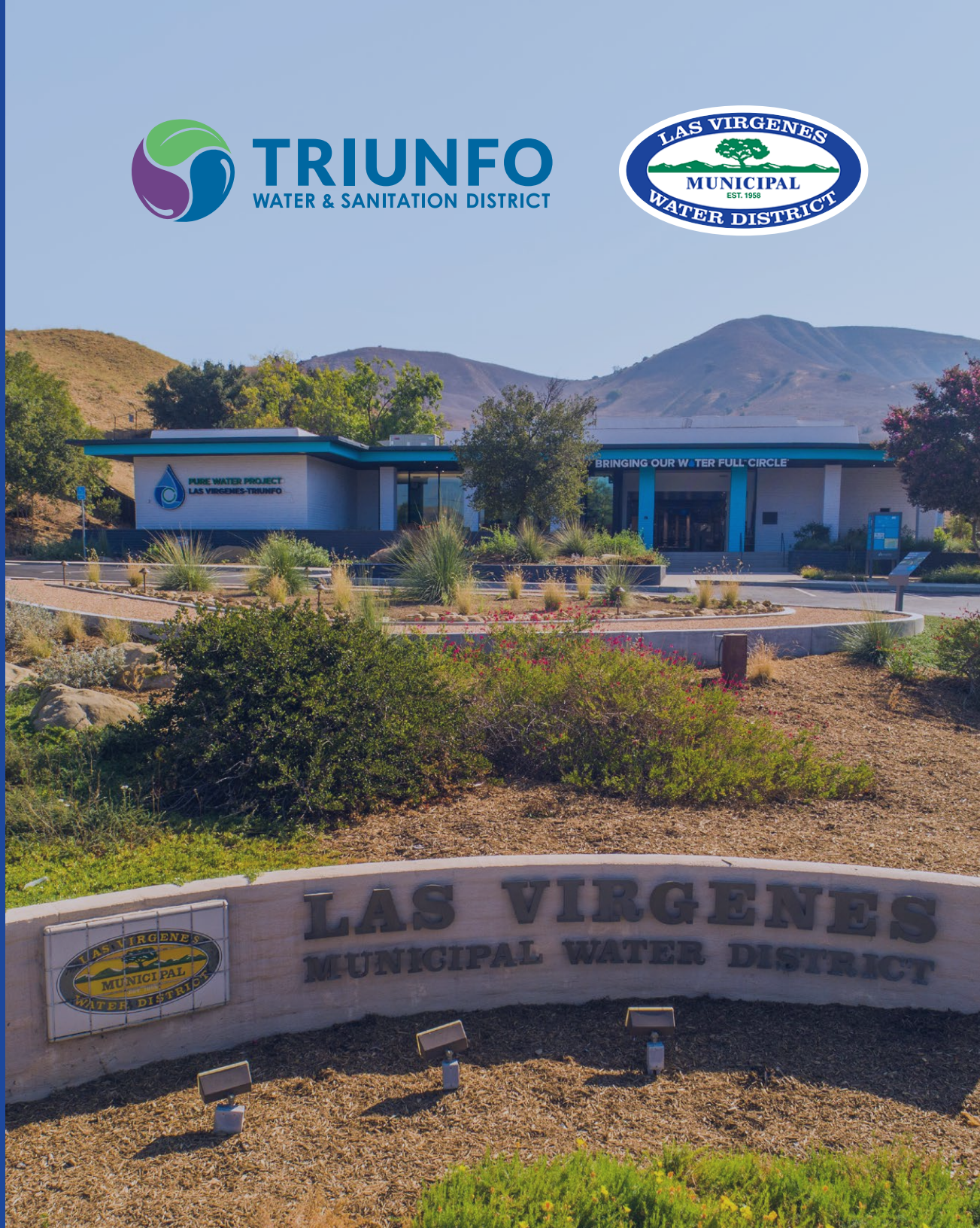
Las Virgenes Municipal Water District &
Las Virgenes-Triunfo Joint Powers Authority

Climate Action & Adaptation Plan

September 2023



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ACRONYMS, ABBREVIATIONS, AND GLOSSARY

A list of acronyms, abbreviations, and glossary terms used in the Climate Action and Adaptation Plan.

A

AB – Assembly Bill

Action – The act, policy, or measure that will be implemented and achieved to reduce greenhouse gases and/or increase resilience to climate change.

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.

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

B

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

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

C

CAAP – Climate Action and Adaptation Plan

CARB – California Air Resources Board

CCA – Community Choice Aggregation. A CCA is a nonprofit electricity provider.

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

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

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

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

Cal Recycle – California Department of Resources, Recycling, and Recovery

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

CEQA – The California Environmental Quality Act

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

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

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

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

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

CPA – Clean Power Alliance. A CCA in the Los Angeles region.

CWC – California Water Commission

D

Decarbonization – The reduction or removal of carbon dioxide.

DWR – California Department of Water Resources

Dry Weather Diversion – A diversion of non-stormwater and stormwater flows from the storm drain system into the sanitary sewer system.

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.

EV(s) – Electric Vehicle(s)

F

FEMA – Federal Emergency Management Agency

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

G

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

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

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

H

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.

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

J

JPA – Las Virgenes – Triunfo Joint Powers Authority

K

L

LED – Light-emitting diode

LVMWD – Las Virgenes Municipal Water District

M

Methane (CH_4) – A hydrocarbon that is a greenhouse gas 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) – common international measurement for the quantity of greenhouse gas emissions – one metric ton is equal to 2,204.6 pounds or 1.1 short tons.

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

MWD – Metropolitan Water District of Southern California

N

Nitrous oxide (N_2O) – A powerful greenhouse gas 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

P

PSPS – Power Safety Power Shutoffs

PV – Photovoltaic (solar energy)

Q

R

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

RCP – Representative Concentration Pathway

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

S

SB – Senate Bill

SCE – Southern California Edision

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

Service population – Residents receiving services

SWP – State Water Project

T

TWSD – Triunfo Water & Sanitation District

TWRF – Tapia Water Reclamation Facility

U

U.S. EPA – United States Environmental Protection Agency

UWMP – Urban Water Management Plan

V

VMT – Vehicle miles traveled

Vulnerability – The propensity or predisposition to be adversely affected.

W

WBCSD – World Business Council for Sustainable Development

Wet Weather Diversion – A diversion of both non-stormwater and stormwater flows from the storm drain system into the sanitary sewer system.

Y

Z

ZEV – Zero emission vehicle

1.

INTRODUCTION

A Climate Action and Adaptation Plan (CAAP) for a municipal water district provides a strategic framework of measures and strategies designed to address the impacts of climate change on water resources, water supply, and water and wastewater infrastructure within the jurisdiction of Las Virgenes Municipal Water District (LVMWD or District) and the Las Virgenes – Triunfo Joint Powers Authority (JPA). The JPA is a long-term partnership between LVMWD and Triunfo Water and Sanitation District (TWSD). LVMWD is the Administering Agent for the JPA. The goal of this CAAP is to both mitigate contributions to climate change (climate action) and adapt operations and systems to the threats and impacts of a changing climate (climate adaptation). The CAAP will play a crucial role in ensuring a reliable and resilient water supply and wastewater services in the face of climate change challenges. It demonstrates a proactive commitment to both reducing the impacts of climate change and adapting to the changing conditions to provide safe and sustainable water and wastewater services to the community.

LVMWD AND TRIUNFO JPA MISSION AND VISION

The CAAP supports the mission of the District and the JPA to provide high-quality, reliable water and wastewater treatment services in a cost-effective and environmentally sensitive manner. This mission applies to all LVMWD and joint LVMWD/JPA activities, as they collectively provide drinking water, recycled water, wastewater services, and biosolids composting.

This CAAP has been developed to align with LVMWD and JPA goals and long-range planning efforts, with the intent to adapt District/JPA operations and infrastructure to a changing climate and reduce greenhouse gas (GHG) emissions over time. Through innovative strategies, collaborative partnerships, and responsible stewardship, LVMWD and the JPA aspire towards a sustainable, cost effective, and equitable water supply, valuing every drop and bringing water full circle. By embracing adaptive measures and progressing towards carbon neutrality, LVMWD and the JPA are dedicated to providing high-quality water and wastewater services in a cost effective and environmentally resilient manner. The following section provides an overview of the CAAPs purpose, a system/facilities overview, and the plans that the CAAP aligns with to ensure cohesion among long-range planning efforts by LVMWD and the JPA.

TRIUNFO WATER & SANITATION DISTRICT

LAS VIRGENES MUNICIPAL WATER DISTRICT EST. 1958

CAAP PURPOSE

The CAAP is a long-range planning document that provides LVMWD and the JPA with a roadmap for achieving long-term GHG emissions reduction and improved resilience to climate change impacts in alignment with the State of California goals, mandates, and current legislation. It includes an analysis of LVMWD and JPA operations, associated GHG emissions sources, forecasted future emissions, climate vulnerabilities, and emissions reduction and adaptation goals and strategies. This document is intended to inform future policy and planning decisions on operations, water resources, capital investments, conservation, and local resource programs. Additionally, the CAAP aligns with LVMWD and JPA long-range plans including the 2020 Las Virgenes Municipal Water District Urban Water Management Plan, 2014 Integrated Master Plan for Las Virgenes Municipal Water District and Triunfo Sanitation District (IMP), and 2019 Hazard Mitigation Plan. The CAAP will support LVMWD and JPA efforts to adjust operations as feasible in order to adapt to climate change effects and to obtain infrastructure grant/loan funding necessary for increasing resiliency.

The CAAP establishes GHG emissions reduction targets that align with those goals set by the State of California, as well as with the international consensus regarding the GHG reductions needed to avoid the most serious climate change impacts. The emissions inventory and forecast presented in Chapter 4 provide a basis for establishing targets for future GHG reductions. LVMWD and the JPA are establishing an annual reduction rate to meet the State's 2045 carbon neutrality goal, as set forth by Assembly Bill (AB) 1279. By setting a straight line to the 2045 target, LVMWD and the JPA commit to reducing mass GHG emissions 69 percent below 1990 levels by 2030, surpassing Senate Bill 32, which requires a 40 percent reduction in emissions from 1990 levels.

The CAAP creates a roadmap that will provide LVMWD and the JPA with a broad range of strategies and measures to mitigate or reduce GHG emissions in line with State goals based on operational feasibility, cost, and the availability of State and federal grant funding. It will help LVMWD and the JPA to reduce overall GHG emissions from its operations and will align them with State mandates and legislation. In addition to establishing a pathway to an emissions reduction goal of 69 percent below 1990 levels by 2030 and carbon neutrality by 2045, the CAAP:

- Incorporates legislation and guidance from State, federal, and international sources,
- Identifies cost-effective energy efficiency and decarbonization measures,
- Provides co-benefits, such as improved operational resilience and improved air quality, and
- Integrates actions to transition away from fossil fuel use in alignment with California's clean fleet goals and overall strategies to reduce GHG emissions from the transportation sector.

CAAP Intent and Use

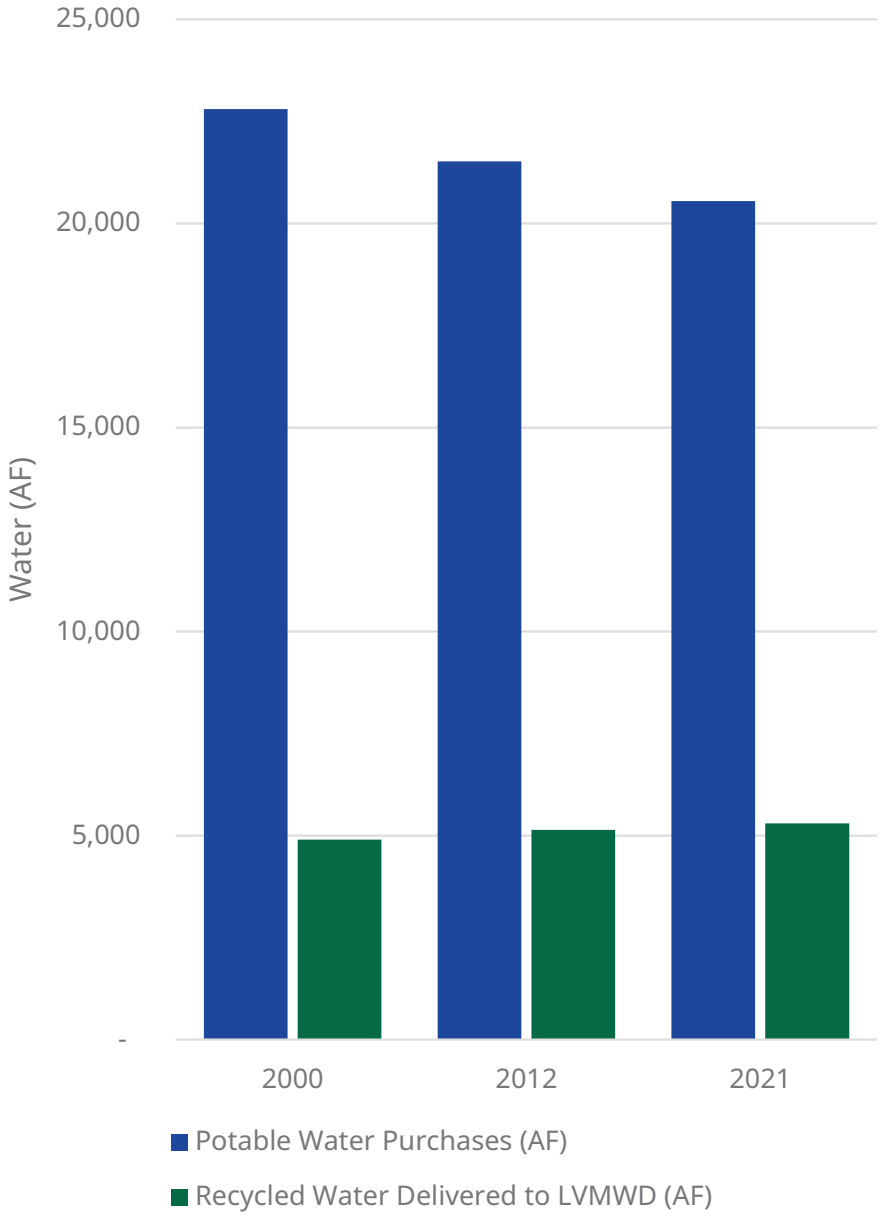
The CAAP provides a comprehensive analysis of climate threats and operational GHG emissions sources, as well as a programmatic guide for opportunities to increase resiliency and reduce GHG emissions. It is not intended to serve as a qualified GHG Reduction Plan per the California Environmental Quality Act (CEQA) requirements of Section 15183.5(b). Although the CAAP discusses climate-related impacts and provides GHG reduction strategies, it cannot be used to tier or streamline development projects as it relates to CEQA requirements. LVMWD and the JPA provide critical services to the communities they serve and are committed to implementing GHG reduction strategies to the extent they are both feasible and cost-effective. The CAAP's intent is to serve as an informative document that introduces concepts related to climate action planning and establishes a set of strategies that align with the State's GHG-reduction goals and associated legislation that can be used to implement mitigation and adaptation strategies. By defining specific reduction goals, LVMWD and the JPA can track their progress towards meeting their goals and measure the success of their CAAP strategies. LVMWD and the JPA are committed to developing new measures and strategies, leverage emerging technologies and products, and updating the CAAP in an effort to adapt to emerging climate threats and maintain progress with their established carbon neutrality target.

LVMWD/JPA System Overview

This CAAP covers LVMWD facilities and operations and JPA operations. LVMWD acts as Administering Agent for the Triunfo JPA, which is a long-term partnership between LVMWD and the Triunfo Water and Sanitation District (TWSD). The JPA co-owns, and LVMWD operates and maintains, several shared wastewater facilities, including the Tapia Wastewater Reclamation Facility, a backbone reclamation water main, the Rancho Las Virgenes Composting Facility, spray fields for seasonal disposal of excess recycled water, and a 5-megawatt solar farm. GHG emissions associated with the operation and maintenance of TWSD's infrastructure are not measured as part of the GHG inventory, as outlined in Chapter 4.

Collectively, the JPA provides wastewater treatment, recycled water, and biosolids composting to more than 100,000 residents in the cities of Agoura Hills, Calabasas, Hidden Hills, Westlake Village, unincorporated areas of western Los Angeles County, and eastern Ventura County, including Oak Park. LVMWD provides potable water services to 70,000 of its residents. LVMWD's potable water distribution system includes 25 storage tanks, 24 pump stations, and almost 400 miles of pipelines. LVMWD's recycled water system consists of 62 miles of pipelines, 3 storage tanks, 3 open reservoirs, and 4 pump stations. The potable water system serves potable retail customers, primarily residential, and the recycled water system provides water resources to irrigate parks, golf courses, roadway landscapes, commercial properties, and multi-family landscapes. Water delivered per year, in acre-feet (AF), by LVMWD in 2000, 2012, and 2021 is shown in Figure 1-1. Water deliveries for these years are shown in alignment with years included in the multi-year GHG inventory, as seen in Chapter 4. Highlighting 1990, 2000, 2012, and 2021 illustrates shifts in water deliveries over two decades of service. The GHG emissions associated with these water deliveries are primarily from the purchase and consumption of electricity used for water treatment, conveyance, and delivery of water throughout the service area, as well as emissions associated with the Tapia Water Reclamation Facility.

Figure 1-1. Water Delivered for Select Years (AF) by LVMWD



Long-Range Planning

As an urban water supplier, LVMWD is required to prepare an Urban Water Management Plan (UWMP) every 5 years in response to the requirements of the UWMP Act, California Water Code Sections (CWC) 10610 through 10656. UWMPs are required to support the long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs over a 20-year planning horizon during different climate scenarios. In July 2021, LVMWD's Board of Directors approved the most recent 2020 Urban Water Management Plan (UWMP 2021). LVMWD coordinated their planning efforts with several local water agencies to calculate demand projections, characterization of shared supplies, and planning for potential water shortages. This partnership included Calleguas Municipal Water District, Triunfo Water and Sanitation District, and The Metropolitan Water District of Southern California (MWD). To be consistent with anticipated growth in operations, water supply and demand projections are incorporated into the CAAP.

The 2014 Integrated Master Plan (IMP) for Las Virgenes Municipal Water District and Triunfo Sanitation District summarizes the findings of the Potable Water Master Plan, Sanitation Master Plan, and Recycled Water Master Plan, all adopted in 2014. The Potable Water Master Plan and Recycled Water Master Plan each evaluate historical and future water demands making several recommendations to secure water and avoid additional costs. The Sanitation Master Plan includes recommendations for specific sanitation projects for LVMWD to undertake such as refurbishment of existing assets, operation optimization, and sanitation system upgrades to allow LVMWD to plan for expansion and projected capacity needs in the future. The IMP recommends relieving demands from the potable system through specific recycled water construction projects and re-working the wastewater system to be more easily managed. Therefore, the CAAP aligns with and highlights opportunities within the IMP to reduce GHG emissions as a co-benefit.

