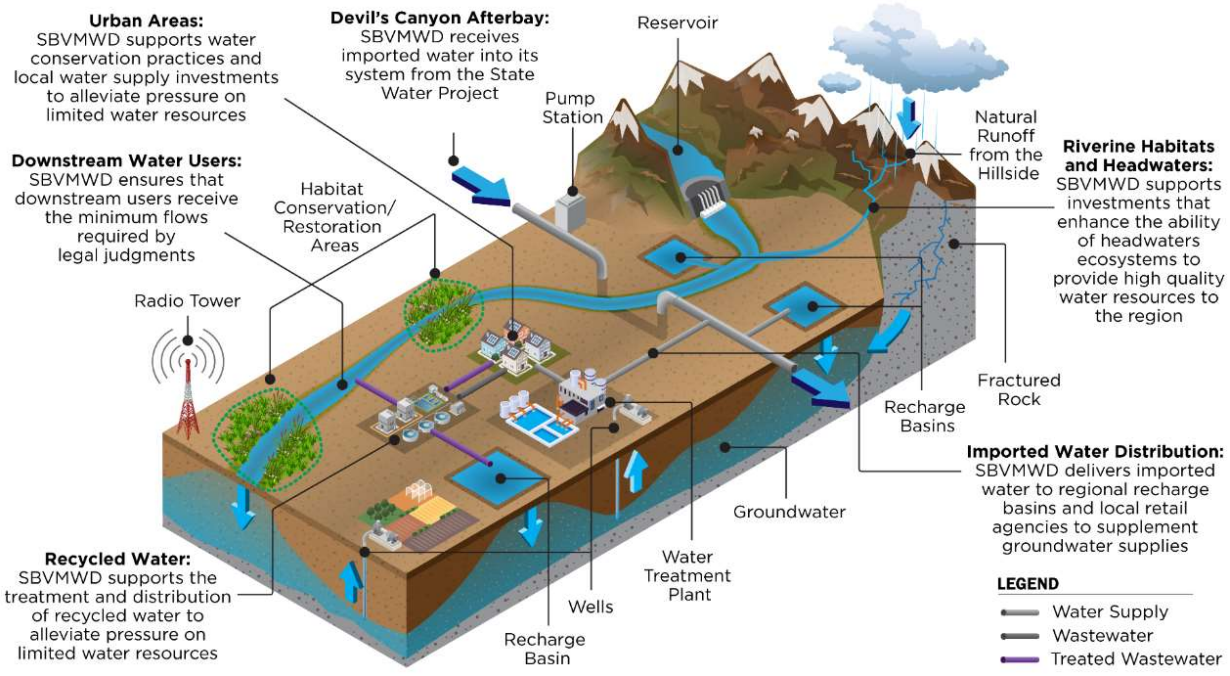
As a court-appointed Watermaster, SBVMWD has responsibilities that include tracking and reporting annually on water supplies in the San Bernardino Basin Area, Colton Basin Area, and Riverside Basin Area within San Bernardino County and maintaining the base flow requirements at the Riverside Narrows on the Santa Ana River on behalf of the San Bernardino Entities. These responsibilities are filled in a variety of ways, including through data collection and analysis and providing the means for supplemental water to be delivered for direct use or for groundwater recharge. SBVMWD has rights to water imported water through the State Water Project and stormwater capture through projects such as the Enhanced Recharge Basins below Seven Oaks Dam. SBVMWD has also invested in projects to support increased utilization of recycled water within the District. Supplemental water, largely imported raw water, is delivered to retail agencies and regional groundwater recharge basins via 42 miles of 12-inch to 78-inch diameter pipelines; a recycled water pipeline was completed in 2023. SBVMWD has a history of working with partners to avoid building duplicative facilities including but not limited to pipelines, pump stations, and groundwater recharge basins; such partners have included The Metropolitan Water District of Southern California, San Gorgonio Pass Water Agency, San Gabriel Valley Municipal Water District, the San Bernardino Valley Water Conservation District, and the San Bernardino County Flood Control District just to name a few. SBVMWD also supports a variety of activities that promote both the reliability of local water resources and efficient water use through conservation activities. The Upper Santa Ana River Wash HCP (Wash Plan HCP) and the Upper Santa Ana River HCP (River HCP) are distinct yet coordinated regional conservation and compliance initiatives that aim to strike a balance between safeguarding local natural resources and effectively managing critical water supply activities. Both plans outline specific measures for protecting, enhancing, restoring, and managing species and their habitats in the future. Through their efforts tied to the Santa Ana River HCP, the region is projected to develop over 4 million acre-feet of water for local use, or approximately 87,000 acre-feet per year over the lifetime of the HCP Permits.[12] The water management sectors in SBVMWD's jurisdiction explored in the CARP include Operations, Natural Resources, Infrastructure and Community, and are explored in detail below.

12 SBVMWD. 2020. Upper Santa Ana River Habitat Conservation Plan, Page ES-1

Operations

SBVMWD takes a holistic approach to its role in long-range water supply management across the region's environmental, built, and social context. The District engages in a wide variety of operational activities such as maintaining and building regional water conveyance and recharge facilities to maintain a reliable water supply for residential, industrial, agricultural, and environmental use. Additionally, SBVMWD supports and facilitates regional water conservation efforts, regional water infrastructure investments and addressing water quality issues that may impact regional water reliability. As shown in Figure 9, this integrated approach allows for delivery on SBVMWD's Strategic Priorities of being resilient, restorative, science-based, and providing cost-effective climate change mitigation and adaptation solutions. Working across this holistic context enables SBVMWD to identify and prioritize the most efficient and effective water supply management options.

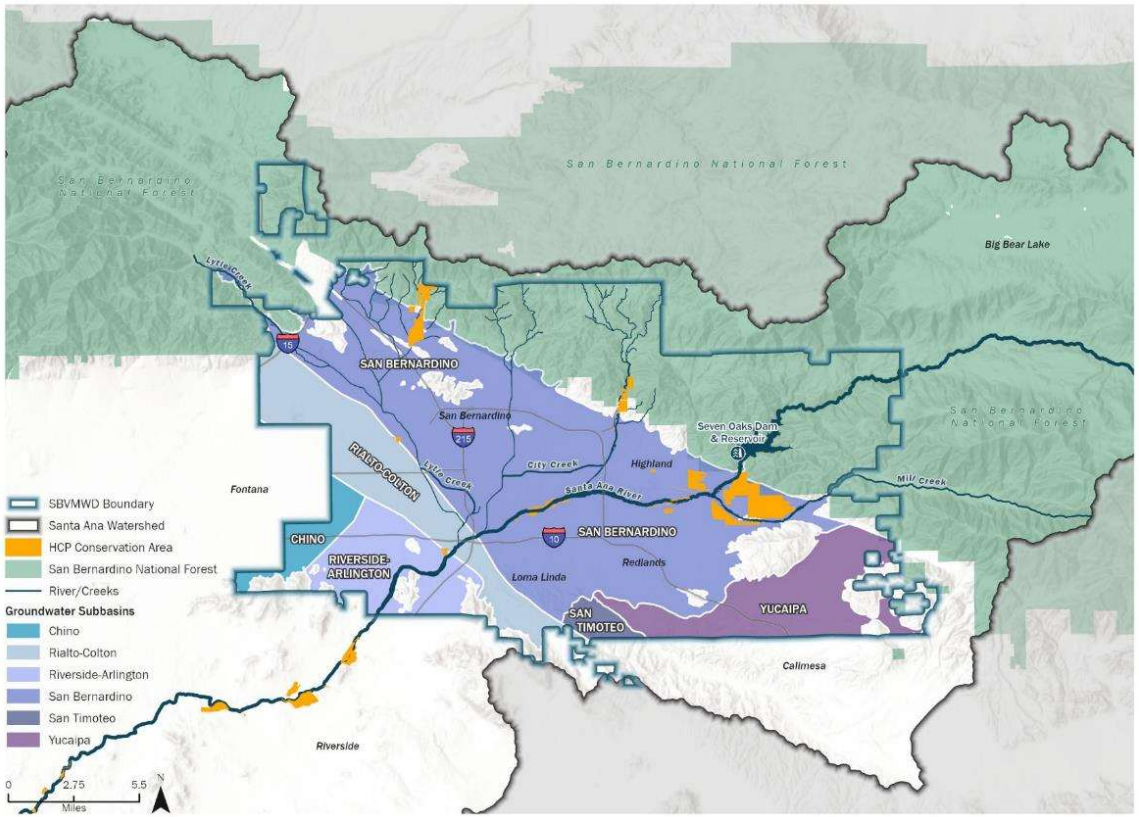
Figure 9 Overview of SBVMWD Water System and Operations



Natural Resources

In addition to maintaining sustainable groundwater resources, SBVMWD supports investments in the natural resources that are essential to the region's water supply. Forest and riverine ecosystems in the Upper Santa Ana River Watershed play an essential role in the supplying, purifying, and protecting local water resources. When these ecosystems and water resources (shown in Figure 10) function better, there is more and higher quality water available for all uses, and more water can recharge local groundwater aquifers that are the region's primary water resource.

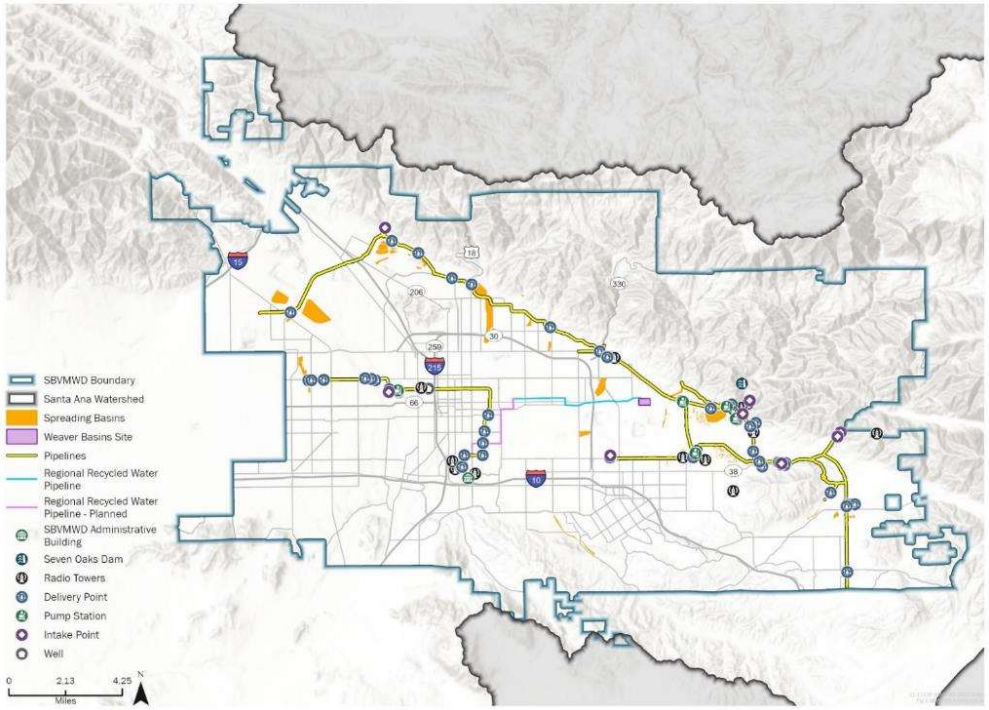
Figure 10 Map of Natural Resources Related to SBVMWD Operations



Infrastructure

SBVMWD plays a key role in supporting the regional water infrastructure (e.g., treatment, storage, flood protection, and conveyance) that enables different types of water supply (e.g., imported, local surface water, groundwater, recycled water) to be efficiently distributed. As shown in Figure 13, SBVMWD manages the distribution of imported and local water to multiple retail agencies and for recharging groundwater through regional spreading basins.

Figure 11 Map of SBVMWD's Infrastructure

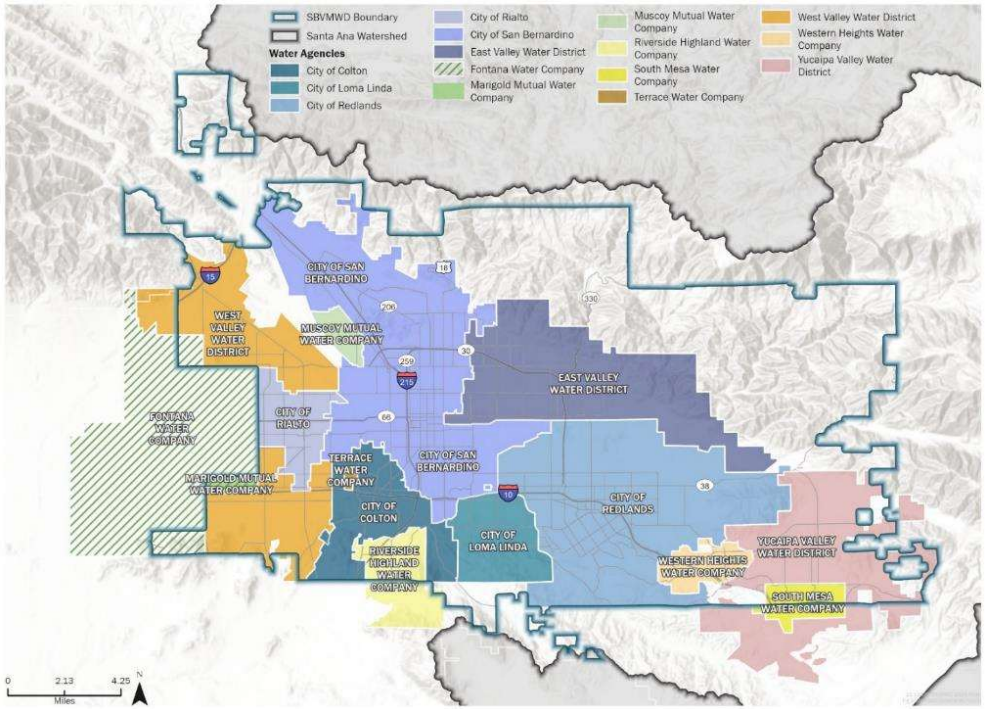


13 Not all infrastructure shown in Figure 10 is owned by SBVMWD. Some infrastructure and facilities are owned by San Bernardino County or other agencies and is used by or managed by SBVMWD.

Community

As shown in Figure 12, SBVMWD supports the distribution of water for household, commercial, industrial, and agricultural predominantly for fifteen retail water agencies within its service area. There are also individual well owners (pumpers) who rely on local groundwater and indirectly on recharged imported water. Some users directly rely on imported SWP deliveries and surface water, but the majority depend primarily on groundwater. SBVMWD also works with regional retail agencies to manage demand through the implementation of water conservation strategies and developing additional local sources of supply.

Figure 12 Map of Water Agencies Served by SBVMWD



3. Climate Risks and Vulnerabilities

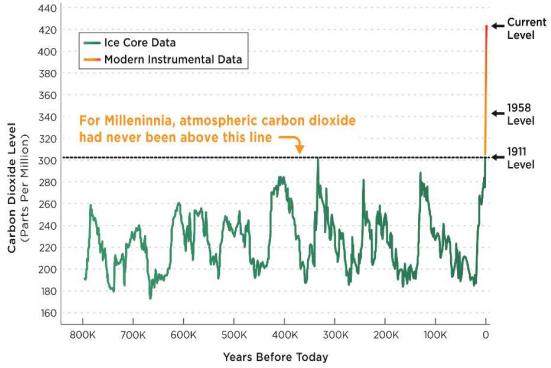
Mainstream scientific research has shown that the excess presence of GHGs in the atmosphere trap heat near the earth's surface and raises global average temperatures (See Figure 13). This is referred to as the greenhouse effect.[14] The levels of GHGs in the atmosphere far surpass anything observed in the historical record (See Figure 14). The increase in average air and sea temperatures across the globe has wide-ranging effects on sea level, the severity of wildfires, the prevalence of extreme weather patterns, and changes in water supply conditions.[15] Governments, agencies, and businesses are taking action to mitigate GHG emissions to reduce or avoid the effects of climate change.

Figure 13 Greenhouse Gas Effect Overview

Data from California's Fourth Climate Assessment was used to identify and assess SBVMWD's climate change vulnerabilities. Daily temperature and precipitation projections from global climate models (GCM) were employed after the data was scaled to the regional level. The dataset includes a historical period of 1950-2005 and then two future projections spanning 2006-2100 based on two GHG emissions level scenarios – Representative Concentration Pathways (RCP) 4.5 and 8.5. RCP4.5 represents a mitigation scenario where global CO_2e emissions peak by 2040, while RCP8.5 represents a business-as-usual (BAU) scenario where CO_2e emissions continue to consistently rise throughout the twenty-first century.[16]

These data predict that the SBVMWD service area and state water supplies are expected to experience a wide variety of climate change impacts by the end of the century (See Figure 15). Other reports, including the California Department of Water Resources' (DWR) Climate Change Vulnerability Assessment, provide information regarding climate change projections and impacts to the SWP and supporting watersheds. Projections throughout this section are consistent with the OPR's use of RCP 8.5 as a conservative approach to assessing and adapting to climate change. Additionally, projections are forecasted to mid-century (2035-2064) and end-of-century (2070-2099) as 30-year averages and are compared to a modeled historical baseline (1961-1990).

