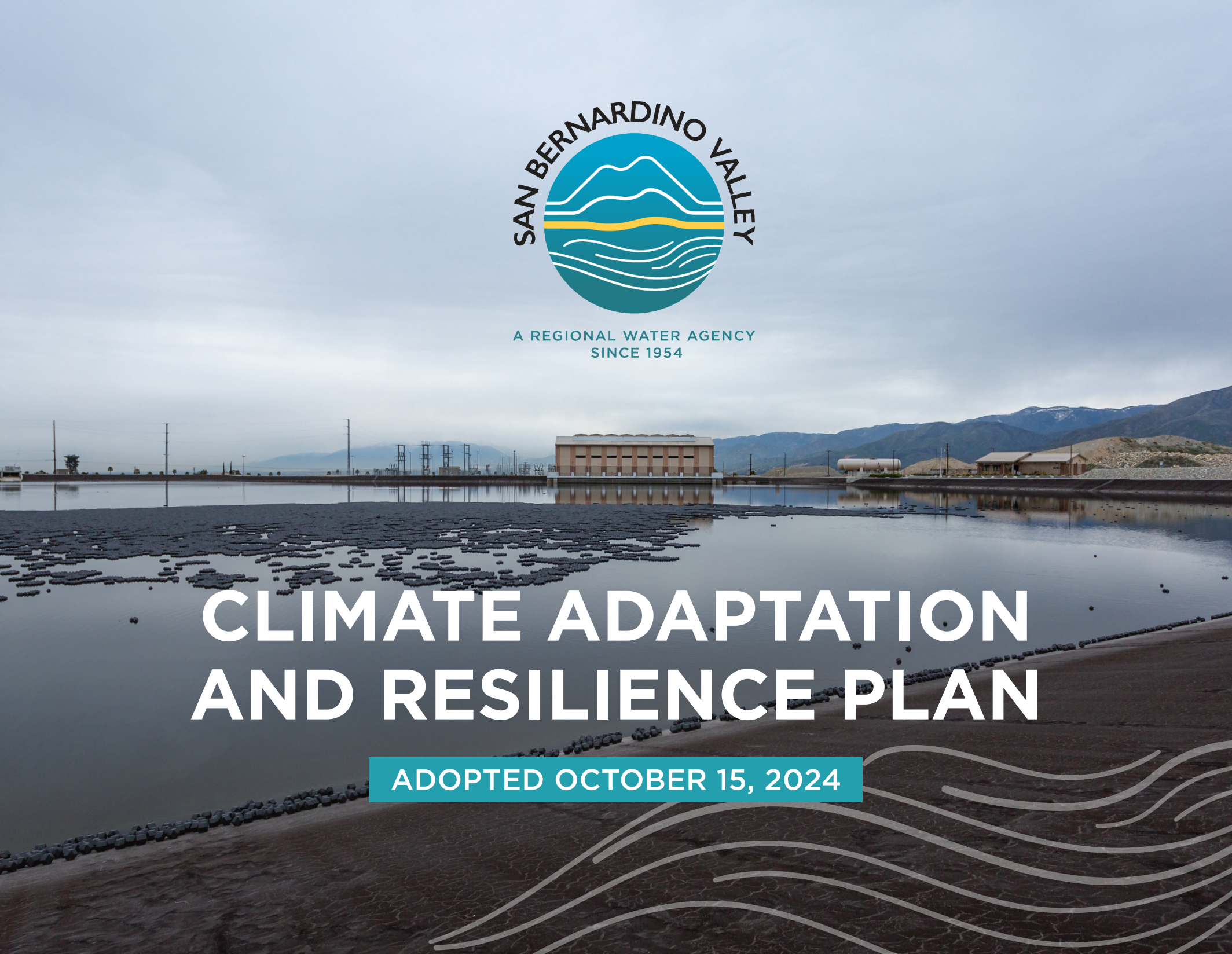
SAN BERNARDINO VALLEY

A REGIONAL WATER AGENCY
SINCE 1954



CLIMATE ADAPTATION AND RESILIENCE PLAN

ADOPTED OCTOBER 15, 2024

FORWARD FROM THE BOARD OF DIRECTORS

Since 1954, San Bernardino Valley Municipal Water District (or SBVMWD, San Bernardino Valley, or Agency) has been working towards a reliable and resilient water supply and has embraced being an agency with comprehensive responsibilities, working collaboratively with many partners on water and watershed solutions to benefit the region's people and environment. Much like the natural systems within the region, the agencies and communities of our watershed are integrally connected, each contributing unique pieces of the innovative solutions that will support a sustainable future for our people and our shared environment.

Climate change has altered, and continues to alter, various climate conditions that are highly influential to weather patterns throughout California. Deviation from historical norms for variables such as temperature, aridity, rainfall, and storm patterns presents new challenges to San Bernardino Valley's planning and operations. Water supply reliability will be impacted by changes to local and imported water availability. Extreme weather events such as heat waves, large atmospheric rivers, and extended droughts are likely to increase in frequency or severity. These conditions may threaten the durability of taxpayer investments in water supply projects and the required habitat conservation efforts associated with those projects.

This Climate Adaptation and Resilience Plan (CARP) is an adaptive guide to delivering this Agency's mission of a reliable and sustainable water supply in consideration of the changing climate. The CARP serves as a policy document which lays out goals and strategies for San Bernardino Valley to be more adaptive in changing conditions, and thus resilient to climate change impacts over decades to come. The CARP outlines an ongoing, multi-decadal implementation of actions that will avoid or mitigate risks to San Bernardino Valley's infrastructure, operations, and investments. Specific actions identified in the CARP are intended to be reviewed and approved by the San Bernardino Valley Board of Directors as part of consideration in future annual budgets, District projects, and programs.

Board of Directors

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

Formed in 1954, San Bernardino Valley is a regional agency with responsibilities to sustain long-term water supply for the region'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 geographic area which is bordered on the north by the eastern San Gabriel Mountains and the San Bernardino Mountains, on the east by the San Jacinto Mountains, and on the south by the Temescal and Santa Ana Mountains. The service area includes the cities and communities of Bloomington, Colton, Grand Terrace, Highland, Loma Linda, Mentone, Redlands, Rialto, San Bernardino, and Yucaipa.

SBVMWD is a wholesale water supplier and State Water Contractor, providing water directly or indirectly to 15 retail water agencies that deliver water to end users. The agency works collaboratively with neighboring agencies on shared supplies, conveyance infrastructure, and other regional solutions. Like many other water agencies in Southern California, SBVMWD's service area uses 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 service area for their water.

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**.

Source: SBVMWD Strategic Plan: Our Foundation completed in 2022

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EXECUTIVE SUMMARY

Purpose

San Bernardino Valley Municipal Water District (or SBVMWD, San Bernardino Valley, or Agency) is working to strengthen water reliability and proactively address existing and future climate change impacts by developing a Climate Adaptation and Resilience Plan (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 for the Agency to increase operational 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, potentially spanning decades.

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 towards achieving resilience. 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, refer to Phasing and Implementation in Chapter 6.

Rationale

Climate change is a global issue caused by the cumulative warming effects of greenhouse gas (GHG) within the atmosphere. Global temperatures have risen in response to the increased levels of carbon dioxide and other GHGs emitted into 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, and/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 like SBVMWD throughout the State.

Recent local experiences with persistent drought conditions and aridification, extreme weather events, and weather whiplash have prompted SBVMWD to incorporate climate change considerations into plans and programs. Shifts in climate and weather extremes are leading the Agency 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 CARP consistent with the Priorities laid out in the 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 serves as a programmatic policy and strategy document for addressing the undesirable impacts of climate change on the Agency and will identify targeted policies, programs, and projects that will both mitigate the Agency's contribution to GHGs, and increase the Agency'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 phased implementation 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 repeatedly repair impacted infrastructure, risking potential service interruptions or resorting to obtaining 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 infrastructure 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.

Imported water infrastructure

How the CARP Will Be Used

This document is intended to inform decisions considered by the current and future Board of Directors (Board) on where to focus investments, partnerships, and initiatives to reduce climate risks to the Agency. Following the Board's adoption, SBVMWD 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 performing a set of actions to achieve climate resilience, finalizing the success metrics for completed projects and actions, and developing a clear system of progress reporting and outreach. The CARP and its accompanying implementation program will assist the Agency and partners in competing for state and federal climate resilience funding as well as supporting 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 or regional planning documents.

In addition to measures and actions, the CARP provides an adaptive management process that promotes flexibility in the Agency's responses to changes in climate projections and adjustments based on real-world conditions, potentially decades into the future.

Adaptive management approaches provide a dynamic planning process in which adjustments to management decisions are made based on tracked metrics over time. For the CARP, adjustments or re-prioritization of the phasing and implementation of measures or actions can be made based on internal or external factors encountered.

Real-world conditions and Board actions will ultimately inform the implementation process. Because projects often take years to plan, 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 underpreparedness if a project is needed.

View of San Bernardino Valley

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

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

EXTREME HEAT

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

WILDFIRE

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 FLOODING

Extreme precipitation and flood events are projected to become more likely, increasing landslide, soil erosion and mudflow, and liquefaction risk in certain locations.

SEA LEVEL RISE

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

Landslides can be triggered by an increase in the frequency 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.

Seasonal pond

Greenhouse Gas Emissions and Reduction Targets

California has legislation committing to carbon neutrality by 2045, which entails reducing GHG emissions by 85 percent and increasing carbon removal and capture (including carbon sequestration) to offset the remaining 15 percent of greenhouse gas emissions. 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 agencies like SBVMWD play a fundamental role supporting State climate change resilience and mitigation goals, particularly by contributing to reducing local GHG emissions. The water sector accounts for 10 percent of California'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, as well as 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% carbon free renewable power.

City Creek Turnout

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***

Guiding Principles of the CARP

This CARP is organized around four (4) Guiding Principles which represent a holistic approach to increasing San Bernardino Valley'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.

Progress implementing the CARP will be monitored and evaluated by SBVMWD on an annual basis 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, including setting performance targets.

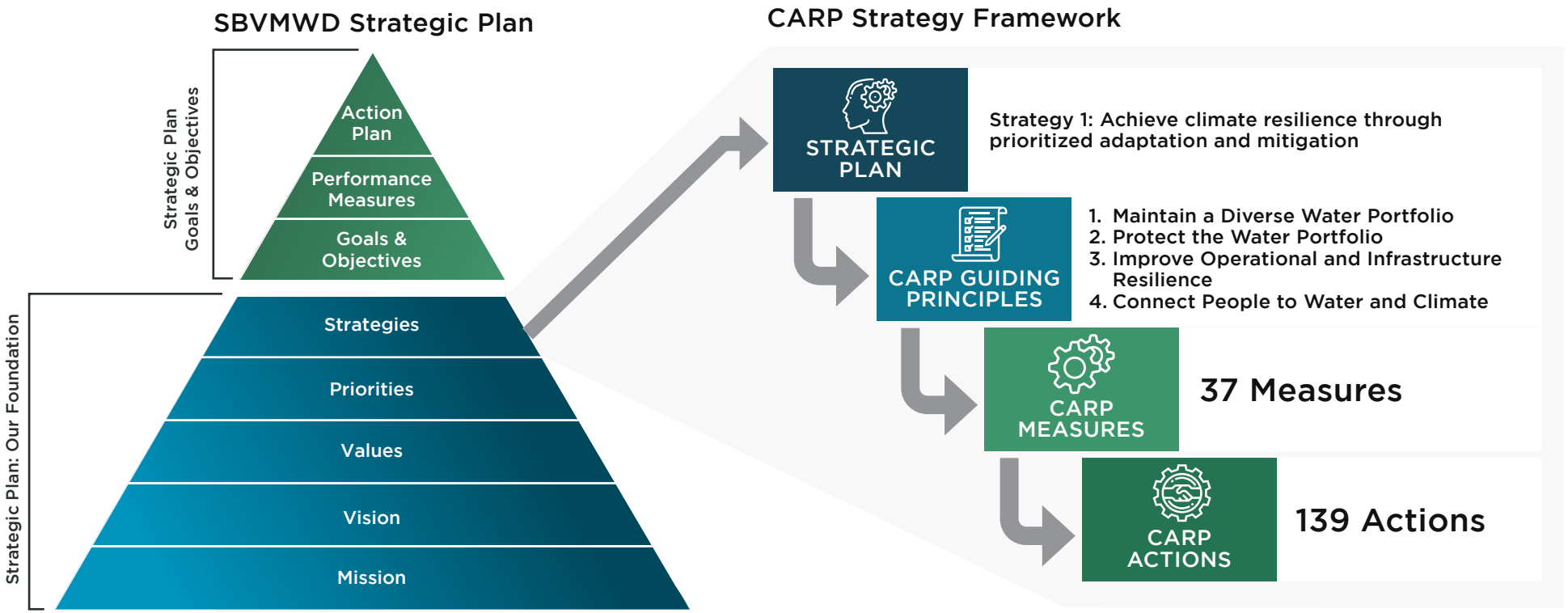
1. Maintain a Diverse Water Portfolio
2. Protect the Water Portfolio
3. Improve Operational and Infrastructure Resilience
4. Connect People to Water and Climate

Resilience Strategy

San Bernardino Valley'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. This CARP fulfills Strategy 1 of the Strategic Plan: Achieve climate resilience through prioritized adaptation and mitigation. The CARP 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 and mission.

The CARP Framework is organized around its four (4) Guiding Principles. Figure 1 shows how the CARP supports the Agency's Strategic Plan by building from Strategy 1. The CARP includes 37 measures, which it intends to implement in phases through 139 actions.

Figure 1. Overview of How the CARP Supports the SBVMWD Strategic Plan



SAN BERNARDINO VALLEY WILL APPLY GO/NO-GO DECISIONS TO IMPLEMENT ACTIONS IN THE FOLLOWING 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

Consists of measures and activities that are complete, ongoing, or already approved.

PHASE 2A

Consists of measures and activities that are planned to begin in Fiscal Year 2024-2025 through Fiscal Year 2029-2030 (FY 24/25 to FY 29/30).

PHASE 2B

Consists of measures and activities that may take place between Fiscal Year 2030-2031 and Fiscal Year 2034-2035 (FY 30/31 and FY 34/35).

PHASE 2C

Consists of measures and activities that may take place between Fiscal Year 2034-2035 to Fiscal Year 2044-2045 (FY 34/35 to FY 44/45) to help SBVMWD achieve 2045 goals.

FY 2019/20 to 24/25

- Existing Projects
- Plan Development and Adoption
- Board make Go/No-Go Decisions
- Implementation Begins

FY 24/25 to 29/30

- Integrated Regional Urban Water Management Plan Update (IRUWMP) (Population Growth/ Demand Update)
- Go/No-Go Needed
- Implementation

FY 30/31 to 34/35

- Climate Update
- IRUWMP Update
- Implementation Review
- Go/No-Go Needed

FY 34/35 to 44/45

- Climate Update
- IRUWMP Update
- Go/No-Go Needed
- Implementation

The actions under Phase 1 are those related to SBVMWD's water supply portfolio, as well as operational and infrastructure resilience. The Phase 2A actions expand 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 have 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 out 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.

Sunrise Ranch seasonal pond and critical habitat

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: RESPONSIBILITIES – Details SBVMWD's role in the Santa Ana River Watershed and its core functions.

SECTION 3: CLIMATE RISKS AND VULNERABILITIES – 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 AND REDUCTION TARGETS – Assesses the District's 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 - GOALS, MEASURES, AND ACTIONS – Defines a range of solutions that will reduce vulnerabilities and mitigate GHG emissions. These solutions align with SBVMWD's principles of maintaining a diverse water portfolio, protecting existing supplies, improving flexibility, and connecting SBVMWD communities to the regional watershed.

SECTION 6: PHASING AND IMPLEMENTATION – Establishes implementation phases and identifies key performance indicators for mitigation and adaptation solutions.

Santa Ana River Enhanced Recharge Phase 1B

Sunrise Ranch Property

GLOSSARY OF TERMS

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

A

AB – Assembly Bill

Adjusted Business As Usual Forecast (ABAU) – This forecast accounts for water demand changes and additionally quantifies and incorporates State legislation that is expected to help reduce San Bernardino Valley Municipal Water District's greenhouse gas emissions through 2030 and 2045.

Acre-foot – The volume that would cover one acre to a depth of one foot.

Actions – The direct, 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 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 (AR) – Atmospheric rivers are long, narrow bands of concentrated water that, when they make landfall, can produce massive amounts of rain or snow.

B

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

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

BTAC – Basin Technical Advisory Committee, an advisory group of San Bernardino Basin and Watershed stakeholders formed by the Upper Santa Ana River Watershed Integrated Water Management Plan.

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 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.

Centum cubic feet (CCF) - Unit that represents one hundred cubic feet of water.

CEQA – California Environmental Quality Act

CLAWA - Crestline-Lake Arrowhead Water Agency

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 or other factors that change the climate system and influence weather patterns.

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.

Delta Conveyance Project (DCP) – A climate adaptation initiative to modernize the State Water Project's infrastructure in the Sacramento-San Joaquin Delta. It involves upgrading the conveyance system with new facilities, including an underground tunnel, to safeguard water supplies against sea level rise, climate impacts, and seismic threats. The project, managed by the Department of Water Resources, is funded by 29 contracted water agencies, including San Bernardino Valley.

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 – East 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

Forecast Informed Reservoir Operations (FIRO) - A strategy to increase water supplies and environmental benefits through optimized operations of a dam informed by high quality weather forecasting.

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 Earth's crust.

G

Global Circulation Models (GCM) - 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.

Greenhouse Gas (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 trap the Sun's heat.

Global Warming Potential (GWP) – 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

Habitat Conservation Plan (HCP) - A federal regulatory mechanism that permits projects to have impacts to federally protected endangered, threatened, or at-risk species. For purposes of this document, the permitting structure for water supply projects within the Upper Santa Ana River watershed. Habitat conservation is required as part of the permit(s) in order to offset loss or impact to species' habitat resulting from construction and/or operations of the project(s).

HVAC – Heating, ventilation, and air conditioning

I

ICLEI - International Council for Local Environmental Initiatives

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.

Intergovernmental Panel on Climate Change (IPCC) – Prepares comprehensive Assessment Reports about the status of scientific, technical and socio-economic 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

L

LED – Light-emitting diode

LEED – Leadership in Energy and Environmental Design

Liquefaction - When loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking, causing subsidence (sinking), fracturing (cracking), and horizontal sliding of the ground surface.

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.

Metric Ton (MT) - 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.

Metric Tons of Carbon Dioxide Equivalent (MT CO_2e) – The standard unit of measure.

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 – 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

Program for Enhanced Recharge Capability (PERC) – A portfolio of proposed storm water capture projects that will make improvements to existing flood control facilities in order to capture additional local storm water for aquifer replenishment or build new recharge facilities.

Per- and Polyfluoroalkyl Substances (PFAS) – 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.