Other long range planning documents such as the 2019 Las Virgenes Municipal Water District Hazard Mitigation Plan, have identified hazards that LVMWD is vulnerable to and recommend specific actions to minimize such vulnerabilities. This hazard mitigation plan developed by LVMWD explicitly sets a goal to increase the resiliency of LVMWD by "reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping guide and coordinate mitigation activities." Included in the plan is a series of hazard mitigation actions to be completed by LVMWD over the next few years to address hazards. The CAAP complements the strategies and hazard mitigation actions detailed in the Hazard Mitigation Plan.

HISTORY AND CURRENT OPERATIONS

This section provides an overview of the history and operations for LVMWD and the JPA, including its water supply sources, treatment requirements, and infrastructure.

LVMWD/JPA Formation and Service Area

LVMWD was formed in 1958 to supply imported water to western Los Angeles County. The Triunfo JPA was established in 1964 to treat wastewater within the Malibu Creek watershed. The respective service areas, shown in Figures 1-2 and 1-3, are located in the cities of Agoura Hills, Calabasas, Hidden Hills, Westlake Village, unincorporated areas of western Los Angeles County, and eastern Ventura County and are within the South Coast Hydrologic region, as defined by the Department of Water Resources. Figure 1-2 also shows LVMWD's water supply sources.

The climate of the service areas is characterized as semi-arid, with mild winters, warm summers, and moderate rainfall. The usually mild climate occasionally has periods of extremely hot weather, winter storms, or hot and dry Santa Ana winds.

Water Sources and Supply

LVMWD and the JPA obtain water from various sources, including treated, drinkable water brought in from the MWD, recycled water derived from the TWRF, groundwater from the Russell Valley Basin in Westlake Village (used to complement the TWRF), and surface runoff collected into the Las Virgenes Reservoir. The imported water originates from the State Water Project (SWP). Water resources have been carefully managed to enhance water reliability, employing a strategy that emphasizes aggressive use of recycled water, minimal reliance on groundwater to supplement recycled water supplies, and storing water in Las Virgenes Reservoir during low-demand periods in the winter to meet peak demand periods during summer months.

Figure 1-2. LVMWD/JPA Vicinity Map

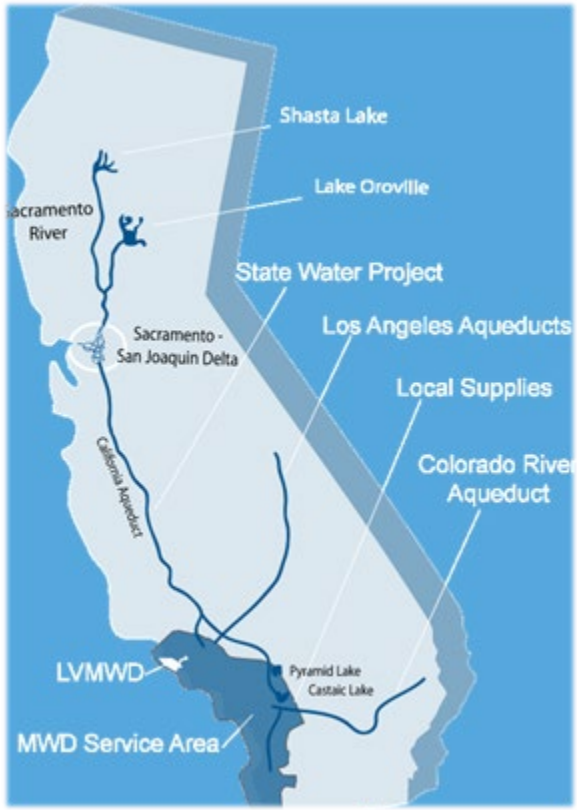
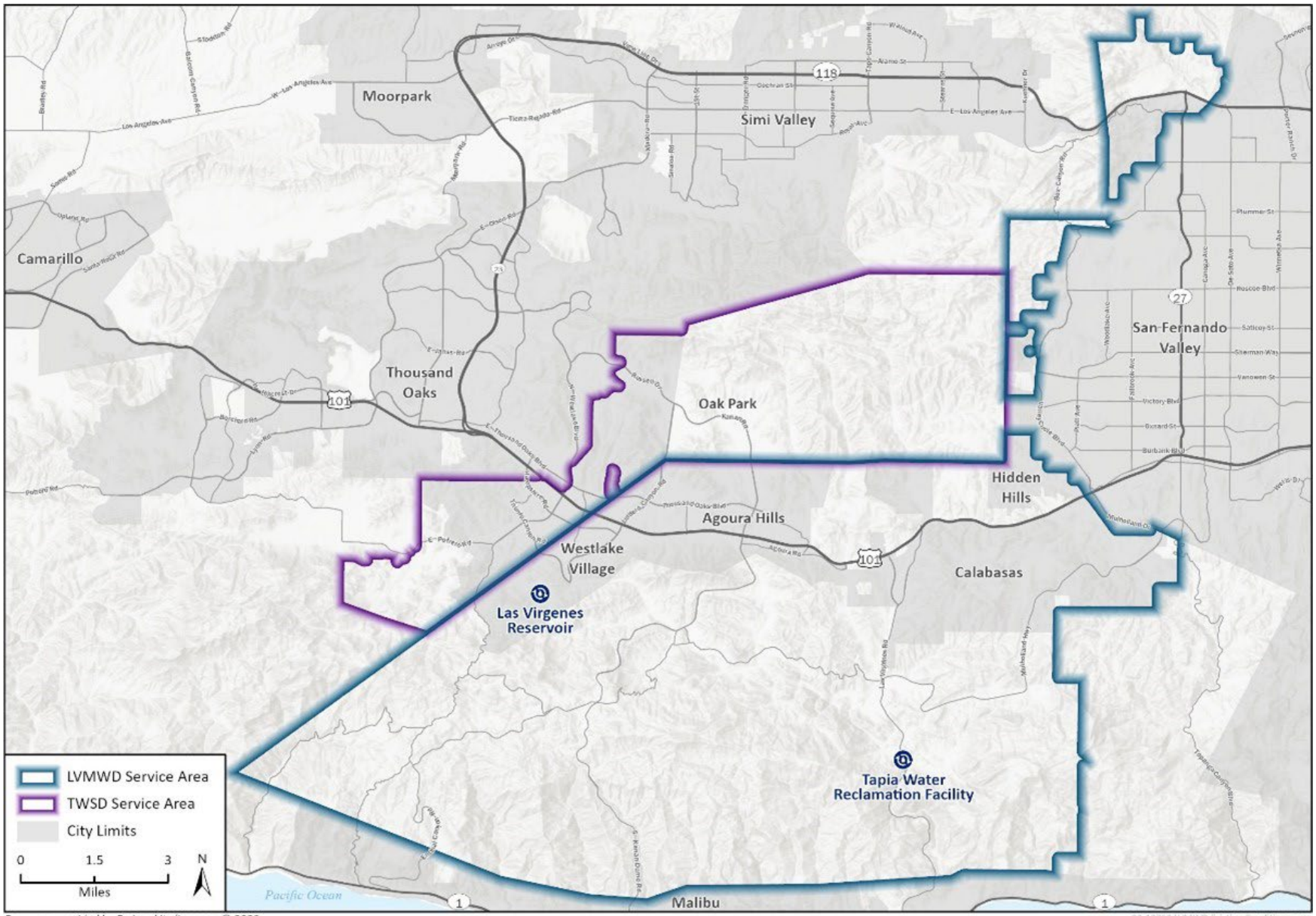


Figure 1-3. LVMWD and Triunfo JPA Service Areas



Basemap provided by Esri and its licensors © 2023.
Additional data provided by LVMWD, 2023.

Domestic Water Delivery

LVMWD serves over 70,000 residents within a service area spanning 122 square miles, offering potable water, recycled water, and sanitation services. The water distribution system comprises 22 primary pressure zones, more than 400 miles of pipelines, 24 pumping stations, 25 storage tanks, and over 75 pressure regulating stations.

Wastewater and Recycled Water

Through the JPA, LVMWD operates the TWRF, which processes an average of 9.5 million gallons per day (MGD) of wastewater and has a total capacity of 16 MGD. The TWRF employs treatment methods to purify the wastewater to a high level, enabling its use for non-potable purposes like landscape irrigation and various commercial applications. Approximately 20 percent of all water supplied by LVMWD is recycled for irrigation purposes. The solid by-products generated during the treatment process are transported through a 4-mile-long buried pipeline to the Rancho Las Virgenes composting facility. At this facility, the solids undergo anaerobic digestion, dewatering, and composting, resulting in Class A Exceptional Quality compost that is made available for use by the public. Pictured to the right is the Rancho Las Virgenes Composing Facility.

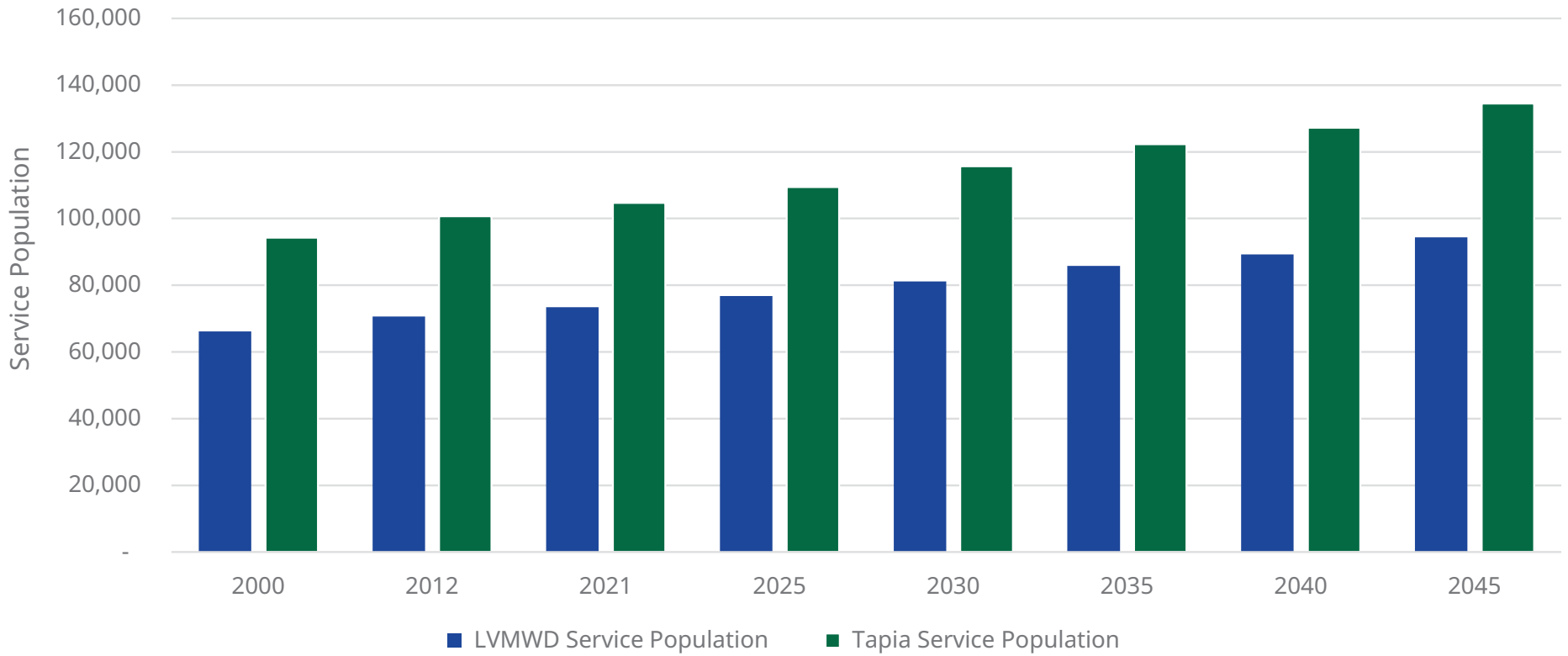
Environmental Commitment and Greenhouse Gas Reduction History

LVMWD and JPA GHG emissions are primarily related to the purchase and consumption of electricity used for operations and wastewater treatment throughout their service areas. Future GHG emissions are anticipated to increase due to planned service expansions and population increases, as estimated in the 2020 UWMP. As shown in Figure 1-4, service populations for LVMWD only (LVMWD Service Population) and for the areas served by the JPA that includes both LVMWD and Triunfo Water and Sanitation District services areas (Tapia Service Population) are estimated to grow from approximately 73,435 and 104,651 in 2021 to 94,392 and 134,516 in 2045, respectively. Chapter 4 describes LVMWD's historic, current, and forecasted emissions in further detail.

Furthermore, impacts from the changing climate such as increased frequency and severity of drought conditions are projected to potentially impact the quantity and quality of local water supplies, as well as the availability of imported water from the SWP. Chapter 3 describes exposure to climate change and vulnerabilities in further detail.

Prior to development of this CAAP, LVMWD and the JPA substantially reduced their GHG emissions through the implementation of operational efficiencies, renewable energy projects, and water conservation programs into their services. Some of these efforts and the associated effects on reducing GHG emissions are summarized below.

Figure 1-4. Historical and Forecasted Service Population by LVMWD and TWRF



Infrastructure Energy Efficiency and Renewable Energy

LVMWD and the JPA have continually invested in projects and efforts to upgrade infrastructure and improve the energy efficiency of its operations. This has included installing a solar system to reduce reliance on fossil fuels and increase energy resilience. The solar energy has resulted in lower energy costs and reduced GHG emissions over time. A back-up battery storage system under construction at the Rancho Composting Facility will provide additional resiliency. Additionally, LED upgrades have been completed at District Headquarters and TWRF, leading to increased energy efficiency, decreased electricity consumption, and reduced GHG emissions.

LVMWD contracted to buy power from a Solar Power Generation Facility (operational in 2014), which is owned and operated by Solar City at a fixed cost over a 20-year period. This facility is designed to generate peak power of approximately 1 million watts or one megawatt, which is used to pump recycled water for regional use. Solar City has estimated that over its lifetime, the solar facility will prevent more than 82 million pounds of carbon from entering the atmosphere or the equivalent of removing 750 cars from the road.[1] Operational in 2021, LVMWD's Solar Generation Project Phase II was developed to provide an additional 4 megawatts of renewable energy. At the time of development, this solar facility was projected to reduce electrical costs by an estimated $10.3 million over a 25-year period. The amount of power generated from the combined 5-megawatt solar facility is enough to operate the TWRF.[2]

Water Conservation and Reliability

LVMWD has developed strategies for water conservation through the Comprehensive Water Conservation Plan,[3] which aligns their water conservation targets with State goals. The plan outlines several water conservation programs aimed at reducing water use, reducing water costs for customers, and meeting state water conservation goals. Current LVMWD water conservation efforts include:

- Weather based Irrigation Controller Giveaway/Rebate Program
- High Water Use Account Review and One-on-One Consultations
- Rain Barrel Giveaway/Rebate Program
- Development and Implementation of a Landscape Transformation Initiative
- Improved Education and Outreach Efforts
- Advanced Water Meter Project

These efforts have led to an estimated water reduction of 421 AF per year, since 2018. As of 2023, the Weather Based Irrigation Controller Giveaway/Rebate Program has provided over 2,000 smart controllers to customers. LVMWD is actively developing additional programs to further water conservation efforts. Specifically, the Landscape Transformation Program, launched in 2023, will further efforts to promote the transformation to water efficient landscaping.

LVMWD and the JPA are committed to ensuring that its customers have access to reliable drinking water resources. The Pure Water Project Las Virgenes - Triunfo will play a critical role in providing reliable water in the future. The project, a joint effort between LVMWD and TWSD, is currently in the development stages, and will take surplus recycled water from the TWRF and further purify the water to meet or exceed drinking water standards. This effort is critical to helping ensure long-term drinking water supply reliability as LVMWD is currently reliant on imported drinking water from the State Water Project. Pure Water operations are expected to come online by no later than 2030.

1. *LVMWD. N.d. Solar Power Generation Facility.* ***https://www.lvmwd.com/our-services/wastewater-services/solar-power-generation-facility#:~:text=The%20solar%20power%20generation%20facility,recycled%20water%20for%20regional%20use.***
2. *LVMWD. N.d. Solar Generation Project Phase II.* ***https://www.lvmwd.com/the-district/departments/engineering-and-external-affairs/technical-services-planning-engineering/master-plans-and-engineering-documents/solar-generation-project-phase-ii***
3. *Comprehensive Water Conservation Plan. LVMWD. 2020.* ***https://www.lvmwd.com/home/showpublisheddocument/13413/637600622563770000***

Vehicle Fleet

LVMWD'S Advanced Meter Project[4] is minimizing fleet vehicle usage as customers with advanced meters will no longer need in-person monthly meter reads, leading to fewer LVMWD fleet vehicles on the road for meter reading. This significantly reduces fleet vehicle usage and reduces LVMWD's GHG emissions.

Wildfire Mitigation and Energy Resilience

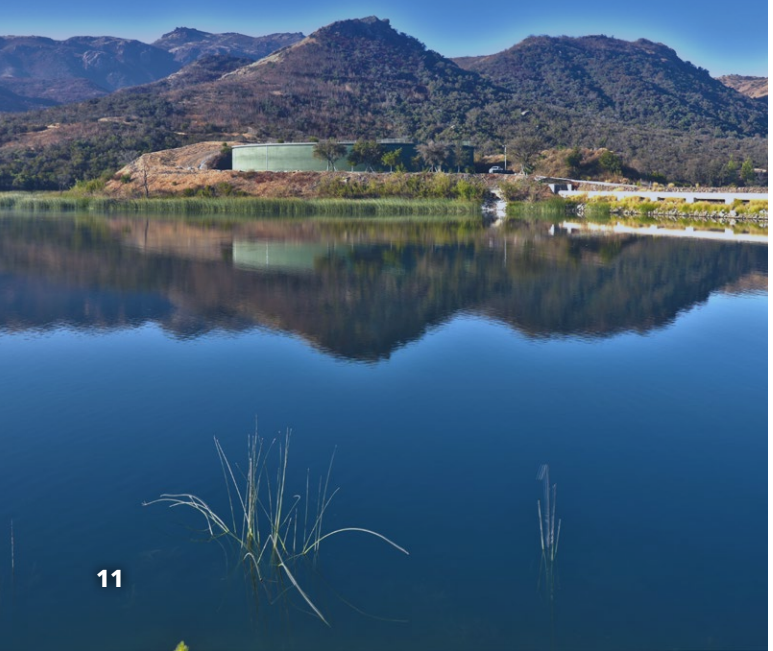
The LVMWD and JPA service areas are in high wildfire risk zones. LVMWD and the JPA are committed to implementing measures to mitigate future wildfire risk, potential damage to facilities and infrastructure, power outages, and associated service disruptions. Completed and ongoing efforts to minimize wildfire risk and increase resilience to power outages include:

- Implementing vegetation and landscape management practices that reduce the amount of flammable materials,
- Clearing brush and trimming trees around critical infrastructure,
- Conducting structure hardening upgrades to improve resilience to wildfires, and
- Completing the installation of emergency power generation systems at several facilities.