Figure 14 Global Change in Atmospheric CO_2

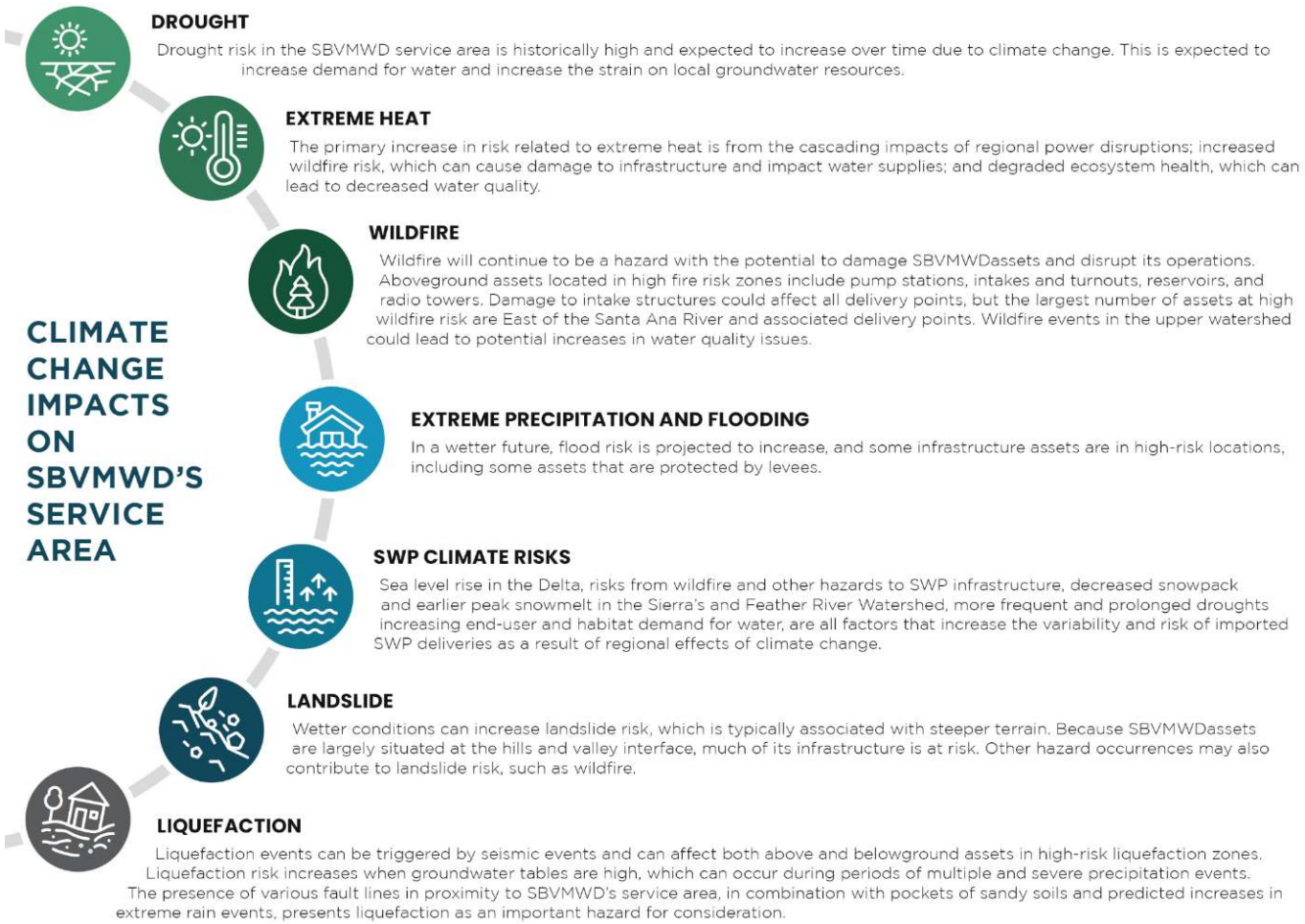


14 Intergovernmental Panel on Climate Change. 2021. The Physical Science Basis. https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/

15 Intergovernmental Panel on Climate Change. 2022. Sixth Assessment Report, https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/

16 Van Vuuren et. al. 2011. The Representative Concentration Pathways: An Overview. https://link.springer.com/article/10.1007/s10584-011-0148-z

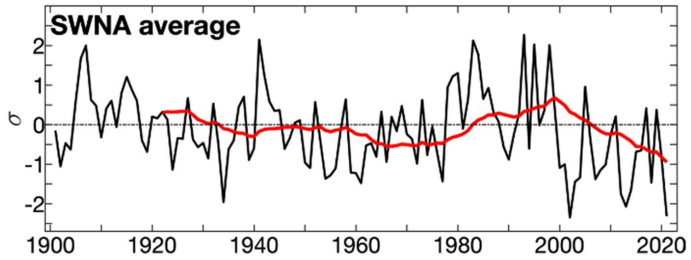
Figure 15 SBVMWD Climate Vulnerabilities



Drought

A drought is an extended period of abnormally low rainfall that can lead to water supply shortages, reduced soil moisture, and negative impacts on biodiversity, agricultural production and human communities. Intensified by climate change, the western U.S. is currently experiencing its driest stretch since A.D. 800, and drought conditions intensified rapidly in 2020-2021 (See Figure 16). Climate models project increasing temperatures and variability in annual precipitation will lead to an increase in the frequency and severity of multi-year drought events. SBVMWD relies on a mix of imported and local water supplies, both of which are vulnerable to local and statewide drought conditions. As localized droughts become more common and local supplies become more limited, reliance on imported SWP water from Northern California will increase. As statewide droughts become more common, and snowpack in the Sierra mountains become less reliable, deliveries of SWP water will become less reliable and potentially increase groundwater use. Potential impacts to SBVMWD related to drought are listed below in Figure 17.

Figure 16 Southwestern North American Soil Moisture Deficit



Williams, A., Cook, B., & Smerdon, J. (2022). Rapid intensification of the emerging southwestern North American megadrought in 2020–2021. Nature Climate Change, 12(3), 232-234. http://dx.doi.org/10.1038/s41558-022-01290-z Retrieved from https://escholars

Aridity generally refers to the condition of being dry or extremely dry. Aridity can be associated with a lack of rainfall or increasing air temperature. As the air temperature increases, evaporation of water from the earth increases and plants transpire greater amounts of water to the atmosphere. The valley and lowland areas of the Santa Ana Watershed are generally referred to as a semi-arid region.

Climate change is anticipated to increase the aridity of many portions of the southwestern United States and California.[17] The process or condition of increasing aridity is generally referred to as 'aridification'. Although it has not been quantified, it is anticipated that the Santa Ana Watershed is likely susceptible to aridification due to climate change. Aridification of the Santa Ana Watershed would result in decreased streamflow rates, decreased soil moisture levels, and decreased natural groundwater recharge. Aridification will affect the supplies of water available for human use and natural systems.

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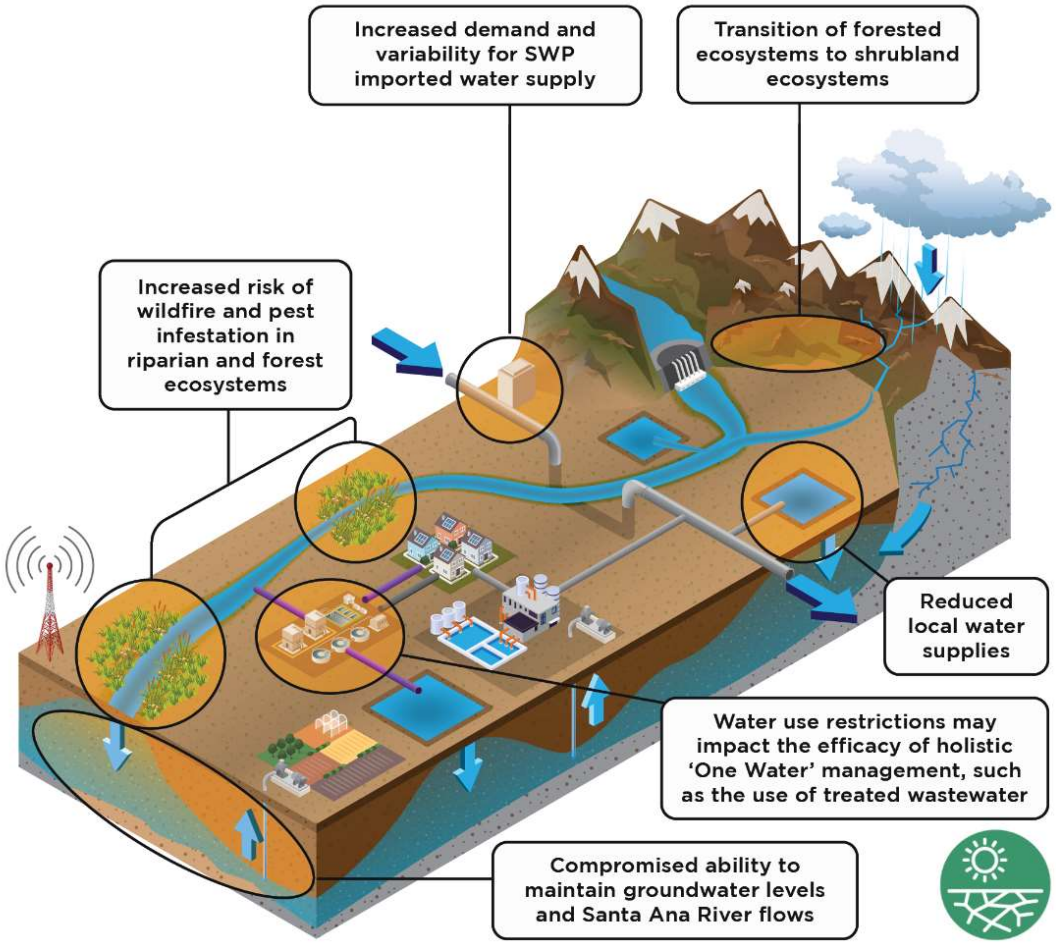
17 Overpeck and Udall. 2020. Climate change and the aridification of North America. https://www.pnas.org/doi/full/10.1073/pnas.2006323117

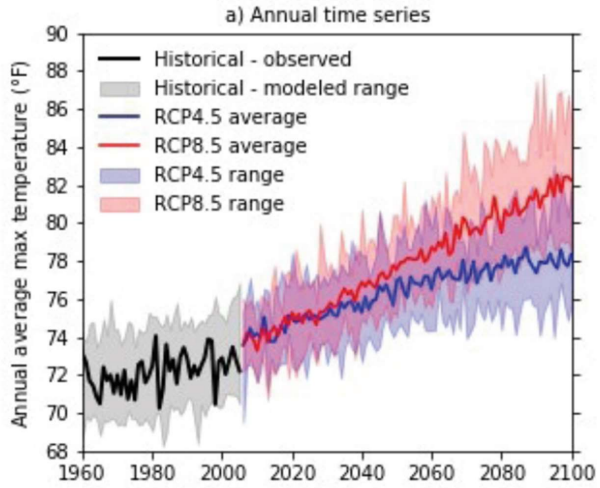
Figure 17 **Potential Drought Impacts**



Extreme Heat

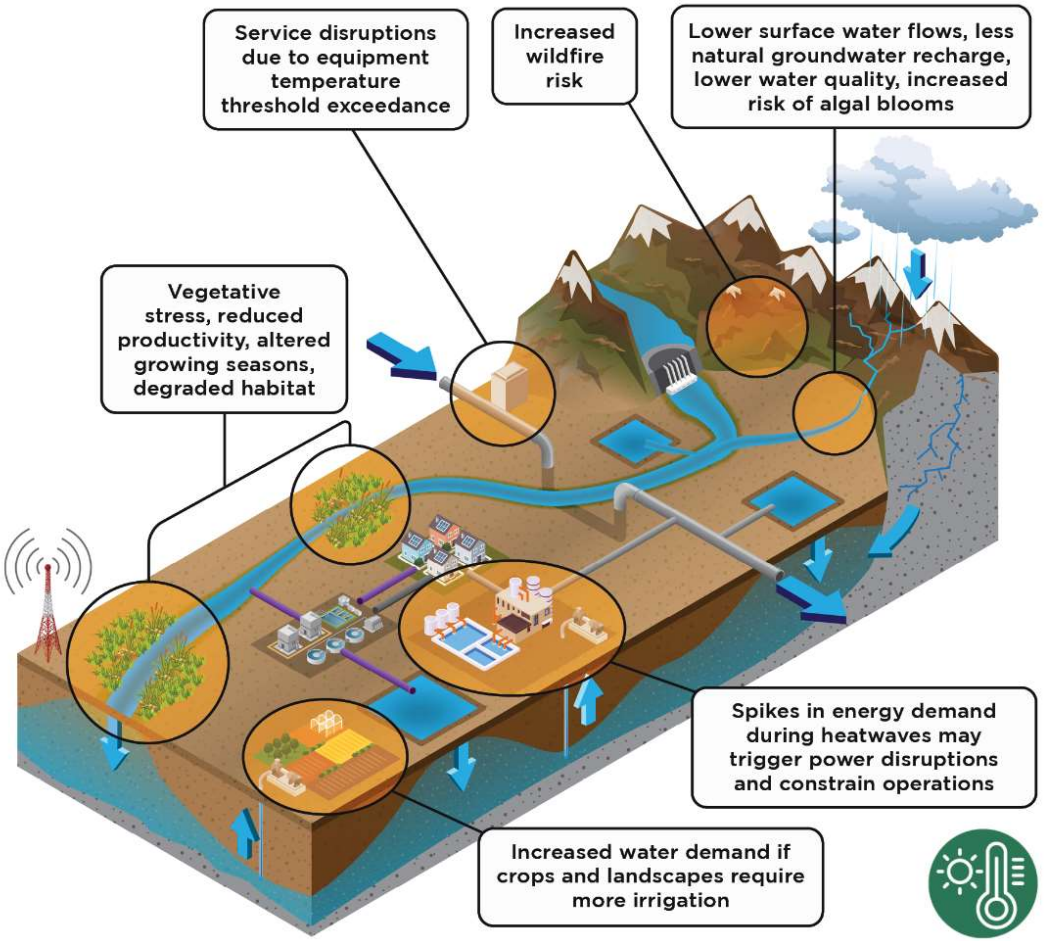
Extreme heat events are defined in the SBVMWD service area as days of the year when daily maximum temperatures exceed 100 degrees Fahrenheit. Observations over the past century indicate that temperature has increased across Southern California. This warming trend is projected to increase across the region in the coming decades with a high degree of certainty (See Figure 18).[18] Inland regions, like the SBVMWD service area, are expected to experience the highest amounts of warming. The intensity and frequency of extreme heat events are also projected to increase over the region and the largest changes in extremes are found in inland regions such as the Inland Empire, Central Valley, and the Coachella Valley. The number of extreme heat days in the SBVMWD service area is projected to increase by 24 to 51 days per year by mid-century (the historical average was 5-6 days per year). Potential impacts to SBVMWD related to extreme heat are listed below in Figure 19.