Public Safety Power Shutoffs (PSPS) – Actions taken by utilities to temporarily turn off power to specific areas to reduce the risk of fires caused by electric infrastructure.

Pumpers – Individual well operators

PV – Photovoltaic (solar energy)

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

Santa Ana River Conservation and Conjunctive Use Program (SARCCUP) - A multi-agency regional program designed to capture water during wet years and store it in the groundwater basin for future use, improve environmental habitat, and increase water use efficiency.

Santa Ana Watershed Project Authority (SAWPA) – Formed in 1968 and comprised of five (5) member agencies: Eastern Municipal Water District, Inland Empire Utilities Agency, Orange County Water District, San Bernardino Valley Municipal Water District, and Western Municipal Water District.

SB – Senate Bill

SBVMWD – San Bernardino Valley Municipal Water District

SCAQMD – South Coast Air Quality Management District

SCE – Southern California Edison

SoCalGas – 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 Gorgonio Pass Water Agency

Sites Reservoir (SITES) - A 1.5-million-acre-foot offstream storage project in Northern California to capture stormwater for dry years. This project is led by the Sites Project Authority, a joint powers authority comprised of many agencies, including San Bernardino Valley. Planning began in 2010, with construction set for 2026/27 and full operation by 2032.

SWC – State Water Contractors

SWP – State Water Project

SWRCB – California State Water Resources Control Board

T

T&D – Transmission and distribution

U

USACE – United States Army Corps of Engineers

USDA Forest Service – United States Department of Agriculture Forest Service

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

Wash Plan HCP – Upper Santa Ana River Wash Habitat Conservation Plan

WBCSD – World Business Council for Sustainable Development

WIFIA – Water Infrastructure Finance and Innovation Act

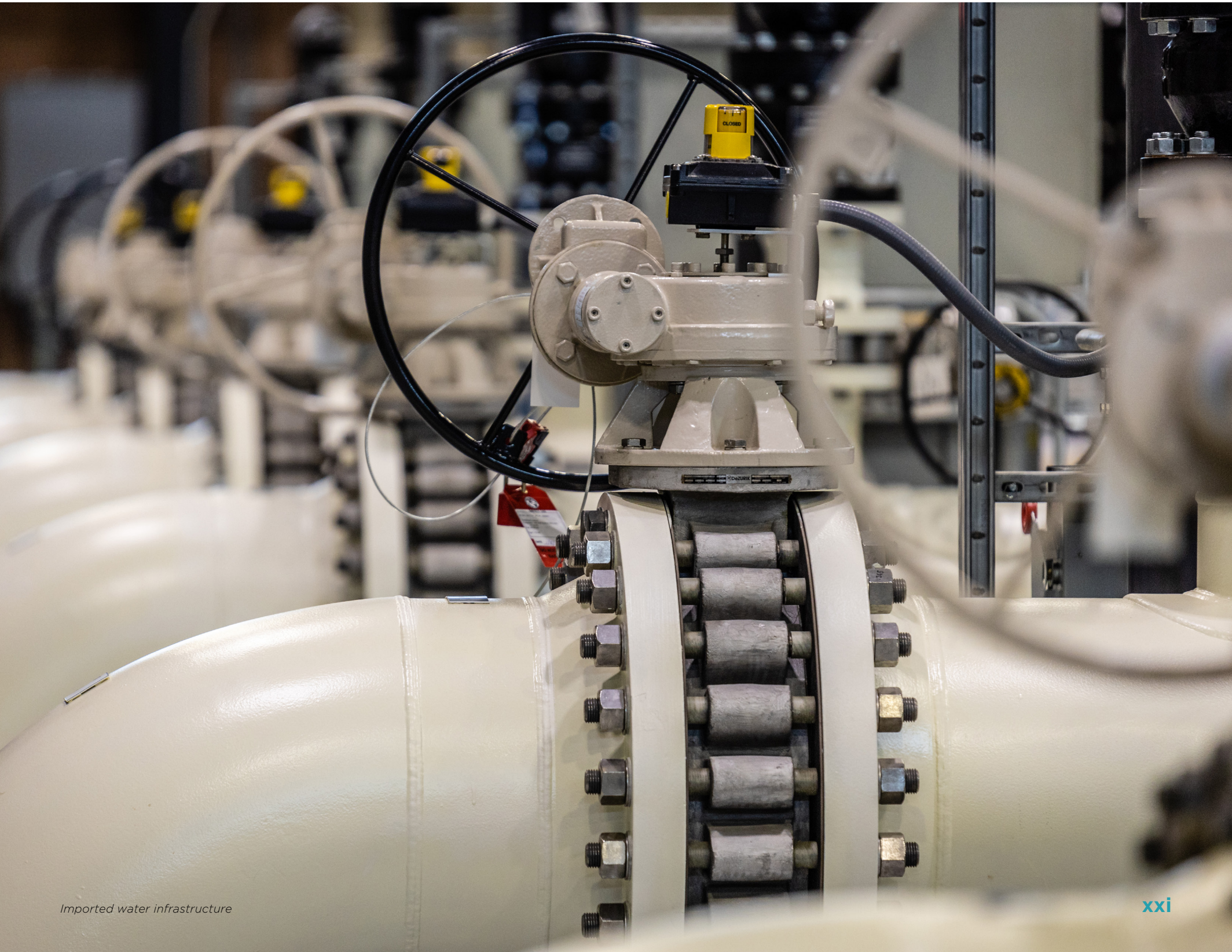
WMWD – Western Municipal Water District

Y

YVWD – Yucaipa Valley Water District

Z

ZEV – Zero-emission vehicle



Imported water infrastructure

1. INTRODUCTION

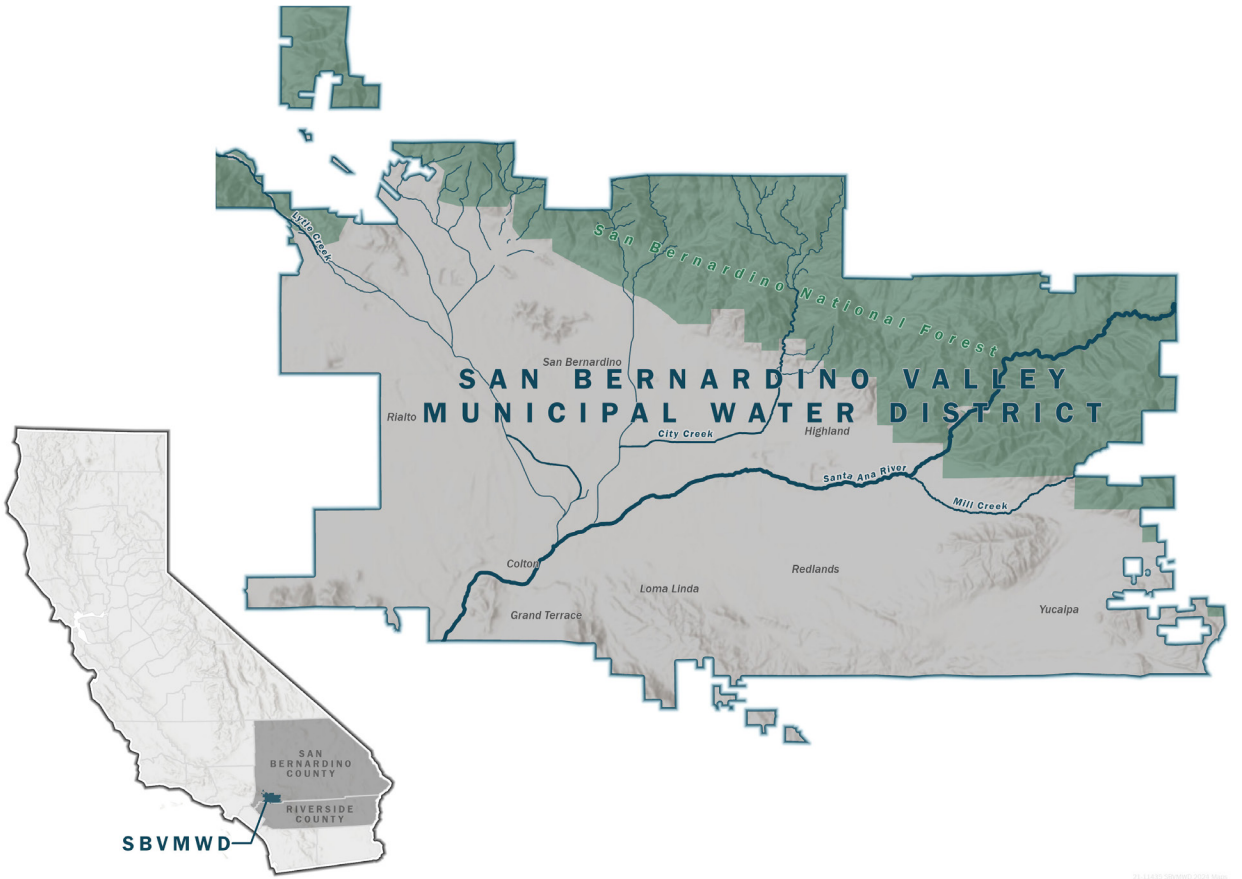
Citrus Pump Station and Reservoir

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. Formed in 1954, San Bernardino Valley is a regional agency with responsibilities to sustain long-term water supply for 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 geographic area which is bordered on the north by the eastern San Gabriel Mountains and the San Bernardino Mountains, on the east by the San Jacinto Mountains, and on the south by the Temescal and Santa Ana Mountains. The service area includes the cities and communities of Bloomington, Colton, Grand Terrace, Highland, Loma Linda, Mentone, Redlands, Rialto, San Bernardino, 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 shared 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.

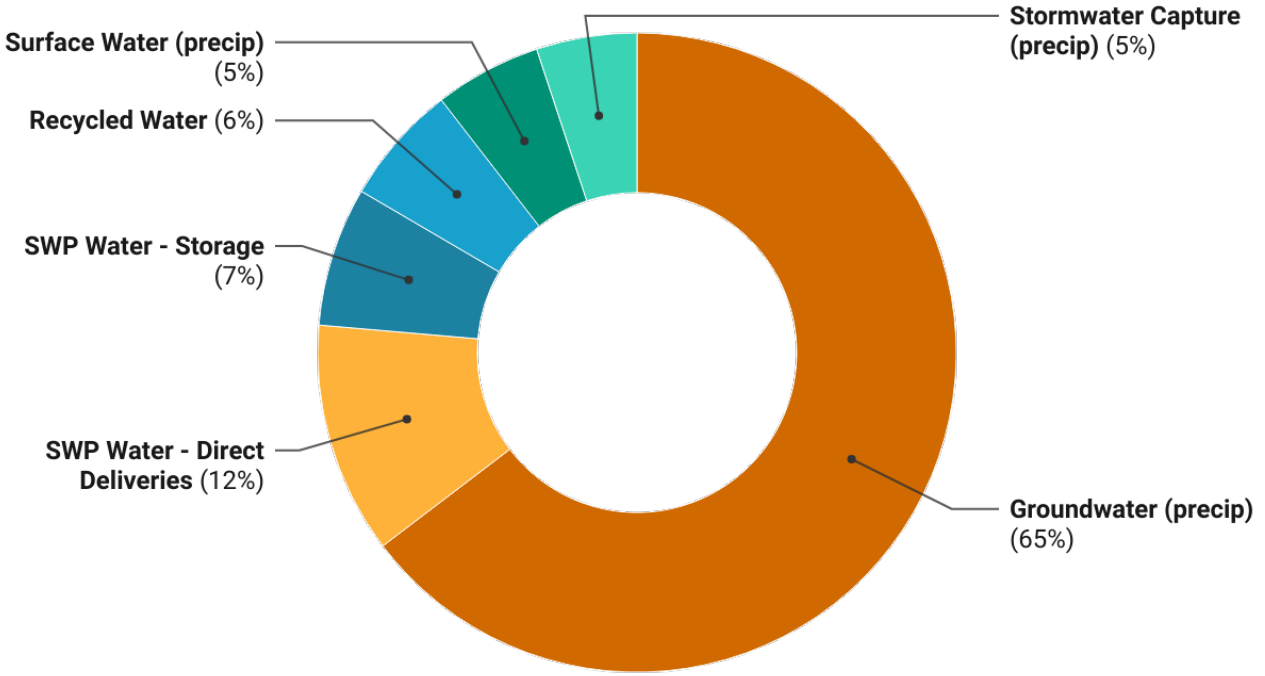
Figure 2. SBVMWD Service Area in California



As a watershed steward, SBVMWD plays a vital role in 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.

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.

Figure 3. Average Year Regional Water Supply



SBVMWD obtains water from the SWP through the East Branch of the State Aqueduct via Lake Silverwood. While SBVMWD's State Contract Table A Allocation 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 a drought-proof supply of recycled water and provided financial incentives to make recycled water investments cost-effective within the region.

Purpose

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 Phasing and Implementation in Chapter 6.

Source: SBVMWD *Strategic Plan: Our Foundation* completed in 2022

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.

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

through 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 to Water and Climate

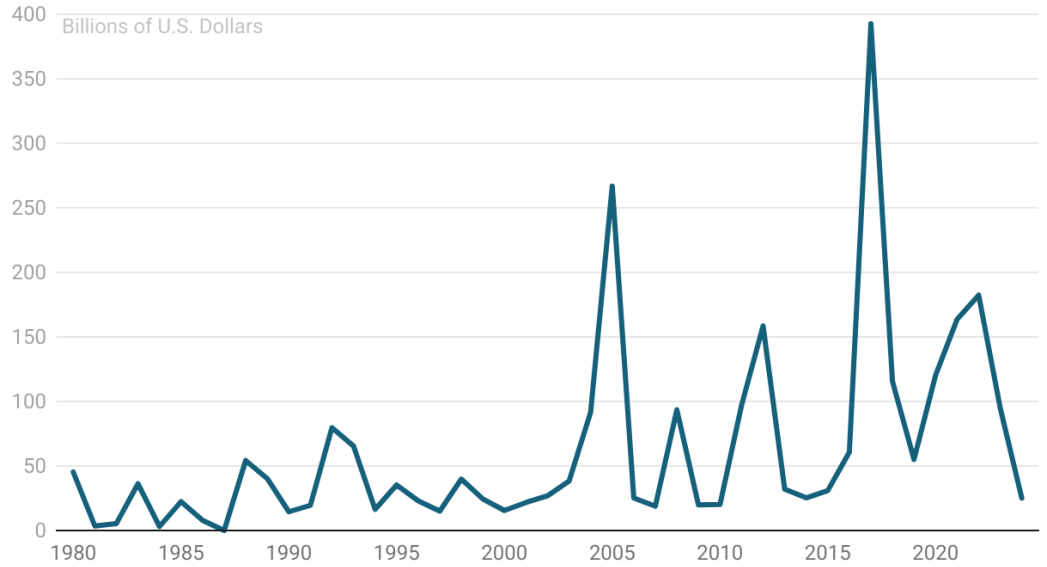
so that the community SBVMWD serves understands and engages meaningfully with the complex water systems that sustains it and the changing climate that affects water resources and the environment. By leading public awareness campaigns and engagement programs and supporting healthy use of the region's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

Rationale

Climate change is a global issue caused by the cumulative warming effects of GHG emissions. Global temperatures have 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 United States 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 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



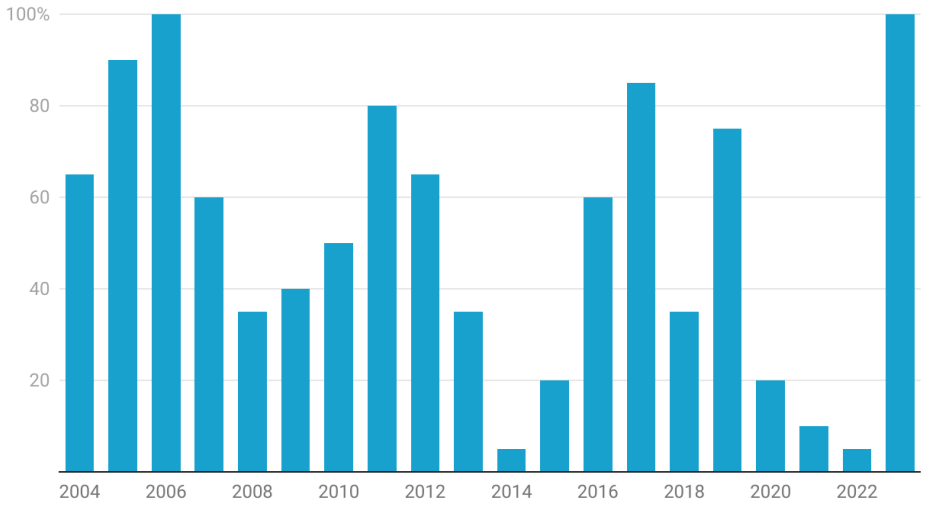
Source: U.S. Global Change Research Program. Billion Dollar Disasters
https://www.globalchange.gov/indicators/billion-dollar-disasters

Note: The increase in billion-dollar disasters is due to a combination of factors, including climate change and changes in the value and location of assets and property.

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 deliveries have ranged between 5% and 100% of the Agency'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 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, innovation, and ultimately resilience through the formulation of a comprehensive CARP consistent with its Strategic Plan.

Figure 5. Historical State Water Project Table A Allocations



Source: California Department of Water Resources. SWP Table A Allocations. *https://water.ca.gov/programs/state-water-project/management/swp-water-contractors*

3 *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*

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*

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).