4. *LVMWD. Advanced Meter Project. 2023.* ***https://www.lvmwd.com/our-services/construction-projects/lvmwd-advanced-meter-program***

2.

SCIENTIFIC CONTEXT FOR CLIMATE CHANGE



CLIMATE CHANGE CAUSES

While the scientific understanding of climate change continues to evolve, the mechanisms driving climate change have been well understood for decades. These mechanisms include the release of GHG emissions associated with human activities into Earth's atmosphere and the effects on the global climate. This section provides an overview of the scientific context of climate change attributed to human activity.

GHG Effect and Emissions Sources

Below is a discussion of the effects of GHG emissions, impacts of global warming, as well as a discussion of GHG emission sources, including those specific to LVMWD's and JPA's operations.

GHG Effect

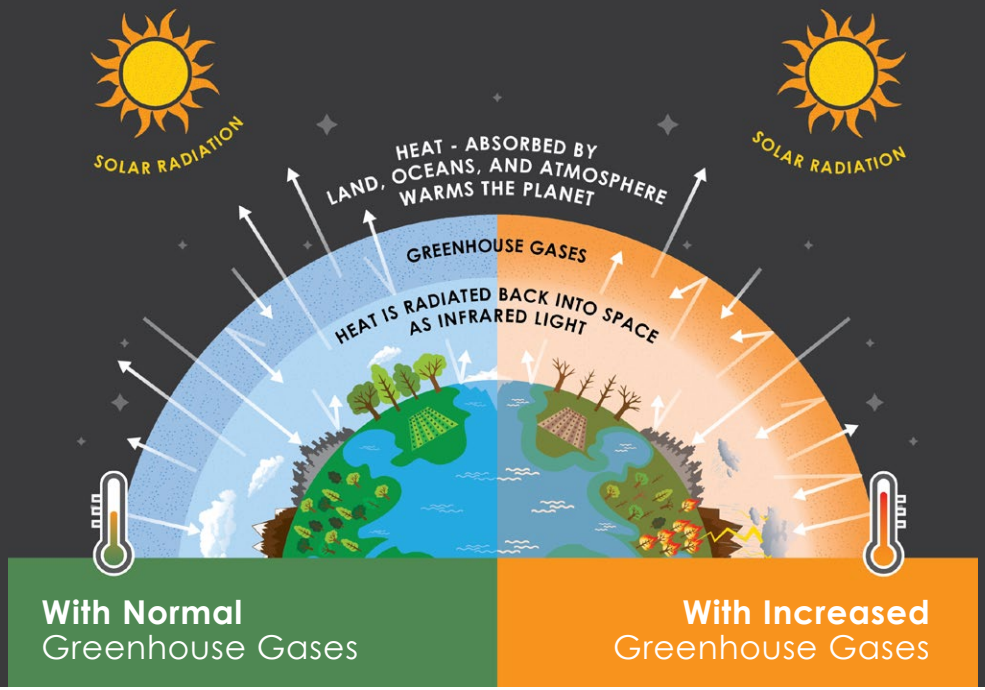
Most of the energy that affects the Earth's climate comes from the sun. When solar radiation reaches the Earth, some fraction is absorbed by the Earth's surface, and some is reflected back into space. Gases in the Earth's atmosphere act like a blanket reducing the amount of energy radiated back into space from Earth's surface resulting in heat being trapped within the atmosphere. This is known as the "greenhouse effect" because atmospheric gases function similar to the windows in a greenhouse, which trap the Sun's rays and create a much warmer space inside the greenhouse than the outside air. The greenhouse effect regulates the Earth's climate, maintaining conditions suitable for life on Earth. However, a rapid increase of GHG emissions can cause excess heat to be trapped, affecting global temperatures and climate. More specifically, human activity, such as burning fossil fuels to generate electricity and heat, and the transportation of people and materials in vehicles has increased the amount of GHGs emitted into the atmosphere. The increase of emitted GHGs has led to an increased adsorption of infrared radiation by the Earth's atmosphere and increased temperatures near the surface. This process is depicted in Figure 2-1.

Figure 2-1. Greenhouse Gas Effect and Associated Climate Impacts[5]

CLIMATE CHANGE OVERVIEW

Since the advent of the industrial revolution in the 18th century, human activities such as burning fossil fuels and deforestation have caused a substantial increase in the concentration of greenhouse gases in the atmosphere.

The Result:
Extra trapped heat and higher global temperatures.



More Gas = More Heat Trapped in the Atmosphere

- Increased greenhouse gases mean less eat escapes to space.
- Between preindustrial times and now, the earth's average temperature has risen by 1.8° F (1.0° C).
- CO_2 emissions are 40% higher than the natural levels in the past 650,000 years. More heat means more energy powering earth's climate systems which results in more intense:
  - Storms
  - Drought
  - Heat
  - Wildfires
  - Flooding
  - Sea level rise
  - Landslides

Projected Impacts to the Southern CA Region

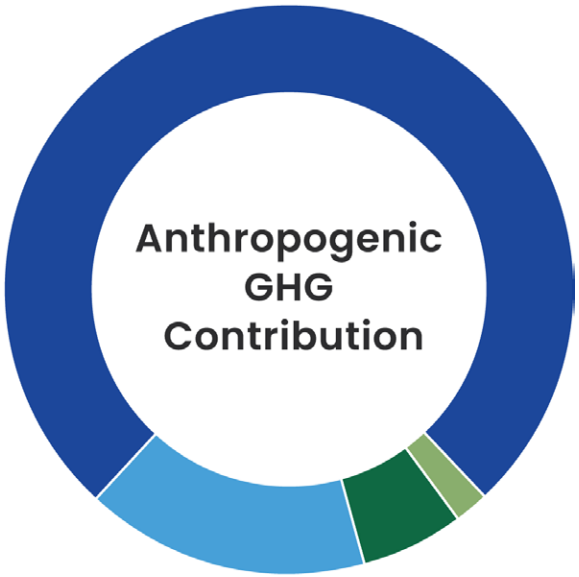
- Increase in wildfires over Southern California
- Temperatures expected to rise 5-8 degrees F by the end of the century
- Number of extremely hot days is expected to increase.
- Changes in Precipitation:
  - Dry and wet extremes are both expected to increase
  - Increases in frequency and severity of atmospheric river events
  - Impacts to the state water system

5. *Information in Figure 2-1 regarding the GHG effect was obtained from* ***https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions***

Global Warming Potential

The primary GHGs that are most responsible for the radiative greenhouse effect on Earth include carbon dioxide (CO_2), methane (CH_4), and nitrous oxides (N_2O). CO_2 contributes approximately 76 percent of total GHG emissions, largely due to combustion of fossil fuel for energy generation and fuel use. As shown in Figure 2-2, CH_4 and N_2O from agriculture and industrial activities contribute approximately 16 percent and 6 percent, respectively, to total GHG emissions. Other GHGs that are used in products and processes include fluorinated gases, which are released in small quantities that contribute about two percent of overall emissions.

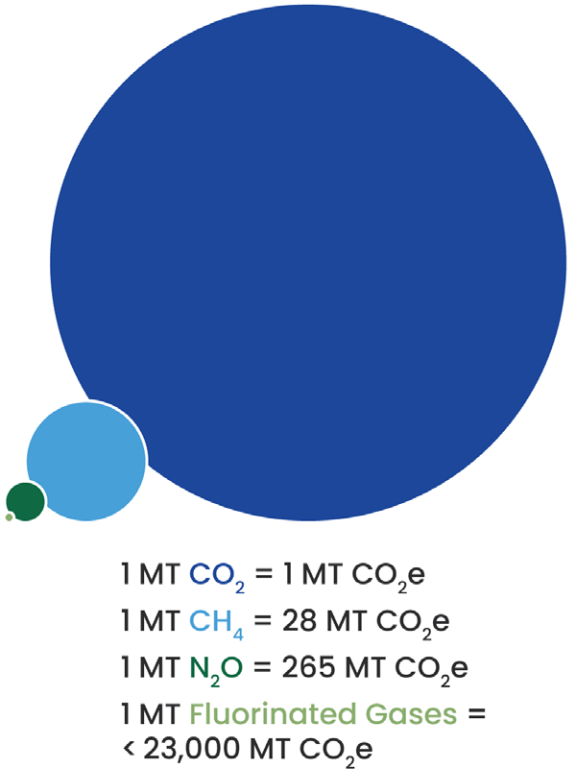
Figure 2-2. GHG Global Contribution



(Source is IPCC 2014 AR5)

Each GHG has its own global warming potential (GWP), which refers to the extent to which the GHG traps energy in the atmosphere.[6] The determination of a GHG's GWP utilizes CO_2 as a reference point and compares the potential impact of different GHGs where CO_2 has a GWP of 1. Using the latest 100-year GWP values published in the International Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC 2014), CH_4 has a GWP of 28, meaning that each unit of CH_4 causes 28 times more global warming potential than 1 unit of CO_2, while N_2O has a GWP of 265.[7,8] Other GHGs include the fluorinated gases, which can have a GWP of up to 23,500. IPCC publishes Assessment Reports to update GWPs of several GHGs following advances in scientific knowledge on the radiative efficiencies and atmospheric lifetimes of GHGs. The IPCC's Fifth Assessment Report (2014) is among the most current and comprehensive peer-reviewed assessments of climate change. When individual GHGs are normalized based on their GWPs, we refer to them as carbon dioxide equivalents or CO_2e. Generally, GHG emissions are quantified in terms of metric tons (MT) CO_2e emitted per year. Figure 2-3 shows a comparison of the most common GHGs and their GWPs.

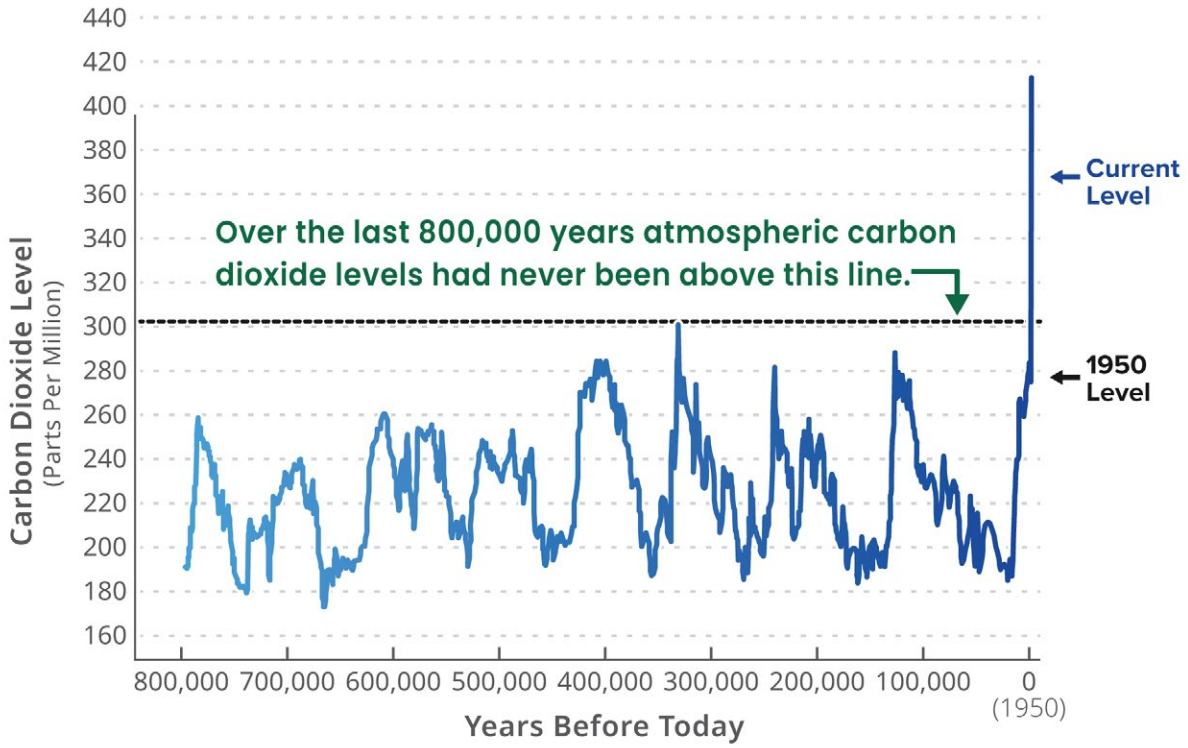
Figure 2-3. Comparison of GHG GWPs



6. *According to the United States Environmental Protection Agency, the GWP was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of CO_2 (EPA 2017).*
7. *International Organization for Standardization (ISO) published ISO 14064-1 in 2006 (revised 2018) to provide an international standard for the quantification and reporting of GHG emissions.*
8. *Greenhouse Gas Protocol. 2016.* ***https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf***

While CO_2 has the lowest GWP of the GHGs, it is by far the largest contributor to climate change effects due to the total mass of anthropogenic CO_2 emissions released annually; this is largely due to the combustion of fossil fuels. Since the start of the industrial revolution in the mid-nineteenth century, human activities have been emitting large quantities of GHGs into the atmosphere, enough to nearly double the amount of CO_2 from 280 parts per million to over 400 parts per million, which is 100 parts per million higher than any time in the last 800,000 years. The atmospheric concentration of CO_2 over time has been calculated by measuring the composition of air trapped in ice cores from Antarctica,[9] as shown in Figure 2-4.

Figure 2-4. Atmospheric Carbon Dioxide Levels



Source: ***https://climate.nasa.gov/evidence/***

GHG Emission Sources

Anthropogenic processes that release GHGs include: the burning of fossil fuels for transportation, heating, and electricity generation; agricultural practices that release methane, such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of high-GWP gases. Deforestation and land cover conversion also contribute to global warming by reducing the Earth's capacity to remove CO_2 from the air and altering the Earth's albedo,[10] or surface reflectance, allowing for absorption of additional solar radiation. According to the U.S. Environmental Protection Agency (USEPA), gross GHG emissions nationwide have increased by 1.3 percent since 1990. While the continued shift from coal to natural gas and increased use of renewables in the power sector helps to reduce GHG emissions, continued increases in population growth and industrialization can lead to further increases in GHG emissions unless technology and practices transition to low carbon alternatives.

9. *Bereiter et. al. 2008.* ***https://www.researchgate.net/publication/5370384_High-resolution_carbon_dioxide_concentration_record_650000-800000_years_before_present***
10. *Albedo refers to the amount of diffuse radiation of energy out of the total, ranging from 0 (a black body that absorbs all radiation) to 1 where no energy/radiation is absorbed. Source: National Snow & Ice Data Center (NSIDC). 2020.* ***https://nsidc.org/cryosphere/seaice/processes/albedo.html***

LVMWD and JPA GHG Emission Sources

Sources of GHG emissions associated with LVMWD and the JPA include the following:

- Electricity usage to pump groundwater, conduct water quality sampling and treatment, provide water conveyance and distribution throughout the service area, and operate LVMWD/JPA facilities such as pump stations, lift stations, water reclamation plants, and water recycling
- Combustion of fuels (such as natural gas) in buildings and stationery equipment
- Combustion of fuels (such as gasoline and diesel) for transportation (fleet vehicle internal combustion of fuel and employee commutes)
- Emissions released from the processing and treatment of wastewater (e.g., combustion of digester gas, N_2O from nitrification or denitrification, and emissions in effluent discharge)
- Waste emissions including combustion of fuels in waste collection vehicles and landfill equipment as well as emissions from the decomposition of waste generated by LVMWD/JPA operations at the landfill

A complete description of operations and associated GHG emissions are located in Chapter 4. Pictured to the right is LVMWD's Headquarters.

3.

CLIMATE CHANGE VULNERABILITIES

CLIMATE CHANGE EXPOSURE

The addition of excess GHGs to the atmosphere is responsible for trapping heat near the earth's surface, increasing the average temperatures across the globe. This increase in average temperatures is the cause of climate change and affects local health, natural resources, infrastructure, emergency response, and many other aspects of society. According to the IPCC, GHGs are now higher than they have been in the past 400,000 years, raising carbon dioxide levels from 280 parts per million to 410 parts per million in the last 150 years (IPCC 2021). The dramatic increase in GHG's is attributed to human activities beginning with the industrial revolution in the 1800s, which represented a shift from an agrarian and handicraft-based economy to one dominated by industry and machine manufacturing (IPCC 2021).

To evaluate the impact of climate change on LVMWD and JPA operations and infrastructure, future conditions were modeled using the State of California's Cal-Adapt tool.[11] These models predict that the combined service area and state water supplies are expected to experience a wide variety of impacts by the end of the century. According to California's Fourth Climate Change Assessment, the service areas will be affected by projected changes that include changes in precipitation patterns, wildfire risk, the prevalence of extreme heat events, and ocean temperatures and chemistry.

The Cal-Adapt tool provides climate data from global-scale models that have been localized (downscaled) to 3.7-mile by 3.7-mile grids (California Energy Commission [CEC] 2021). The data in Cal-Adapt specific to the combined service area is consistent with information provided by the California Fourth Climate Change Assessment, Los Angeles Regional Report (2018) to describe protected future changes for specific types of hazards. Other reports, including the California Department of Water Resource's Climate Change Vulnerability Assessment, provide information regarding climate change projections and impacts to the State Water Project and water supplies. Projections throughout this section are presented consistent with the Governor's Office of Planning and Research (OPR) using Representative Concentration Pathway (RCP) 8.5 as a conservative approach to assessing and adapting to climate change. RCP 8.5 is a high greenhouse emissions scenario in which global emissions continue to rise through the end of the twenty-first century. 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).

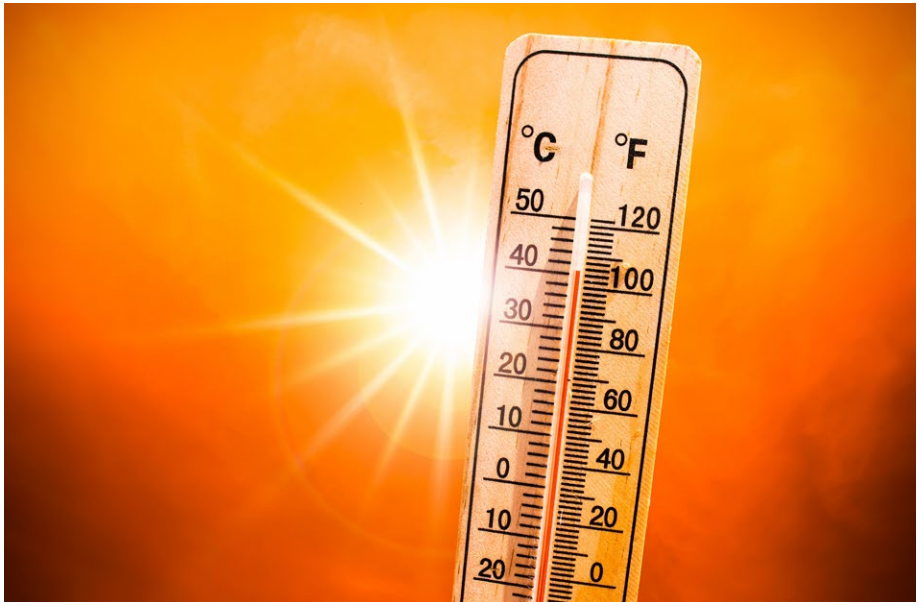
11. Cal-Adapt 2.0 is an online tool that presents historic and modeled projections based on 10 different global climate models. The tool was developed and is maintained by the University of California, Berkeley Geospatial Innovation Facility with funding and oversight by the CEC. This tool was used to present projection data related to minimum and maximum temperature, precipitation, extreme heat, warm nights, drought, and wildfire.