Figure 18 Annual Average Maximum Temperature Projections



18 Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

Figure 19 **Potential Extreme Heat Impacts**



Wildfire

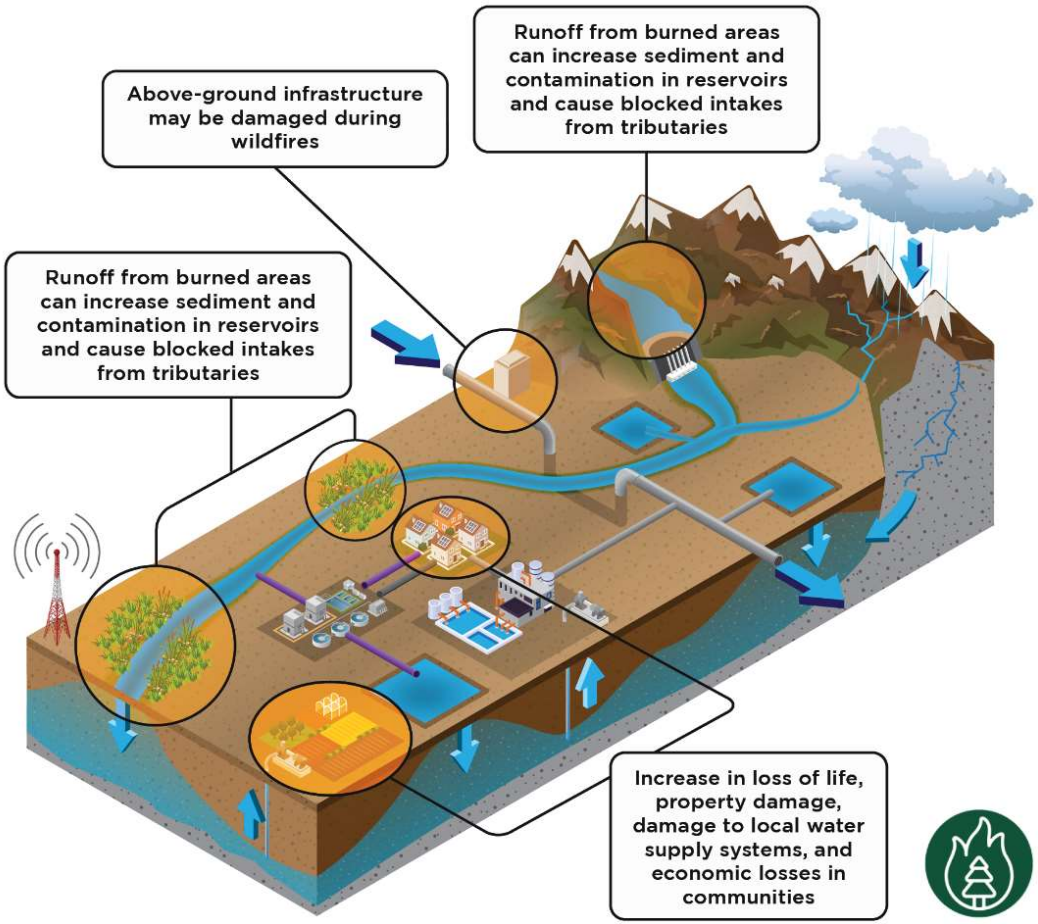
Wildfire events are characterized by uncontrolled and rapidly spreading fires that spread mainly in vegetated wildland or wildland-urban interface areas. The historical record of wildfire events in Southern California, including the Sterling Fire of 2018, Hillside Fire of 2019, El Dorado Fire of 2020, Apple Fire of 2020, Easton Fire of 2020, Mount R Fire of 2020, Nob Fire of 2023, and in nearby Los Angeles County the Woolsey Fire of 2018, and the Bobcat Fire of 2020, confirm that wildfires happen frequently in the SBVMWD region. Future projections indicate that the SBVMWD sphere of influence will be affected by a larger number of wildfires and burned area by the mid-twenty-first century, driven by climate-related factors such as low precipitation, hot temperatures, strong winds, and availability of dry vegetation[19] (See Figure 20). The probability of a wildfire occurring in the SBVMWD service area over a ten-year period is projected to increase by up to 20 percent by mid-century. Potential impacts to SBVMWD related to wildfire are shown in Figure 21.

Figure 20 How Climate Change Fuels Wildfires

https://www.ucsusa.org/sites/default/files/2020-09/wildfires-global-warming-united-states-infographic.pdf

19 Hall, Alex, Neil Berg, Katharine Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007.

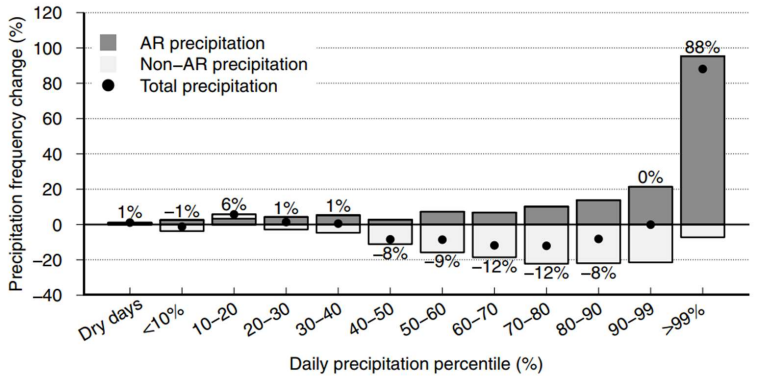
Figure 21 Potential Wildfire Impacts



Extreme Precipitation Events and Flooding

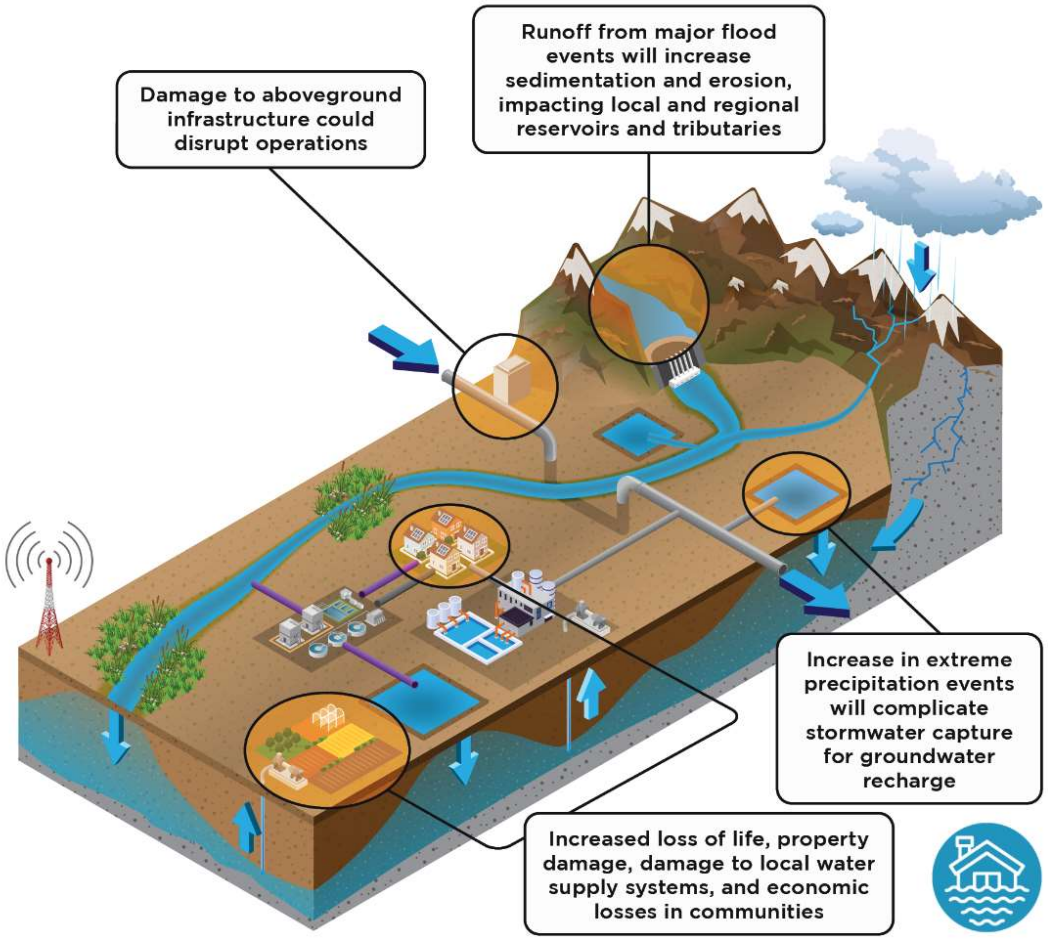
Flooding occurs when rivers and streams overflow due to heavy rainfall, or speedy snowmelt, and the capacity of stormwater infrastructure to move and discharge water cannot keep up with the rate of water inflow. Precipitation occurring during extreme events, known as atmospheric rivers (AR), is projected to increase in the future (See Figure 22). In a wetter future, flood risk is projected to increase in the SBVMWD region, and a significant number of critical infrastructures, like the Foothill Pipeline Crossing at City Creek, are exposed to increased flood and scour risk, per FEMA. The projected decrease in the frequency of precipitation from moderate size events and increase in precipitation frequency of extreme events will affect the region's ability to capture stormwater for groundwater recharge. Additionally, some of SBVMWD's assets and investments are located behind levees that could make them vulnerable to flooding and/or extreme weather events. Potential impacts to SBVMWD related to extreme precipitation and flooding are listed below in Figure 23.

Figure 22 Precipitation Regime Change in the SAR Basin



Gershunov, A., Shulgina, T., Clemesha, R.E.S. et al. Precipitation regime change in Western North America: The role of Atmospheric Rivers. Sci Rep 9, 9944 (2019). https://doi.org/10.1038/s41598-019-46169-w

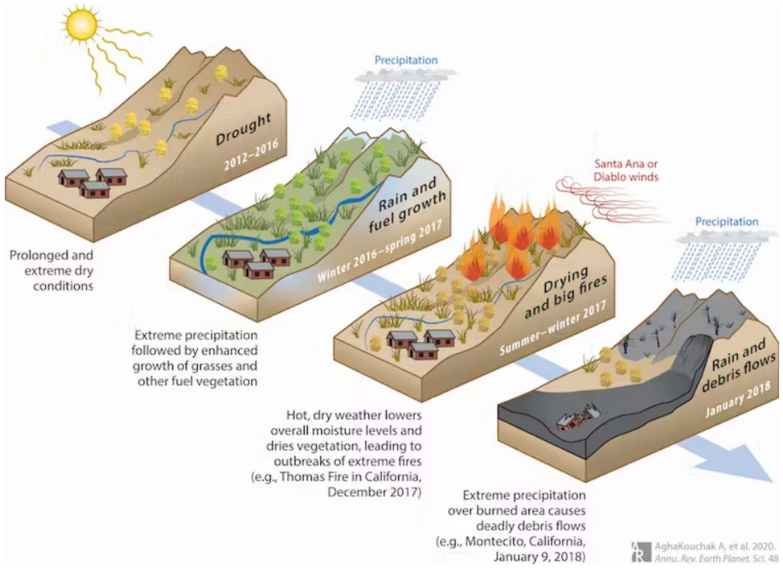
Figure 23 Potential Extreme Precipitation and Flooding Impacts



Landslide

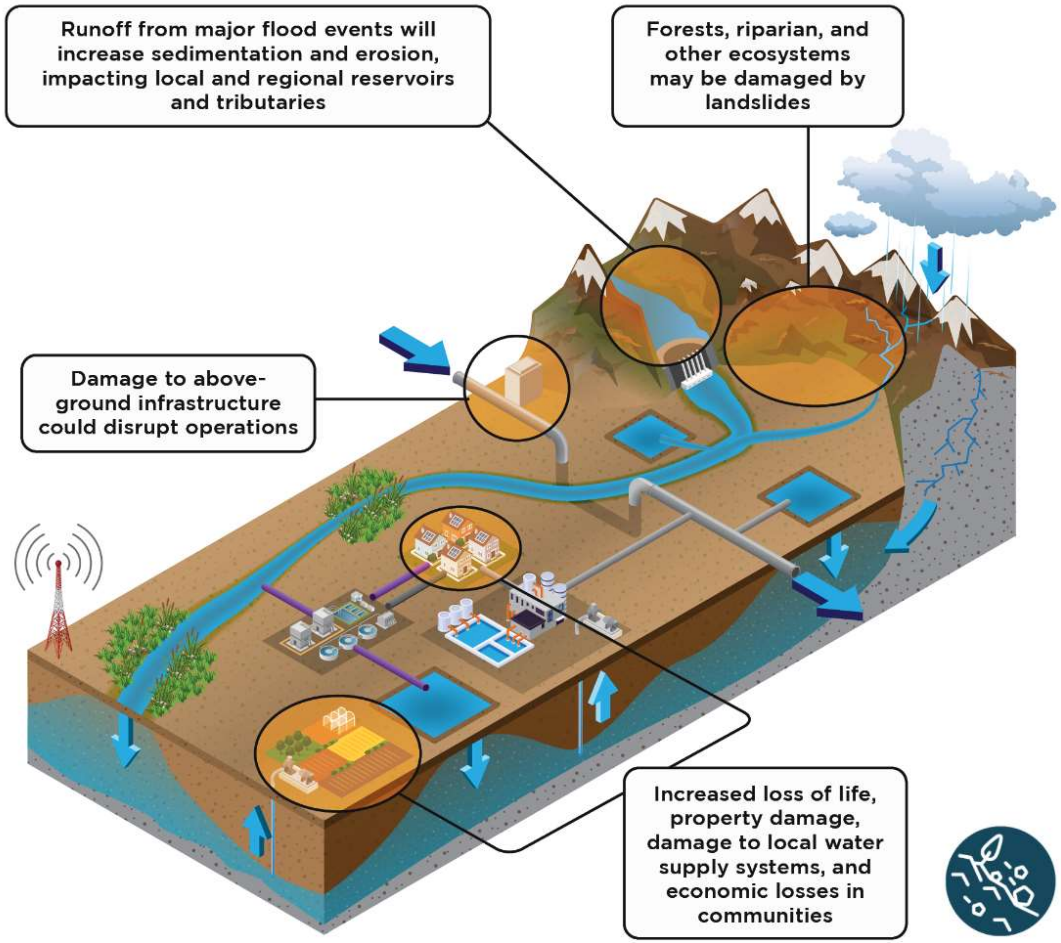
A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Debris flows (commonly referred to as mudflows or mudslides) and rock falls are examples of common landslide types on alluvial landforms, particularly at the urban-wildland interface. Almost every landslide has multiple causes. Slope movement occurs when forces acting down-slope (mainly gravity) exceed the strength of the earth materials that compose the slope. Landslides can be initiated in slopes already on the verge of movement by rainfall, snowmelt, changes in water level, stream erosion, changes in groundwater, earthquakes, disturbance by human activities, or any combination of these factors. Climate change is projected to increase landslide risk for two reasons. First, the projected increase in the frequency and severity of extreme precipitation events increases the likelihood that a landslide will be triggered. Secondly, landslides are even more likely to occur in areas affected by wildfires (See Figure 24). Potential impacts to SBVMWD related to landslides are shown below in Figure 25.

Figure 24 Climate Change Contributions to Landslide Risk



An example of the cascading effects of climate change for wildfires. AghaKouchak et al., Annual Review of Earth and Planetary Sciences, 2020