A DEPENDABLE AND SUSTAINABLE WATER SUPPLY

By building from 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. 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 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]

Crafton Reservoir

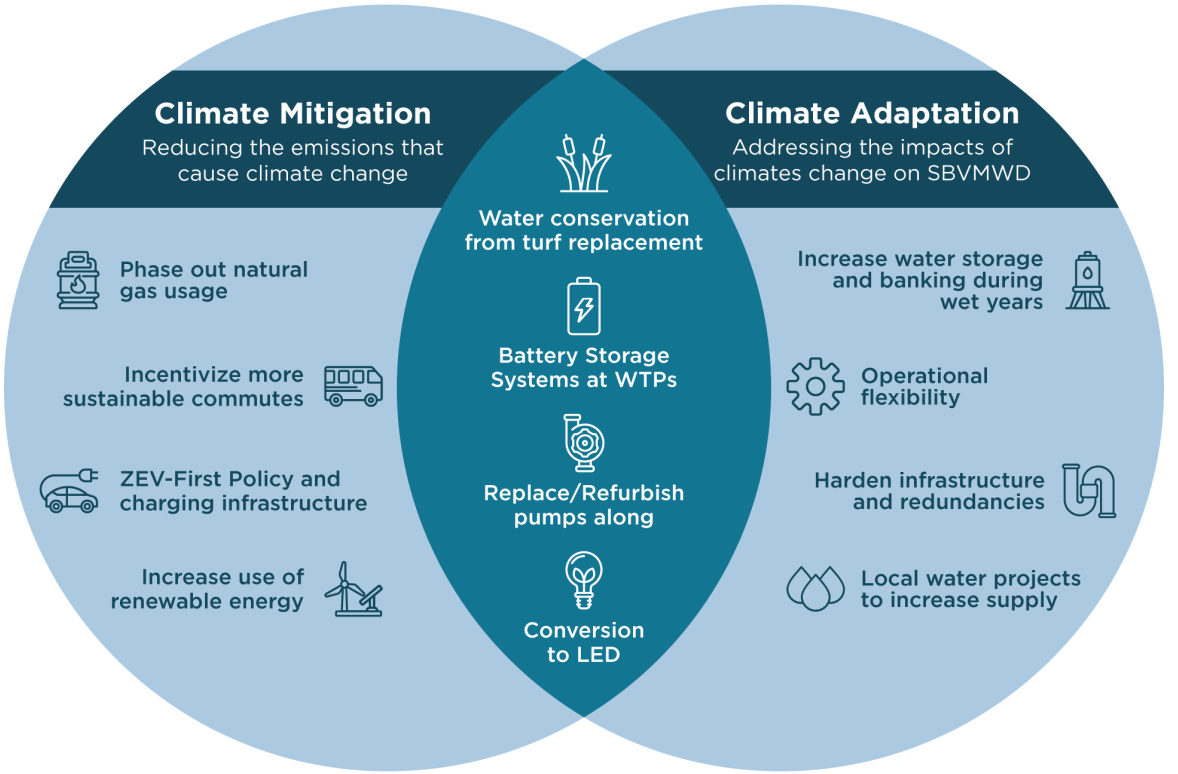
Figure 6. One Water Concept

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

Partnership

SBVMWD provides regional leadership in the many facets of ensuring 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 streamline the permitting required by the water and wildlife 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 bring partners and stakeholders together and identify innovative ways to fund proactive management and investments in the long-term health of the San Bernardino National Forest, which includes the headwaters of the Santa Ana River Watershed and supports local water resources within.

Figure 7. Climate Mitigation versus Adaptation



Approach

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***

Methodology

The CARP was developed with cross-departmental input and with direction 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.

Step 2:

A climate vulnerability assessment that identified climate vulnerabilities to SBVMWD infrastructure and operations under four future climate change scenarios. Natural hazards that are not impacted by climate change, such as earthquakes, have not been included in the climate vulnerability assessment or this CARP. 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. Although we didn't specifically address earthquakes as a spedific climate vulnerability, in the CARP seismic activity is considered in the potential impacts of landslide and liquefaction vulnerabilities. For example, landslides triggered by earthquakes could be more extensive due to more moisture in slopes from extreme precipitation rates 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.

Step 4:

A resilience strategy development process that articulates guiding principles, tangible measures, and actions for increasing resilience, which included soliciting the input of various stakeholders.

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.

San Bernardino Valley staff hosting a local organization field trip

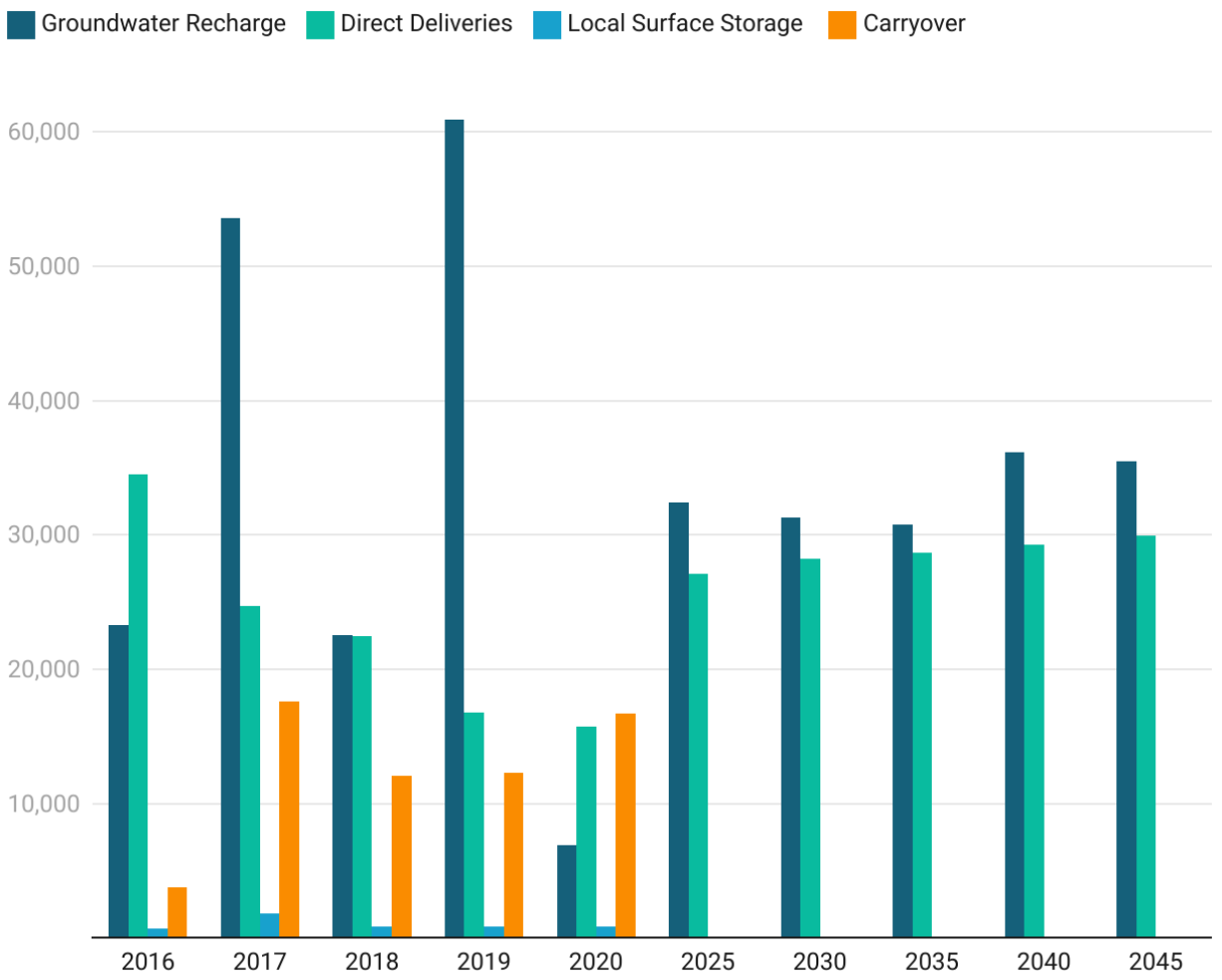
2. RESPONSIBILITIES

View of San Bernardino Valley and Santa Ana River Enhanced Recharge 1A

2. RESPONSIBILITIES

SBVMWD supports long-range water supply management and prepares water use trends 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)



Source: San Bernardino Valley Water Conservation District. 2020. Upper Santa Ana River Integrated Regional Water Management Plan.
https://www.sbvwcd.org/our-projects/upper-santa-ana-integrated-regional-water-management-plan/

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 under the Judgments. 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 Agency. 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; and a recycled water pipeline and recharge basins became operational in 2024.

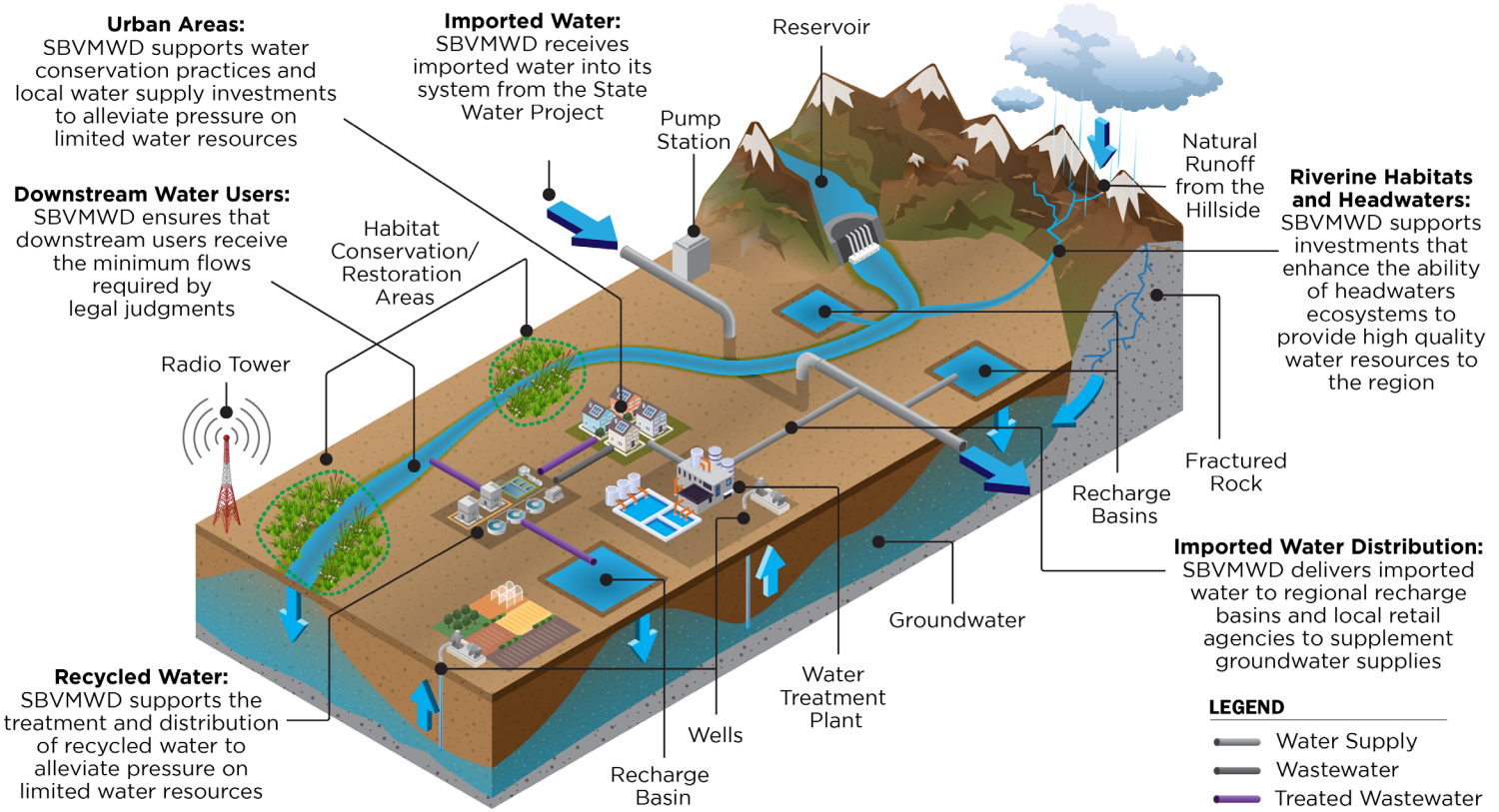
SBVMWD has a history of working with partners to avoid building duplicative facilities including but not limited to pipelines, pump stations, and groundwater recharge basins; such partners have included The Metropolitan Water District of Southern California (MWD), San Gorgonio Pass Water Agency (SGPWA), 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 (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 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.[11]

11 *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 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 integrated context enables SBVMWD to identify and prioritize the most efficient and effective water supply management options.

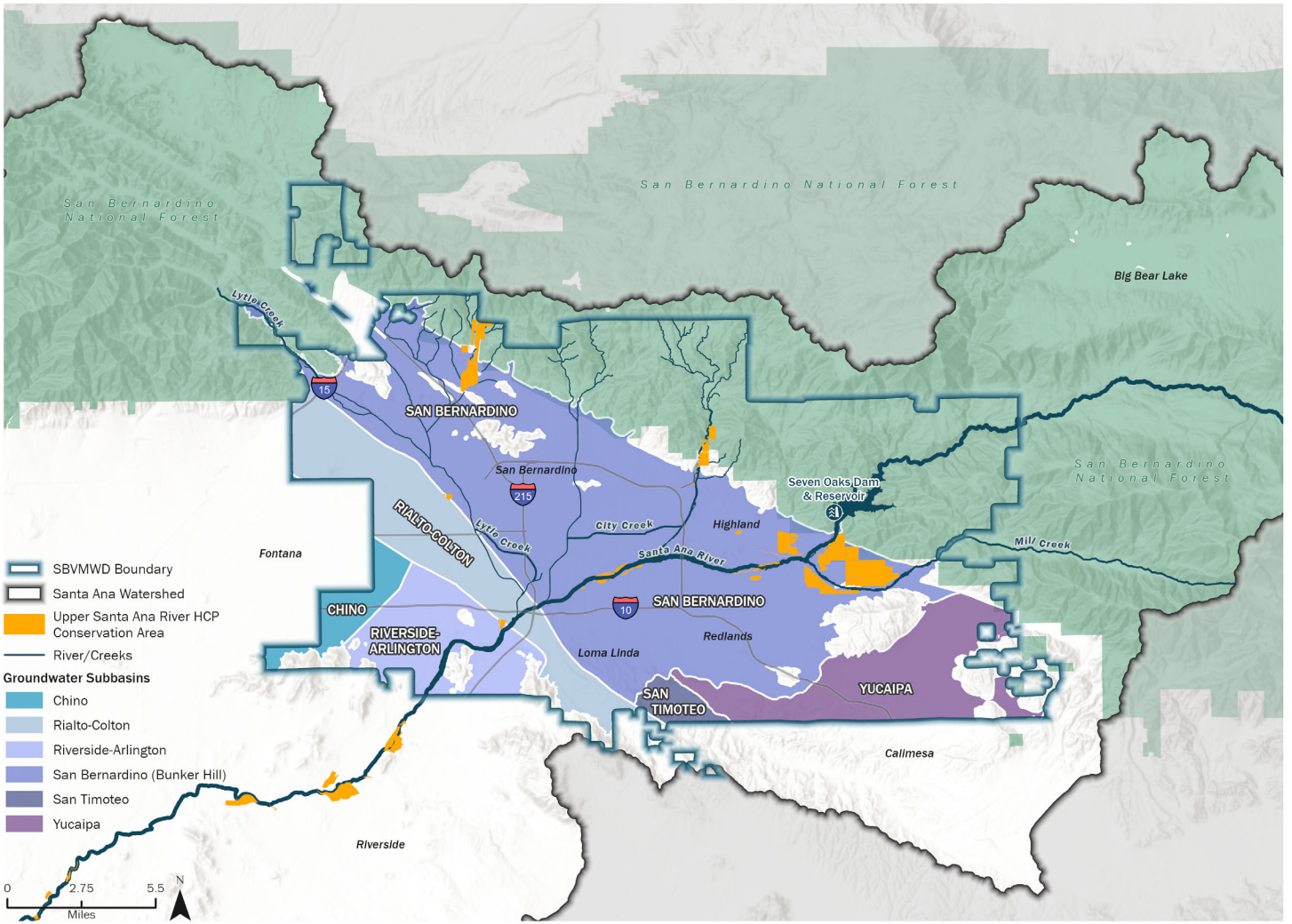
Figure 9. Overview of SBVMWD Water System and Operations



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 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.

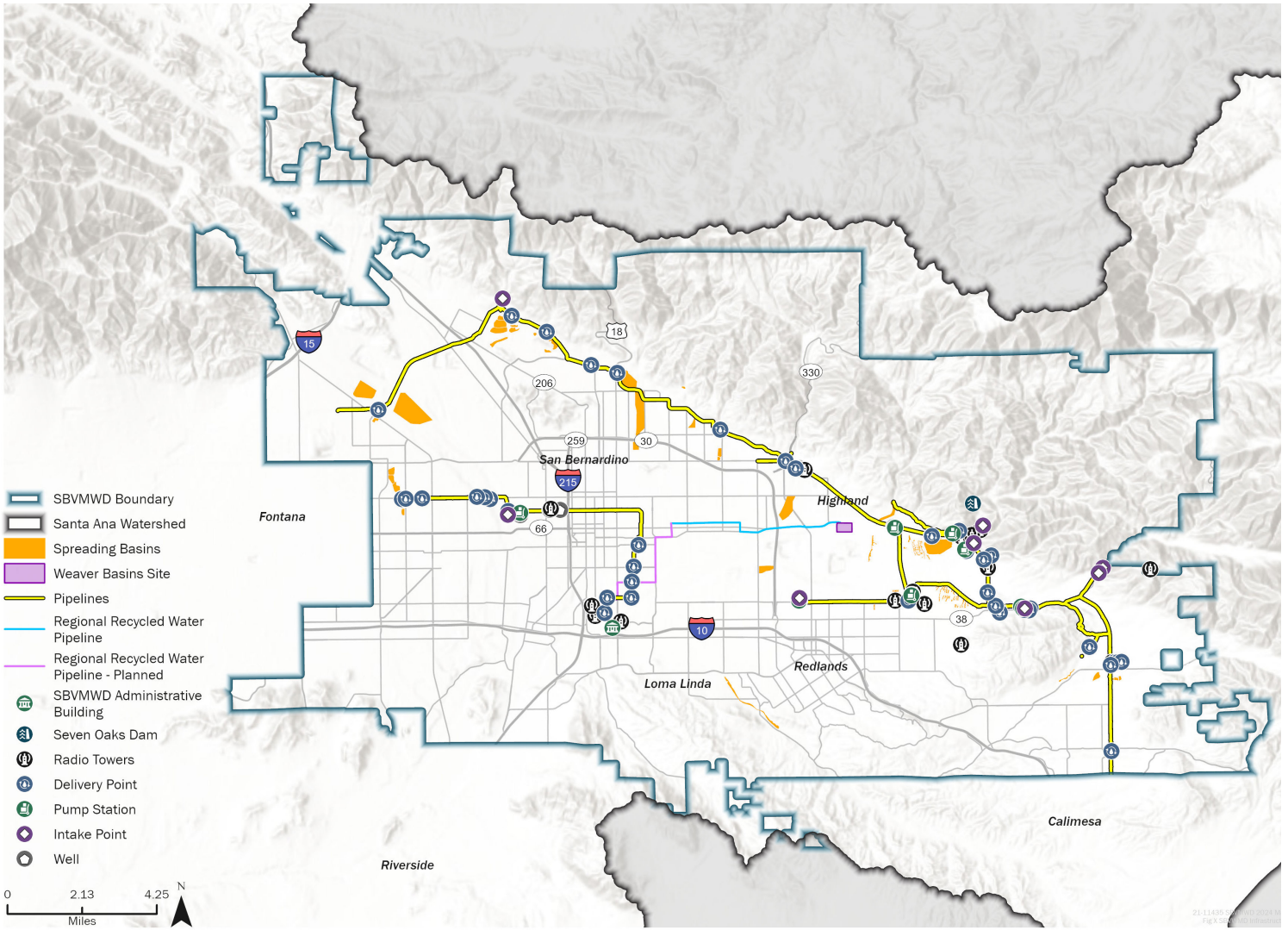
Figure 10. Map of Natural Resources Related to SBVMWD Operations