Climate Drivers

The climate drivers of concern include temperature and precipitation.

Temperature

Average maximum temperatures are expected to increase in the combined service area. Compared to the observed baseline (1961-1990), average maximum temperatures in Calabasas (District Headquarters) are expected to rise between 4.3 °F and 8.1 °F by the end of the century. According to "Our Climate Crisis: A Guide for SoCal Communities in the Wildland Urban Interface" prepared by the Malibu Foundation, the cities of Calabasas, Agoura Hills, and Hidden Hills, will face the highest temperature increases in the Santa Monica Mountains region. Temperature increases influence extreme heat, drought, and wildfire, as discussed further in this Chapter.



Precipitation and Drought

Precipitation in the combined service area is highly variable from year to year. According to California's Fourth Climate Change Assessment, Los Angeles Region Report (2018), typically about five storms each year generate approximately 50 percent of total precipitation in the Los Angeles region. Model projections are inconsistent, however, small changes in average annual precipitation compared to the region's historic baseline are expected.[12]

Increased intensity of precipitation events is expected for the greater Los Angeles Area, including the combined service area, through the end of the century. Both dry and wet extremes are expected to occur in the future. By the end of the century, the wettest day of the year is expected to increase across most of the Los Angeles region, with some locations experiencing 25-30 percent increases. Maximum 1-day precipitation is projected to increase between 0.3 and 0.4 inch by the end of the century. Extremely dry years are expected to increase in the Los Angeles region, potentially doubling or more in frequency by the end of the century. The maximum length of dry spell currently has a 158-day average in the combined service area and is projected to increase between 8 and 16 days by the end of the century.[13]

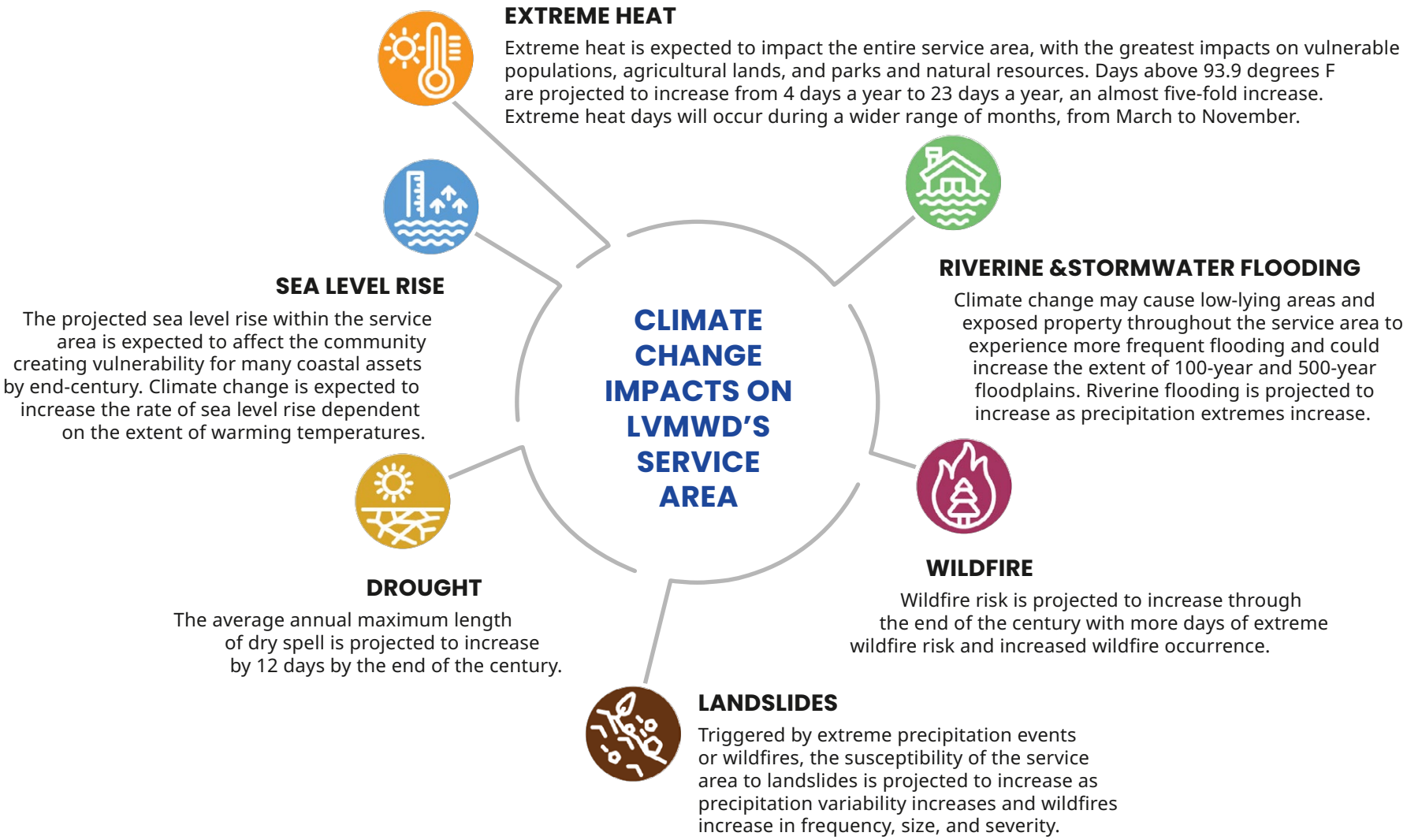
12. *Hall et al. 2018. Los Angeles Region Report: California's Fourth Climate Change Assessment.* ***https://www.energy.ca.gov/sites/default/files/2019-11/Reg%20Report-%20SUM-CCCA4-2018-007%20LosAngeles_ADA.pdf****. Accessed July 2023*

13. *California Energy Commission (CEC). 2023. Cal-Adapt.* ***https://cal-adapt.org/tools/local-climate-change-snapshot****. Accessed July 2023*

Regional Climate Hazards

LVMWD and JPA infrastructure, facilities and water supplies are exposed to climate hazards including drought, wildfire, extreme heat, extreme storms/precipitation events, floods, and landslides. A summary of climate change impacts is shown in Figure 3-1.

Figure 3-1. Climate Change Impacts on the Combined (LVMWD and JPA) Service Area



Wildfire

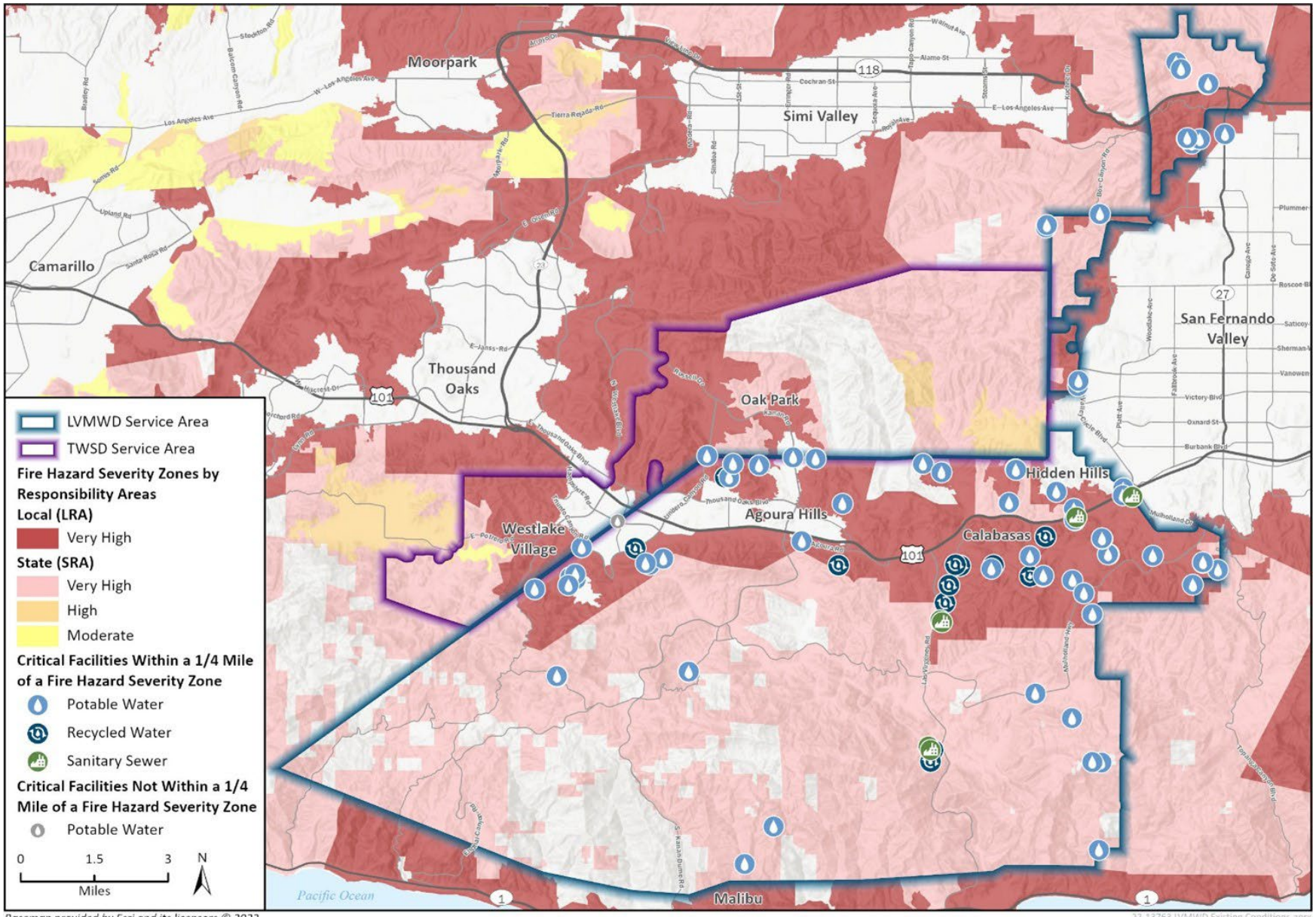
Wildfires in California have occurred with increased frequency and intensity over the past two decades. There are many areas in the combined service area designated by CAL FIRE as High and Very High Fire Hazard Severity Zones, with the greatest risk in the Santa Monica Mountains and Simi Hills. Additionally, many of the critical facilities in the potable, recycled, and sanitary water systems, are in Fire Hazard Severity Zones, as seen in Figure 3-2. Critical potable water, recycled water, and sanitary sewer facilities located within a ¼ mile of a fire hazard severity zone are highlighted in the figure. The combined service area is projected to experience increasing wildfire risk through the end of the century due to a variety of factors including an increase in temperatures and prevalence of drought conditions. The decadal probability of wildfire is projected to increase from the historical baseline of 10 percent to 30 percent by the end of the century.[14]

On November 8, 2018, the Woolsey Fire broke out in Ventura County and spread into combined service area, due to large amount of flammable vegetation and the influence of Santa Ana winds. On November 11, LVMWD's Board declared a state of emergency for the service area due to the significant impacts of the fire, authorizing response and recovery efforts and actions. LVMWD critical facilities and services were damaged and disrupted, including the Calabasas Headquarters. By November 9, LVMWD and the JPA lost power to nearly all of their critical facilities and backup generators were utilized to keep pump stations and other equipment operational. The Woolsey Fire footprint and location of LVMWD and JPA critical facilities are shown in Figure 3-3.

Photo credit: Peter Buschmann/U.S. Forest Service

14. California Energy Commission (CEC). 2023. Cal-Adapt. ***https://cal-adapt.org/tools/local-climate-change-snapshot****. Accessed July 2023*

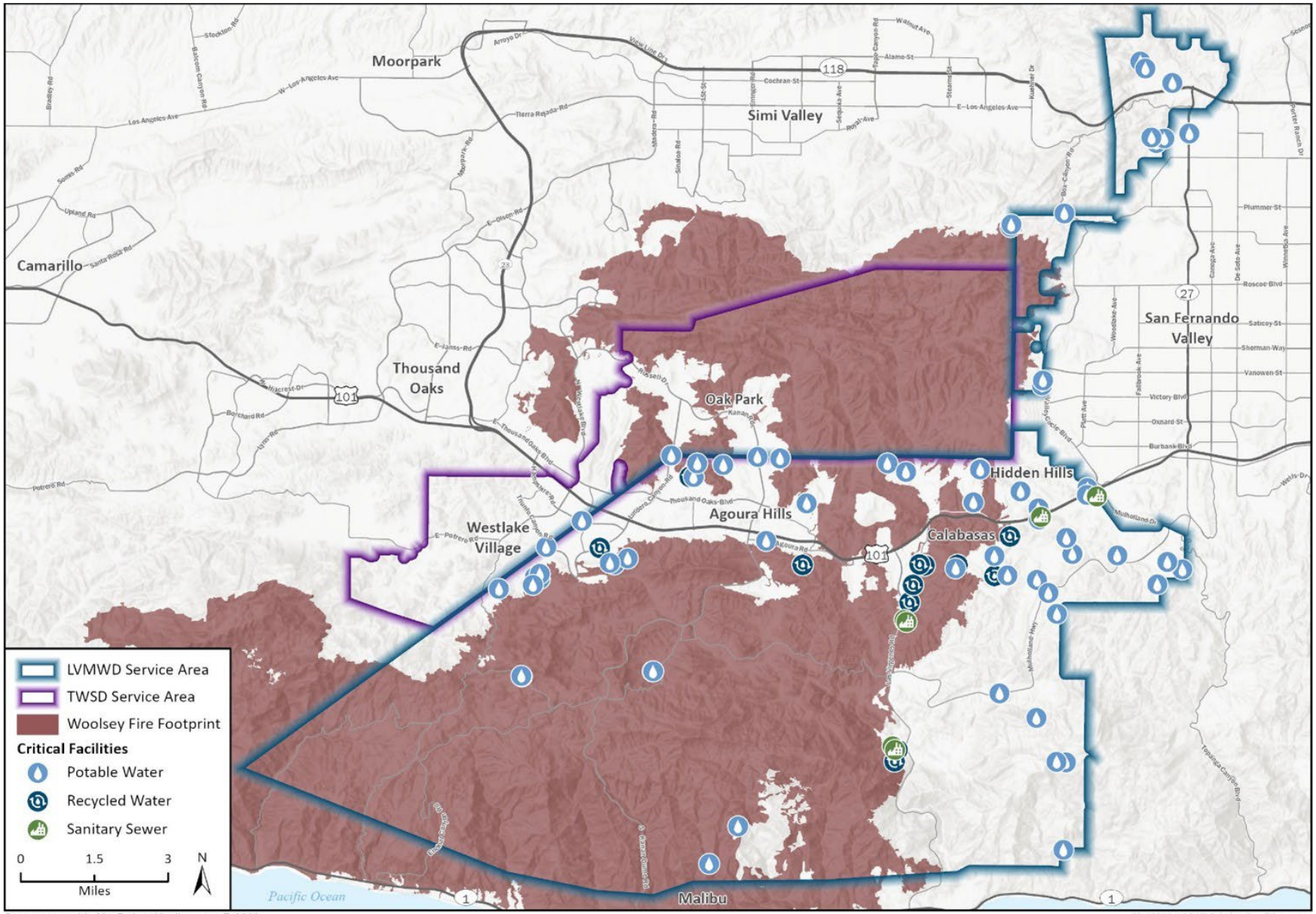
Figure 3-2. Fire Hazard Severity Zones and Critical Facilities



Basemap provided by Esri and its licensors © 2023.
Additional data provided by LVMWD, 2023; CAL FIRE, SRA 2007, LRA 2010 & 2012.

22-13763 LVMWD Existing Conditions.aprx
Fig 1 Fire Hazard Severity Zones and Critical Facilities

Figure 3-3. Woolsey Fire and Critical Facilities



Basemap provided by Esri and its licensors © 2023.
Additional data provided by LVMWD, 2023; CAL FIRE, FRAP, 2022.