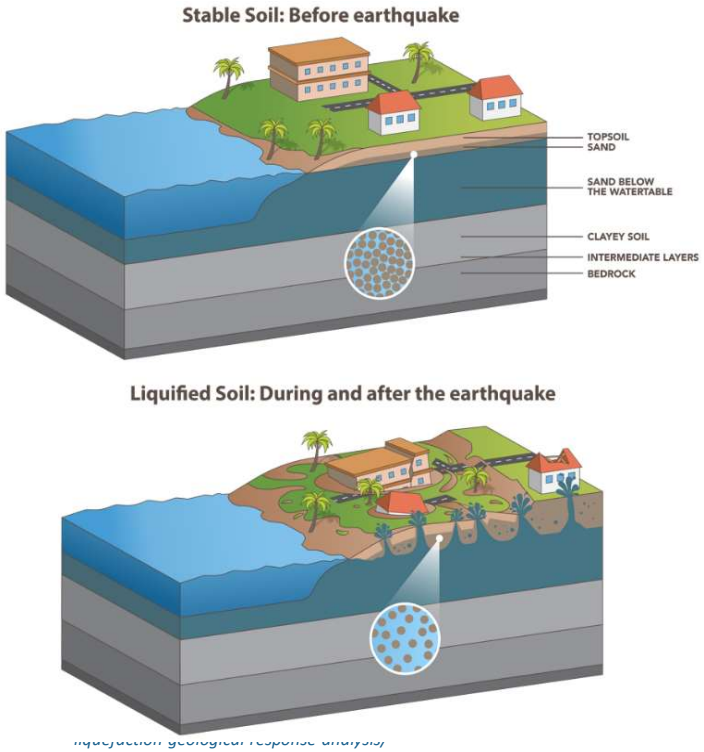
Figure 25 Potential Landslide Impacts



Liquefaction

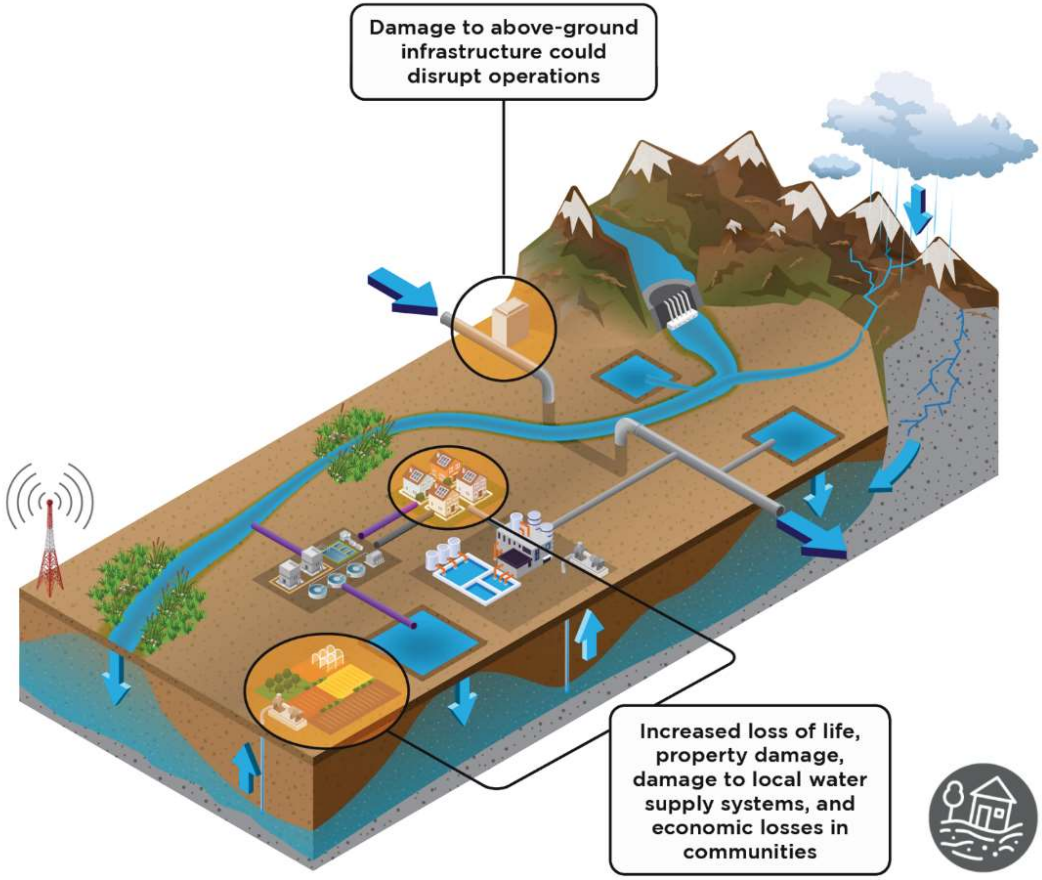
The presence of various fault lines in proximity to SBVMWD's service area, in combination with pockets of sandy soils and predicted increases in extreme rain events, presents liquefaction as an important hazard for consideration (See Figure 26). In the context of SBVMWD, the potential for liquefaction is connected to high groundwater levels, which can occur under extreme precipitation conditions. SBVMWD has a history of managing local groundwater-related liquefaction risk and it has management options for alleviating high-groundwater conditions, particularly in the Pressure Zone of the San Bernardino Basin. Potential impacts to SBVMWD related to liquefaction are listed below in Figure 27.

Figure 26 Liquefaction Overview



liquefaction geological response analysis)

Figure 27 Potential Liquefaction Impacts

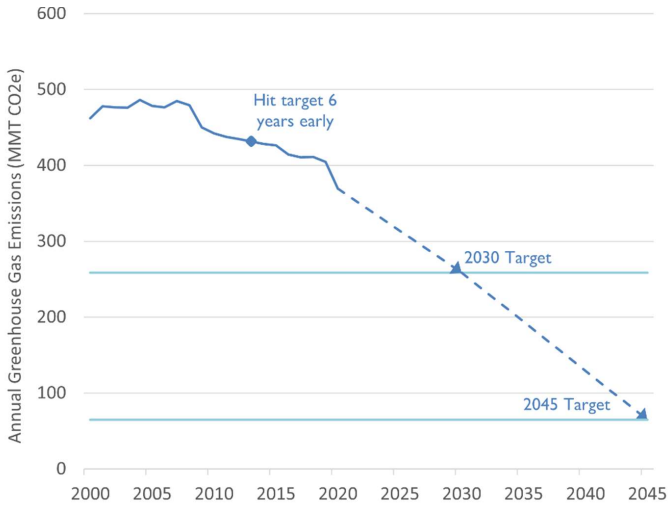


4. GHG Emissions Footprint

California has a sector-by-sector roadmap for carbon neutrality by 2045 (See Figure 28 a near-term target to return GHG emissions to 1990 levels by 2020. California surpassed this target 4 years early in 2016 (CARB). California's next climate target is set to reduce emissions by 40 percent below 1990 levels by 2030. The 2022 Scoping Plan lays out how California can surpass this target, estimating a 48 percent reduction by 2030. AB 1279 establishes California's long-term target to reduce anthropogenic emissions 85 percent below 1990 levels in 2045 and achieve carbon neutrality (the remaining 15 percent of emissions in 2045 will be addressed through carbon dioxide removal). For a comprehensive overview of related legislation, see Appendix B.

Water districts like SBVMWD play a fundamental role supporting state climate change resilience and mitigation goals, particularly by contributing to reducing local GHG emissions. California's water sector is a major source of GHG emissions; this is largely related to the energy required to move water across the state through systems such as the State Water Project, Central Valley Project, and the Colorado River Aqueduct. Water agencies account for approximately 5 percent of California's electricity consumption.[1] However, water utilities are positioned to reduce their emissions dramatically, through the identification of energy efficiency opportunities and conversion to carbon free energy sources.

Figure 28 California Carbon Neutrality Target



https://calepa.ca.gov/climate-dashboard/

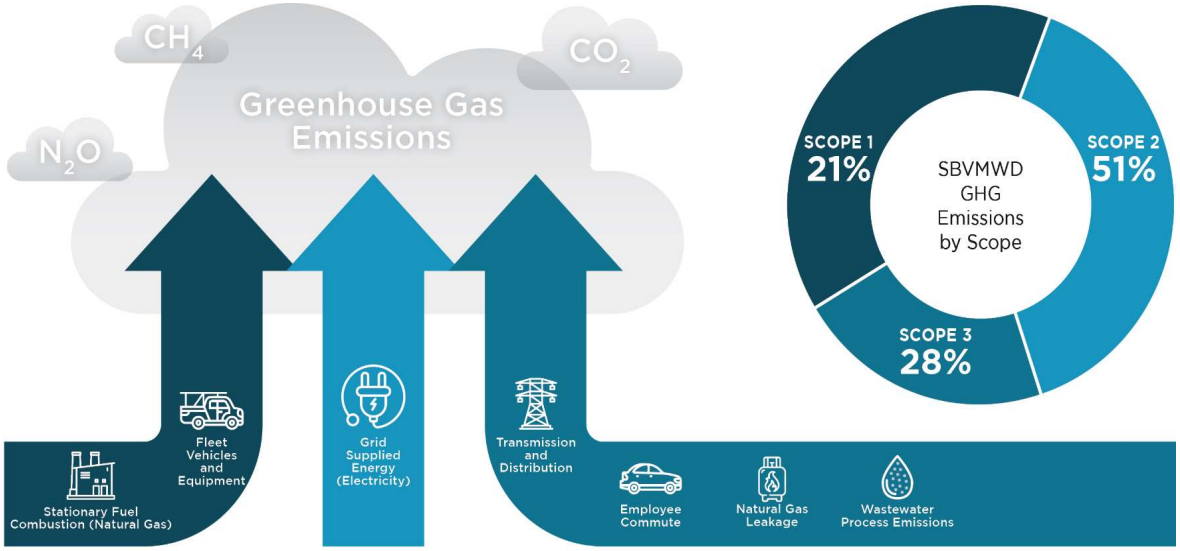
SBVMWD exercises direct and indirect control over its GHG emissions-generating activities (see

20 California Air Resource Board. 2022. 2022 Scoping Plan for Achieving Carbon Neutrality

GHG Emissions by Scope for definitions of GHG emissions by Scope). For example, SBVMWD can reduce or offset energy consumption with renewable energy in its buildings and facilities and reduce or mitigate consumption in its vehicle fleet. Estimating GHG emissions in an inventory enables SBVMWD to quantify the major sources of GHG emissions produced by its operations and programs and establish an emissions baseline for developing a forecast. The forecast allows SBVMWD to estimate future emissions trends and facilitates target setting for future reductions. These will be the first GHG inventory, forecast, and reduction targets established for SBVMWD.

Standard protocols for organization-focused inventories, such as the inventory for SBVMWD, commonly utilize a framework that categorizes GHG emissions by scope. The various scopes account for GHG emissions based on the level of operational control that the organization has over each GHG emissions source. The operational control methodology is well documented by established protocols, such as the Corporate Standard GHG Protocol developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) and has been used by other agencies to avoid double counting of GHG emissions and conservation efforts (WRI and WBCSD 2015). See Figure 29 for an overview of SBVMWD's GHG emissions share by scope and source.

Figure 29 SBVMWD GHG Emissions by Scope and Source



GHG Emissions by Scope

Scope 1 is defined as direct GHG emissions generated from sources that are owned or directly controlled by SBVMWD, including:

- Natural gas – emissions from natural gas delivered by Southern California Gas (SCG).
- Vehicle fleet and equipment (on- and off-road) – vehicle fleet emissions from diesel, gasoline, compressed natural gas, and propane usage.

Scope 2 refers to GHG emissions that are indirectly generated by SBVMWD due to its consumption of purchased electricity, steam, heating, or cooling, including:

- Emissions from electricity delivered by Southern California Edison (SCE).

Scope 3 refers to all other indirect GHG emissions not covered under Scope 2 that are associated with sources that are not directly owned or controlled by SBVMWD but are fundamental to the organization's operation, including:

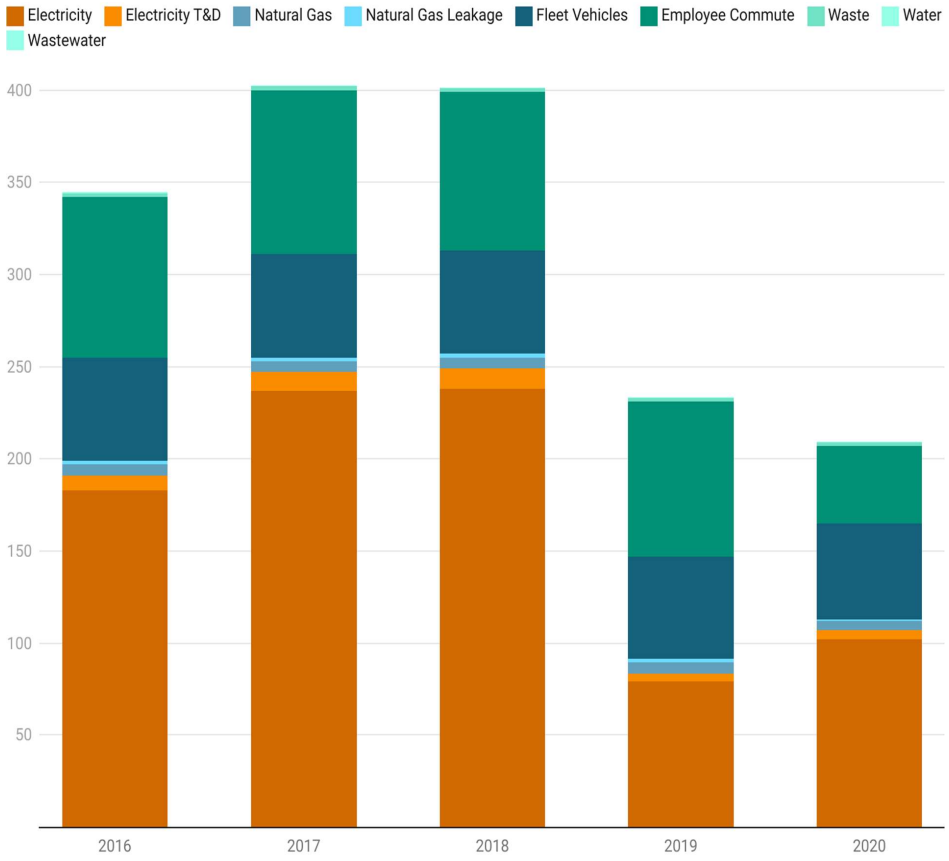
- Water –emissions associated with water use at SBVMWD facilities.
- Wastewater – process emissions associated with wastewater from SBVMWD facilities.
- Electricity transmission and distribution (T&D) losses– transmission and distribution losses associated with delivered electricity from SCE.
- Waste – emissions from waste generated by all SBVMWD office buildings and facilities.
- Employee commute – emissions from vehicles used by employees to commute to and from SBVMWD facilities.
- Construction – emissions associated with construction projects affecting SBVMWD facilities.

GHG Emissions Inventory

The methodology used to calculate SBVMWD's inventory is consistent with standard reporting protocols from the WRI, WBCSD, and the International Council for Local Environmental Initiatives (ICLEI). These protocols serve to guide the measurement and reporting of GHG emissions in a standardized way and have been used by other water agencies to support their own inventory and CARP development. They also include steps to evaluate the relevance, completeness, consistency, transparency, and accuracy of data used in the inventory and forecast.

Scope 1 makes up approximately 21 percent of SBVMWD emissions. Scope 2 makes up the largest share of emissions at approximately 51 percent of total emissions. Scope 3 emissions make up approximately 28 percent of total emissions. The largest emissions source driving SBVMWD's emissions is electricity consumption at offices and pump stations (Scope 2). Other major sources of emissions include employee commute and the vehicle fleet. SBVMWD's GHG emissions fluctuate year to year depending on the source of water and the extent of water demand and services provided. The inventory was therefore developed to include GHG emissions accounting for years 2016, 2017, 2018, 2019, and 2020, to capture and quantify some of this variability. See Figure 30 for a visual summary of SBVMWD emissions by source, scope 1 emissions are depicted in blue tones, scope 2 emissions are depicted in orange tones, and scope 3 emissions are depicted in green tones. The multi-year inventory, informed by an understanding of the variability drivers for each year, was then used to develop SBVMWD's GHG emissions forecast.

Figure 30 SBVMWD Annual Emissions by Source (2016-2020)



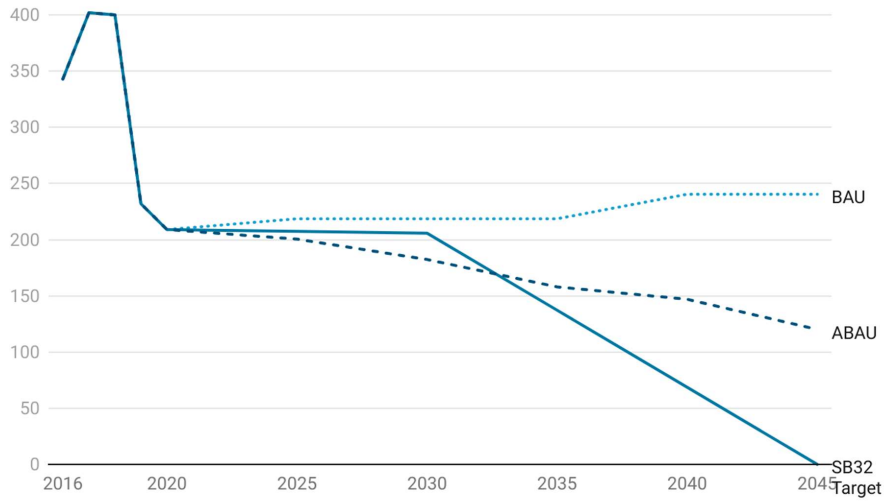
Forecast and Targets

SBVMWD's GHG emissions are expected to change over time due to expected changes in water demand and new projects. A GHG emissions forecast accounts for projected future changes using growth rates and extrapolates from the inventory an estimate of GHG emissions in future years, while also accounting for projected GHG emissions reduction impacts from state legislation. Calculating the difference between the forecasted GHG emissions and the reduction targets determines the gap to be closed through direct action taken by SBVMWD to reduce GHG emissions.

Two forecast scenarios are presented in Figure 30: a BAU (Business as Usual) forecast scenario and an adjusted forecast scenario. The BAU forecast scenario projects the expected growth for all GHG emissions sources based solely on SBVMWD's water service changes. The adjusted forecast accounts for water demand changes and additionally quantifies and incorporates State legislation that is expected to help reduce SBVMWD's future GHG emissions. The adjusted forecast, when compared to the BAU forecast, represents a more accurate picture of future GHG emissions inclusive of the anticipated effects of future State legislation. The adjusted forecast is therefore used to determine the gap between the forecast and the GHG reduction targets that will need to be bridged through actions taken by SBVMWD.