Infrastructure

SBVMWD plays a key role in supporting the regional water infrastructure that enables different types of water supply to be efficiently distributed. As shown in Figure 11, SBVMWD manages the distribution of imported and local water to multiple retail agencies and for recharging groundwater through regional spreading basins.[12]

Figure 11. Map of SBVMWD's Infrastructure



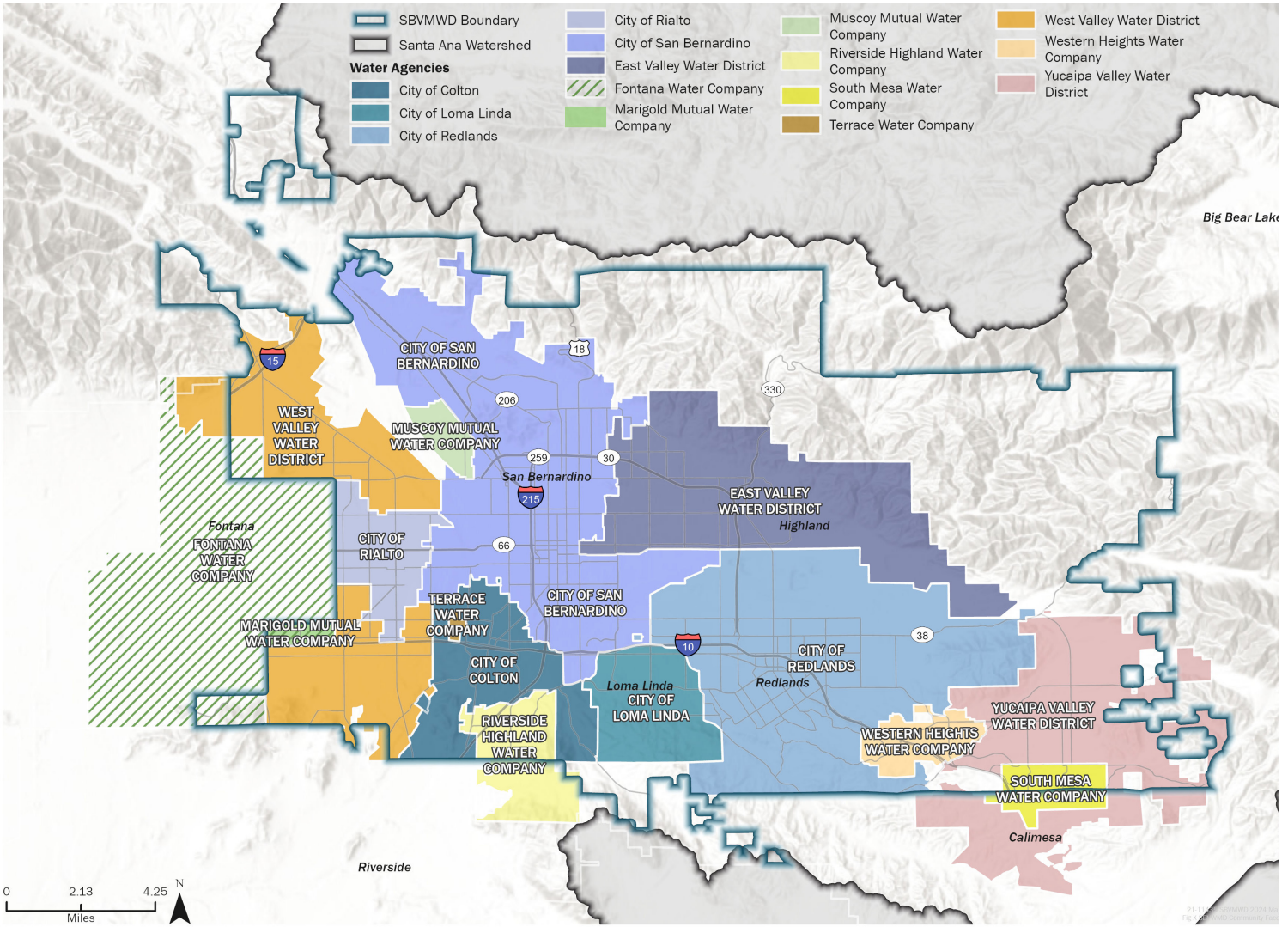
12 *Not all infrastructure shown in Figure 11 is owned by SBVMWD. Some infrastructure and facilities are owned by San Bernardino County or other agencies and is used by or managed by SBVMWD.*

Community

As shown in Figure 12, SBVMWD supports the distribution of water for household, commercial, industrial, and agricultural uses predominantly for fifteen retail water agencies within its service area. There are also individual well owners (pumpers) who rely on local groundwater. 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.

SBVMWD can deliver non-potable water for irrigation and groundwater recharge to other entities including but not limited to the Bear Valley Mutual Water Company, County of San Bernardino, and the San Bernardino Valley Water Conservation District.

Figure 12. Map of Retail Water Agencies Served by SBVMWD



South of the Enhanced Recharge 1-B near the Santa Ana River

3.
CLIMATE RISKS *and* VULNERABILITIES

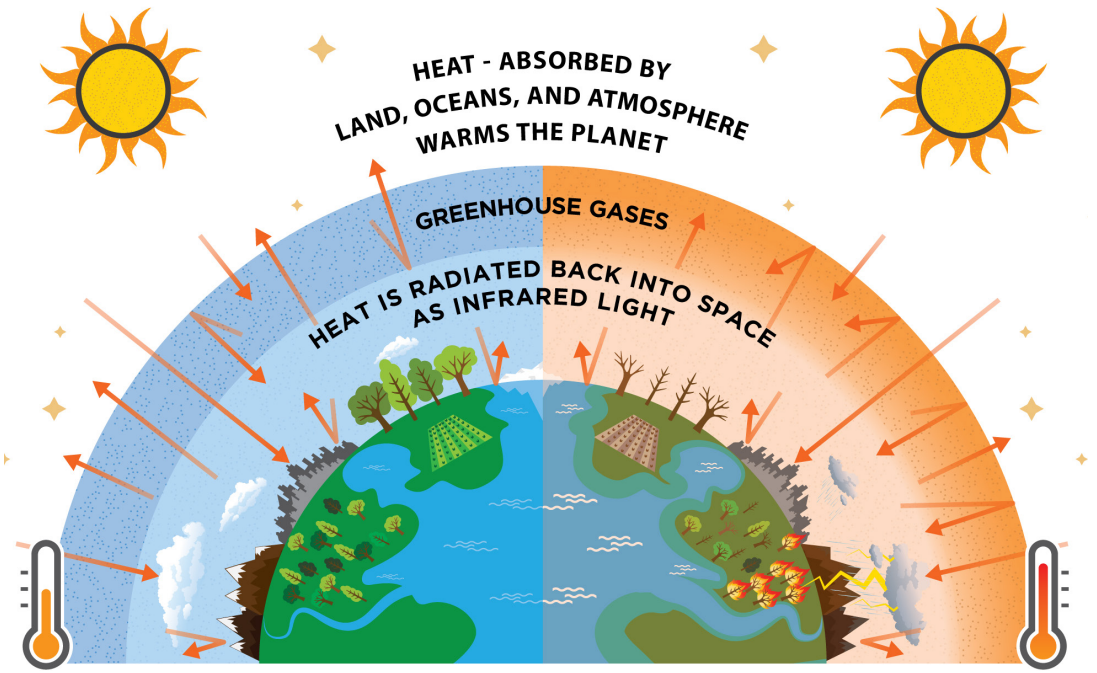
3. CLIMATE RISKS *and* VULNERABILITIES

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.[13] The levels of GHGs in the atmosphere far surpass anything observed in the historical record. 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.[14] Governments, agencies, and businesses are taking action to mitigate GHG emissions to reduce or avoid the effects of climate change.

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) was 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.[15]

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 14). 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 13. Greenhouse Gas Effect Overview

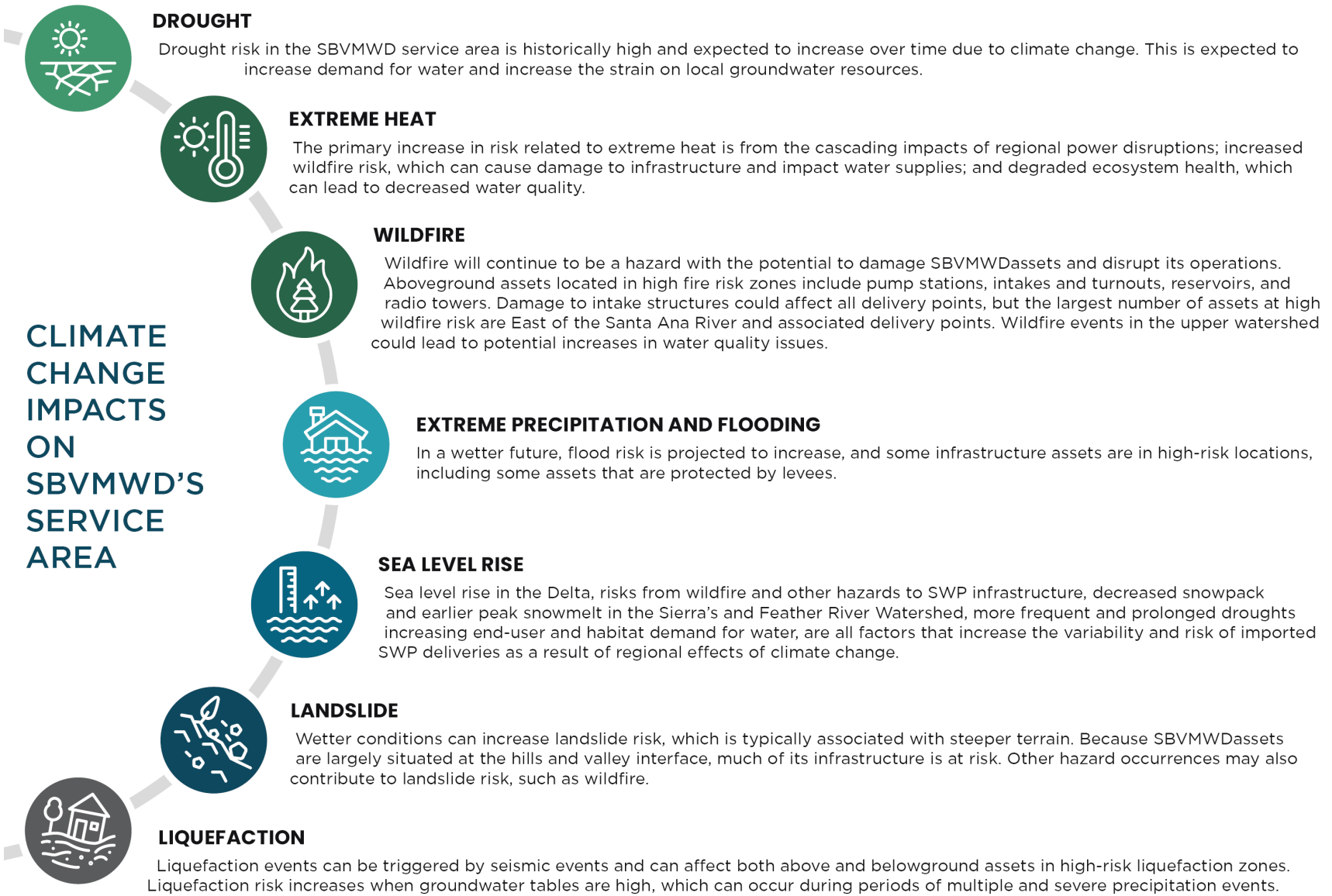


13. Intergovernmental Panel on Climate Change. 2021. The Physical Science Basis. **https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/**

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

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

Figure 14. SBVMWD Climate Vulnerabilities



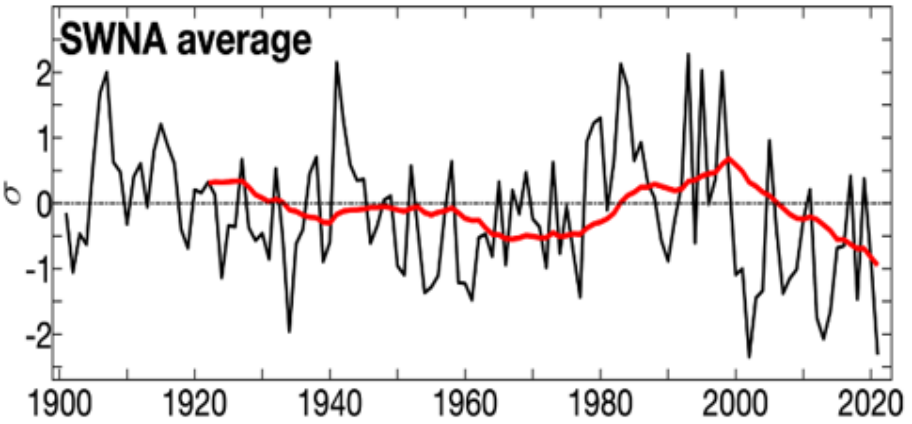
Drought

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 15). 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 16.

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.[16] 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, soil moisture levels, and natural groundwater recharge. Aridification will affect the supplies of water available for human use and natural systems.

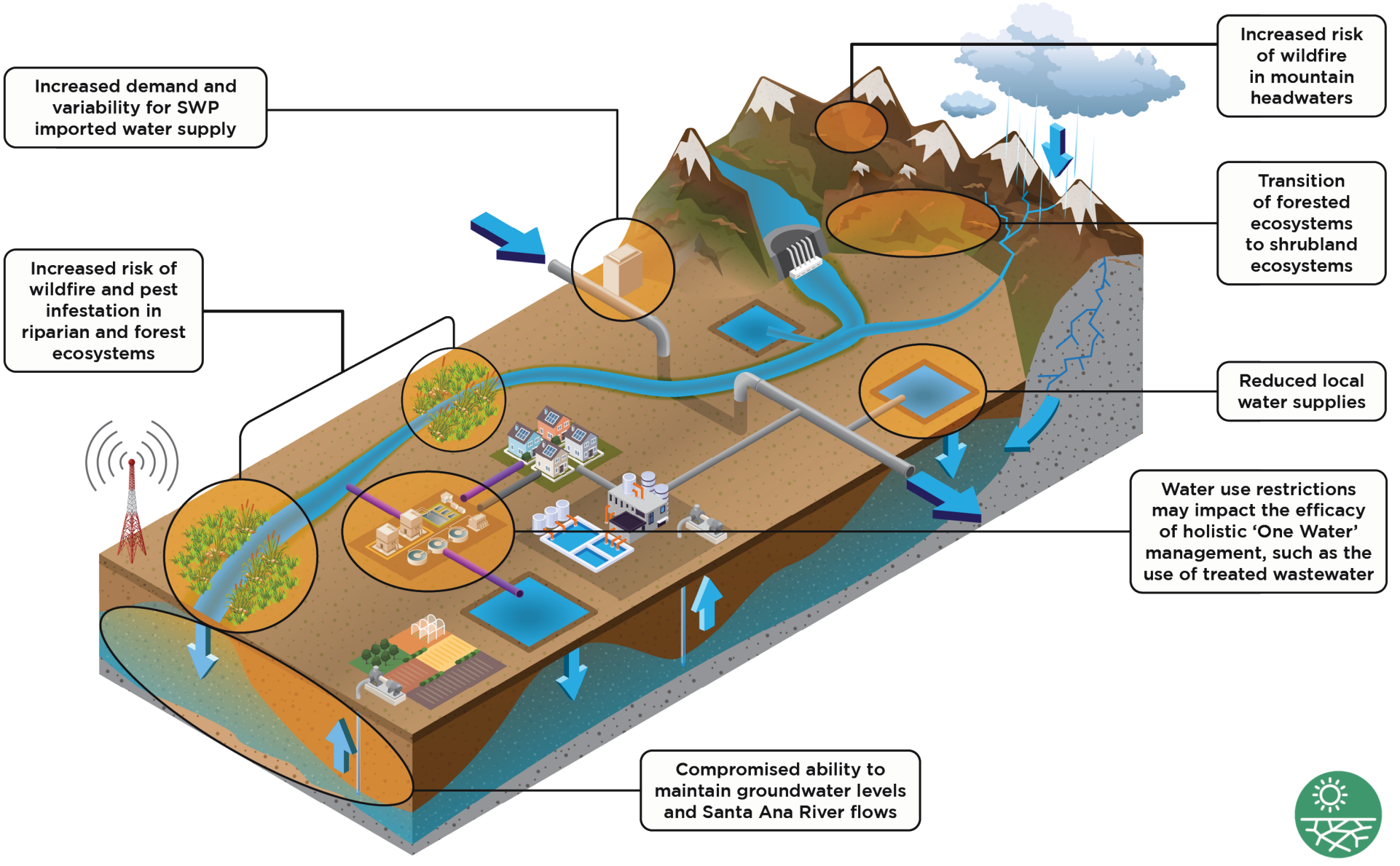
Figure 15. Southwestern North American Soil Moisture Deficit