22-13763 LVMWD Existing Conditions.aprx
Fig 2 Woolsey Fire and Critical Facilities

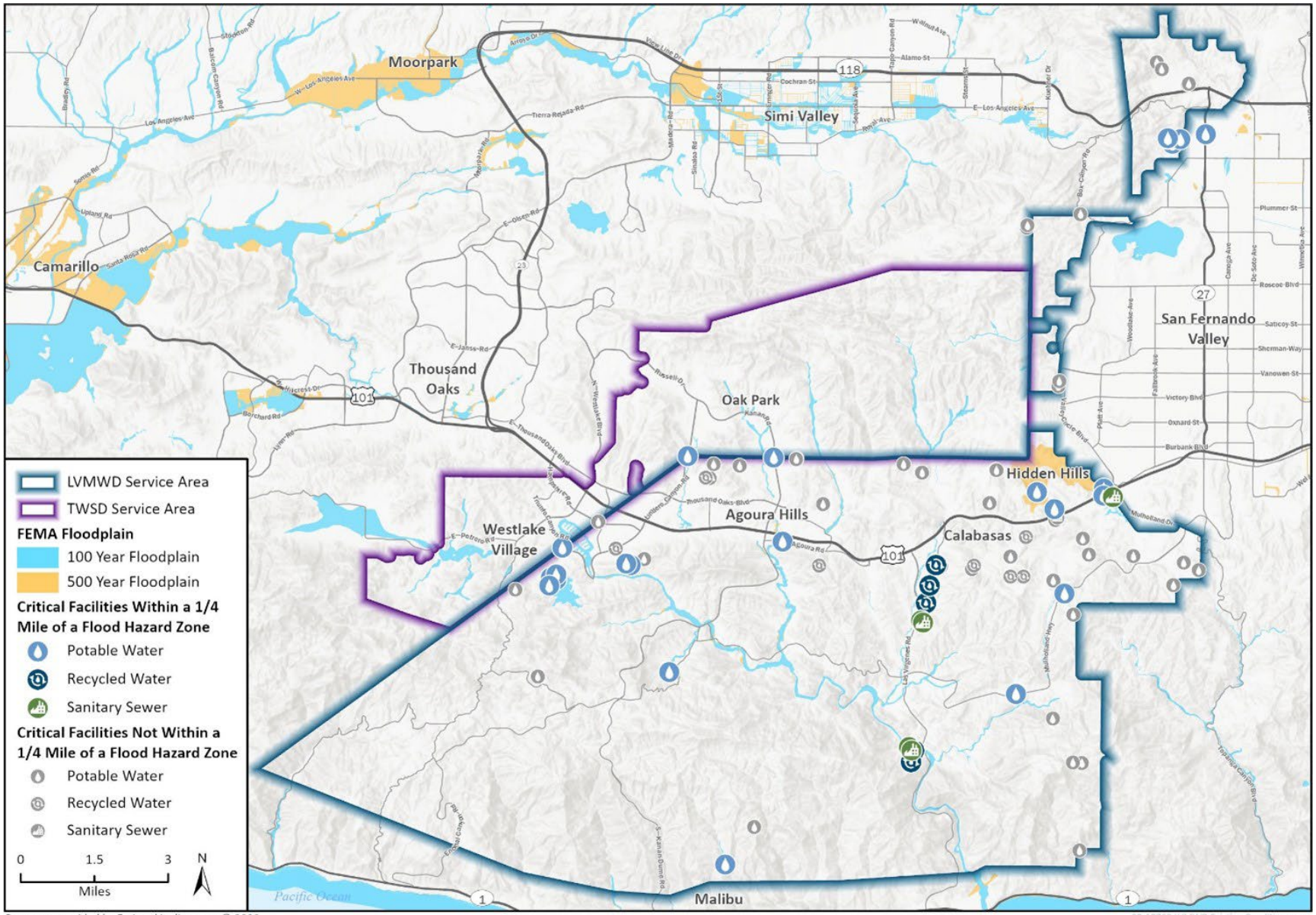
Flooding and Extreme Storms

Low-lying areas in the combined service area are expected to experience more frequent flooding as a result of climate change. Riverine flooding is expected to increase as precipitation extremes increase. Waterways including the Malibu Creek are particularly susceptible to riverine flooding. Extreme precipitation events often produce large and high velocity flows, which may overwhelm stormwater systems, causing localized flooding. Climate models project that the frequency of atmospheric river/large storm events may increase in the future. Additionally, the peak season of atmospheric rivers is projected to lengthen, which may extend the flood-hazard season in Southern California.[15] The combined service area contains both 100-year and 500-year FEMA floodplains, with several critical facilities located in or near those floodplains, as seen in Figure 3-4. Critical potable water, recycled water, and sanitary sewer facilities located within a ¼ mile of a flood hazard zone are highlighted in Figure 3-4.

Photo credit: USFWS Pacific Southwest Region

15. *Hall et al. 2018. Los Angeles Region Report: California's Fourth Climate Change Assessment.* ***https://www.energy.ca.gov/sites/default/files/2019-11/Reg%20Report-%20SUM-CCCA4-2018-007%20LosAngeles_ADA.pdf****. Accessed July 2023*

Figure 3-4. FEMA Flood Zones and Critical Facilities



Basemap provided by Esri and its licensors © 2023.
Additional data provided by LVMWD, 2023; FEMA, 2021.

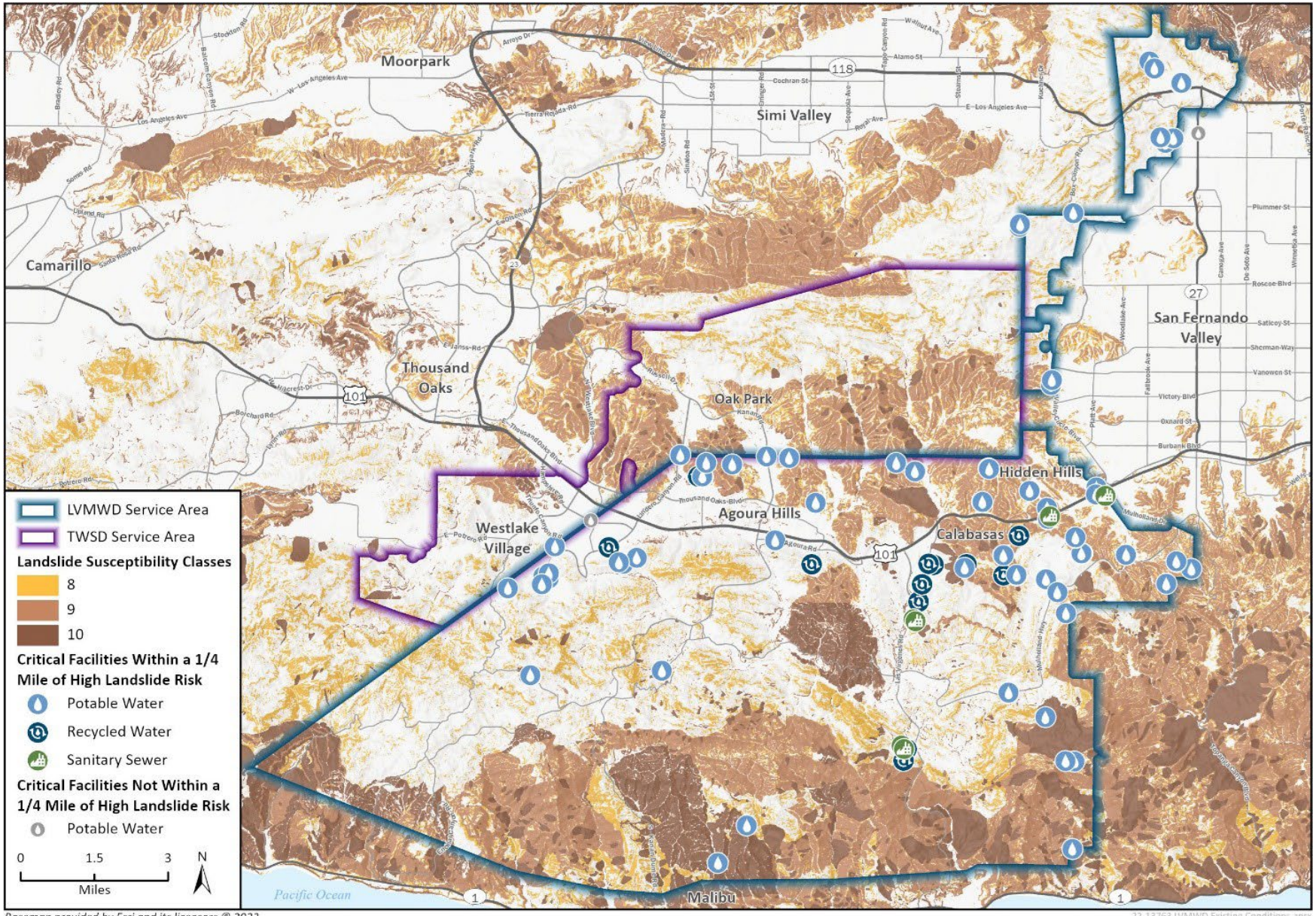
22-13763 LVMWD Existing Conditions.aprx
Fig 3 Flood Zones and Critical Facilities

Landslides

Increased frequency and intensity of extreme precipitation events and wildfires may contribute to increased landslide susceptibility in the combined service area. Landslide susceptibility is typically highest in areas with unstable soils, weak rocks, and steep slopes. Landslide susceptibility in the combined service area is based on a range from 1 to 10, with 10 being the highest susceptibility. As seen in Figure 3-5, susceptibility levels of 8 to 10, are common throughout the combined service area, particularly in the Santa Monica Mountains and Simi Hills. Critical potable water, recycled water, and sanitary sewer facilities located within a ¼ mile of a high landslide susceptibility area are highlighted in the figure. Areas impacted by recent fires, including the 2018 Woolsey Fire, are especially prone to debris flow. Debris flow events are particularly dangerous because they often have little warning during severe storm events and are fast moving. Post-wildfire debris flows are likely to occur in burn scar for between 2-5 years after a wildfire, during significant rainfall events.[16]

16. U.S. Geological Survey (USGS). 2018. Emergency Assessment of Post-Fire Debris Flow Hazards. **https://www.usgs.gov/programs/landslide-hazards/science/emergency-assessment-post-fire-debris-flow-hazards**. Accessed July 2023

Figure 3-5. Landslide Susceptibility Areas and Critical Facilities



Basemap provided by Esri and its licensors © 2023.
Additional data provided by LVMWD, 2023; CGS, Map Sheet 58, 2018.

22-13763 LVMWD Existing Conditions.aprx
Fig 4 Landslide Susceptibility and Critical Facilities

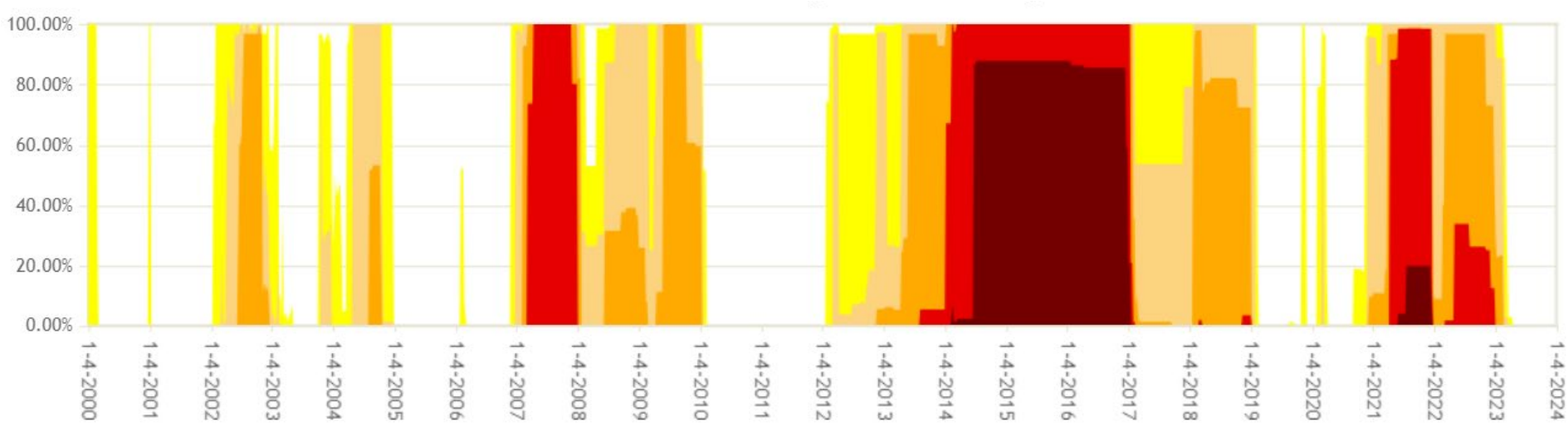
Extreme Heat

The number of extreme heat days per year is expected to increase in the combined service area. In this area, an extreme heat day occurs when the maximum temperature exceeds 97.4 °F. Historically, the area experiences three extreme heat days per year on average. By the end of the century, extreme heat days are expected to increase to between 16 and 34 days.[17]

Droughts

Climate change will increase the likelihood that low-precipitation years will coincide with above-average temperature years. Warming temperatures increase seasonal dryness and the likelihood of drought due to decreased supply of moisture and increased atmospheric demand for moisture as evaporation from bare soils and evapotranspiration from plants increases. Extremely dry years are projected to increase over Southern California, potentially doubling or more in frequency by the late-twenty-first century.[18] The U.S. Drought Monitor characterizes areas within LVMWD as Abnormally Dry (D0) and Moderate Drought (D1), as of May 2023. Drought intensity ranges from None to Exceptional Drought (D4). [19] The drought status of Los Angeles County for the past 23 years is shown in Figure 3-6. The county experienced moderate to exceptional drought periods in 2002, 2004-2005, 2007-2010, 2011-2019, and 2021-2023. Drought exposure will have a more prominent impact on LVMWD and the JPA through the SWP, as described below, than on local water sources, as a majority of its water supply is imported.

Figure 3-6. A Recent History of Drought Conditions in Los Angeles County



Source: U.S. Drought Monitor Los Angeles County CA. 2023. ***https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?fips_06037***

17. California Energy Commission (CEC). 2023. Cal-Adapt. ***https://cal-adapt.org/tools/local-climate-change-snapshot****. Accessed July 2023*

18. Hall et al. 2018. Los Angeles Region Report: California's Fourth Climate Change Assessment. ***https://www.energy.ca.gov/sites/default/files/2019-11/Reg%20Report-%20SUM-CCCA4-2018-007%20LosAngeles_ADA.pdf****. Accessed July 2023*

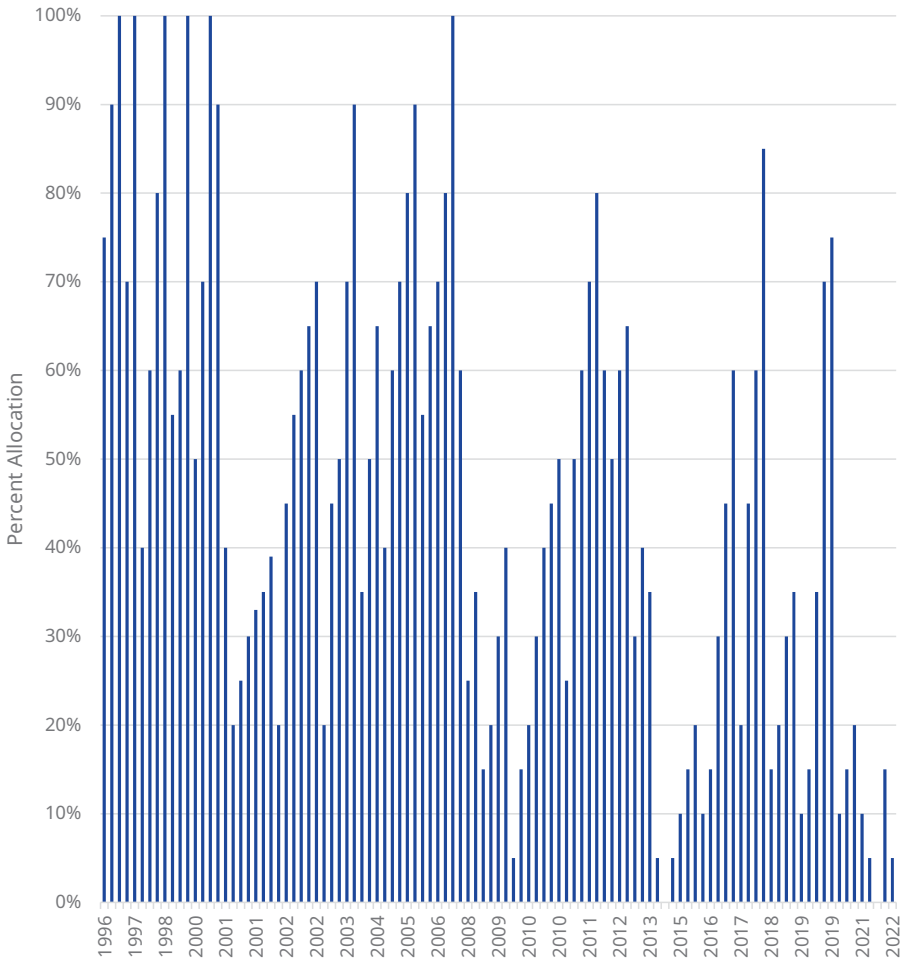
19. National Drought Mitigation Center at the University of Nebraska-Lincoln et al. 2023. U.S. Drought Monitor. ***https://droughtmonitor.unl.edu/****. Accessed July 2023*

State Water Project and California Department of Water Resources Climate Hazards

LVMWD primarily relies on potable water supplies provided by MWD. MWD receives water allocations from the SWP, a state water management project supervised by the California Department of Water Resources (DWR). As much as 10 percent of California's existing water supply could diminish by 2040 due to hotter and drier weather. Through the twenty-first century, there is expected to be increased evaporation, less snowfall, and increased consumption of water by soil, vegetation, and the atmosphere itself.[20] Over the past 40 years, there has been a clear downward trend in SWP (Table A) allocations (See Figure 3-7). In this context, imported water supply from the SWP is projected to be significantly impacted by climate change through the end of century. Several key reasons for SWP impacts include higher temperatures and shorter winters leading to reduction in Sierra Nevada and Colorado River Basin snowpack volume and increased evapotranspiration of watersheds from heightened temperatures. Smaller snowpack results in decreased flows in the Colorado River and greatly impacts SWP sourced water, which is designed to capture and store winter and spring runoff to prevent downstream flooding and deliver stored water during summer and fall months when it is needed. However, a diminished snowpack would result in larger volumes of runoff entering reservoirs during the winter and early spring and less runoff arriving in late spring and early summer, when it is needed. A reduced snowpack from increased temperatures also creates less retainable water and more surface water flowing to the ocean. This would lead to higher downstream flow during flood events and reduced late summer storage levels. Climate change is projected to bring about longer and more frequent periods of drought for the entire region. This prolonged drought occurrence may further impact LVMWD and the JPA as SWP allocations are likely to be reduced during such periods. These factors collectively pose significant challenges for water management and availability in the region.

California Department of Water Resources (DWR) analysis projects that there is a 22 percent probability that long-term average annual SWP deliveries will fall to approximately 50 percent of maximum allocations.[21]

Figure 3-7. State Water Project Table A Allocations



20. *California Natural Resources Agency et al. 2022. California's Water Supply Strategy: Adapting to a Hotter, Drier Future.* ***https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Water-Resilience/CA-Water-Supply-Strategy.pdf****. Accessed July 2023*

21. *California Department of Water Resources (DWR). 2019. Climate Action Plan, Phase 3: Climate Change Vulnerability Assessment.* ***https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Climate-Change-Program/Climate-Action-Plan/Files/CAP-III-Vulnerability-Assessment.pdf****. Accessed July 2023*

As DWR manages and oversees the SWP, LVMWD is reliant on its infrastructure and operations. DWR infrastructure are also exposed to various climate hazards that may have downstream impacts on LVMWD. With anticipated climate hazards, DWR faces an elevated exposure to increased short-term extreme hydrologic events. Several critical DWR facilities are particularly susceptible to flood hazards, potentially affecting SWP deliveries and overall operational continuity.

Furthermore, certain assets owned and managed by DWR are situated in wildfire hazard areas, making them vulnerable to damage or disruption. Additionally, all DWR locations are projected to experience more extreme heat days and higher average maximum temperatures due to climate change. Moreover, sea level rise is projected to increase the Sacramento-San Joaquin Delta's salinity, requiring extra Delta outflow to dilute the increasingly brackish Delta water to meet environmental standards. The extra Delta outflow comes at a cost of reducing Delta exports, meaning less water is available for distribution through the California Aqueduct to water suppliers and users located south of the Delta, including LVMWD. This scenario poses a challenge for water availability and management in the region, impacting various communities and water-related operations.[22]

22. California Department of Water Resources. 2019. Climate Action Plan, Phase 3: Climate Change Vulnerability Assessment. **https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Climate-Change-Program/Climate-Action-Plan/Files/CAP-III-Vulnerability-Assessment.pdf**. Accessed July 2023

CLIMATE CHANGE IMPACTS

Climate Change Impacts in the Combined Service Area

LVMWD and the JPA face significant risks associated with climate change impacts from the climate hazards described above. Their vulnerability increases when critical facilities, assets, and infrastructure are not designed, operated and/or maintained to function effectively under more extreme weather conditions or can be damaged by more extreme weather conditions. Critical facilities that are sensitive to climate hazards include pump stations, treatment facilities, LVMWD Headquarters, and other buildings and equipment associated with potable, recycled, and sanitary water systems.