Figure 31 also shows SBVMWD's target emissions forecast needed to support the State's carbon neutrality goals as codified in SB 32 and AB 1279. SBVMWD is currently on track to meet SB 32 requirements of a 40 percent reduction below 1990 levels by 2030 based on State actions. However, it will need to take additional actions (approximately 120 MT CO_2e) to achieve carbon neutrality by 2045. It should be noted that this forecast does not include any significant operational changes (such as adding new pumps or other facilities) or construction projects. Measures and action that SBVMWD will take to eliminate the 120 MT CO_2e are described in Section 5 (Measures 3-I through 3-P).

Figure 31 SBVMWD GHG Emissions Forecast and Targets

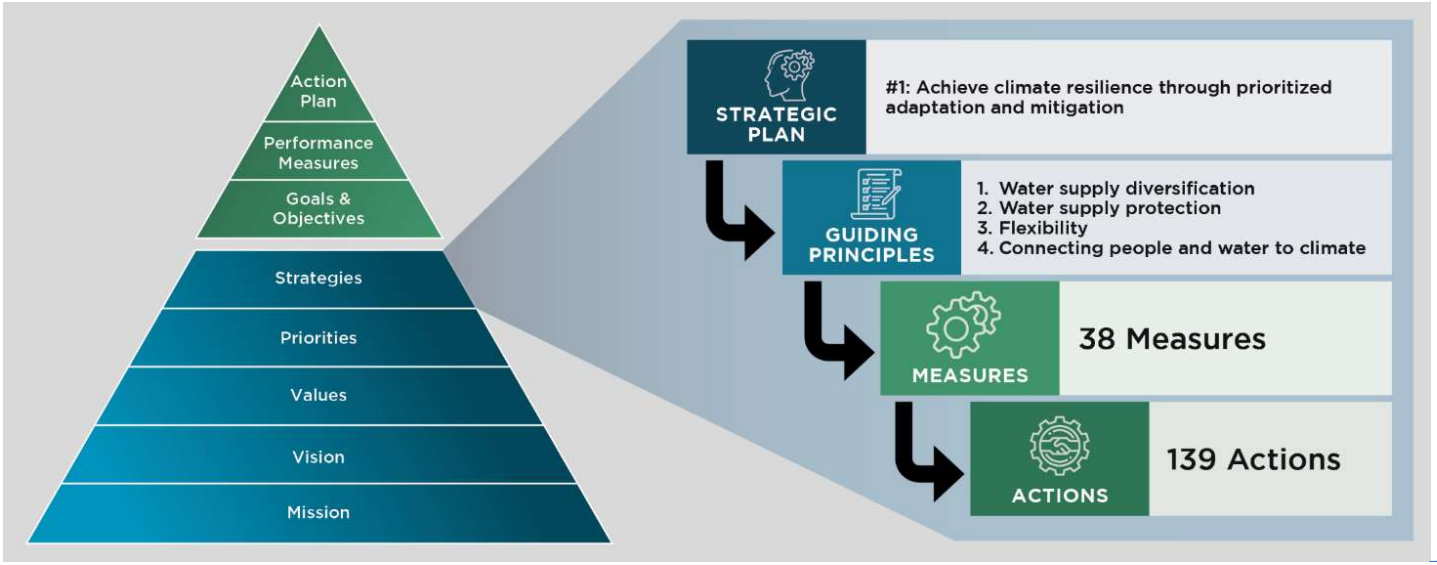


5. Resilience Strategies – Goals, Measures, and Actions

The CARP is designed to build on the strong foundation of climate action and adaptation already integrated into SBVMWD's operations and will provide a framework for updated policies and programs that work towards resilience. The CARP will incorporate the many programs that SBVMWD has in place and will include new guiding principles, measures, and actions that SBVMWD will develop based on climate vulnerabilities, the needs of the community, and the values of SBVMWD. CARP actions have been organized into two phases of implementation, which is described in Section 6.

As described in Section 1, SBVMWD's Strategic Plan recognizes that the long-term viability of the region's water supply must include the reduction of GHG emissions and adaptation to the impacts of climate change among other priorities. The CARPs strategy framework includes measures and actions that primarily support SBVMWD's adaptation and resilience strategic priorities, while also supporting other aspects of its strategic plan, including its core values. The CARP Framework begins with guiding principles. The guiding principles support Strategy 1 (Achieve climate resilience through prioritized adaptation and mitigation) in the SBVMWD Strategic Plan. Measures or strategies will then be developed to support CARP guiding principles. The measures are then implemented through a set of actions. Indicators for CARP guiding principles, measures, and actions to assist staff in tracking progress and evaluating efficacy. Included in Figure 32 below is a summary of the framework.

Figure 32 Overview of How the CARP Supports the SBVMWD Strategic Plan



Commented [AO3]: Figure 32 - there are 37 measures, not 38

Commented [RS4R3]: This is in progress

The CARP supports SBVMWD's Strategic Plan and aligns with the State Water Resilience Portfolio through its four Guiding Principles:

1.  **Maintain a Diverse Water Portfolio** through recycled water production, stormwater capture, aquifer recharge and strategic water imports in order to provide multiple benefit resilience outcomes for the regional water supply. By relying on a diversified mix of imported and localized water sources, SBVMWD can help the region better cope with future climate extremes as they occur at a local and statewide scale. Diversification additionally maintains a reliable and sustainable water supply, particularly in the Southern California region that is prone to water supply volatility and relies on imported water.
2.  **Protect the Water Portfolio** through conjunctive use planning, watershed restoration initiatives and strategic aquifer recharge. Sustainable management of existing supplies and natural resources will help maintain SBVMWD's investments and the benefits provided by our infrastructure and the natural environment, allowing SBVMWD to meet the needs of a changing and dynamic population of customers and the environment.
3.  **Improve Operational and Infrastructure Resilience** by making strategic investments in crucial operations and infrastructure in order to create reliability and continuity of service and assist in long-term regulatory compliance. By creating redundant systems where necessary, exploring water transfer options, and incorporating resilient design criteria in capital improvement projects, SBVMWD is setting itself up for providing reliable service in an uncertain climate future prone to disruptions. Prioritizing resilience in operations and infrastructure, while requiring initial investments up front, will prevent more extensive and expensive damages that might occur in vulnerable or outdated systems.
4.  **Connect People and Water to Climate** By leading education and engagement programs and supporting familiarity and use of the Watershed. Support activities that enable the communities that SBVMWD serves to understand and meaningfully engage with the complex water systems that sustain it. SBVMWD will embrace community members and groups as allies in sustainable water management and regional climate resilience.

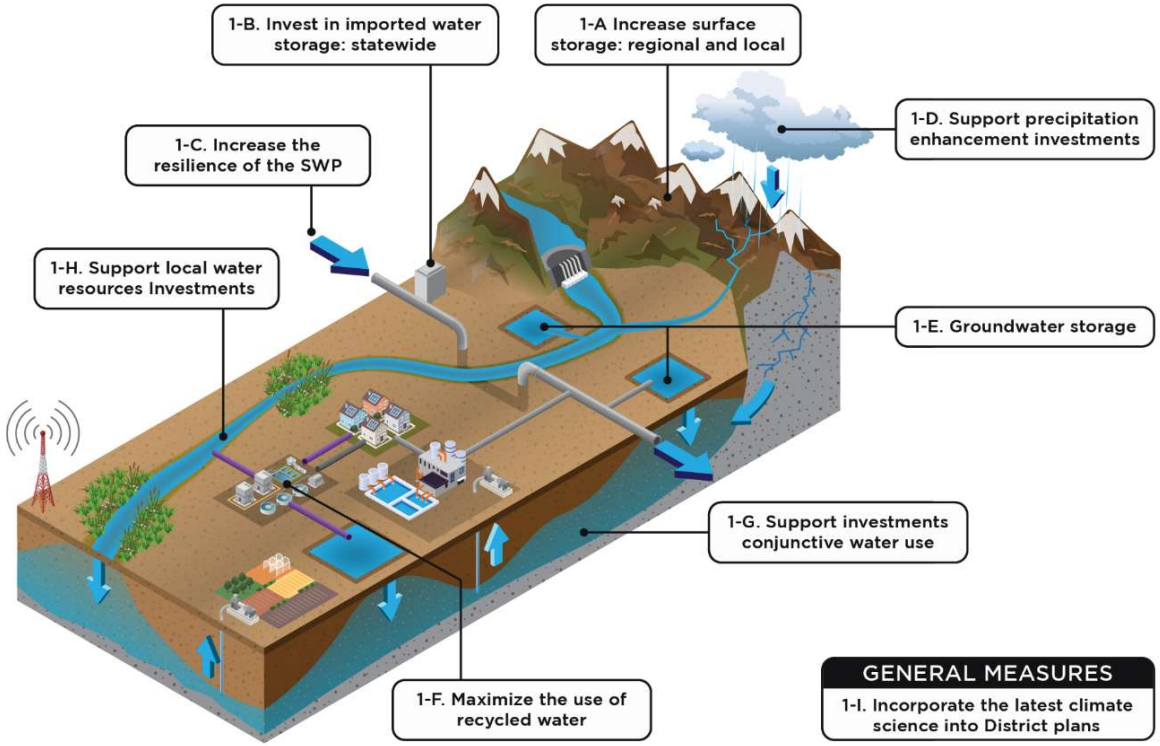
CARP Measure descriptions include the following elements.

- Adaptive Management Indicators outlining how efficacy will be assessed
- Climate vulnerabilities addressed by the measure
- Partners necessary for successful implementation
- Actions SBVMWD will take to implement the measure

1. Maintain a Diverse Water Portfolio

Figure 33 below depicts the CARP measures that support Guiding Principle 1: Maintain a Diverse Water Portfolio. The diagram illustrates how measures contribute to enhancing the resilience of SBVMWD's water portfolio within its operational context. SBVMWD is one of the 29 State Water Contractors and a likely investor in the future Sites Reservoir Project. This project will capture wet-year water to be delivered in dry years, which is a critical strategy to achieve climate resilience within our water portfolio due to the highly variable hydrologic cycles.

Figure 33 CARP Measures Supporting Guiding Principle 1: Maintain a Diverse Water Portfolio



1-A Surface Storage: Regional and Local

Description: Increase capacity to store and deliver local surface water or a blend to treatment plants.

Adaptive Capacity Indicator: Local Surface Water Storage Capacity (acre-feet)

Key Partners: Western Municipal Water District, Western Water, Scripps UC San Diego, U.S. Army Corps of Engineers, and other local and regional agencies

Actions:

1-A-1. Complete Master Plan for Sunrise Ranch to evaluate the potential for an on-site reservoir that can store local and imported water.

1-A-2 If feasible, design Sunrise Ranch Reservoir - including engineering, CEQA, and permits.

1-A-3 If feasible, construct the Sunrise Ranch Reservoir; action include financing, partnerships, and construction management.

1-A-4 Conduct a Viability Assessment for seasonal and temporary storage at Seven Oaks Dam through Forecast Informed Reservoir Operations (FIRO) Study.

1-B Surface Storage: Statewide

Description: Increase imported water storage capacity, such as through investment in the development of Sites Reservoir and other off-aqueduct storage.

Adaptive Capacity Indicator: Imported Surface Water Storage Capacity (acre-feet)

Key Partners: State Water Contractors (SWC), SWC Class 8 Contractors, Department of Water Resources, Sites Reservoir participating agencies

Actions:

1-B-5. Continue participation in Sites Reservoir Authority's design, planning, environmental documentation, and permitting for the Sites Reservoir Project.

1-B-6 Consider Board action to fund the construction of Sites Reservoir and determine the funding mechanism of SBV's share of the construction cost only. Future O & M cost not included.

1-B-7 Participate in the construction and delivery of the Sites Reservoir Project through the Sites Project Authority and ongoing operation and maintenance of the Reservoir.

1-B-8 Complete a Storage Feasibility Study with Class 8 State Water Contractors to evaluate storage needs and opportunities.

1-B-9 Identify or explore additional short-to-intermediate term storage programs with other partners such as the State Water Contractors Association and MWDSC (for example, storage in Diamond Valley Lake), Pass Agency, Antelope Valley-East Kern, Central Valley, Mojave Basin, etc. and local direct delivery customers.

1-C Delta Conveyance and California Aqueduct Resilience

Description: Continue support for reliability investments in the SWP system, such as the Delta Conveyance and California Aqueduct improvements.

Adaptive Capacity Indicator: Additional SWP imported water capacity (acre-feet)

Key Partners: California Department of Water Resources, Delta Conveyance Project Participating Agencies, and State Water Contractors

Actions:

1-C-10. Continue to participate in project planning and completion of environmental documentation and permitting through the Delta Conveyance Design and Construction Authority (DCA).

1-C-11 Consider Board action to fund the Delta Conveyance Project (DCP) and funding mechanism for SBV's share of the construction cost only. Future O & M cost not included.

1-C-12 Participate in the construction of the DCP by DCA, other DCP agreements and export of water through DCP.

1-C-13 Evaluate investments to optimize the operations and maintenance of the California Aqueduct and maximizing its conveyance capacity, especially on the East Branch.

1-D Precipitation Enhancement

Description: Implement and assess effectiveness of weather modification pilot program by SAWPA

Adaptive Capacity Indicator: Additional potential local precipitation per year (inches)

Key Partners: Santa Ana Watershed Project Authority (SAWPA) and SAWPA Member Agencies

Actions:

1-D-14. Participate and monitor the implementation of the SAWPA Cloud Seeding Pilot Program (2023-26), evaluate results, and make recommendation to the Board on next steps.

1-D-15 If the decision is to implement a Cloud Seeding Program, work with SAWPA and other partners on implementation, monitoring and evaluation.

Deleted: Weather Modification

Deleted: Weather Modification

Deleted: develop

Deleted: and implement the program with partners

1-E Groundwater Storage

Description: Develop and implement stormwater capture projects and SWP recharge in conjunction with demand management to increase groundwater volume and water levels

Adaptive Capacity Indicator: Additional regional annual stormwater capture capacity (acre-feet)

Key Partners: Western Water, Riverside Public Utilities, Fontana Water Company, West Valley Water District, Redlands, East Valley Water District, Yucaipa Valley Water District, San Bernardino Valley Water Conservation District, and San Bernardino County Flood Control District, and others.

Actions:

1-E-16 Complete Enhanced Recharge, Phase 1B to allow for the diversion and recharge of up to 80,000 acre-feet per year and maximizing the two water right permits held by San Bernardino Valley and Western Water.

1-E-17 Complete facilities' upgrades and agreements to recharge imported water at Cactus Basins, Weaver Basins, County Line Basins, and other feasible locations.

1-E-18 Evaluate the use of demand and supply management incentives to encourage retail agencies to maximize direct deliveries when recharge capacity is limited in order to reduce groundwater pumping; explore treated water delivery.

1-E-19 Develop a priority list for the Program for Enhanced Recharge Capability (PERC) and other active recharge projects, complete the pre-construction strategy, and develop a funding strategy.

1-E-20 Complete a change in point of diversion petition to the State Water Board (Umbrella Permit) and time extension to maximize Santa Ana River water rights.

1-E-21 If feasible, support the implementation of Phase 1 Project(s) of PERC and other active recharge projects outside of PERC; coordinate or provide necessary funding and resources.

1-E-22 Evaluate, identify, and utilize passive recharge opportunities using local streambeds while mitigating habitat and invasive species concerns.

1-F Recycled Water

Description: Support projects to sustainably increase production and use of recycled water

Adaptive Capacity Indicator: Additional annual recycled water production capacity (acre-feet)

Key Partners: East Valley Water District, City of San Bernadino Municipal Water Department, City of Redlands, Yucaipa Valley Water District, City of Colton, City of Rialto, Riverside Public Utilities, and others

Actions:

1-E-23 Complete the Regional Recycled Water System Phase 1 (Pipeline and Weaver Basins).

1-E-24 Complete Phase 2 of Regional Recycled Water Pipeline to connect City of San Bernardino Municipal Water Department Tertiary Treatment System to Weaver Basins.

1-E-25 Continue working with retail agencies to maximize their recycled water programs, evaluate dual plumbing where feasible and direct potable reuse while prioritizing findings from the Salt and Nutrient Management Plan and Regional Salt Mitigation Study.

1-G Conjunctive Use

Description: Secure up to 120,000 acre-feet in additional groundwater storage for dry year yield for local and regional partners

Adaptive Capacity Indicator: Annual conjunctive water use capacity (acre-feet)

Key Partners: Basin Technical Advisory Committee (BTAC), San Gorgonio Pass Water Agency, Yucaipa Valley Water Districts, Western Water, and others

Actions:

1-G-26 Engage with participating agencies and potential partners to finance the planning, development, and operation of conjunctive use projects such as the Bunker Hill Conjunctive Use Program (BHCUP) and the Santa Ana River Conservation and Conjunctive Use Program (SARCCUP); reevaluate the IRUWMP and BTAC Conjunctive Use Guidelines.