Source: 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***

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

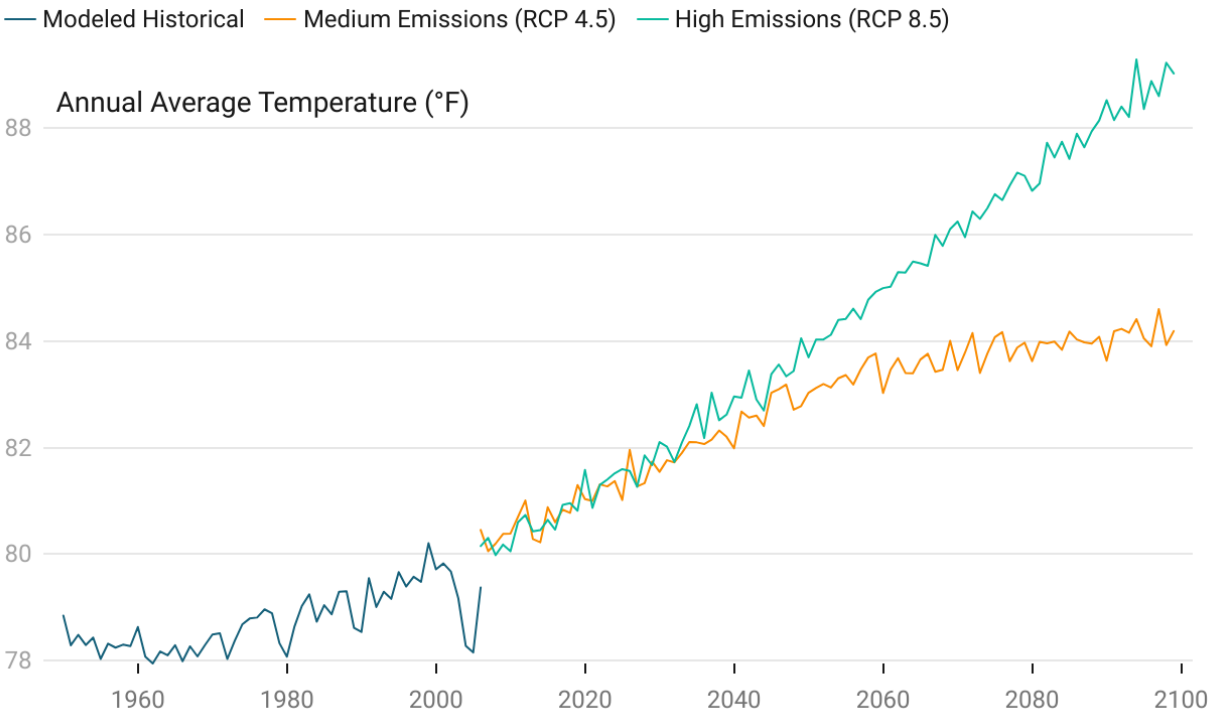
Figure 16. Potential Drought Impacts



Extreme Heat

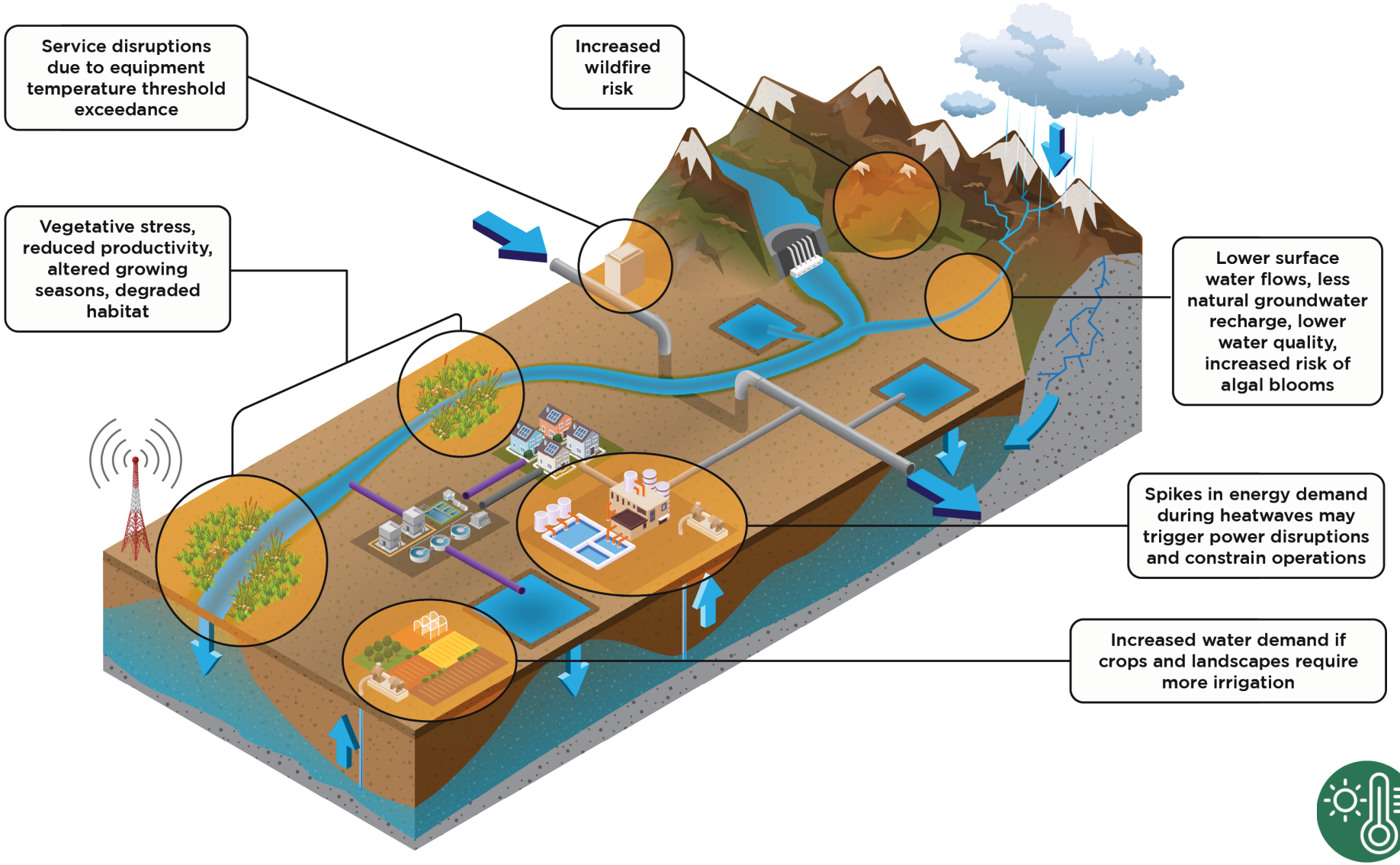
Extreme heat events are defined in the SBVMWD service area as days of the year when daily maximum temperatures exceed 100 degrees Fahrenheit. Observations over the past century indicate that temperature has increased across Southern California. This warming trend is projected to increase across the region in the coming decades with a high degree of certainty (See Figure 17). 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 18.

Figure 17. Annual Average Maximum Temperature Projections for San Bernardino County



Source: California Energy Commission. 2024. Cal-Adapt. Local Climate Change Snapshot for San Bernardino County, California. ***https://cal-adapt.org/tools/local-climate-change-snapshot***

Figure 18. 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[17] (See Figure 19). 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 20.

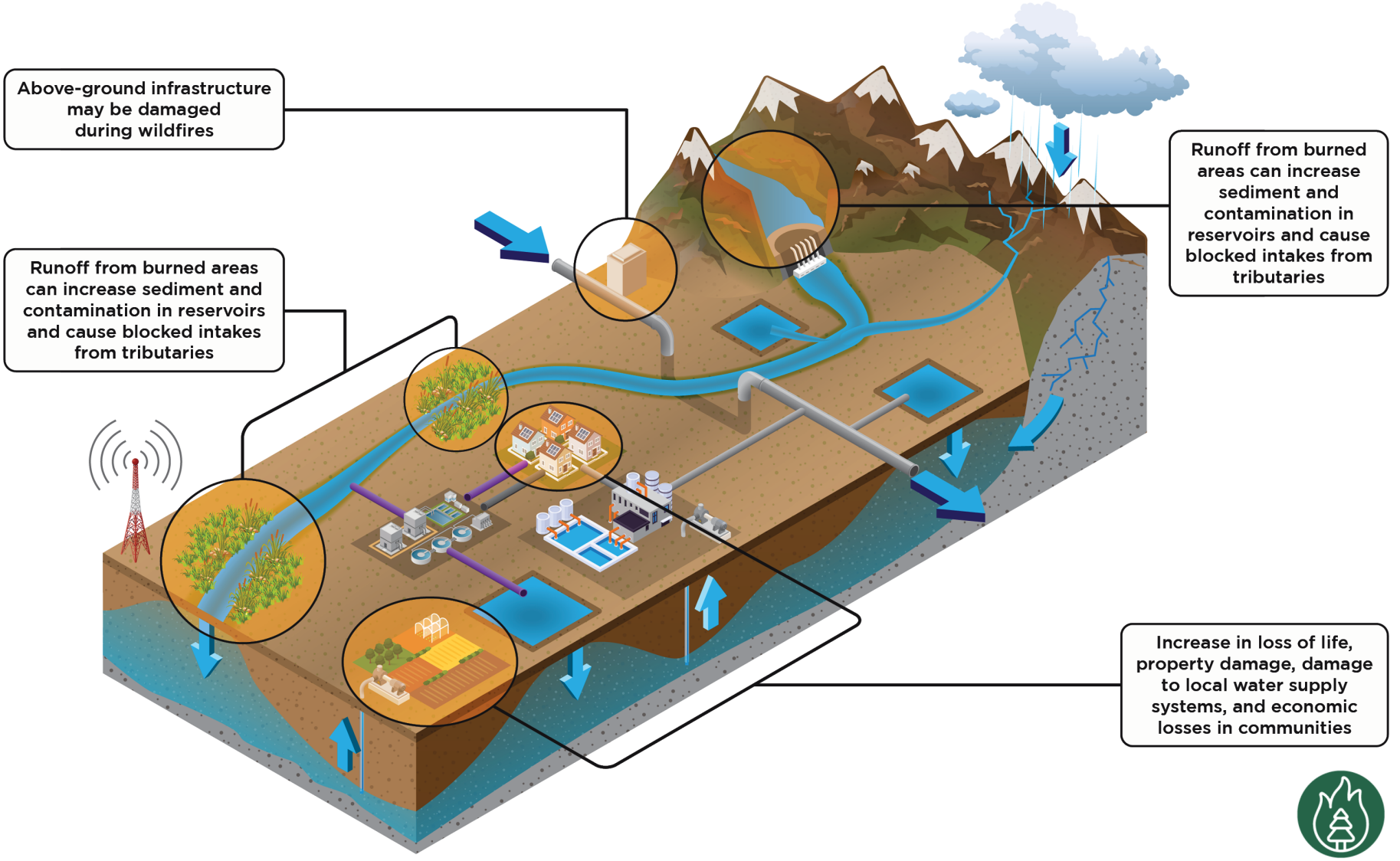
Wildland Urban Interface

Figure 19. How Climate Change Fuels Wildfires

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

17. *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 20. Potential Wildfire Impacts

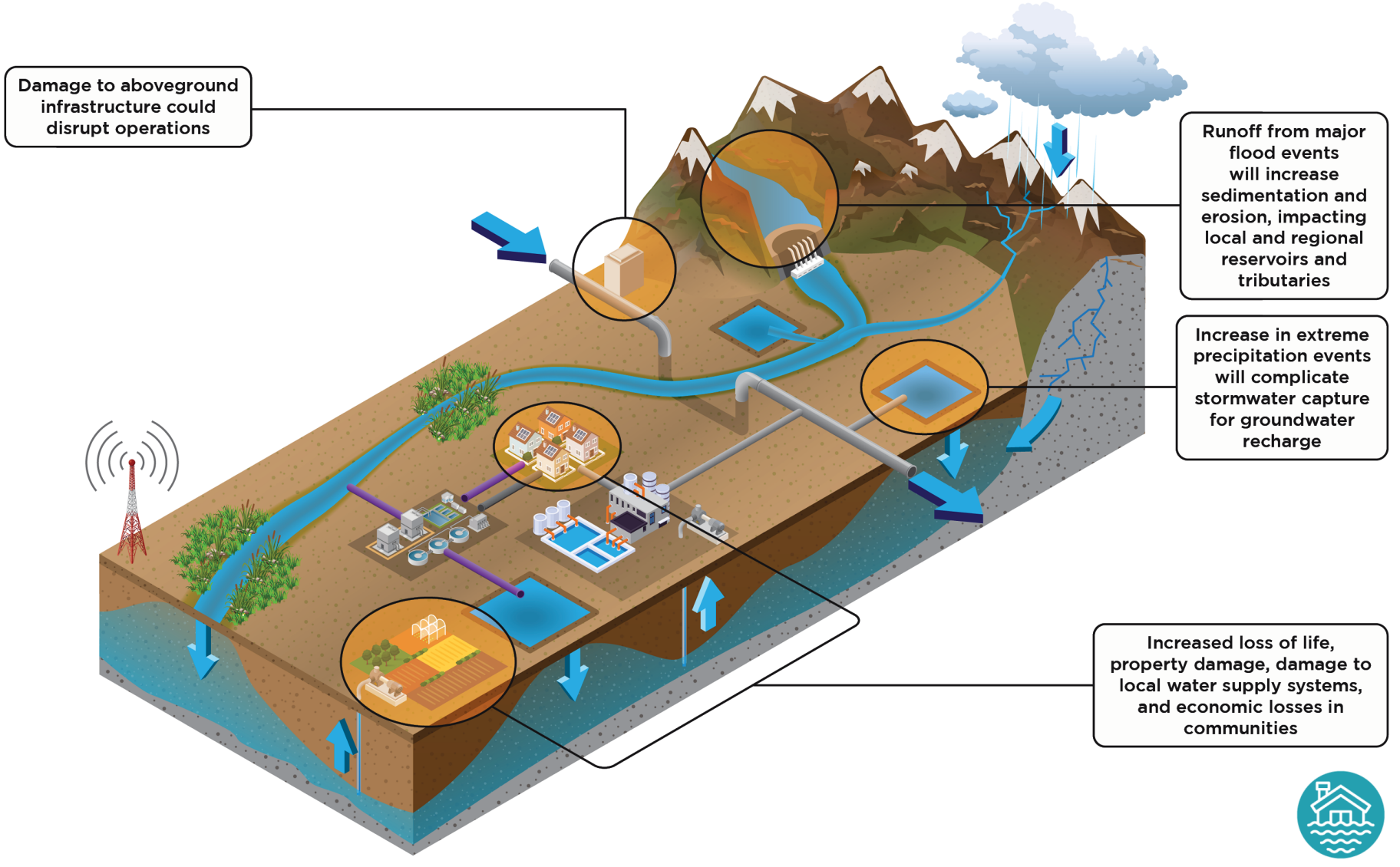


Extreme Precipitation Events and Flooding

Flooding occurs when rivers and streams overflow due to heavy rainfall, or rapid 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. 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 21.

Wilson Creek Recharge Basins

Figure 21. Potential Extreme Precipitation and Flooding Impacts

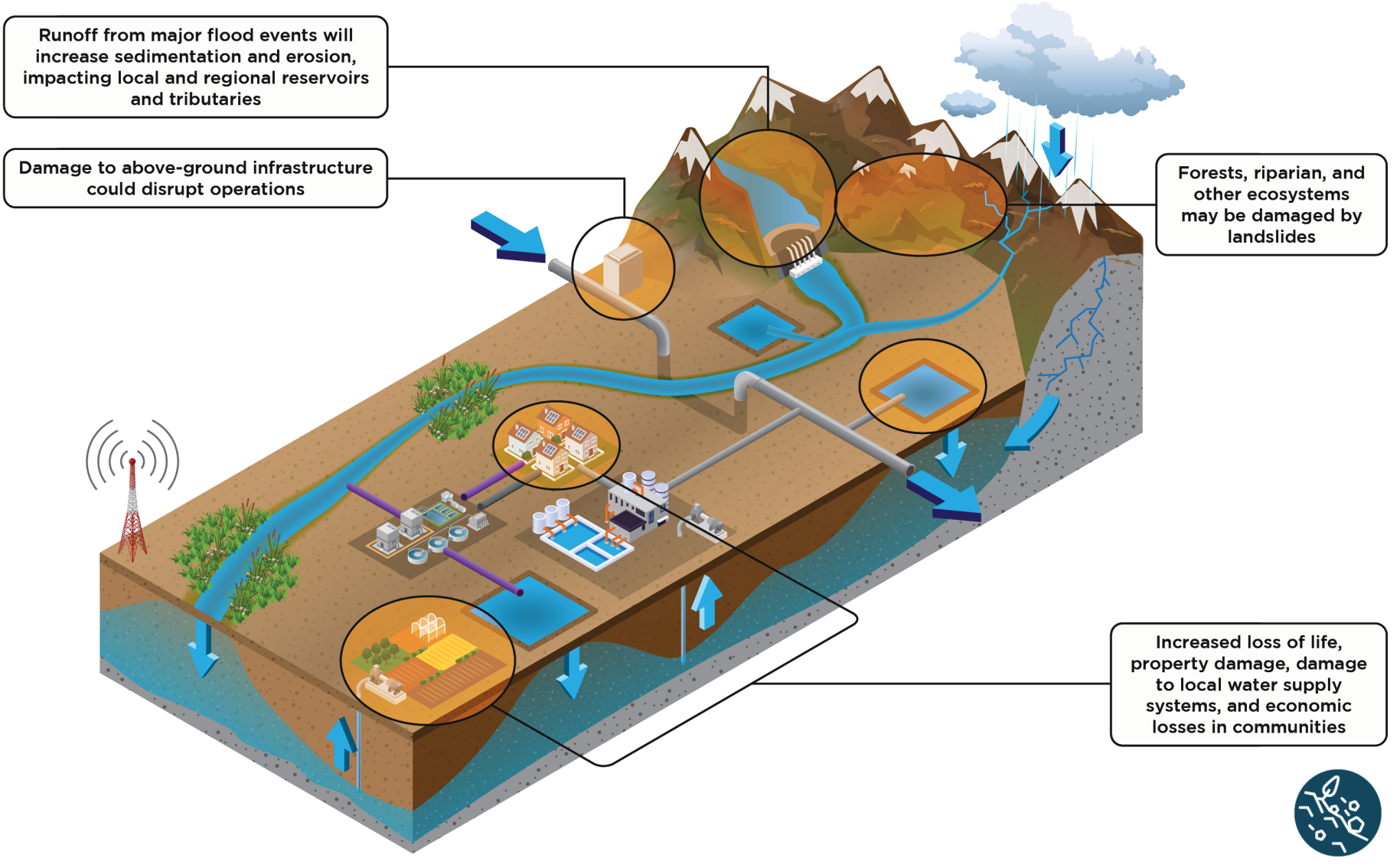


Landslide

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 on areas affected by wildfires. Potential impacts to SBVMWD related to landslides are shown in Figure 22.