LVMWD and JPA staff, with support from a consultant team, hosted a Climate Action and Adaptation Plan Strategy Workshop in March 2023 to assess climate risks to facilities, operations, and resources. As part of the workshop, a climate risk matrix was developed to assign a numerical risk score for each water sub-system based on each climate exposure. The matrix ranked each water sub-system from 1 to 9, with 1 indicating a system less impacted by a certain climate risk and 9 indicating a system most impacted by a certain climate risk. LVMWD's and JPA systems and sub-systems included in the matrix are seen below:

Potable Water

- MWD Imported Water
- Potable Distribution System
- Las Virgenes Reservoir
- Westlake Filtration Plant

Wastewater

- Sewer Collection System
- Tapia Wastewater Reclamation Plant
- Biosolids Composting (Rancho Las Virgenes Composting Facility)

Recycled/Pure Water

- Recycled Water Distribution
- Pure Water

Headquarters

- Central Operations and Administration

TWRF Aeration Basin

Wildfire

Table 3-1. Wildfire – Climate Risk Matrix Scoring

System	Sub-System	Climate Risk Score
Potable Water	MWD Imported Water	3
	Potable Water Distribution System	**8**
	Las Virgenes Reservoir	**8**
	Westlake Filtration Plant	**9**
Wastewater	Sewer Collection System	5
	Tapia Water Reclamation Plant	**7**
	Biosolids Composting	**8**
Recycled/ Pure Water	Recycled Water Distribution	6
	Pure Water	**7**
Headquarters	**Operations, Administration & Finance**	**8**

Staff ranked the potable water distribution system, Las Virgenes Reservoir, Westlake Filtration Plant, Rancho Las Virgenes Composting Facility, Tapia Water Reclamation Plant, Pure Water Las Virgenes-Triunfo, and District Headquarters at high risk to wildfire impacts, as seen in Table 3-1. All of these facilities are located in CAL FIRE Moderate, High, or Very High Fire Hazard Severity Zones and are susceptible to impacts from wildfire. During the Woolsey Fire, the Westlake Filtration Plant sustained damage to both the building itself and surrounding property. While the Plant still faces significant risk to future wildfire, the area around the building has been rehabilitated and now features a restored, water wise and more fire-resistant landscape.[23]

Wildfire can create risk of injury or death, damage to properties, critical facilities, and infrastructure, and need for evacuation. It can also trigger cascading impacts of worsened air quality, power outages and other service disruptions. During a wildfire event, LVMWD's water pipes, both underground and above-ground, may burn due to the heat from a wildfire. This may lead to contaminated drinking water which may threaten local public health and disrupt the District's service continuity. Wildfire may threaten the safety of LVMWD and JPA employees and customers and impede access to assets in need of repair or maintenance. Water supply availability may be disturbed if LVMWD supplies water for fighting fires. Additionally, sedimentation rates may increase in the Las Virgenes Reservoir if there is a large and/or frequent fire in the area surrounding the reservoir. Recent research conducted by the United States Geological Survey, shows that an increase in magnitude and frequency of wildfires is expected to double the rates of sedimentation in one-third of the West's large watersheds, reducing reservoir storage and affecting water supplies. Increased sedimentation can result in lost reservoir storage and decrease water quality. LVMWD may face additional challenges treating water from the reservoir if it is contaminated with ash, sediments, and contaminates created by active burning.[24]

Utility providers may temporarily shut off power to the combined service areas when wildfire risk is particularly high; this is referred to as a Public Safety Power Shutoff (PSPS). If a PSPS event lasts several days and involves the entire grid serving the District's water systems, service continuity may be disrupted, and staff may not be able to provide all its customers with water. Wildfire can also lead to smoke and associated air toxins which can lead to worsening air quality, creating or exacerbating respiratory issues for sensitive customers and employees and impact indoor areas without adequate air filtration systems.

23. LVMWD. 2020. Westlake Filtration Plant. ***https://www.lvmwd.com/our-services/drinking-water/facilities-infrastructure/westlake-filtration-plan****. Accessed July 2023*

24. Bland. 2017. The West's Wildfires Are Taking a Toll on Reservoirs. ***https://static1.squarespace.com/static/55dc9bade4b05820bf02d414/t/5a149cfe53450a59dc531297/1511300351736/Watershed1%28NewsDeeply%29.pdf****. Accessed July 2023*

Extreme Heat

Table 3-2. Extreme Heat – Climate Risk Matrix Scoring

System	Sub-System	Climate Risk Score
Potable Water	**MWD Imported Water**	**7**
	Potable Water Distribution System	4
	Las Virgenes Reservoir	**7**
	Westlake Filtration Plant	**7**
Wastewater	Sewer Collection System	3
	Tapia Water Reclamation Plant	4
	Biosolids Composting	5
Recycled/ Pure Water	**Recycled Water Distribution**	**7**
	Pure Water	5
Headquarters	Operations, Administration & Finance	4

Various infrastructure, equipment, and resources can be damaged, strained, or diminished during extreme heat events. Staff ranked MWD Imported Water, the Las Virgenes Reservoir, Westlake Filtration Plant, and Recycled Water Distribution at high risk to extreme heat, as seen in Table 3-2. As average maximum temperatures and extreme heat days, both in the combined service area and throughout California, are projected to increase through the century, evaporation of imported water and water in the Las Virgenes Reservoir is expected to increase. This may lead to or exacerbate future water scarcity issues.[25] Extreme heat and increased average maximum temperatures can lead to harmful algal blooms which can contaminate water supplies and require increased water treatment capacities.[26] Additionally, certain types of algal blooms produce dangerous toxins that can sicken people and wildlife. The overgrowth of algae consumes oxygen and blocks sunlight from underwater plants, potentially leading to the die off of aquatic life.[27]

Additionally, the ambient operating temperature within which the equipment operates is a significant factor in the equipment's lifespan. High ambient operating temperatures may lead to a reduction of the lifespan for motors and related equipment within LVMWD and JPA systems. LVMWD and the JPA may face increased costs associated with the additional cooling required for certain facilities and assets.[28] LVMWD has historically faced pump operating issues due to extreme heat impacts. During an extreme heat event, electricity utilities may turn off power in a PSPS in order to mitigate wildfire risk. If a PSPS event lasts several days and involves the entire grid serving LVMWD's and the JPA's systems, service continuity may be disrupted, and service disruptions may result to some or all customers. Future extreme heat events may pose significant health risk to LVMWD and JPA employees and customers who may suffer from heat stroke, heat exhaustion, or dehydration. Extreme heat may also lead to vegetation die-off, which can exacerbate wildfire risk in areas surrounding LVMWD and JPA facilities.

25. *Friedrich et al. 2018. Reservoir Evaporation in the Western Unites States: Current Science, Challenges, and Future Needs.* ***https://journals.ametsoc.org/view/journals/bams/99/1/bams-d-15-00224.1.xml****. Accessed July 2023*
26. *EPA. 2013. Impacts of Climate Change on the Occurrence of Harmful Algal Blooms.* ***https://www.epa.gov/sites/default/files/documents/climatehabs.pdf*** *Accessed July 2023*
27. *EPA. The Effects: Dead Zones and Harmful Algal Blooms.* ***https://www.epa.gov/nutrientpollution/effects-dead-zones-and-harmful-algal-blooms#:~:text=Dead%20zones%20are%20areas%20of,excess%20nutrients%20from%20upstream%20sources****.. Accessed July 2023*
28. *Water Utility Climate Alliance and Association of Metropolitan Water Agencies. 2020. It's Hot and Getting Hotter: Implications of Extreme Heat on Water Utility Staff and Infrastructure, and Ideas for Adapting.* ***https://www.amwa.net/system/files/linked-files/Heat%20Impacts%20copy.pdf*** *Accessed July 2023*

Drought

Table 3-3. Drought – Climate Risk Matrix Scoring

System	Sub-System	Climate Risk Score
Potable Water	**MWD Imported Water**	**9**
	Potable Water Distribution System	3
	Las Virgenes Reservoir	**9**
	Westlake Filtration Plant	6
Wastewater	Sewer Collection System	4
	Tapia Water Reclamation Plant	**8**
	Biosolids Composting	6
Recycled/ Pure Water	**Recycled Water Distribution**	**8**
	Pure Water	**9**
Headquarters	**Operations, Administration & Finance**	**9**

LVMWD and JPA staff ranked MWD Imported Water, the Las Virgenes Reservoir, Pure Water, and District Headquarters at high risk to drought impacts, as seen in Table 3-3. Warming temperatures combined with more frequent dry years will exacerbate drought impacts. Drought can lead to vegetation stress and die-off, which may exacerbate wildfire risk in the combine service area. Extended drought conditions may lead to a loss of District revenue and increased water rates which may disproportionally impact under-resourced populations. Drought can also impact the reliability of local water resources. While LVWMD's primary water supplies are imported from MWD, it also sources some groundwater supplies from the Russell Valley Basin, which is used to supplement recycled water system.[29] During periods of drought, local groundwater sources may run dry if there is not enough consistent reliable recharge from precipitation. Drought conditions may also have impacts to water stored in Las Virgenes Reservoir, which stores treated potable water from MWD. Specific drought impacts to imported water supplies is discussed below in the Climate Change Impacts to Imported Potable Water Supplies section.

29. LVMWD. 2020. Urban Water Management Plan. ***https://www.lvmwd.com/home/showpublisheddocument/13459/637616788962730000*** *Accessed July 2023*

Flood and Extreme Precipitation

Table 3-4. Flood and Extreme Precipitation – Climate Risk Matrix Scoring

System	Sub-System	Climate Risk Score
Potable Water	MWD Imported Water	5
	Potable Water Distribution System	5
	Las Virgenes Reservoir	3
	Westlake Filtration Plant	3
Wastewater	**Sewer Collection System**	**7**
	Tapia Water Reclamation Plant	5
	Biosolids Composting	3
Recycled/ Pure Water	Recycled Water Distribution	3
	Pure Water	2
Headquarters	Operations, Administration & Finance	5

LVMWD and JPA staff ranked the sewer collection system at high risk to flooding and extreme precipitation impacts, as seen in Table 3-4. During extreme precipitation events, power conveyance and distribution infrastructure can be damaged by wind and heavy rain which may cause service disruptions. Electrical equipment, operational, and administrative assets can be vulnerable if exposed to water damage. During heavy precipitation events, localized flooding may occur if storm-drain infrastructure or Malibu Creek in the combined service area becomes overwhelmed. Localized flooding may damage or inundate properties, structures, infrastructure, and other assets. It may also close streets and inhibit mobility of certain locations. Heavy rainfall may increase pollutant runoff and sedimentation into Las Virgenes Reservoir and other potable water sources. Contaminated runoff and sedimentation may require extra treatment capacities which may increase costs to LVMWD and the JPA.[30] Severe flooding may cause erosion issues near sewer lines and may lead to increased risks of flooding impacts to the sewer collection system. As of 2014, only two of the four pumps in the sewer collection system are equipped with variable pumping capacity (variable frequency drives) and have limited abilities for handling peak storm flows. Flooding and increased precipitation may lead to greater flows into Malibu Creek which may increase turbidity, contamination, and erosion. Extreme precipitation events may also oversaturate spray fields, overwhelming them and potentially impacting operations of water disposal.[31]

Photo credit: USFWS Pacific Southwest Region

30. EPA. 2023. Climate Adaptation and Source Water Impacts. **https://www.epa.gov/arc-x/climate-adaptation-and-source-water-impacts**

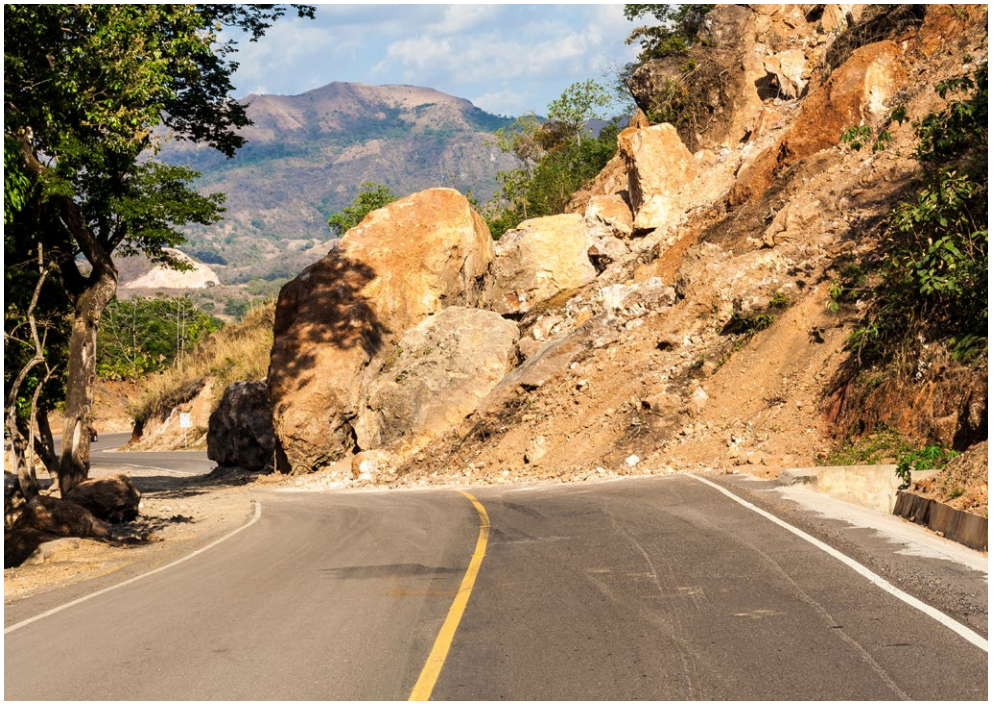
31. LVMWD and Triunfo Sanitation District. 2014. Sanitation Master Plan. **https://www.lvmwd.com/home/showpublisheddocument/4321/635392121338370000** Accessed July 2023

Landslide

Table 3-5. Landslide – Climate Risk Matrix Scoring

System	Sub-System	Climate Risk Score
Potable Water	MWD Imported Water	2
	Potable Water Distribution System	6
	Las Virgenes Reservoir	4
	Westlake Filtration Plant	3
Wastewater	Sewer Collection System	6
	Tapia Water Reclamation Plant	2
	Biosolids Composting	2
Recycled/ Pure Water	Recycled Water Distribution	2
	Pure Water	6
Headquarters	Operations, Administration & Finance	3

LVMWD and JPA staff ranked the potable water distribution system, sewer collection system, and Pure Water at risk to landslides, as seen in Table 3-5. Landslides may damage critical facilities, structures, and infrastructure. This can cause service disruptions, impact community members, and isolate certain areas if roadways are compromised. Landslides can directly damage buildings and facilities by disrupting structural foundations either by deforming the ground on which an asset is located or by physically impacting an asset. [32] Facilities and infrastructure in and adjacent to the Woolsey Fire footprint are particularly susceptible to debris flows. Debris flows and landslides can negatively impact the sewage conveyance system and Tapia Wastewater Reclamation Facility by sending more sediment and debris into the system than the plant can take out. Landslides may also increase sedimentation in potable water sources and the Virgenes Reservoir, which may lead to lost reservoir storage and water quality impacts.



32. USGS. 2008. The Landslide Handbook – A Guide to Understanding Landslides. ***https://pubs.usgs.gov/circ/1325/pdf/C1325_508.pdf****. Accessed July 2023*

Climate Change Impacts to Imported Potable Water Supply

Long-term persistent hydrologic changes in California, including increases in the frequency, duration, and severity of dry periods and earlier Sierra Nevada snowmelt-based runoff, may significantly impact the operations of the SWP. Hydrologic changes can affect water quantity and quality, and therefore the ecosystems supported by the Sierra Nevada watersheds SWP relies on. Recent DWR analysis predicts that SWP delivery performance is at risk of climate change and will most likely fall short in the future. As outlined above in the SWP Climate Hazards section, there is a 22 percent probability that long-term average annual SWP deliveries will fall to approximately 50 percent maximum allocations. As imported water from the SWP is LVMWD's primary water source and supplies virtually all potable water demands, decreases in future allocations may lead to water shortages and loss of revenue to LVMWD. LVMWD and the JPA are moving forward with the construction and implementation of the Pure Water Project Las Virgenes-Triunfo, which will take recycled water from the Tapia Water Reclamation Facility and treat it to provide up to 30 percent of LVMWD's future potable water needs, locally. As future imported water supply becomes more volatile and unpredictable, the Pure Water Project will mitigate imported water reliability concerns by providing a long-term local potable water supply.[33] Wildfire, flooding, and landslides in the Sierra Nevada's or in other areas adjacent to SWP infrastructure and supplies, may lead to water quality impacts (i.e. from ash, contaminants, or sediments), which may have downstream impacts to imported water supplies. Severe flooding, extreme storms, and wildfire events may physically damage infrastructure, potentially disrupting SWP services statewide, including those to LVMWD.[34] Pictured below is the 5 million gallon tank at Las Virgenes Reservoir.

33. LVMWD. 2022. Pure Water Project Achieves Major Milestone. **https://www.lvmwd.com/Home/Components/News/News/5988/22**. Accessed July 2023

34. California Department of Water Resources (DWR). 2019. Climate Action Plan, Phase 3: Climate Change Vulnerability Assessment. **https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Climate-Change-Program/Climate-Action-Plan/Files/CAP-III-Vulnerability-Assessment.pdf**. Accessed July 2023

4.

GHG EMISSIONS INVENTORY AND FORECAST

LVMWD AND JPA OPERATIONAL BOUNDARY AND GHG EMISSIONS SOURCES

As part of the LVMWD and JPA CAAP development process, a multi-year inventory of operational GHG emissions was prepared for 2000, 2012 and 2021. The inventory provides a measurement of GHG emissions associated with the operation and maintenance of LVMWD and JPA infrastructure, including buildings, facilities, fleet, equipment, as well as emissions from wastewater, waste streams, and employee commutes.[35]

Conducting a GHG inventory is an important component of the CAAP development process, as it allows LVMWD, the JPA, and their stakeholders to understand which activities contribute substantially to their GHG emissions footprint. The inventory also provides the groundwork for forecasting future GHG emissions and developing GHG emissions reduction targets.