1-G-27 Update/revise the Surplus Water Policy (Ordinance No. 79).

1-G-28 Complete the modeling and conjunctive use proposal for the SARCCUP/BHCUP and related approvals from BTAC, Board, and Watermaster.

1-G-29 Finalize and implement conjunctive use investments for SARCCUP and Bunker Hill CUP, and related construction.

1-H Local Resource Investment

Description: Invest in local and regional water supply projects that reduce demand on imported water supplies and increase water supply reliability

Adaptive Capacity Indicator: Increase in annual local water availability (acre feet)

Key Partners: Retail Agencies

Actions:

1-H-30 Continue the implementation of a local resource investment program incentivizing local stormwater capture, groundwater replenishment and recovery, water conservation, and recycled water and onsite reuse, tree-planting in disadvantaged communities that lacks tree canopy, rainwater harvesting, and dual-plumbing investments.

Deleted: rain-barrel distribution

1-I Adaptive Supply Planning and Portfolio Management

Description: Incorporate latest climate science and scenarios into plans for water resource development and management, emergency preparedness and response, and financial sustainability.

Adaptive Capacity Indicator: Number of plans that incorporate the latest climate science.

Key Partners: Retail Agencies, United States Geological Survey, California Department of Water Resources, Center for Western Weather and Water Extremes, Santa Ana Watershed Project Authority, California Data Collaborative, and technology solutions providers

Actions:

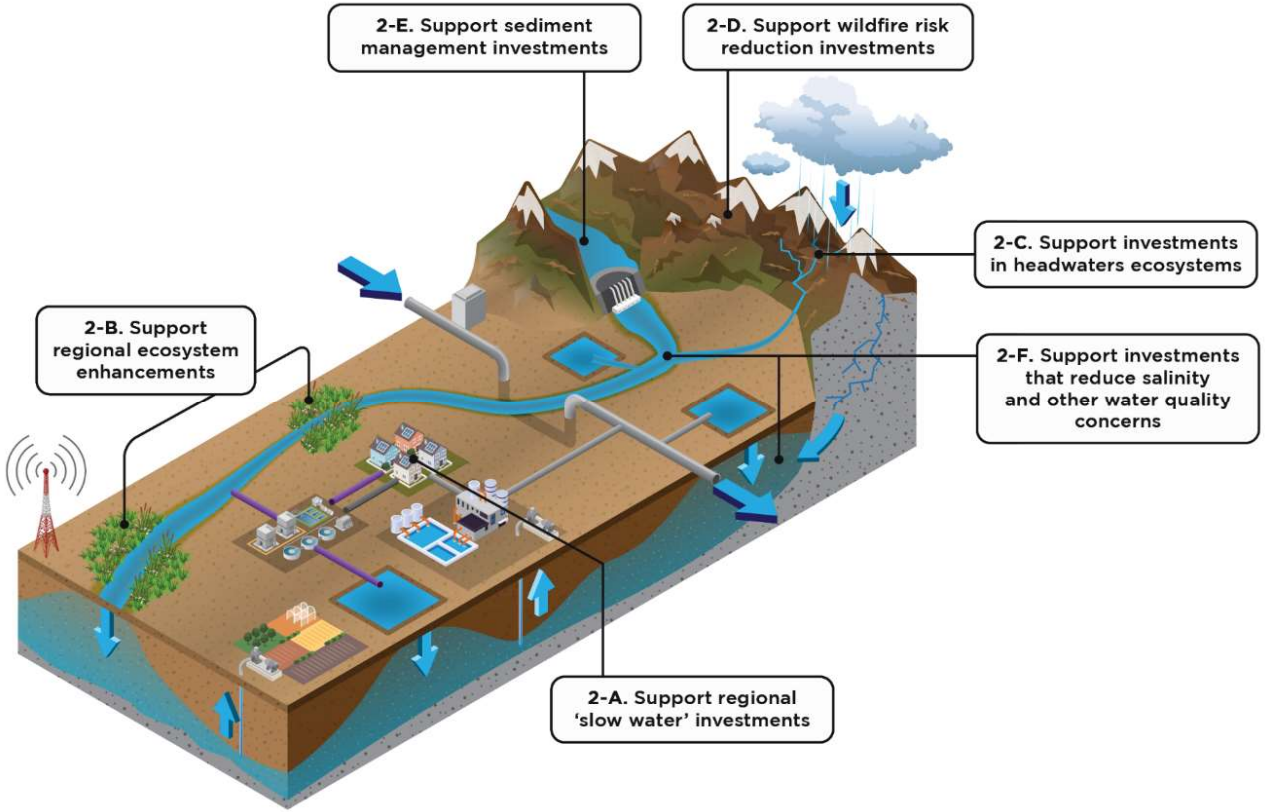
1-I-31 Periodically update models and plans with the latest data and forecast; invest in high-quality science and enhanced data management to better understand Basin's trends and response to management actions; and conduct climate sensitive analysis (back-end solutions).

1-I-32 Identify and implement water portfolio tool(s), dashboards and decision-support and engagement portals necessary to adapt to a variety of plausible futures successfully and agile enough to adjust the water portfolio to changing times (front-end solutions).

2. Protect the Water Portfolio

Figure 34 below depicts the CARP measures that support Guiding Principle 2: Protect the Water Portfolio. The diagram illustrates how measures contribute to enhancing the resilience of SBVMWD's water portfolio within its operational context.

Figure 34 CARP Measures Supporting Guiding Principle 2: Protect the Water Portfolio



2-A Nature-Based Solutions

Description: Support regional slow water initiatives or local efforts to attenuate runoff and increase permeable surfaces in urban areas

Adaptive Capacity Indicator: Additional aquifer recharge capacity from storm runoff per year (acre-feet)

Key Partners: Retail agencies, cities, flood control district, property owners, non-profits

Actions:

2-A-33 Engage with retail agencies, cities, and flood control district to identify urban areas affected by localized flooding, areas that are a significant source of pollutant loads, and ongoing efforts to increase urban habitats and open space.

2-A-34. Consider conducting a study to determine opportunities to attenuate runoff and to determine the extent to which these opportunities (tree canopy, rain gardens, rain-barrels, infiltration basins, check dams, ponds, wetlands, etc.) can improve recharge and water quality.

2-A-35 Identify funding opportunities to pool resources or develop a regional fund for financing these projects (e.g., grants, loans, bonds, fees).

2-A-36 In partnership with land use authorities such as cities, consider opportunities for direct use of local runoff in addition to infiltration as an offset to potable water or recycled water.

2-A-37 Evaluate additional recharge and infiltration opportunities through passive recharge in local waterways and flood plains, while providing multiple benefits and mitigating habitat issues.

2-B Ecosystem Enhancements

Description: Support the implementation of the HCP conservation and restoration activities

Adaptive Capacity Indicator: Annual additional restored/conserved area (acres)

Key Partners: City of Rialto, East Valley Water District, Inland Empire Utilities Agency, Metropolitan Water District of Southern California, Orange County Water District, Riverside Public Utilities, San Bernardino Municipal Water District, San Bernardino Valley Municipal Water District, San Bernardino Valley Municipal Water Conservation District, West Valley Water District, Western Municipal Water District of Riverside County

Actions:

2-B-38 Complete the ecosystem restoration and translocation projects identified in the HCP.

2-B-39. Evaluate additional enhancement opportunities within the HCP Preserve System (for example Sunrise Ranch), and if feasible, develop and implement.

2-C Headwaters Landscape Management

Description: Support the implementation of headwaters landscape management practices in the upper SAR watershed

Adaptive Capacity Indicator: Annual additional enhanced/ improved habitat (acres)

Key Partners: San Bernardino National Forest, US Forest Service, all members of the Headwaters Resilience Partnership

Actions:

2-C-40 Investigate, identify, and develop an investment and partnership plan for headwater health and restoration projects.

2-C-41 Develop and prioritize a web-based inventory of watershed and/or ecosystem services projects that feature nature-based solutions and enhanced ecosystem services to prioritize a list of projects for investment and implementation.

2-C-42 Develop a long-range financial plan to fund ecosystem investments that provide water quality, water supply, and resilience benefits.

2-C-43 Develop a monitoring and evaluation approach for headwaters/forest resources and align with regional, state, and federal monitoring efforts.

2-C-44 Consider conducting a study to determine headwaters landscape management opportunities to increase water storage capacity (e.g., meadows and mountain wetlands, catchment pools).

2-D Land Stewardship and Land Use Planning

Description: Develop and implement wildfire abatement and response program

Adaptive Capacity Indicator: Adopted document or policy

Key Partners: Inland Empire Fire Safe Alliance, USDA Forest Service, San Bernardino County Fire Protection District, Southern California Edison, CAL FIRE

Actions:

2-D-45 Partner with Inland Empire Fire Safe Alliance, USDA Forest Service, San Bernardino County Fire Protection District, Southern California Edison, CAL FIRE, and other agencies and partners with vegetation and fuel management programs to identify opportunities to reduce wildfire risks in the headwaters and urban-wildlands interface.

2-D-46 Engage with and educate public users, landowners, businesses, and resorts to encourage participation in vegetation and fuel management programs that reduce fire and erosion risks.

2-D-47 Partner with relevant authorities to plan, implement, maintain, and enhance wildfire risk reduction strategies in the headwaters that would additionally address risks to San Bernardino Valley's infrastructure, conservation investments, water supply, and water quality.

2-D-48 Leverage current and upcoming State and federal wildfire risk scenarios to develop appropriate response and restoration policies and strategies.

2-D-49 Develop and implement a long-range financial plan or strategy to conduct targeted vegetation management in the Upper SAR Watershed.

2-D-50 Partner to develop, implement, and maintain an Ignition Reduction Plan and Wildfire Early Detection in the areas of greatest risk, including the use of cameras and artificial intelligence.

2-E Sediment Management

Description: Support and implement a Sediment Management Plan for surface storage facilities and recharge basins that incorporates climate change extremes

Adaptive Capacity Indicator: Increased annual sediment capture capacity (cubic feet)

Key Partners: Water Conservation District, Flood Control District

Actions:

2-E-51 Conduct studies or synthesize existing studies to assess the risks due to climate change-driven increases in sediment and identify high-priority investments for implementation.

2-E-52 Scope potential enhancements to existing water infrastructure and/other projects and implement high-priority projects to reduce maintenance costs associated with increased sediment flow.

2-E-53 Partner with relevant agencies to develop and implement a Sediment Management Plan to reduce impacts and increase water supply, water quality, and habitat benefits.

2-F Salt and Water Quality Management

Description: In collaboration with partners, develop and implement a Water Quality Program

Adaptive Capacity Indicator(s): Adopted document or policy with salinity, blending quantities/requirements

Key Partners: Santa Ana Regional Water Quality Control Board, Santa Ana Watershed Project Authority

Actions:

2-F-54 Assess the salt and nutrient impacts of existing and new water supply projects and basin management activities under different climate change scenarios; update and maintain a Water Quality Model and continue collaboration with the Santa Ana Watershed Project Authority on Watershed water quality initiatives.

2-F-55 Evaluate the potential impacts to water supply reliability and water quality of State and federal water quality standards especially pertaining to PFAS, emerging constituents, recycled water, and stormwater in the context of climate change.

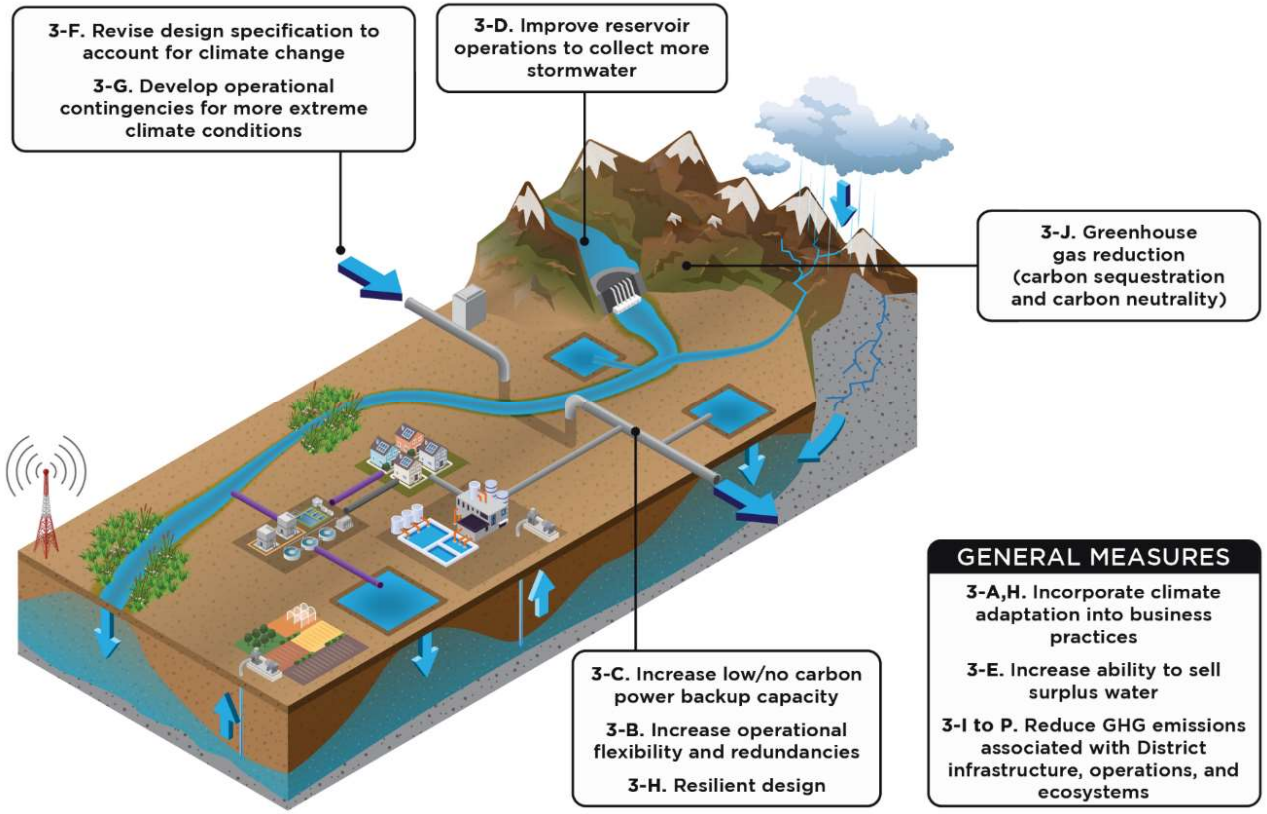
2-F-56 Complete the Salt and Nutrient Management Plan and continue collaboration with the Santa Ana Regional Water Quality Control Board and SAWPA on water quality.

2-F-57 Evaluate investments and programs to mitigate salt, manage contamination plumes, manage, and treat emerging contaminants, and provide equitable access to available supplies.

3. Improve Operational and Infrastructural Resilience

Figure 35 below depicts the CARP measures that support Guiding Principle 3: Improve Operational and Infrastructural Resilience. The diagram illustrates how measures contribute to enhancing SBVMWD's infrastructure resilience within its operational context.

Figure 35 CARP Measures Supporting Guiding Principle 3: Improve Operational and Infrastructural Resilience



3-A Climate Adaptable and Resilient Business Model

Description: Evaluate existing services and programs that may support climate adaptation and explore opportunities to innovate

Adaptive Capacity Indicator: Number of new/revised decision-making frameworks that incorporate climate change risks and opportunities

Key Partners: TBD

Actions:

3-A-58 Mainstream adaptation into decision-making by factoring climate risk and evaluating complex trade-offs and unintended consequences; this may involve more climate-centric extended financial costs and benefits, avoided losses and damage, extended returns on investment, etc.

3-A-59 Annually evaluate that climate resilience is being built in SBVWD's human, political, physical, financial, social, and natural systems to maintain holistically resilient operations, strategies, human resources, finances, and legal/compliance functions

3-A-60 Evaluate the formation of a Climate Resilience District (SB 852) with other entities for the purposes of raising and allocating funding for eligible projects

3-A-61 Utilize technology to reimagine both climate risks and opportunities e.g. artificial intelligence (AI) and machine learning to integrate real-time observations and simulations to determine the effects of extreme weather events and climate hazards, digital twins to provide insights into systems and processes, etc.

3-B Operational Flexibility and Redundancies

Description: Maximize operational flexibility and redundancies, including periodically reviewing and evaluating water transfer agreements, interties, flexible exchanges, additional system interconnections, points of delivery, etc.

Adaptive Capacity Indicator: Number of additional connections/interconnections developed

Key Partners: TBD

Actions:

3-B-62 Review all water transfer, exchange and cooperation agreements (e.g. CLAWA, MWDSC, SGPWA, and SARCCUP) to confirm their relevance to resilience, and repeal or update if necessary.