View of the San Bernardino Valley

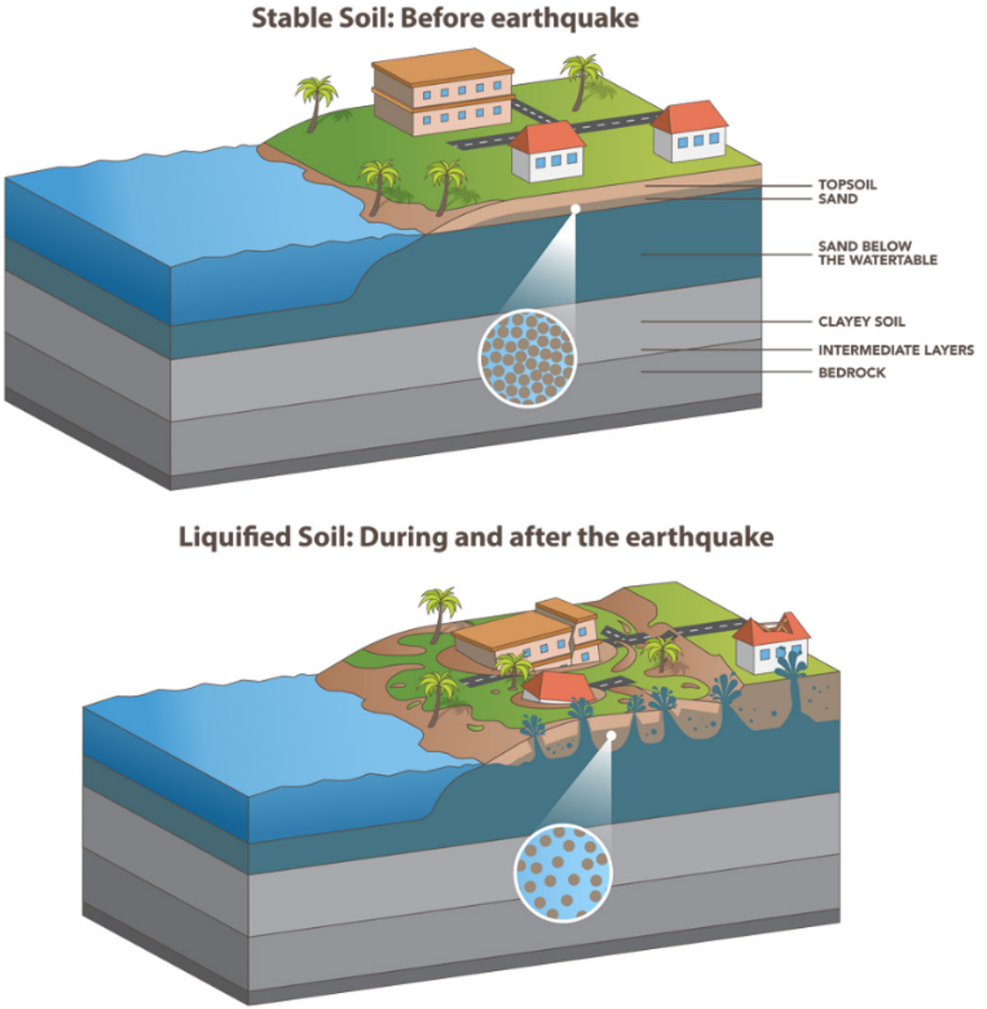
Figure 22. Potential Landslide Impacts



Liquefaction

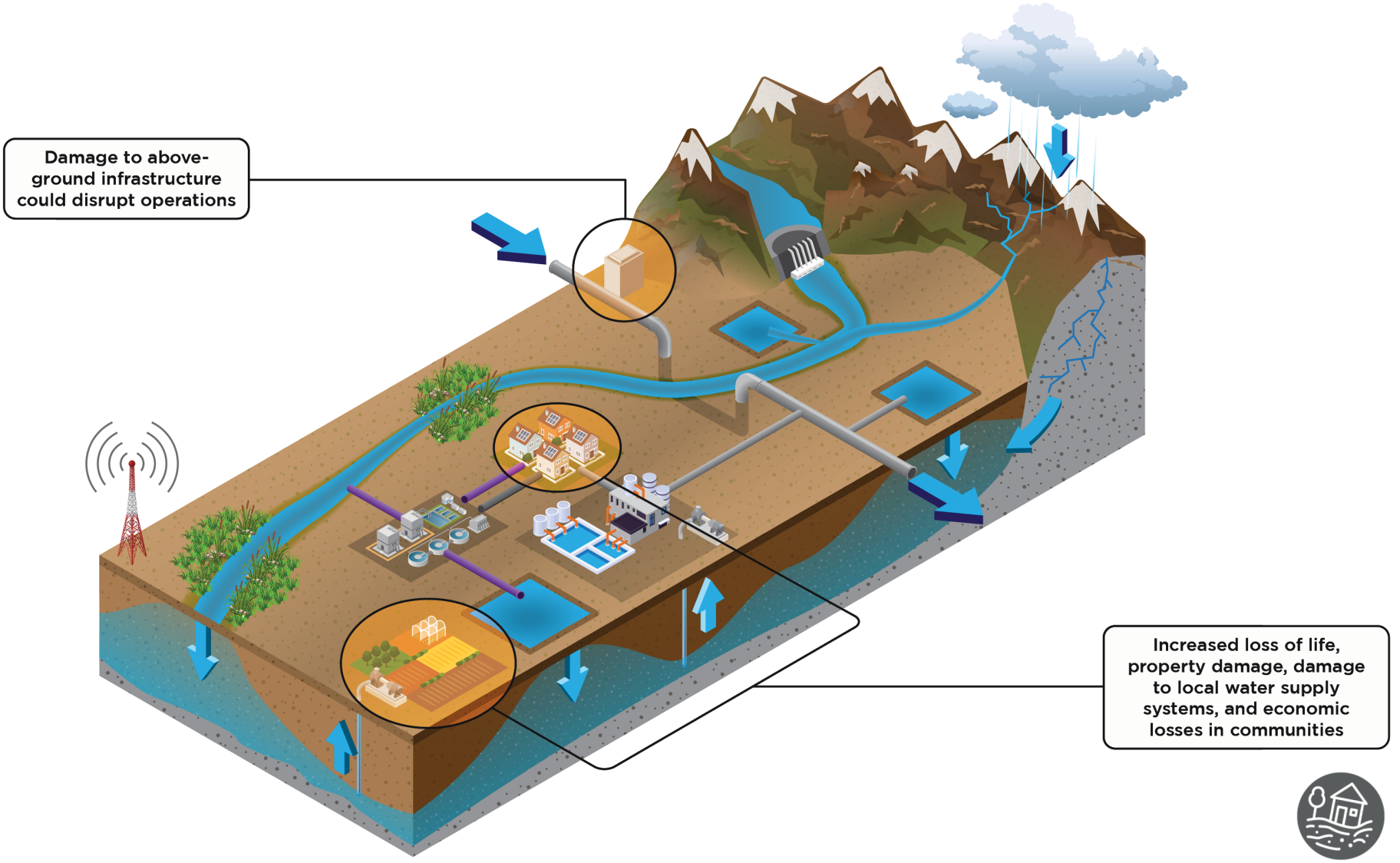
The presence of various fault lines in proximity to SBVMWD's service area, in combination with pockets of sandy soils and predicted increases in extreme rain events, presents liquefaction as an important hazard for consideration (See Figure 23). In the context of SBVMWD, the potential for liquefaction 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 24.

Figure 23. Liquefaction Overview



Source: ***https://researchoutreach.org/articles/predicting-post-seismic-liquefaction-geological-response-analysis/***

Figure 24. Potential Liquefaction Impacts



Sunrise Ranch property looking northeast

4. GREENHOUSE GAS EMISSIONS *and* REDUCTION TARGETS

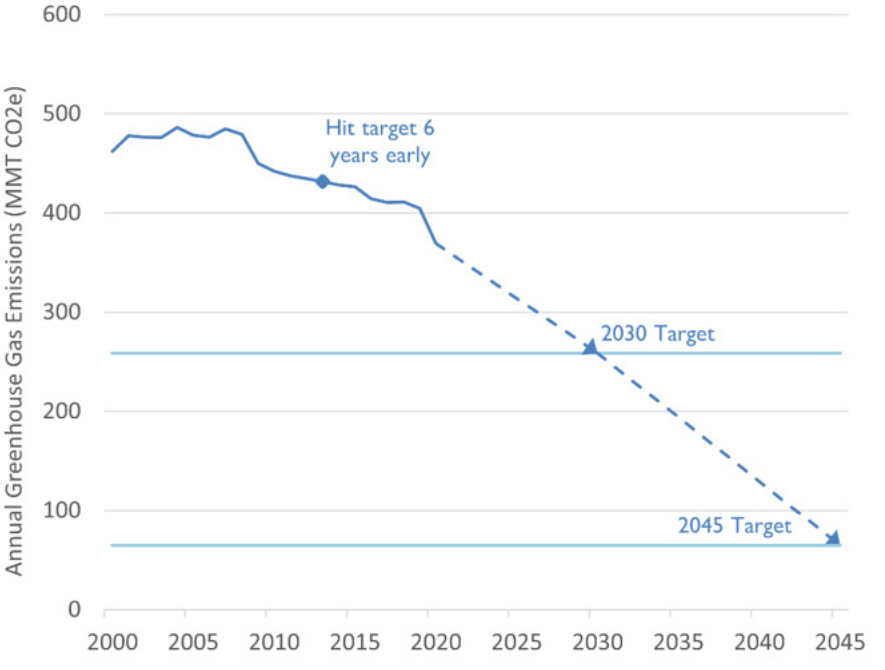
4. GREENHOUSE GAS EMISSIONS *and* REDUCTIONS TARGETS

California has a sector-by-sector roadmap for carbon neutrality by 2045 (See Figure 25).[18] The 2006 California Global Warming Solutions Act (AB 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. 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.

Water agencies 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. 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 exercises direct and indirect control over its GHG emissions-generating activities (see GHG Emissions by Scope, on page 39, 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 are the first GHG inventory, forecast, and reduction targets established for SBVMWD.

Figure 25. California Carbon Neutrality Target

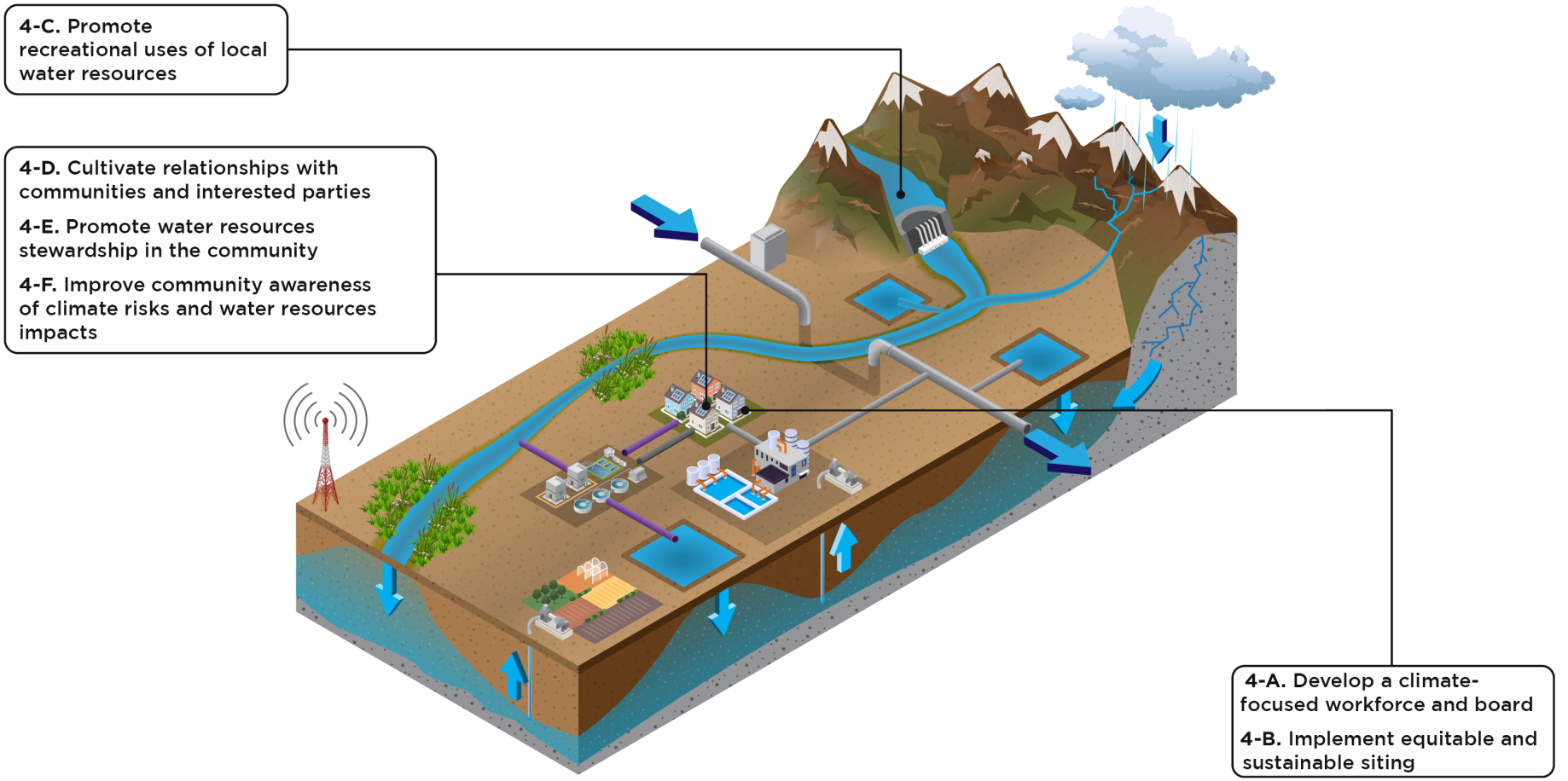


Source: California Environmental Protection Agency. California Climate Dashboard. ***https://calepa.ca.gov/climate-dashboard/***

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

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 26 for an overview of SBVMWD's GHG emissions share by scope and source.

Figure 26. 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:

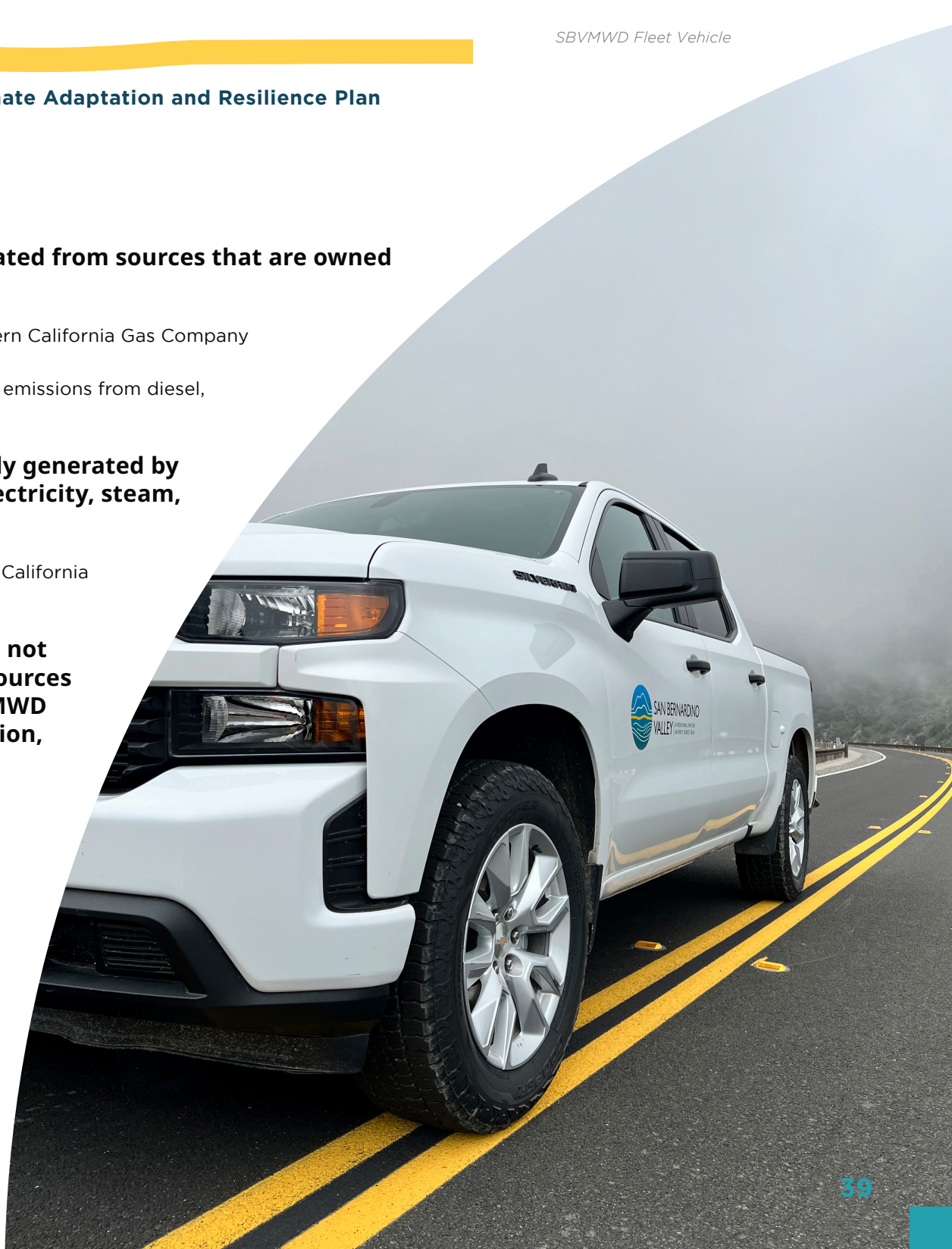
- **Natural gas –** emissions from natural gas delivered by Southern California Gas Company (SoCalGas).
- **Vehicle fleet and equipment (on- and off-road) –** vehicle fleet emissions from diesel, gasoline, compressed natural gas, and propane usage.

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

- **Electricity –** 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.
- **Solid Waste (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.