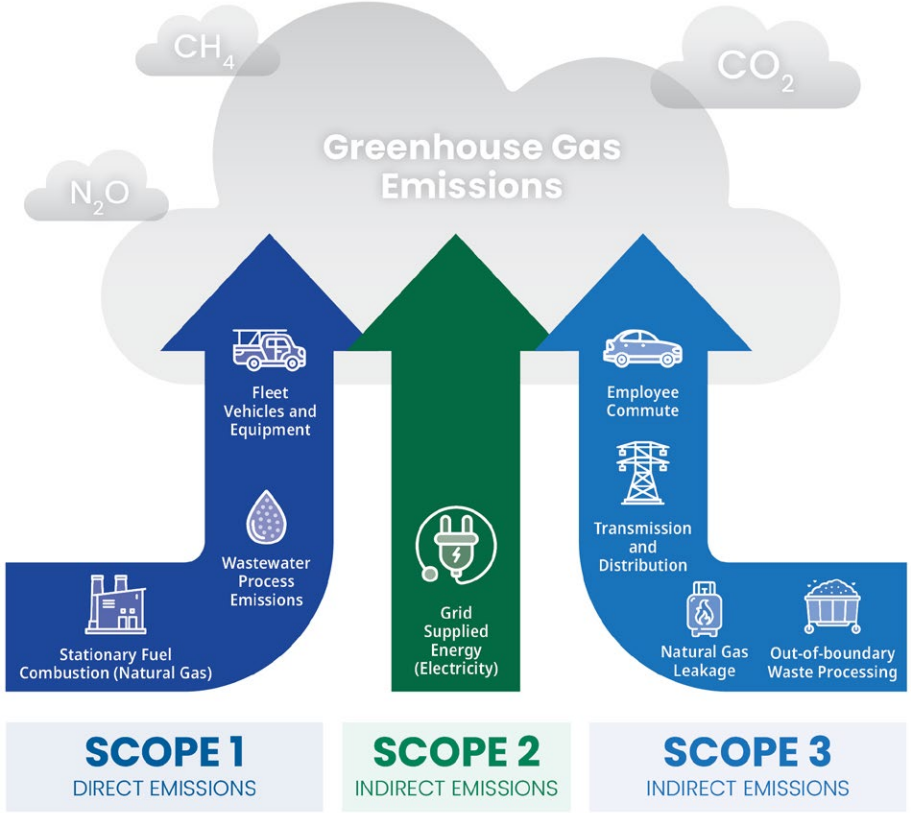
35. LVMWD acts as Administering Agent for the JPA, a long-term partnership between LVMWD and the Triunfo Water and Sanitation District (TWSD). The JPA co-owns, and LVMWD operates and maintains, several shared wastewater facilities, including the Tapia Wastewater Reclamation Facility, a backbone reclamation water main, the Rancho Las Virgenes Composting Facility, spray fields for seasonal disposal of excess recycled water, and a 5-megawatt solar farm. GHG emissions associated with the operation and maintenance of TWSD's infrastructure are not measured as part of this inventory.

The LVMWD and JPA GHG emissions inventory is consistent with standard reporting protocols from the World Resources Institute (WRI), World Business Council for Sustainable Development (WBCSD), and the International Council for Local Environmental Initiatives (ICLEI).[36,37] The WBCSD and WRI's Corporate Standard GHG Protocol requires that an inventory quantify emissions from all GHG-generating activities that fall under some level of the entity's operational control.[38] GHG-generating activities are categorized into three "scopes" which separate GHG emissions under an organization's operational control into direct and indirect GHG emissions.

- **Scope 1** consists of all direct GHG emissions that occur from sources that are controlled by the organization. For LVMWD and the JPA, these sources include natural gas consumption, vehicle fleet and equipment usage, and wastewater processing.
- **Scope 2** consists of indirect GHG emissions associated with the consumption of purchased or acquired electricity, steam, heat, or cooling. For LVMWD and the JPA, these emissions sources include the consumption of purchased of electricity.
- **Scope 3** consists of all other indirect GHG emissions not covered under Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, outsourced activities, and waste disposal. For LVMWD and the JPA, these emissions sources include natural gas leakage,[39] transmission and distribution losses,[40] employee commute, and solid waste disposal.[41]

GHG-generating activities that were included in the inventory are categorized by scope as shown in Figure 4-1. These activities include natural gas combustion, wastewater process emissions, vehicle fleet and equipment usage, electricity usage, out-of-boundary waste processing, electricity transmission and distribution, natural gas leakage, and employee commute. Activities include both LVMWD-only and JPA facilities and operations.

Figure 4-1. LVMWD and JPA GHG Emissions by Scope



36. *WRI and WBCSD. The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol). Revised Edition. Accessed at* ***https://ghgprotocol.org/corporate-standard****.*
37. *ICLEI - Local Governments for Sustainability. Local Government Operations Protocol (May 2010). Version 1.1. Accessed at* ***https://s3.amazonaws.com/icleiusaresources/lgo_protocol_v1_1_2010-05-03.pdf****.*
38. *An organization has operational control over an operation when they have the full authority to introduce and implement its operating policies at the operation. Operational control can be established by wholly owning an operation or having full authority to introduce and implement GHG or non-GHG related policies.*
39. *Natural gas consumption is associated with some amount of leakage as a result of moving natural gas from the location where it was generated to the facility where it is used. These are GHG emissions that occur upstream and outside of LVMWD's operational control.*
40. *Electricity usage is associated with some amount of transmission and distribution losses as a result of moving electricity from the location where it was generated to the facility where it is used. These are GHG emissions that occur upstream and outside of LVMWD's operational control.*
41. *GHG emissions associated with solid waste disposal include those GHG emissions associated with, fuel combustion for landfill equipment, and waste decomposition emissions once landfilled.*

Conducting the multi-year inventory for LVMWD and JPA operations consisted of collecting summary data on each GHG-generating activity shown in Figure 4-1 for each year (2000, 2012, 2021), then converting the activity data to GHG emissions using GHG emissions factors such as those from the U.S. Environmental Protection Agency (EPA), ICLEI, and local utilities (e.g., Southern California Edison). Water districts can produce fluctuating GHG emissions year to year depending on the source of water delivered and the extent of water deliveries and wastewater treatment services provided, as well as environmental conditions. To address this variability, LVMWD and the JPA elected to conduct a multi-year inventory over two decades, rather than a single-year inventory. This multi-year inventory captures some of variability and provides an understanding of LVMWD and the JPA GHG emissions over a broader time period. Developing historic and current GHG inventories also allows LVMWD and the JPA to memorialize all the projects it has completed over the last 10 years that have reduced GHG emissions but have not been individually tracked. The following sections detail the progress LVMWD and the JPA have made on reducing GHG emissions through projects including energy efficiency improvements and solar panel installations.

The 2000 GHG inventory reflects conditions before recent GHG-reduction projects were implemented and serves as a baseline. The 2012 GHG inventory reflects conditions during the implementation of GHG-reduction projects. The 2021 GHG inventory is based on the most recent year in which data is completely available and reflects conditions after recent GHG-reduction projects have been completed.

HISTORIC AND CURRENT GHG EMISSIONS

In 2000, major sources of emissions associated with LVMWD and the JPA were electricity usage (79 percent of total emissions) and natural gas usage (7 percent of total emissions). All other sources were less than 5 percent of total emissions. In 2000, 22,804 AF of potable water and 4,904 AF of recycled water were delivered. The results of the 2000 GHG emissions inventory for LVMWD and the JPA are shown in Table 4-1.

In 2012, major sources of emissions associated with LVMWD and the JPA were electricity usage (82 percent of total emissions) and natural gas usage (5 percent of total emissions). All other sources were 5 percent or less of total emissions. These results show GHG emissions remained relatively constant between 2000 and 2012. While most emissions sources did not experience significant changes, GHG emissions from natural gas and natural gas leakage decreased by about 38 percent. This was primarily due to decreased natural gas usage, as staff had previously been procuring additional natural gas for an on-site fuel cell that was discontinued in the early 2000s. In 2012, 21,519 AF of potable water and 5,136 AF of recycled water were delivered. The results of the 2012 GHG emissions inventory for LVMWD and the JPA are shown in Table 4-2.

Table 4-1. LVMWD and JPA 2000 GHG Emissions Inventory

GHG-Generating Activity	Scope	2000	Average % Contribution to Total
Vehicle Fleet & Equipment	Scope 1	330	2%
Natural Gas	Scope 1	1,088	7%
Wastewater	Scope 1	253	2%
Electricity	Scope 2	11,643	79%
Electricity T&D Losses	Scope 3	563	4%
Natural Gas Leakage	Scope 3	305	2%
Employee Commute	Scope 3	322	2%
Waste	Scope 3	143	1%
Total in Metric Tons CO_2e		**14,647**	**100%**

Table 4-2. LVMWD and JPA 2012 GHG Emissions Inventory

GHG-Generating Activity	Scope	2012	Average % Contribution to Total
Vehicle Fleet & Equipment	Scope 1	323	2%
Natural Gas	Scope 1	679	5%
Wastewater	Scope 2	221	2%
Electricity	Scope 3	12,028	82%
Electricity T&D Losses	Scope 3	693	5%
Natural Gas Leakage	Scope 3	190	1%
Employee Commute	Scope 3	444	3%
Waste	Scope 3	143	1%
Total in Metric Tons CO_2e		**14,721**	**100%**

In 2021, major sources of emissions associated with LVMWD and the JPA were electricity usage (78 percent of total emissions) and employee commute (5 percent of total emissions). All other sources were less than 5 percent of total emissions. These results show a trend of decreasing GHG emissions since 2012, primarily due to decreasing GHG emissions from electricity. Emissions reductions from electricity were driven by an increase in carbon free electricity procured by LVMWD and the JPA's electricity provider in response to California's Renewable Portfolio Standard (RPS), which has reduced emissions in the electricity sector since 2012.[42] LVMWD and the JPA have brought online two solar fields since 2012, one megawatt in February 2014 and a 4-megawatt expansion in January 2021. These solar fields generated over 9,000 megawatt hours of solar in 2021, offsetting the electricity use of the Tapia Water Reclamation Facility. LVMWD and the JPA have also made energy efficiency improvements from 2012 to 2021, that have contributed to the decrease in electricity emissions. Improvements included the conversion of lights at several facilities including Headquarters to LEDs and upgrading aging air blowers and an air diffusion system at the Tapia Water Reclamation Facility. The 2021 GHG emissions inventory also showed nearly a 60 percent decrease in natural gas emissions compared to 2012. In 2021, 20,546 AF of potable water and 5,300 AF of recycled water were delivered. Water supply and service population were not significantly variable between 2000 and 2021. LVMWD and JPA service population grew by 11 percent and total water deliveries decreased by 7 percent. LVMWD's operational personnel nearly tripled from 2000 to 2021 to accommodate growing services and operations. The results of the 2021 GHG emissions inventory for LVMWD and the JPA are shown in Table 4-3.

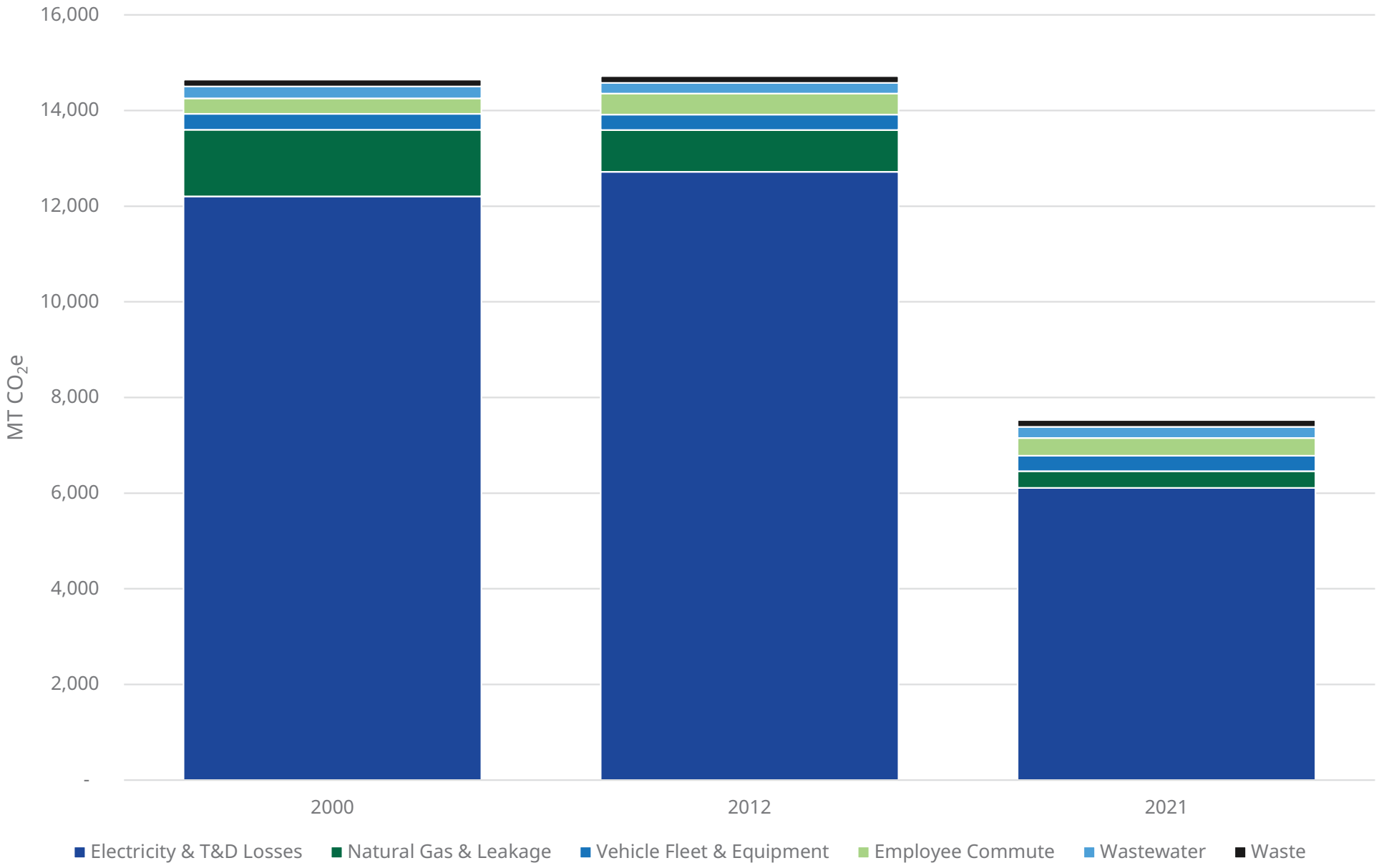
Table 4-3. LVMWD and JPA 2021 GHG Emissions Inventory

GHG-Generating Activity	Scope	2021	Average % Contribution to Total
Vehicle Fleet & Equipment	Scope 1	323	4%
Natural Gas	Scope 1	273	4%
Wastewater	Scope 2	232	3%
Electricity	Scope 3	5,853	78%
Electricity T&D Losses	Scope 3	258	3%
Natural Gas Leakage	Scope 1	76	1%
Employee Commute	Scope 3	371	5%
Waste	Scope 3	143	2%
Total in Metric Tons CO_2e		**7,528**	**100%**

GHG emissions have decreased by nearly 49 percent from 2012 to 2021, primarily due to significant decreases in natural gas and electricity consumption due mainly to utilizing carbon-free electricity from development of the 5 MW solar project. GHG emissions from 2000, 2012, and 2021 inventories are shown by sector in Figure 4-2.

42. California's RPS requires all retail electricity providers in California to procure 50 percent of their electricity supply from carbon-free resources by 2026, 60 percent by 2030, 90 percent by 2035, 95 percent by 2040 and 100 percent by 2045. This will effectively reduce the GHG emissions intensity of electricity across the state, including the electricity LVMWD purchases from Southern California Edison.

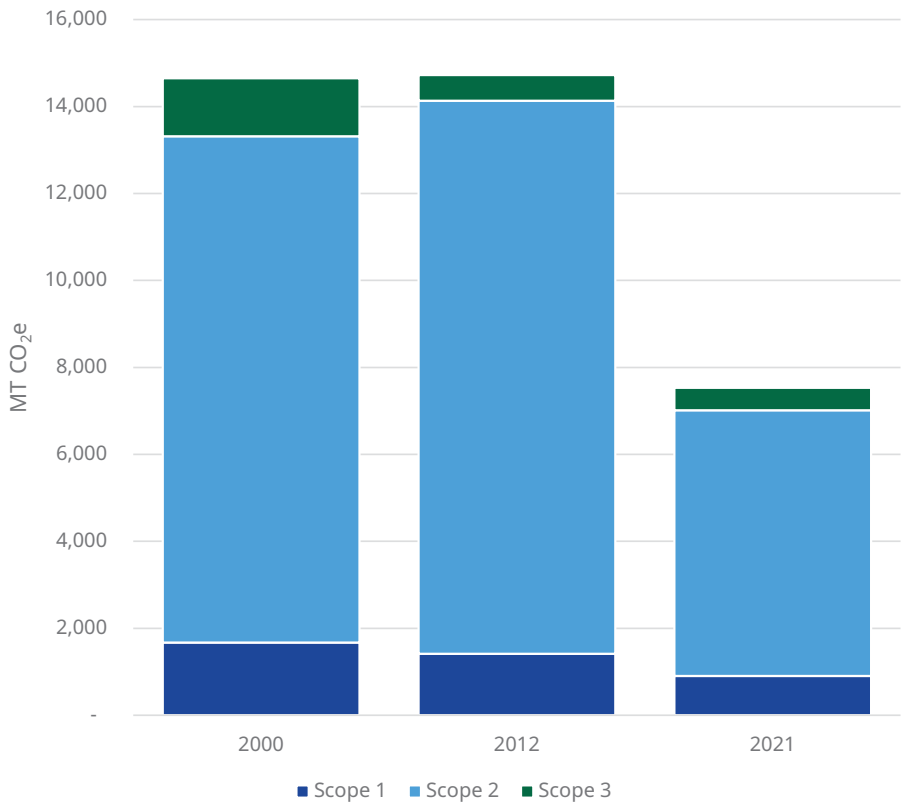
Figure 4-2. LVMWD and JPA GHG Emissions Inventory by Sector



GHG Emissions by Scope

In 2021, the majority of GHG emissions occur under Scope 2 (78 percent of total emissions), followed by Scope 1 (11 percent of total emissions) and Scope 3 (11 percent of total emissions). As such, the largest portion of GHG emissions generated by LVMWD and the JPA (i.e., Scope 1 and Scope 2 emissions) are under their operational control. The largest source of emissions – Scope 2 emissions associated with electricity usage – will continue to decrease over time as electricity sources become carbon free due to the California's RPS.4 GHG emissions by scope (1- direct emissions, 2- indirect emissions, and 3- indirect emissions) are shown in Figure 4-3 for 2000, 2002, and 2021.

Figure 4-3. LVMWD and JPA GHG Emissions Inventory by Scope



Scope 1 – Direct Emissions

Scope 1 GHG emissions associated with LVMWD and the JPA include emissions from vehicle fleet, combustion of natural gas in their facilities, and from the treatment of wastewater. Natural gas usage is the largest contributor to Scope 1 in 2000, 2012, and 2021.