3-B-63 Annually evaluate and test interconnections and delivery points to maintain operability and ability to function at installed capacity; develop action report and perform any repairs and upgrade.

3-B-64 Evaluate and utilize the flexibility and redundancy provided by interties such as the Central Feeder-East Branch Extension Intertie, and the MWDSC Intertie at the Foothill Pump Station; complete any associated construction/improvements.

3-B-65 Consider utilizing storage and delivery partnerships to meet short and intermediate needs (e.g., Diamond Valley Lake with MWDSC and SARCCUP agencies, Class 8 Contractors, Sunrise Ranch Reservoir with other partners).

3-B-66 Develop programs to bridge infrastructural and contractual gaps through initiatives such as the San Bernardino Basin Optimization and Stewardship Program.

3-C Onsite Renewable, Backup Power & Grid Resilience

Description: Increase the availability of environment-friendly backup power or onsite renewable energy production at critical facilities

Adaptive Capacity Indicator: Number of additional redundancies added to system

Key Partners: TBD

Actions:

3-C-67 Use renewable energy and optimize battery storage at critical facilities to meet basic electrical needs and reduce grid dependence for heating and air-conditioning, lights and security, and communication and Board meetings; examples include rooftop solar at Headquarters and battery storage for the 9th Street Well (BLF).

3-C-68 Assess the reliability of renewable-based backup power and energy storage systems for continuity of business operations for facilities and field operations during power disruptions that may be caused by extreme weather (wind, heatwaves, floods, etc.).

3-C-69 Assess the need for additional backup power capacity to mitigate power outages, emergency water storage capacity to provide pumping flexibility, and the feasibility of pumped-storage hydroelectricity.

3-C-70 Maintain partnership with local and regional agencies to develop mutual aid agreements for standby power (e.g., Regional Standby Generator Fleet through ERNIE).

3-C-71 Incorporate on-site renewable generation and storage (wind, solar, small hydropower, hydrogen, battery, etc.) when feasible at new facilities (for example, future facilities at Sunrise Ranch).

3-C-72 Consider long-term leases, licenses, temporary easements, or other arrangements for the use of appropriate SBVMWD properties for energy developers and investors to develop renewable energy generation and storage projects, thereby increasing grid resilience

3-D System Reoperation (Parts 1 and 2)

Description: (3-D1) Forecast Informed Reservoir Operation (FIRO) at Seven Oaks Dam; and (3-D2) Prioritize multipurpose facilities over single-use facilities

Adaptive Capacity Indicator: Additional annual usable storage capacity in Seven Oaks Dam (acre-feet)

Key Partners: U.S. Army Corps of Engineers, Western Water Municipal District, Seven Oaks Dam Local Sponsors

Actions (3-D1):

3-D-73 Continue working with the USACE, relevant Flood Control Districts, and other interested parties to assess FIRO at Seven Oaks Dam.

3-D-74 Continue working with interested parties to determine the best use of seasonal storage across users, taking into account climate change.

3-D-75 Update or create an Optimization Model that maximizes the benefits of direct use, surface storage, water quality benefits, and groundwater storage of stormflow captured and diverted at the Dam; coordinate this effort with Sediment Management Plan.

Actions (3-D2):

3-D-76 Complete facilities' improvements to optimize local and imported water recharge at SAR and Mill Creek Spreading Basins, Cactus Basins, County Line Basin, and Weaver Basins.

3-D-77 Complete the next phase of facility improvements to optimize recharge, including Program for Expanded Recharge Capability (PERC) sites, Devil Canyon, Oak Creek Basins, and other feasible locations.

3-D-78 Evaluate and identify how to reoperate or maximize the use of local and regional facilities that can be shared to maximize resilient water and power grid resilience and resilient habitat and ecosystem (e.g., Foothill Pump Station, Greenspot Pump Station, Central Feeder).

3-D-79 Evaluate and identify how to reoperate or maximize hydropower facilities to aid regional water reliability.

3-E Water Sales and Transfers

Description: Develop principles to evaluate selling surplus water under certain conditions

Adaptive Capacity Indicator: Additional ability to sell or transfer excess water (acre-feet)

Key Partners: Western Water, Basin Technical Advisory Committee

Actions:

3-E-80 Review and update decision criteria and/or thresholds for sale of surplus water, ensuring that sale or transfer outside the service area is done strategically to maintain a diverse water portfolio.

3-E-81 Maintain a High Groundwater Mitigation and Liquefaction Reduction Plan (Dewatering Contingency Plan) to dewater areas of concern and pump additional water to beneficial users.

3-F Resilient Design

Description: Develop a policy and/or process to prioritize when to apply and implement climate change-informed design criteria for flooding, extreme heat, wildfire, liquefaction, and other climate extremes.

Adaptive Capacity Indicator: Number of assets designed based on resilient design criteria

Key Partners: San Georgino Pass Water Agency

Actions:

3-F-82 Review existing standards and guidelines for the design and operation of SBVMWD assets and habitat investments to identify potential weaknesses and climate risks, including where thresholds for resilience are missing or insufficient; update standards and specifications where necessary.

3-F-83 For new projects, perform a Climate Vulnerability Analysis and develop project designs that address those vulnerabilities using cutting-edge climate science and research into technical guidance (Climate Resilience Design Guidelines).

3-F-84 Create and implement a priority list of assets that need to be prepared for changing extreme weather decades into the future (e.g., City Creek Tunneling Project).

3-F-85 For new buildings, incorporate resilient design and construction sustainability elements such as fire-resistant building envelopes, geothermal energy, green roofs, high efficiency toilets, etc.; design buildings to meet LEED (Leadership in Energy and Environmental Design) certification, the nationally accepted benchmark of high performance, green buildings.

3-G Operational Contingencies

Description: Develop and implement operational contingencies for projected extreme weather conditions

Adaptive Capacity Indicator: Number of operational contingencies developed and incorporated into plans

Key Partners: TBD

Actions:

3-G-86 Review and update the Local Hazard Mitigation Plan every 5 years, which also helps receive state and federal grants.

3-G-87 Incorporate data and information from the United States Geological Survey, Center for Western Weather and Water Extremes, National Weather Service, and other credible sources to improve operational planning, emergency preparedness and response, and water deliveries.

3-H Climate Resilient Infrastructure and Operations

Description: Develop and implement adaptive management and processes, including monitoring, infrastructure planning, financing, and capacity building to maintain continuity of business.

Key Performance Indicator(s): Number of new adaptive management processes incorporated in existing business systems

Key Partners: TBD

Actions:

3-H-88 Develop a process or guidelines for routinely assessing climate vulnerabilities and risks, incorporating climate change into a clearly defined capital improvement program development, and determining the right investment mix to achieve climate adaptation and resilience targets.

3-H-89 Establish a climate monitoring and evaluation framework, as well as regular updates of climate adaptation and resilience planning that includes key climate indicators and progress toward desired outcomes; conduct climate adaptation analysis and planning for climate-informed financial and management decisions and program implementation.

3-H-90 Periodically educate and train San Bernardino Valley and key retail agencies' staff on adaptive water management approaches (e.g., Water Utility Climate Alliance (WUCA) Engagement, Training, and Best Practices); maintain awareness of best available science as new climate research, projections, and scenarios better constrain likely future climate risks.

3-H-91 Pursue more flexible and innovative financing strategies, including, but not limited to, Watershed Connect, WIFIA, Public-Public Partnerships, and Public-Private Partnerships just to mention a few to fund resilience projects.

3-H-92 Develop and use SBVMWD-wide information management systems and dashboards to track energy use/purchase and water deliveries.

3-H-93 Reform policies and programs that are maladaptive to climate change or that increase climate risks and vulnerabilities; develop and enhance tools that assess climate change impacts, and support climate adaptation planning and implementation.

3-H-94 Cultivate a culture of resilience throughout the organization by ensuring that planning and exercises are based on principles rather than processes; preparedness and resilience must become part of the DNA and be inclusive of everyone, from the staff all the way to the Board.

3-I Greenhouse Gas Reduction (Investments, Procurement and Supply Chain)

Description: Revise/update investment and purchasing policies and procedures to reduce the embedded carbon of purchased goods and services

Climate Mitigation Indicator: GHG Emissions associated with investments, procurement, and supply chain (tons CO_2e)

Key Partners: TBD

Actions:

3-I-95 Evaluate the District's Investment Policy and procurement practices to identify opportunities to increase sustainability and reduce GHG emissions without introducing undesired risk.

3-I-96 Consider updating procurement rules to prioritize vendors and contractors that can demonstrate progress in their own climate adaptation and resilience journey; explore a climate leadership preference similar to the Local Purchasing Preference (5 percent) under State law.

3-I-97 Maximize the procurement of sustainable products and services, including EnergyStar rated equipment; products that are bio-based, made from recycled content, water efficient, fuel-efficient, made with safer chemical ingredients, and non-ozone depleting; products that have earned third-party ecolabels and recommended by USEPA and avoid the procurement of products containing PFAS.

3-I-98 Set procurement specifications to quantify and reduce waste and emissions from procured goods and services (e.g., battery recycling, composting, comprehensive recycling program, electronics recycling, recycled and reusable service items).

3-J Greenhouse Gas Reduction (Carbon Sequestration and Carbon Neutrality)

Description: Neutralize emissions that cannot be reduced or eliminated

Climate Mitigation Indicator: Sequestered GHG Emissions (tons CO_2e)

Key Partners: TBD

Actions:

3-J-99 Develop a carbon neutrality hierarchy to SBVMWD projects and programs with Avoid being the highest priority followed by Reduce, Replace, Compensate/Offset; Neutralize/Remove should be the least used.

3-J-100 To achieve carbon neutrality by 2035, reduce emissions where feasible, sequester carbon from unavoidable emissions (such as essential flights), and when emissions are unavoidable (such as from construction), calculate the amount of emissions produced and then take appropriate actions to remove an equivalent or greater amount of carbon emissions from the atmosphere.

3-J-101 Develop and implement a Carbon Sequestration Plan to capture and store unavoidable carbon emissions through forest restoration, growing trees, or other forms of carbon capture that are directly controlled by SBVMWD or in active partnership; monitor and track the CO_2 captured; and consider developing a carbon offset program that can be sold to others.

3-K Greenhouse Gas Reduction (Buildings & Facilities)

Description: Phase out natural gas combustion at facilities to reduce natural gas use and associated GHG emissions by 50% before 2030

Climate Mitigation Indicator: GHG Emissions associated with natural gas use (tons CO_2e)

Key Partners: TBD

Actions:

3-K-102 Collect data on aging natural gas equipment due for replacement and identify operationally and financially viable electric alternatives.

3-K-103 Develop and establish guidelines for new HVAC equipment and appliances acquired by SBVMWD to be EnergyStar certification or have the highest level of efficiency available; guidelines should require any new building to be all-electric and use heat pumps for space and water heating.

3-K-104 Electrify equipment at the time of replacement to reduce natural gas consumption over time; if desirable, accelerate replacement before end of life by taking advantage of energy efficiency rebates, incentives, and financing.

3-L Greenhouse Gas Reduction (Energy Efficiency and Carbon Pollution-Free Electricity)

Description: Proactively reduce SBVMWD's electricity carbon footprint

Climate Mitigation Indicator: GHG Emissions associated with electricity use (tons CO_2e)

Key Partners: TBD

Actions:

3-L-105 Conduct an energy audit of SBVMWD's facilities and buildings and implement the findings/improvements especially for motors and pumps, lighting and lighting controls, and HVAC.

3-L-106 Consider offsetting grid power use by at least 25 percent by 2030 by installing solar power, energy storage (battery) system), and other renewable energy systems to lower carbon footprint, reduce fossil fuel use, and improve resilience to power outages.

3-L-107 Seek ways to pilot and accelerate promising carbon pollution-free electricity sources such as green hydrogen, fuel cells, and other innovative approaches.

3-M Greenhouse Gas Reduction (Light-Duty Vehicles)

Description: Reduce emissions associated with SBVMWD's light-duty fleet

Climate Mitigation Indicator: GHG Emissions associated with the light-duty fleet (tons CO_2e)

Key Partners: TBD

Actions:

3-M-108 Conduct a zero-emission vehicles assessment to determine which fleet vehicles can be converted to electric vehicles (EV) or alternative fuels, what chargers are required, and where they should be located.

3-M-109 Implement an "EV first" purchasing rule and fast-track the replacement of ICE vehicles. When vehicles are due for replacement, check for EV availability and purchase. If EV is not available, then buy the most environmentally-friendly option.

3-M-110 Install EV chargers, refueling infrastructure, energy storage technologies, and ancillary services to support zero-emission vehicles.

3-M-111 Expand the use of vehicle telematics and using fleet operational data to inform fleet planning and vehicle acquisition strategies; improve accounting and reporting of asset-level fleet data including fueling transactions, mileage, and acquisition and disposal costs.

3-N Greenhouse Gas Reduction (Heavy-Duty Vehicles and Construction)

Description: Reduce emissions from construction through decarbonization of construction machinery

Climate Mitigation Indicator: GHG Emissions associated with heavy-duty vehicles and construction equipment (tons CO_2e)

Key Partners: TBD

Actions:

3-N-112 Consider offsetting emissions from construction machinery by reducing embedded carbon through the use of low-carbon concrete and steel where feasible; consider preferences for such material in public works projects.

3-N-113 Improve collaboration with project partners to rethink design and construction processes to reduce emissions, minimize hauling and onsite waste, and tracking and reporting of construction-related emissions.

3-O Greenhouse Gas Reduction (Equipment and Tools)

Description: Replace gas-powered equipment with electrically powered equivalents

Climate Mitigation Indicator: GHG Emissions associated with equipment and tool fuel combustion (tons CO_2e)

Key Partners: TBD

Actions:

3-O-114 Create an inventory of gas-powered equipment including generators, pumps, landscaping equipment, etc.

3-O-115 Research appropriate electric and battery-powered replacements and develop a phased approach to replace (replacement schedule).

3-O-116 Implement a replacement program and explore applicable incentives from utility (e.g., SCE and SCG), regulatory (e.g. South Coast AQMD), state, and federal sources.

3-P Greenhouse Gas Reduction (Commuting and Business Travel)

Description: Reduce GHG emissions associated with commuting

Climate Mitigation Indicator: GHG Emissions associated with commuting (tons CO_2e)

Key Partners: TBD

Actions:

3-P-117 Evaluate the feasibility of workplace EV charging and install chargers if feasible; evaluate potential EV charging incentives.

3-P-118 Continue to encourage flexible working arrangement and virtual meetings where appropriate to reduce commute trips.

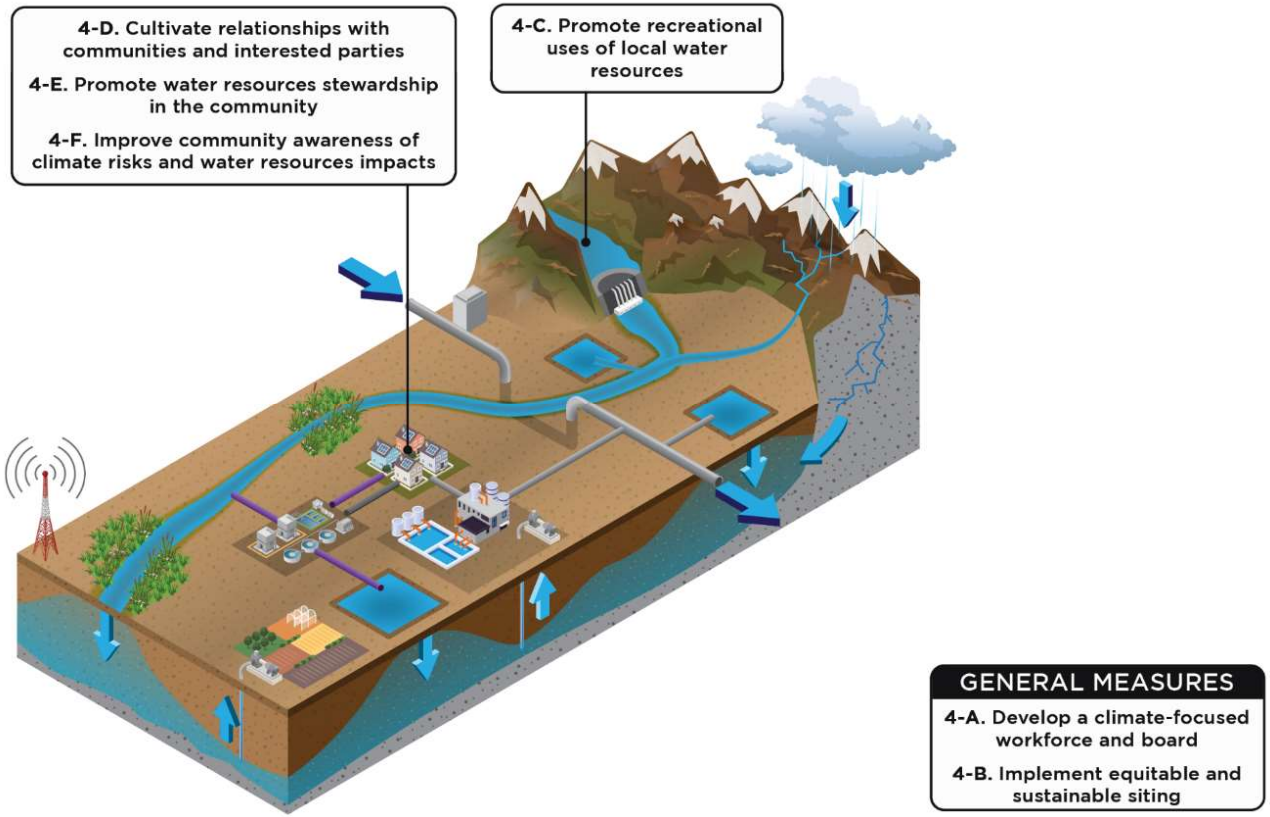
3-P-119 Increase awareness among Board members and staff on the impact of business travel, and update travel policy or guidelines to encourage low-carbon travel alternatives and sustainable practices where feasible (EV and hybrid car rentals, airlines with sustainable practices, eco-friendly hotel chains, rail and bus travel, and videoconferencing).