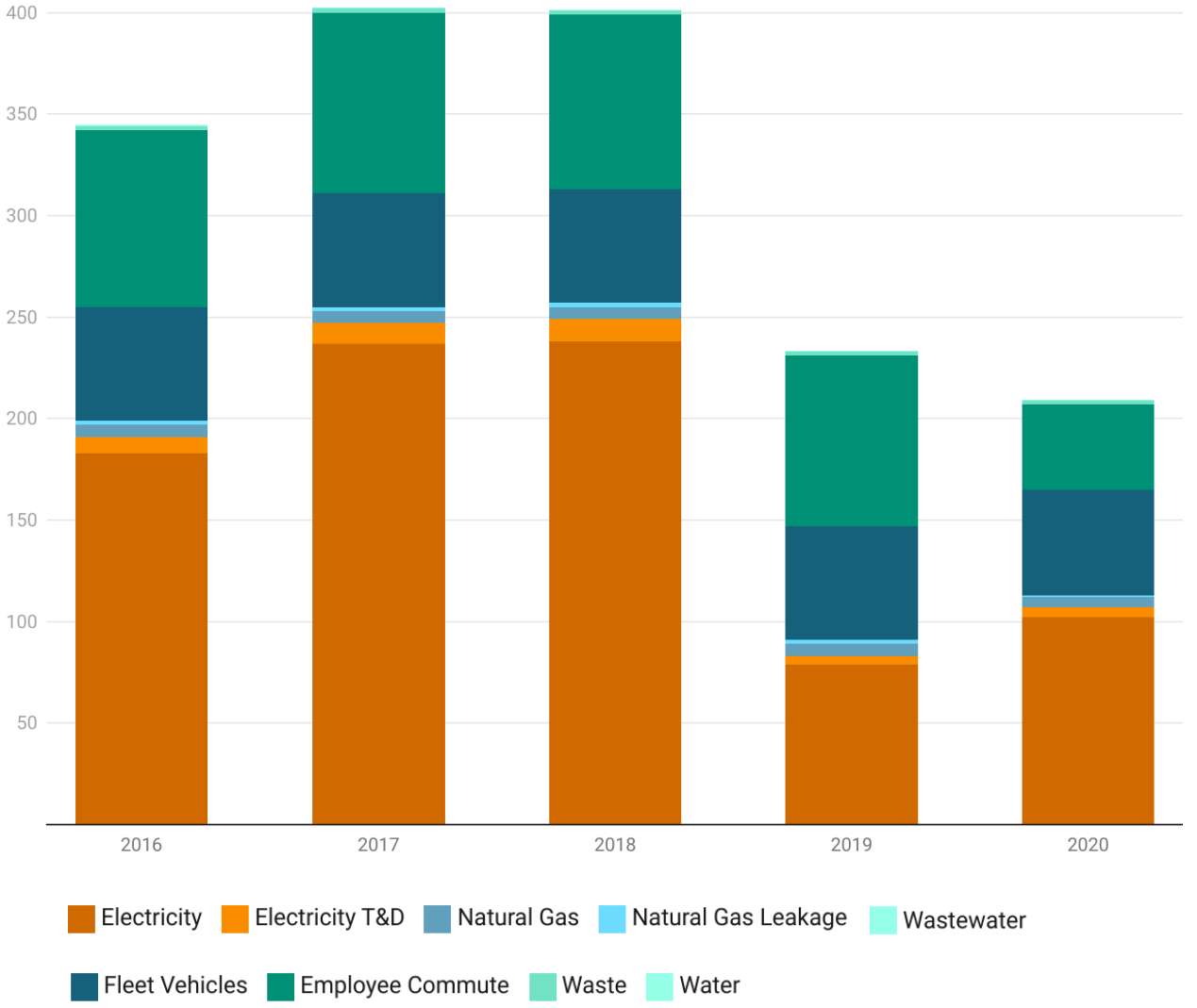
SBVMWD Fleet Vehicle

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 27 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 27. SBVMWD Annual Emissions by Source (2016-2020)



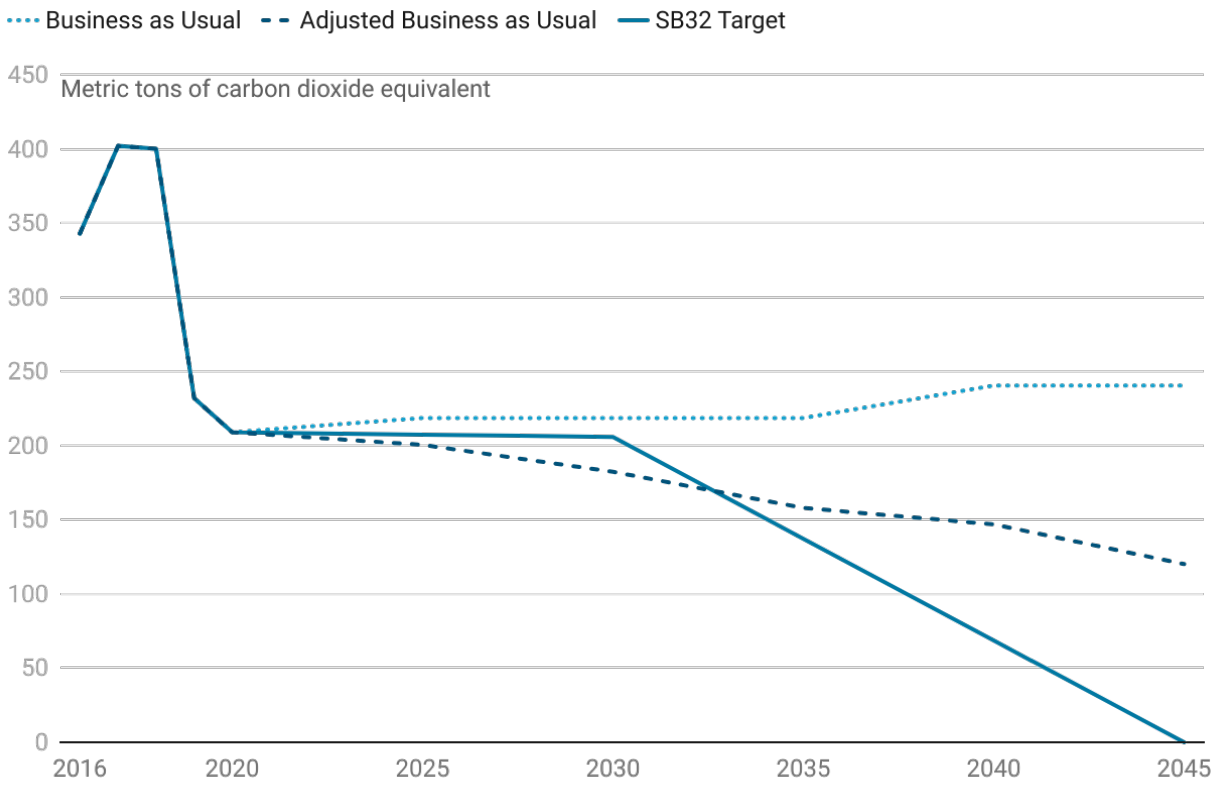
Forecast and Targets

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 28: a businesses as usual (BAU) forecast scenario and an adjusted business as usual (ABAU) 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 28 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 28. SBVMWD GHG Emissions Forecast and Targets



Sunrise Ranch property looking north

5.
RESILIENCE STRATEGIES – GOALS, MEASURES, *and* ACTIONS

Santa Ana River Enhanced Recharge Phase 1A and Seven Oaks Dam

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 incorporates the many programs that SBVMWD has in place and includes new guiding principles, measures, and actions that SBVMWD developed based on climate vulnerabilities, the needs of the community, and the values of SBVMWD. CARP actions have been organized into four 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 CARP's 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 have been developed to assist staff in tracking progress and evaluating efficacy.

Hulda Crooks Park, Loma Linda

Guiding Principles

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

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 to maintain reliability and continuity of service

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

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:

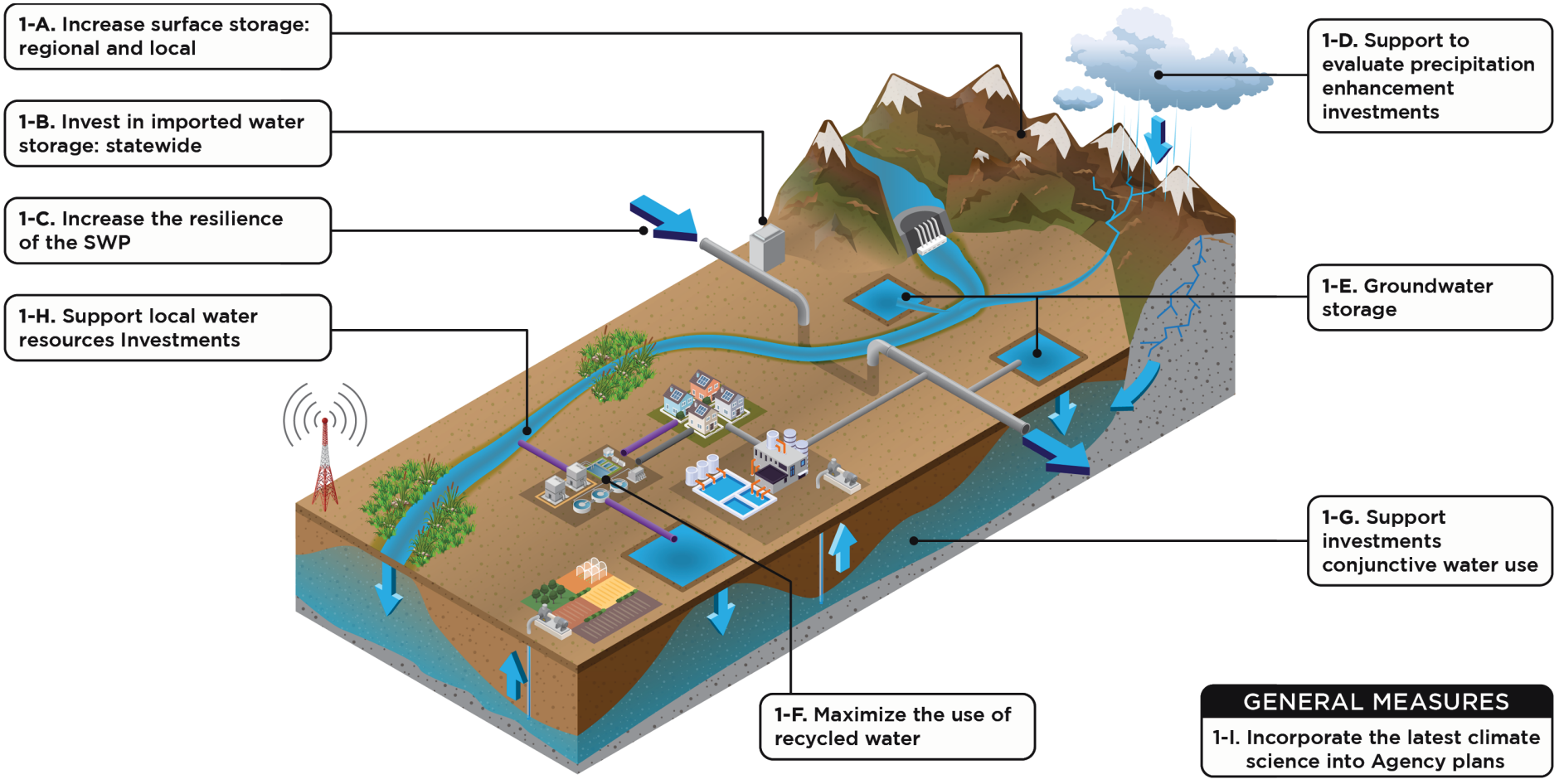
- Adaptive Management Indicators outlining how efficacy will be assessed
- Climate vulnerabilities addressed by the measure
- Partners necessary for successful implementation
- Actions SBVMWD will take to implement the measure

Devil Canyon Recharge Basins

GUIDING PRINCIPLE 1: MAINTAIN A DIVERSE WATER PORTFOLIO

Figure 29 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 an 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 29. CARP Measures Supporting Guiding Principle 1: Maintain a Diverse Water Portfolio



Measure 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, 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.

Measure 1-B Surface Storage: Statewide

Description: Increase imported water storage capacity, such as through 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.

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

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 MWD (for example, storage in Diamond Valley Lake), Pass Agency, Antelope Valley-East Kern, Central Valley, Mojave Water Agency, etc. and local direct delivery customers.

Measure 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.

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.

Measure 1-D Precipitation Enhancement

Description: Implement and assess effectiveness of weather modification pilot program by Santa Ana Watershed Project Authority (SAWPA).

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

Key Partners: SAWPA and SAWPA Member Agencies

Actions:

1-D-14 Participate and monitor the implementation of the SAWPA Weather Modification 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 Weather Modification Program, develop and implement the program with partners.

Measure 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 Municipal Water District, Riverside Public Utilities, Fontana Water Company, West Valley Water District, City of Redlands, East Valley Water District, Yucaipa Valley Water District, San Bernardino Valley Water Conservation District, San Bernardino County Flood Control District, and others.

Actions:

1-E-16 Complete Enhanced Recharge, Phase 1-B 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 Municipal Water District.

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 other actions to fully utilize the two Santa Ana River water rights permits held jointly by San Bernardino Valley and Western Water, including petitioning the State Water Resources Control Board to allow additional points of diversion.

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.

Measure 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.

Measure 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, San Gorgonio Pass Water Agency, Yucaipa Valley Water Districts, Western Municipal Water District, 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 BHCUP and 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 Santa Ana River Conservation and Conjunctive Use Program/BHCUP and related approvals from BTAC, Board, and Watermaster.

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

Measure 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, recycled water and onsite reuse, tree-planting in disadvantaged communities that lack tree canopy, rain-barrel distribution and dual-plumbing investments.

Measure 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

Drought | Extreme Heat | Flooding | Landslides | Liquifecation | Sea Level Rise | Wildfire | GHG Mitigation

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 the groundwater basin's trends and response to management actions; and conduct climate sensitive analysis (back-end solutions).

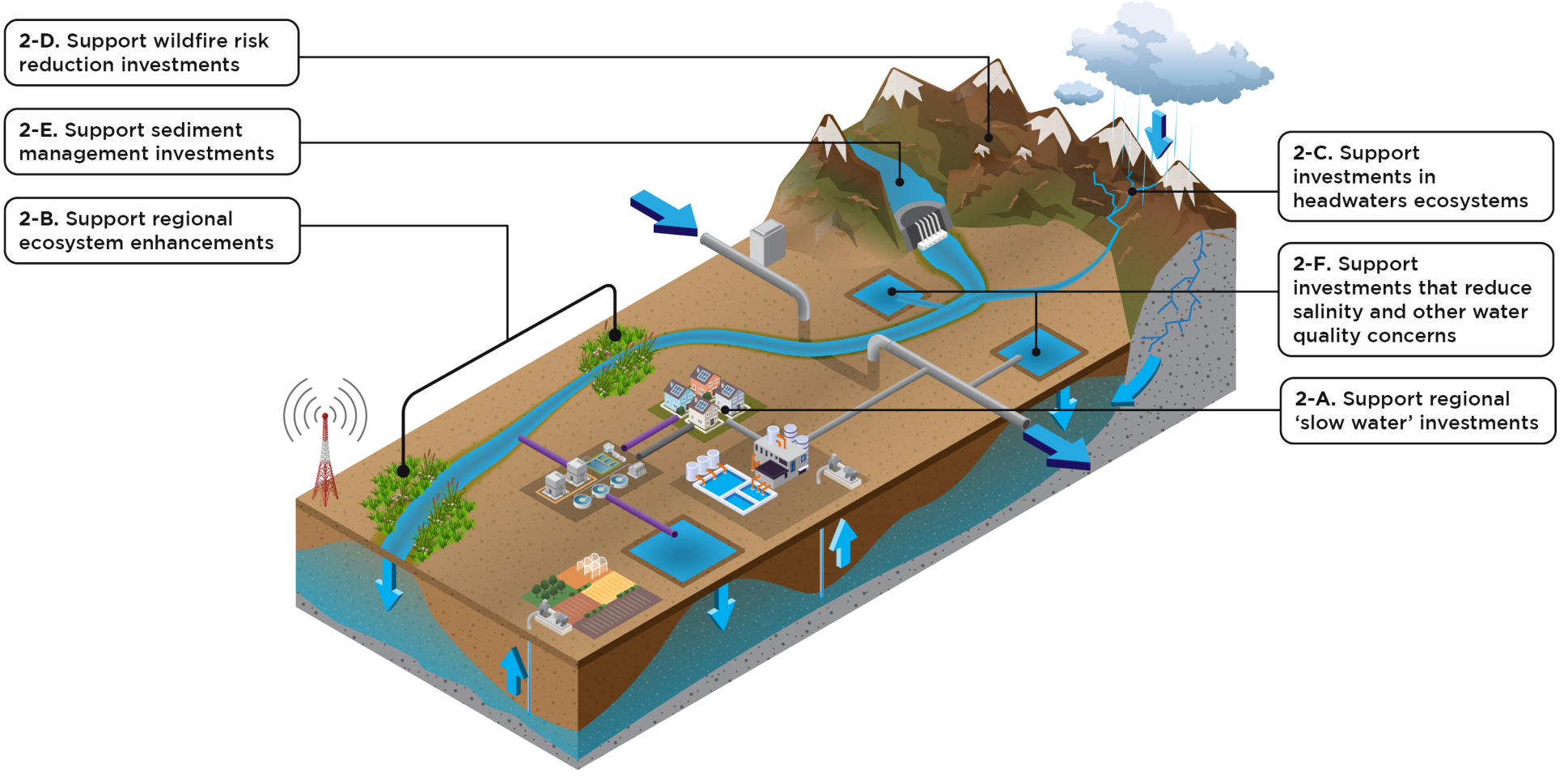
1-I-32 Identify and implement water portfolio tool(s), dashboards and decision-support and engagement portals necessary to adapt to a variety of plausible futures successfully and agile enough to adjust the water portfolio to changing times (front-end solutions).

Seven Oaks Dam

GUIDING PRINCIPLE 2: PROTECT THE WATER PORTFOLIO

Figure 30 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 30. CARP Measures Supporting Guiding Principle 2: Protect the Water Portfolio

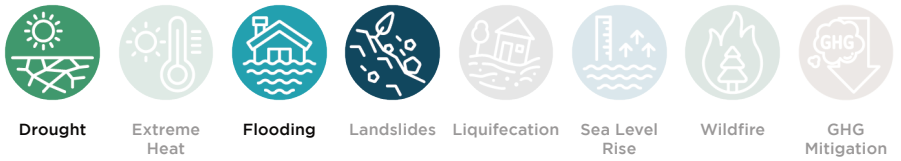


Measure 2-A Nature-Based Solutions

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 Districts, property owners, and 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.

Measure 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, City of San Bernardino, San Bernardino Valley Water Conservation District, West Valley Water District, Western Municipal Water District.

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.

Measure 2-C Headwaters Landscape Management

Description: Support the implementation of headwaters landscape management practices in the Upper Santa Ana River 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).

Measure 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 relevant agencies and 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 Santa Ana River 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.

Measure 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: San Bernardino Valley Water Conservation District, Orange County Water District, Flood Control Districts

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.

Measure 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 RWQCB), 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.

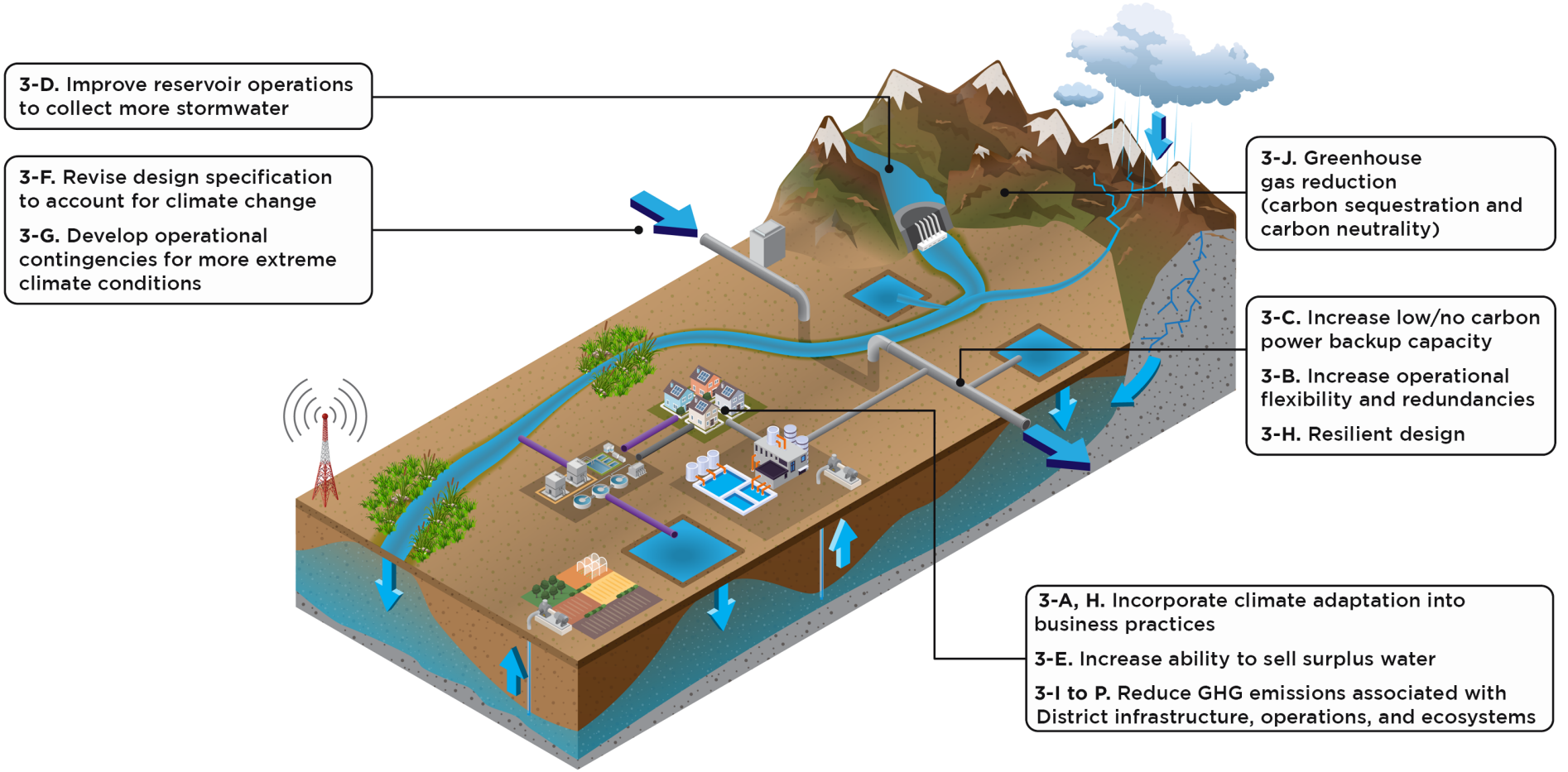
2-F-56 Complete the Salt and Nutrient Management Plan and continue collaboration with the Santa Ana RWQCB and SAWPA on water quality.

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.

GUIDING PRINCIPLE 3: IMPROVE OPERATIONAL AND INFRASTRUCTURAL RESILIENCE

Figure 31 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 31. CARP Measures Supporting Guiding Principle 3: Improve Operational and Infrastructural Resilience



Measure 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: Partners to be determined during implementation

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 SBVMWD'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), 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.

Measure 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: Partners to be determined during implementation

Actions:

3-B-62 Review all water transfer, exchange and cooperation agreements (e.g. CLAWA, MWD, 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 MWD 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 MWD 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.

Measure 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: Partners to be determined during implementation

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 (Baseline Feeder).

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 Emergency Response Network of the Inland Empire (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.

Measure 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 Municipal Water 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 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 Seven Oaks 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 Santa Ana River 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 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, Greens pot Pump Station, Central Feeder).

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

Measure 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: San Gorgonio Pass Water Agency, Metropolitan Water District of Southern California, SARCCUP Agencies, 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.

Measure 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 Gorgonio 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.

Measure 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: Partners to be determined during implementation

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.

Measure 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: Partners to be determined during implementation

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, etc. 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.

Measure 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: Partners to be determined during implementation

Actions:

3-I-95 Evaluate the Agency'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).

Measure 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: Partners to be determined during implementation

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.

Measure 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: Partners to be determined during implementation

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 have EnergyStar certification or 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.

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

Description: Proactively reduce SBVMWD's electricity greenhouse gas emissions.

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

Key Partners: Partners to be determined during implementation

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 greenhouse gas emissions, 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.

Measure 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: Partners to be determined during implementation

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 internal combustion engine vehicles. When vehicles are due for replacement, check for EV availability and purchase. If EV is not available, then buy the most fuel-efficient 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.

Measure 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: Partners to be determined during implementation

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.

Measure 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: Partners to be determined during implementation

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 SoCalGas), regulatory (e.g. South Coast AQMD), State, and Federal sources.

Measure 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: Partners to be determined during implementation

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.

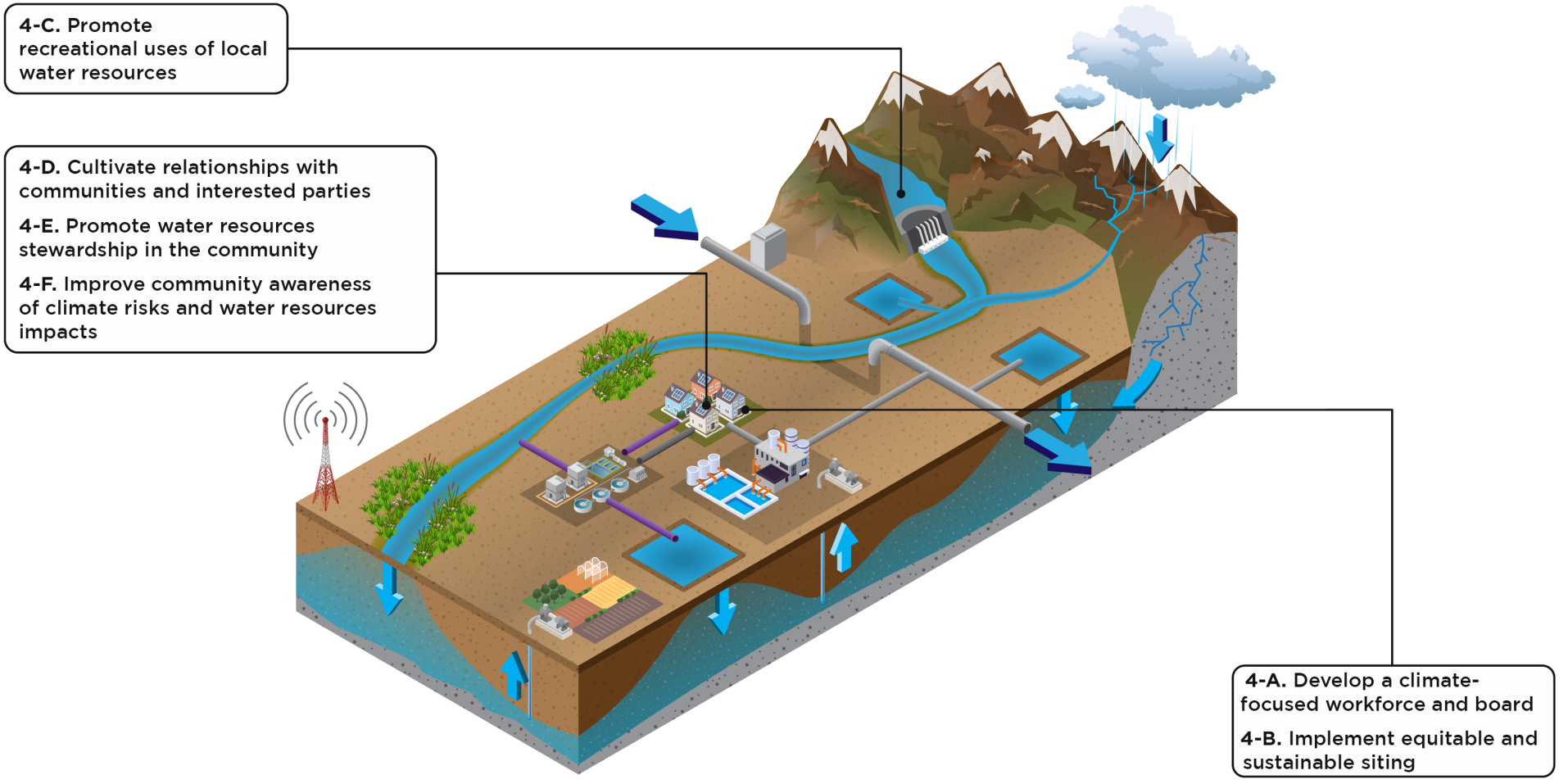
3-P-119 Increase awareness among Board Members and staff on the impact of business travel, and update travel policy or guidelines to encourage low-carbon travel alternatives and sustainable practices where feasible (EV and hybrid car rentals, airlines with sustainable practices, eco-friendly hotel chains,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

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.

GUIDING PRINCIPLE 4: CONNECT PEOPLE TO WATER AND CLIMATE

Figure 32 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 32. CARP Measures Supporting Guiding Principle 4: Connect People to Water and Climate



Measure 4-A Develop a Climate-Focused Workforce and Board of Directors

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: Partners to be determined during implementation

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 the Board's ongoing leadership development efforts and decision-making.

Measure 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 greenhouse gas emissions

Key Partners: Partners to be determined during implementation

Actions:

4-B-124 Develop and adopt climate adaptive and resilient policies 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.

Measure 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 educational and/or recreational uses.

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

Key Partners: Partners to be determined during implementation

Actions:

4-C-127 Identify educational uses of Agency'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.

Measure 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, Climate Resilience Organizations

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).

Measure 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 demand studies 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 comprehensive 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.

Measure 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-137 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-138 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-139 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).

Sedimentation Basin below Seven Oaks Dam
(Enhanced Recharge Phase 1A)

6.
PHASING *and* IMPLEMENTATION

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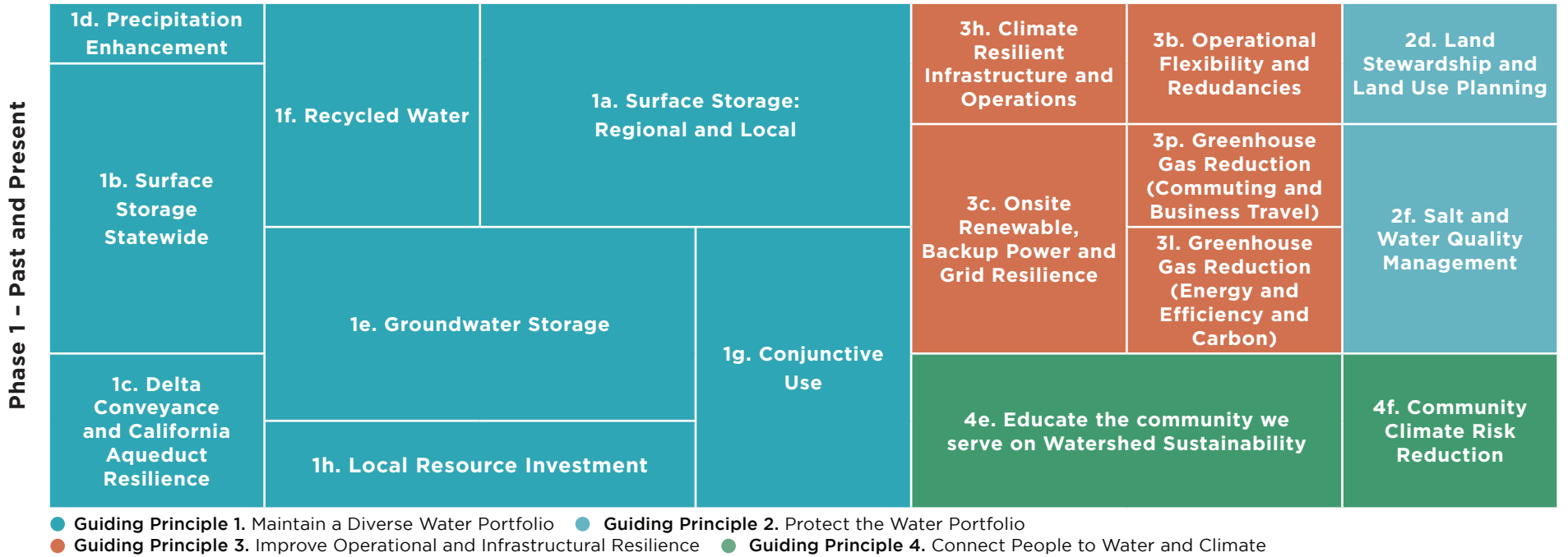
To effectively implement this CARP, it is necessary to incorporate flexibility into its implementation as conditions change alongside a general phasing of planned measures to maintain continued progress. Section 5 identified the planned measures and actions that support climate adaptation and mitigation for SBVMWD. Figure 33 and Figure 34 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 FY 23/24 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 reliability of the water supply portfolio, a core mission of SBVMWD. Phase 1 measures emphasize adaptation and resilience, while the later phases build on the first phase and focus on mitigation and adaptation. The shift in the costs between Figure 33 and Figure 34 is because the District has invested a substantial amount of money in Guiding Principle 1 Maintain a Diverse Water Portfolio (shown in darker blue) over the last 20 years. Moving forward, there will be a shift towards a different mix of adaptation and mitigation investments to optimize previous investments.

Figure 33. Phase 1 Measures by Guiding Principle

Note: The size of individual boxes depicts their relative cost across all measures.



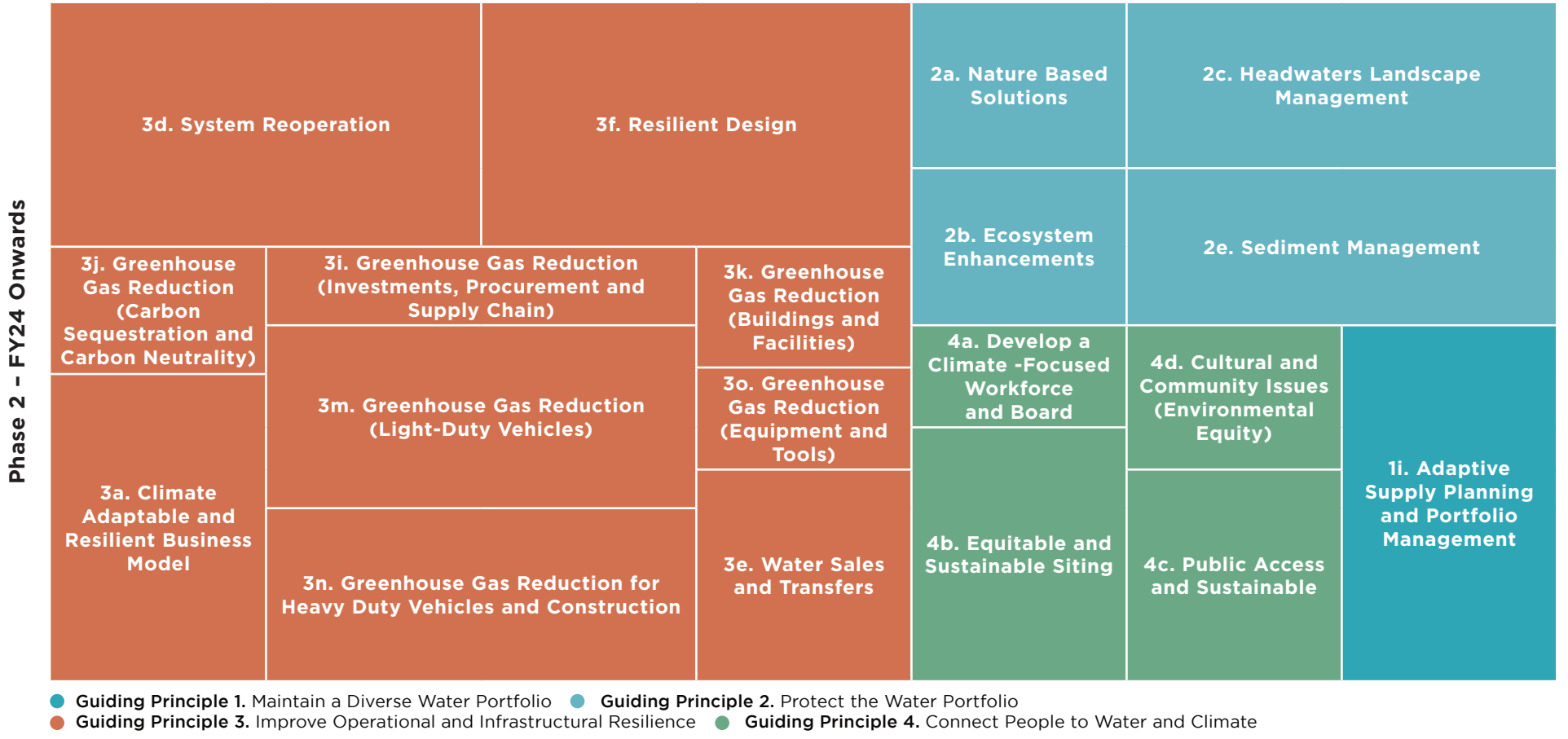
Phase 1 measures are generally those related to SBVMWD's water supply portfolio, covering imported and local surface water, groundwater, recycled water, and precipitation enhancement. Operational and infrastructure resilience are also prioritized here, with a focus on climate resilience, operational 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, are 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. This kind of long-term planning is consistent with the nature of San Bernardino Valley's responsibilities. Many of of these actions require highly technical and complex consideration, including regulatory requirements that may span decades from conception to completion.

Groundwater level measurement at Enhanced Recharge Phase 1B

Figure 34. Phase 2 Measures by Guiding Principle

Note: The size of individual boxes depicts their relative cost across all measures.



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 SBVMWD, 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, SBVMWD could utilize the metrics detailed in Figure 35 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.

Engineering and Environmental staff on Project Site

Figure 35. Performance Metrics

Should Performance Metrics be Adjusted?

Signpost Metrics track actual trends in factors that influence future planning decisions (i.e., setting performance targets)

Supply/Headwaters	Infrastructure/Operations	Demand
• Annual SWP allocations (Acre-Feet) • Soil moisture in the Upper Watershed (volumetric water content) • Vegetation mapping in the Upper Watershed (Acres) • Average annual surface waterflow (cu-ft/sec)	• Average annual temperature in the service area (°F) • Number of climate-related disasters • Changes in water quality regulations	• Population change • Economic growth • Water use regulations

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

1. Maintain a Diverse Water Portfolio	2. Protect the Water Portfolio	3. Improve Operational and Infrastructure Resilience	4. Connect People to Water and Climate
Annual water stored, by type (Acre-Feet)			Annual recreational visits to water resources
Annual groundwater recharge, by type (Acre-Feet)			
Annual SWP deliveries (Acre-Feet)	Sediment removed (cubic-feet)	Annual water sold/ transferred (Acre-Feet)	
Regional recycled water use (Acre-Feet)	Salinity/Water quality (Concentration)	Annual GHG footprint (tons GHGe)	Per capita water use (CCF/capita/year)
		Number of SBVMWD service disruptions	People who understand the value of water resources (survey results)

How is Adaptive Capacity improving?

Measures and Actions
Adaptive Capacity Metrics track changes in the capabilities of ecosystems, infrastructure, operations, and communities that are intended to achieve performance imrpovements (see Section 5 for a complete list organized by Measure)

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OUR *roadmap* TO INCREASE *operational resilience* AND REDUCE CONTRIBUTIONS TO CLIMATE CHANGE.

Crafton Hills Reservoir