3-P-120 Improve accounting and reporting of business travel data, such as car rental miles, personal vehicles mileage reimbursement, air travel miles, etc., and their associated GHG emissions.

4. Connect People to Water and Climate

Figure 36 below depicts the CARP measures that support Guiding Principle 4: Connect People to Water and Climate. The diagram illustrates how measures support better connectivity between the services that SBVMWD provides and the communities it serves.

Figure 36 CARP Measures Supporting Guiding Principle 4: Connect People to Water and Climate



4-A Develop a Climate-Focused Workforce and Board

Description: Build internal capacity through engagement, education, and training on climate adaptation and resilience

Adaptive Capacity Indicator: Annual person-hours supporting implementation of the CARP

Key Partners: TBD

Actions:

4-A-121 Identify human resources requirements for effective implementation of climate adaptation and resilience goals and objectives so that SBVMWD has the necessary staff, training, and resources; develop workload/staff planning to implement the CARP.

4-A-122 Incorporate sustainability and climate resilience into staffing, engagement and training, performance, etc., to foster a culture of climate competency and action throughout SBVMWD.

4-A-123 Incorporate sustainability and climate resilience content in Board's ongoing leadership development efforts and decision-making.

4-B Equitable and Sustainable Siting

Description: Strategically plan to construct SBVMWD's future assets in a manner that will reduce GHG emissions and reduce climate hazard risks. Work with local agencies to encourage regional planning for economic growth that is equitable and sustainable.

Adaptive Capacity Indicator: Number of assets developed with adaptive design features and/or low/no carbon footprints

Key Partners: TBD

Actions:

4-B-124 Develop and adopt climate adaptive and resilient policies, principles or guidelines that will be used to evaluate future development in all areas vulnerable to changing climate impacts.

4-B-125 Develop and adopt green infrastructure policies to protect, restore and mimic the natural water cycle (tree planting, wetlands, and sustainable urban drainage systems) so that the most vulnerable communities will benefit as evaluated by climate-equity guidelines and priority criteria.

4-B-126 Create clear guidelines to promote sustainable location of SBVMWD facilities and strengthen the community benefits of SBVMWD facilities; the guidelines may address topics such as strategically locating future SBVMWD facilities to promote efficient use of local infrastructure.

4-C Public Access and Sustainable Events

Description: Partner with local agencies, nonprofits, and other interested parties to support public use of applicable SBVMWD assets, including recreational uses

Adaptive Management Indicator: Educational and public use statistics per year (number of visits)

Key Partners: TBD

Actions:

4-C-127 Identify educational and recreational uses of District's water resources and assets that could be impacted by climate change and consider new or improved programs to offset impact.

4-C-128 Establish guidelines so that all events hosted by SBVMWD are eco-friendly, sustainable, and creates minimal waste with consideration being given to sustainability practices in communication and marketing, waste management, food and beverage, decorations, giveaways, transportation, and energy saving opportunities.

4-D Cultural and Community Issues (Environmental Equity & Justice)

Description: Develop and maintain relationships with community groups and other interested parties so that SBVMWD is aware of community needs

Adaptive Management Indicator: Survey data indicating awareness and support

Key Partners: Community groups, US Water Alliance Water Equity Network, and The Climate Center

Actions:

4-D-129 Identify community groups and neighborhoods that are likely to be impacted by measures and actions at SBVMWD's infrastructure investments and take actions to collaborate with impacted community members.

4-D-130 Assign staff responsible for responding to community groups and engaging in a thoughtful and impactful way that reflects San Bernardino Valley's commitments to connecting people to water and climate.

4-D-131 Consider collaborating with national organizations or efforts developing approaches to enhance equity and inclusion in water resources planning and management (e.g., U.S. Water Alliance Water Equity Network, The Climate Center).

4-E Educate the community we serve on Watershed Sustainability

Description: Support and amplify programming and investments in water stewardship

Adaptive Management Indicators: Number of people reached through outreach efforts or survey data indicating improved knowledge.

Key Partners: Retail Agencies

Actions:

4-E-132 Leverage findings from the Ultimate Demand Study to understand which retail agencies could drive risk of heightened demand, and advance water efficiency through assisting retail agencies to implement the Making Conservation a California Way of Life efficiency standards.

4-E-133 Partner with retail agencies to design strategic/high-priority programming, education, and investment programs to manage demand and empower customers to become water stewards.

4-E-134 Promote holistic legislative and regulatory understanding of the water resources complexity in the face of climate resilience and adaptability through a system approach.

4-E-135 Implement a tailored funding program to fund customer-side solutions such as stormwater capture, water efficiency and conservation, and on-site reuse and recycled water investment.

4-F Community Climate Risk Reduction

Description: Invest in programs that help community groups understand climate risks and how to mitigate impacts at the local level with a focus on partnerships with organizations already engaged in this work

Adaptive Management Indicators: Number of programs implemented with support from SBVMWD staff or survey data indicating improved knowledge

Key Partners: Local community groups

Actions:

4-F-136 Identify staff at San Bernardino Valley responsible for sustained community engagement and accelerating progress through partnerships.

4-F-136 Implement regular engagement with local community groups undertaking climate risk reduction activities to identify activities and opportunities that could be effective broadly or replicated in other communities.

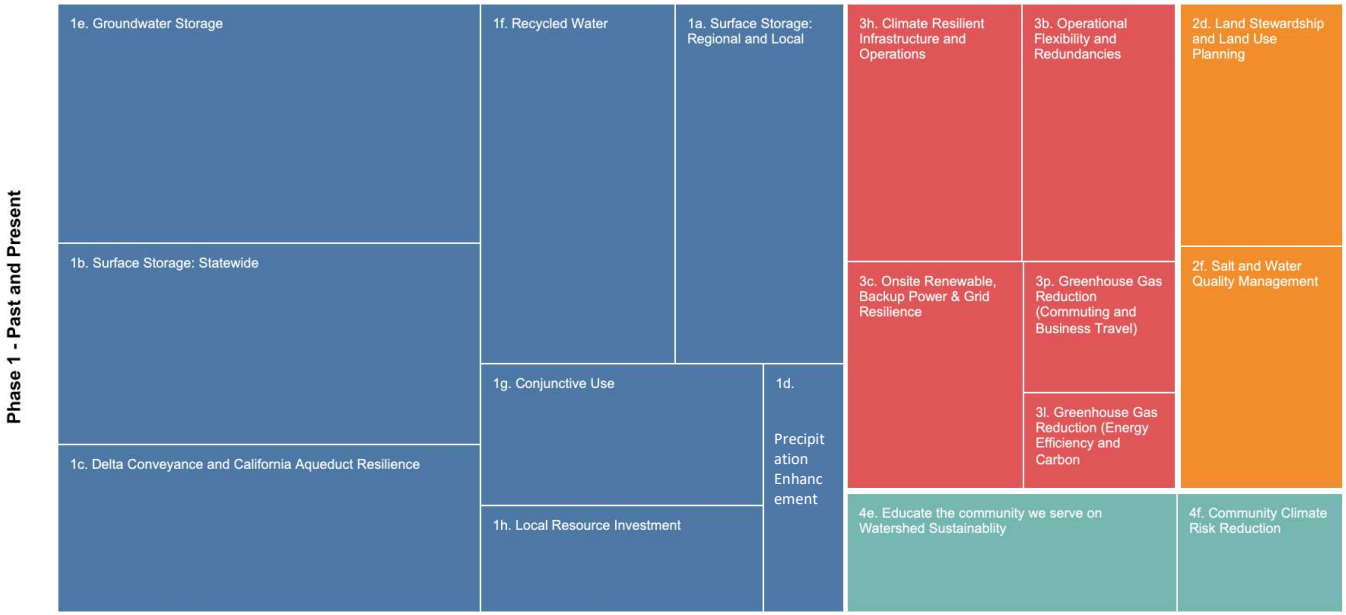
4-F-136 Identify areas where San Bernardino Valley could directly support, provide expertise, or foster formal discussions about new programming and investments that could reduce climate risks and enhance community resilience.

4-F-136 Establish best practices for inclusive community engagement as appropriate for the community we serve (e.g., Groundwork USA's Best Practices for Meaningful Community Engagement).

6. Phasing and Implementation

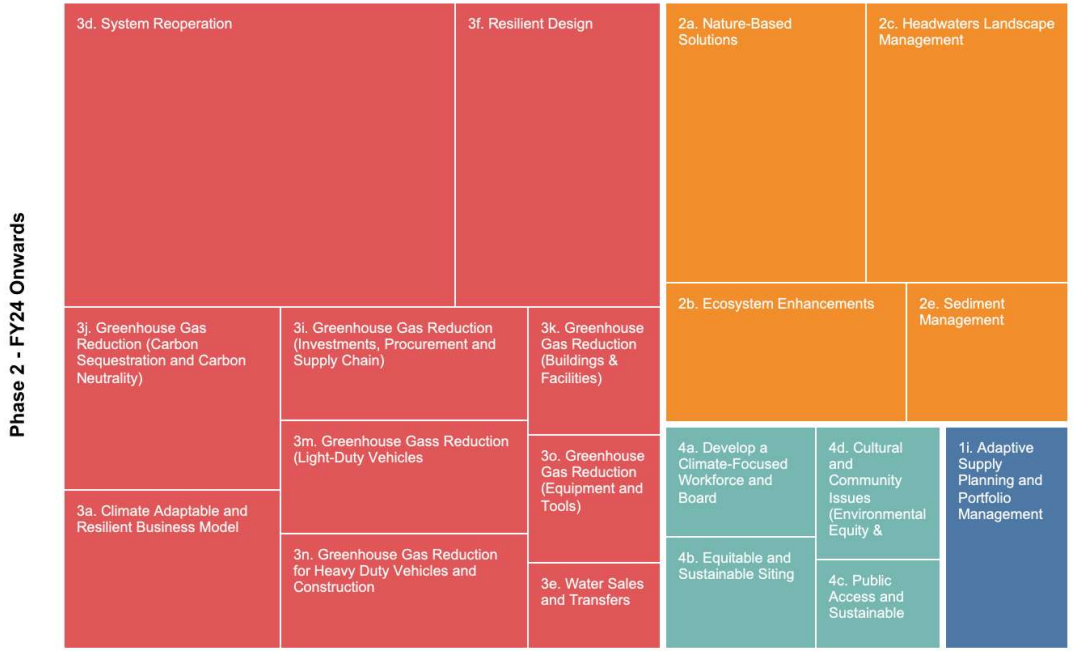
To effectively implement this plan, it is necessary to incorporate flexibility into its implementation as conditions change alongside a general phasing of planned measures to maintain continued progress. Section 5 identifies the planned measures and actions that support climate adaptation and mitigation for SBVMWD. Figure 37 and Figure 38 bring these together and show all planned measures separated into two proposed phases – Phase 1 which includes complete, ongoing, or already approved measures and Phase 2 which contains those measures planned to begin, from conceptualization or detailed planning to full implementation, in FY24 and beyond. The total size of all the boxes in each phase represents the relative approximate cost of the portfolio of measures, with the size of individual boxes indicating their cost relative to all other measures. As an example, 1e. Groundwater Storage is a relatively high-cost measure but one that is already in progress and addresses key water system vulnerabilities – namely, drought and extreme precipitation. Relatedly, most of the relatively higher cost measures are those related to securing and bolstering aspects of the water supply portfolio, a core mission of San Bernardino Valley.

Figure 37 Phase 1 Measures by Guiding Principle



Note: The size of all boxes for Phase 1 and Phase 2 depicts the relative anticipated costs of these portfolios. The size of individual boxes depicts their relative cost across all measures.

Figure 38 Phase 2 Measures by Guiding Principle



Note: The size of all boxes for Phase 1 and Phase 2 depicts the relative anticipated costs of these portfolios. The size of individual boxes depicts their relative cost across all measures.

Phase 1 measures are generally those related to SBVMWD's water supply portfolio, covering imported and local surface water, groundwater, recycled water, and precipitation enhancement. Operational and infrastructure resilience are also prioritized here, with a focus on climate resilience, operational redundancy and flexibility and greenhouse gas emissions mitigation efforts. Phase 2 expands this focus on adaptation and mitigation to include efforts related to resilient design, reservoir operations and multi-benefit projects, and a greater expansion of measures that mitigate greenhouse gas emissions. Importantly, both watershed protection and community engagement measures span across both phases, with a nearer-term focus on wildfire abatement and management, water quality management, water demand management and community education around climate risk.

Each measure will be implemented as a set of actions that contribute to the goals set forth by a given measure. For example, 1a. Surface Storage: Regional and Local includes a set of actions that build on one another – a master plan and feasibility study that evaluate local storage options followed by the design and construction of these storage options. This means that while a measure may begin in Phase 1, the implementation of actions within it may extend out further out into the future. Looking across planned actions, most actions related to assessing, studying or planning, such as assessing FIRO at Seven Oaks Dam, at anticipated to be implemented in Phase 1, meaning they have already begun or are already complete, or early in Phase 2. Actions related to monitoring, engagement, programming, and policy are generally spread across implementation horizons on an ongoing basis.

Adaptive Management

Adaptive management approaches seek to move from static plans to dynamic planning processes in which entities track metrics of consequence to their management decisions and adjust their decision-making over time. Adaptive management approaches have been increasingly used across California to respond to changing conditions due to climate change, human and ecological factors or other uncertainties present in a system during a given planning process. For San Bernardino Valley, the decision to adjust the phasing and implementation of measures or actions, potentially re-prioritizing them, could be triggered by a number of factors. These could include deeper droughts affecting water supply, more severe atmospheric rivers bringing the potential for local storage or contrastingly damaging the watershed's natural or built infrastructure, high rates of population growth or per capita water use, or many other climatic, demographic, and geographic variables that impact SBVMWD's short and long-term operations. From a management perspective, nearly all actions can be framed with an eye towards adaptive management.

This suggests that moving forward, San Bernardino Valley could utilize the metrics detailed in Figure 39 to set performance targets based on changing climate conditions, track both the performance of their investments over time, determine where performance is lower or higher than anticipated or where additional needs have emerged, and trigger the re-evaluation or implementation of additional actions or measures.

- **Signpost Metrics** describe factors that influence strategic planning decisions, such as if SWP allocations are trending downward or if local precipitation trends are changing. Signposts should be monitored and used to determine if SBVMWD should change its strategies and performance targets, such as changing its level of investment in local water resources or headwaters resilience. Signposts are intended to be reviewed on a five-year basis.
- **Performance Metrics** are intended to track changes in the function of water resources, infrastructure, operations, or demand. SBVMWD can use these metrics to evaluate the efficacy of its measures and actions. Performance measures are intended to be reviewed on an annual basis.
- **Adaptive Capacity Metrics** are intended to track the implementation of CARP Measures and Actions (see Section 5 for a complete list organized by Measure). Adaptive Capacity Metrics are intended to be reviewed on an annual basis to determine if implementation is taking place as expected.

Figure 39 Performance Metrics

Should Performance Metrics be Adjusted?

Signpost Metrics *track actual trends in factors that influence future planning decisions (i.e., setting performance targets)*

Are adaptive capacity investments having impact?

Performance Metrics *track actual changes in the function of ecosystems, infrastructure, operations, and communities that CARP measures aim to improve*

How is adaptive capacity improving?