Scope 1 emissions remained relatively steady between 2000 and 2012. However, Scope 1 emissions decreased between 2012 and 2021 due to decreased natural gas usage, as noted above. Vehicle fleet and equipment emissions and wastewater emissions remained relatively similar between 2000, 2012, and 2021, as operations did not change significantly over these time periods.

Scope 2 – Indirect Emissions

Scope 2 GHG emissions are 100 percent attributable to electricity purchased from Southern California Edison (SCE) and used by LVMWD and the JPA for their buildings and facilities. LVMWD and the JPA use electricity primarily for water pumping and wastewater treatment. In 2021, the Tapia Water Reclamation Facility's electricity consumption accounted for 44 percent of all electricity used at LVMWD and JPA facilities, although this was offset by renewable energy generated by the on-site solar power facility and other improvements such as replacement of Tapia Water Reclamation Facility's aging and inefficient air blowers and diffusion system. Scope 2 emissions have decreased between 2000 and 2021 due to the increased requirements for carbon free electricity procurement on SCE from California's RPS and energy efficiency improvements made by LVMWD and the JPA.

Scope 3 – Indirect Emissions

Scope 3 GHG emissions include employee commuting, electricity transmission and distribution, natural gas leakage, and waste disposal. Electricity transmissions and distribution and natural gas leakage decreased from 2000 to 2021, as reducing electricity and natural gas consumption lead to proportionate decreases in leakage of natural gas and electricity transmission and distribution losses. Employee commute emissions and waste emissions remained relatively similar between 2000, 2012, and 2021, as operations and staffing did not change significantly over these time periods. However, a per capita decrease in employee commute emissions was experienced in 2021, as less staff worked in person due to the COVID-19 pandemic.

HISTORICAL GHG EMISSIONS

The GHG emissions inventory helps LVMWD, the JPA, and other interested parties understand the relative magnitude of GHG emissions arising from each GHG-generating activity associated with current operations. This inventory also aided in the development of GHG emissions targets consistent with State goals. As described in Chapter 1 the State goals included in SB 32 and AB 1279, are based on reductions from the 1990 level of emissions. Because LVMWD and the JPA do not have a GHG emissions inventory for 1990, 1990 emission levels associated with their operations were estimated by back casting from the 2012 inventory. The methods used to develop a back-cast to their 1990 emissions level is described in the following section. LVMWD and JPA adopted emissions targets are based on 1990 levels and are discussed in more detail in Chapter 5.

Back-Cast to 1990

To aid in determining LVMWD's 2030 GHG emissions target, a back-cast of GHG emissions to 1990 was developed based on the 2012 inventory results. The 2012 GHG emission inventory was selected for the back-cast because the 2012 operations are like present day operations, and this is prior to the current GHG emissions reduction projects that came online. The 2012 GHG inventory also has the latest and most complete dataset. The 1990 back-cast assumes that LVMWD's emissions have followed approximately the same trajectory as the state's emissions such that for a given year, emissions for LVMWD and the state have increased or decreased approximately the same percentage relative to 1990. For example, the State experienced a four percent decrease in GHG emissions between 1990 and 2012; therefore, LVMWD's 1990 emissions were assumed to be about four percent higher than the 2012 emissions levels quantified in the 2012 GHG emissions inventory. Table 4-4 shows this calculation in more detail.

Table 4-4. LVMWD's 1990 GHG Emissions Back-Cast

Emissions	Total
State of CA 1990 Emissions (MMT CO_2e)	303
State of CA 2012 Emissions (MMT CO_2e)	291
1990 Change Factor (%)	(4.03%)
2012 Emissions (MT CO_2e)	14,721
1990 LVMWD Emissions (MT CO_2e)	15,314

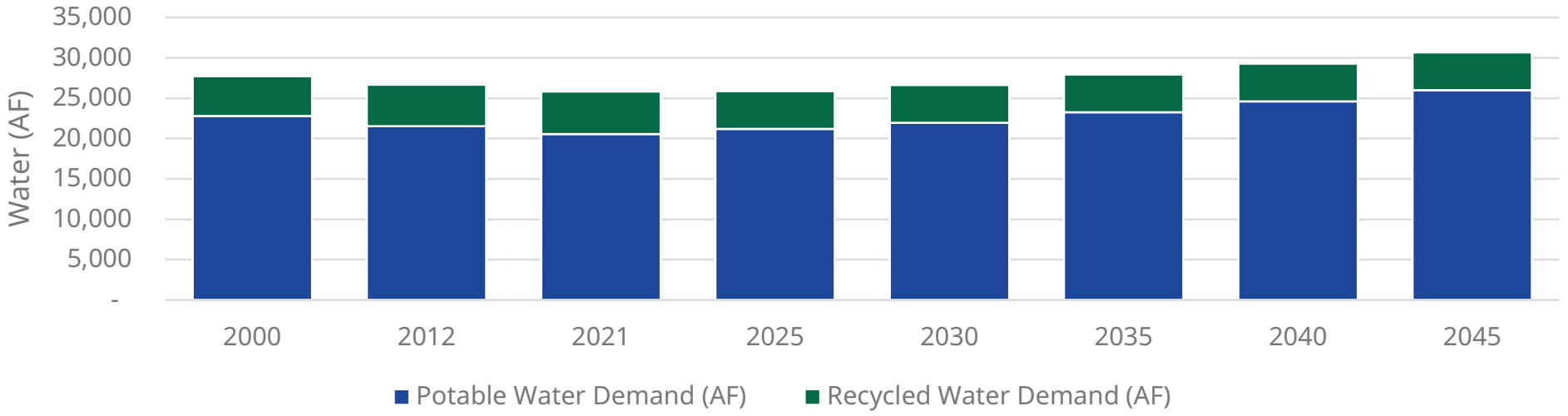
Notes: State-level GHG emissions values used for the 1990 back-cast were sourced from CARB,[43] and exclude emissions from the industrial, agricultural, and high-GWP emissions sectors, for better comparison to LVMWD's 2012 emissions inventory, which also excludes these sectors. Parathesis indicate a negative number.

43. California Air Resources Board (2022). California Greenhouse Gas Emission Inventory - 2022 ***https://ww3.arb.ca.gov/cc/inventory/data/data.htm****. Accessed July 2023*

LVMWD AND JPA GHG EMISSIONS FORECAST

Using the 2021 inventory, future operational GHG emissions were forecasted for LVMWD and the JPA. The forecast provides an estimate for how GHG emissions will look in the future, based primarily on projected services over time. These projections were derived from LVMWD's UWMP. Electricity usage by LVMWD and the JPA is expected to increase in future years consistent with increased recycled water operations via the Pure Water Project, which is expected to come online in 2030. Projections used to forecast GHG emissions are based on the UWMP's 5-consecutive-year drought scenario which provides a conservative estimate of future water deliveries as a reflection of the driest 5-year historical sequence. This scenario is considered conservative as it included the largest water demand through 2045, compared to the other scenarios in the UWMP. Pure Water operations emissions are forecasted based on the CEQA documentation outlining expected future GHG emissions associated with amortized construction emissions, emergency engines, electricity use, fleet vehicles, and employee commute.[44] This forecast allows LVMWD and the JPA to estimate how GHG emissions will change based on expected water demand, and how much LVMWD and the JPA will need to reduce emissions in order to meet GHG reduction targets for 2030 and 2045. Historical and projected water demand[45] is shown in Figure 4-4. Potable water demand is expected to increase by up to 27 percent between 2021 and 2045, in accordance with the 2020 UWMP projected population growth in the combined service area. The actual increase in potable water demand may be less due to more recent efforts to reduce water demands in the wake of the 2020-2022 drought along with implementing new conservation regulations. With conservation efforts, recycled water demand is expected to decrease by approximately 12 percent between 2021 and 2045, as recycled water used for landscape irrigation and golf course irrigation is projected to decrease through 2045. Recycled water consumption may be reduced by as much as 20 percent if conservation efforts are prioritized. Limited opportunities for developing substantial new recycled water demands and LVMWD encouraging conservation are expected to influence future decreases in recycled water demand.[46]

Figure 4-4. Historical and Projected Water Demand



44. LVMWD. Appendix A Emissions Calculations. ***https://www.lvmwd.com/home/showdocument?id=14540***

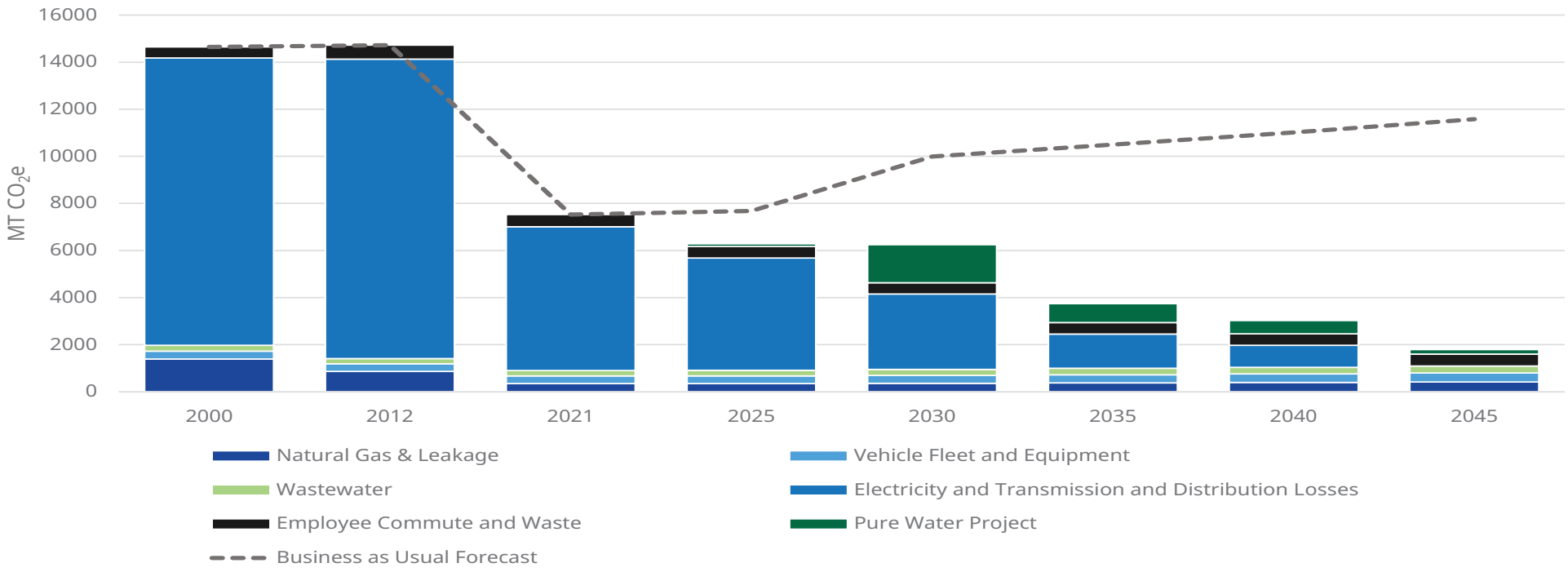
45. Projected water deliveries were used as a proxy for all LVMWD's future services, with the assumption that LVMWD operations scale approximately with water delivery to customers. Accessed July 2023

46. LVMWD. 2020 Urban Water Management Plan. ***https://www.lvmwd.com/home/showpublisheddocument/13459/637616788962730000****. Accessed July 2023*

To clearly demonstrate how LVMWD and JPA emissions will look in the future, two forecasts were developed – a business-as-usual (BAU) forecast, and an adjusted forecast. The BAU forecast shows what LVMWD's emissions would look like based on water delivery projections alone. The adjusted forecast adjusts the BAU forecast to account for State-level implementation of policies and programs that will help California reduce its emissions through 2045. The adjusted forecast includes the California RPS,[47] which will significantly reduce LVMWD and JPA GHG emissions from electricity through 2045 due to the requirements on utility providers to be entirely renewable and carbon-free by 2045. Based on review of other State legislation intended to reduce GHG emissions, such as Title 24 and the Advanced Clean Cars program, they were found to have limited impact on LVMWD and JPA operations and therefore were not included in the adjusted forecast.

Incorporating State-level policies and programs in the adjusted forecast creates a more realistic picture of what LVMWD and JPA emissions will look like in the future. The BAU forecast is useful for comparison with the adjusted forecast, to show the extent to which State-level policies and programs will help to reduce GHG emissions at LVMWD (Figure 4-5). Under the BAU forecast, overall emissions are projected to increase steadily through 2045, as service population and water services continue to grow, and as the Pure Water Project comes online in 2030. However, in the adjusted forecast, electricity emissions will significantly decrease through 2045, decreasing total emissions over time. The numerical results of the forecast are included in Table 4-5.

Figure 4-5. LVMWD and JPA GHG Emissions Forecast



47. Adopted in September 2018, SB 100 supports the reduction of GHG emissions from the electricity sector by accelerating the State's RPS Program, which was last updated by SB 350 in 2015. SB 100 requires electricity providers to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020, 60 percent by 2030, and 100 percent by 2045.

Table 4-5. LVMWD and JPA GHG Emissions Forecast

Emissions Source	2025	2030	2035	2040	2045
Forecast Summary (MT CO_2e)					
BAU Forecast	7,681	9,996	10,499	11,018	11,579
Adjusted Forecast	6,287	6,249	3,740	3,028	2,260
Legislative Reductions	1,395	3,747	6,758	7,989	9,319
Adjusted Forecast Detail (MT CO_2e)					
Vehicle Fleet & Equipment	323	332	348	365	383
Natural Gas	273	281	295	309	324
Natural Gas Leakage	76	79	82	86	91
Wastewater	242	256	271	281	298
Electricity	4,564	3,069	1,400	898	0
T&D Losses	201	135	62	40	0
Employee Commute	347	330	324	324	336
Waste	143	147	154	162	170
Pure Water	117	1,619	805	563	197

5.

CLIMATE ACTION TARGETS

INTERNATIONAL CONTEXT

Climate change is a global phenomenon and a major driver for GHG reduction activities which have continued to evolve on the international level. The United Nations Framework Convention on Climate Change (UNFCC) is an international environmental treaty, signed by 154 states at the United Nations Earth Summit in June 1992. The Framework established responsibilities for participating countries to reduce their anthropogenic emissions and return to 1990 emissions levels. The treaty was superseded in 2016 by the Paris Agreement, which established a goal to keep the rise in global average temperatures below 2 °C with efforts to limit increases to 1.5 °C by reducing global GHG emissions to carbon neutrality by mid-century.[48] The Paris Agreement has been ratified by 191 members of the UNFCC.[49]

To assist in achieving these ambitious goals, the United Nations developed Sustainable Development Goals (SDG) intended to be achieved by the year 2030. The SDGs are a collection of 17 interlinked global goals designed to guide sustainable development. These international frameworks have become the drivers for many of California's own climate related legislation.

48. IPCC. Special Report. ***https://www.ipcc.ch/sr15/****. Accessed July 2023*

49. UN Climate Change. Paris Agreement. ***https://unfccc.int/process/the-paris-agreement/status-of-ratification****. Accessed July 2023*

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CLIMATE ACTION AT THE STATE LEVEL

California has become a global leader in climate change action, having established extensive legislation, policies, and programs to reduce GHG emissions within the state over the last decade. The primary drivers of climate action at the state level are Assembly Bill (AB) 32, Senate Bill (SB) 32, and AB 1279. These regulations chart a path towards a carbon neutral California by 2045, as explained below.

Assembly Bill 32 – Codified the statewide goal of reducing GHG emissions to 1990 levels by 2020 and requires the California Air Resources Board (CARB) to prepare a Scoping Plan that outlines the main strategies the State will employ to meet the 2020 target. The AB 32 Scoping Plan was adopted in 2014.

Senate Bill 32 – The successor to AB 32 and requires the State of California to achieve a statewide reduction in GHG emissions of 40 percent below 1990 levels by 2030. The SB 32 Scoping Plan was adopted in 2017.

Assembly Bill – AB 1279, adopted in 2022, codifies the statewide carbon neutrality goal into a legally binding requirement for California to achieve carbon neutrality no later than 2045 and ensure 85 percent GHG emissions reduction under that goal. AB 1279 builds upon Executive Order B-55-18 which originally established California's 2045 goal of carbon neutrality.

Programs and policies that support the goals established in the above bills and which will impact GHG emissions for LVMWD and the JPA include the California Renewable Portfolio Standard (RPS), which, through SB 1020 and SB 100, requires electricity providers to procure 100 percent of electricity from renewable and carbon-free sources by 2045.[50] The Advanced Clean Fleets rule will also support the goals by requiring LVMWD to transition to a 100 percent zero-emission capable utility fleet by 2045. LVMWD and the JPA may choose to purchase only ZEVs beginning in 2024 and remove internal combustion engine vehicles at the end of their useful life or elect to meet the State's ZEV milestone targets as a percentage of the total fleet starting with vehicle types that are most suitable for electrification.[51]

50. As part of California's RPS program SB 100 signed in 2018 mandated that electricity providers increase GHG-free sources to 100 percent of total procurement by 2045. Furthering RPS requirements, SB 1020 established additional requirements that procurement from eligible renewable energy resources increase to 90 percent of total procurement by 2035 and 95 percent of total procurement by 2040.

*51. CARB. Advanced Clean Fleets. **https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets**. Accessed July 2023*

LVMWD AND JPA CLIMATE ACTION TARGETS

While LVMWD and the JPA are not beholden to AB 32, SB 32, or AB 1279, and currently faces no legislative requirements to reduce their GHG emissions, the State recognizes water agencies as one of the largest contributors to energy emissions in California, primarily due to the large quantities of electricity used to pump water. It is also anticipated that as California works towards the 2045 carbon neutrality goal, additional legislation and regulations will be established in the future that may require LVMWD and the JPA to adopt low-carbon practices and operations. As part of the process of developing a CAAP, LVMWD and the JPA have elected to establish climate action targets that align with the State's goals to serve as targets for their facilities and operations going forward and provide a framework for achieving voluntary GHG emissions reductions in future years. LVMWD and the JPA have already taken numerous steps to reduce emissions, conserving resources, and reduce energy use; the CAAP builds on those existing efforts.

The CAAP establishes a 2030 GHG emissions target in alignment with the annual reduction rate needed to eventually meet the State's 2045 carbon neutrality goal, as set forth by AB 1279. By setting a straight line from 2021 emissions levels to the AB 1279 target, the 2030 target will surpass the SB 32 goal of a 40 percent reduction in GHG emissions from 1990 level by 2030 and will put LVMWD on a pathway to achieving carbon neutrality by 2045.52 LVMWD and JPA climate action targets are shown in Table 5-1, along with the 1990 back-cast emissions level from the 2012 inventory,[53] adjusted forecast emissions, percent reduction from 1990 levels and the emissions gap (the difference between the AB 1279 absolute target pathway and adjusted forecast emissions). The target emissions trajectory in absolute emissions is shown in Figure 5-1. Figure 5-1 also shows the BAU forecast, adjusted forecast, and the 1990 baseline inventory back-cast.

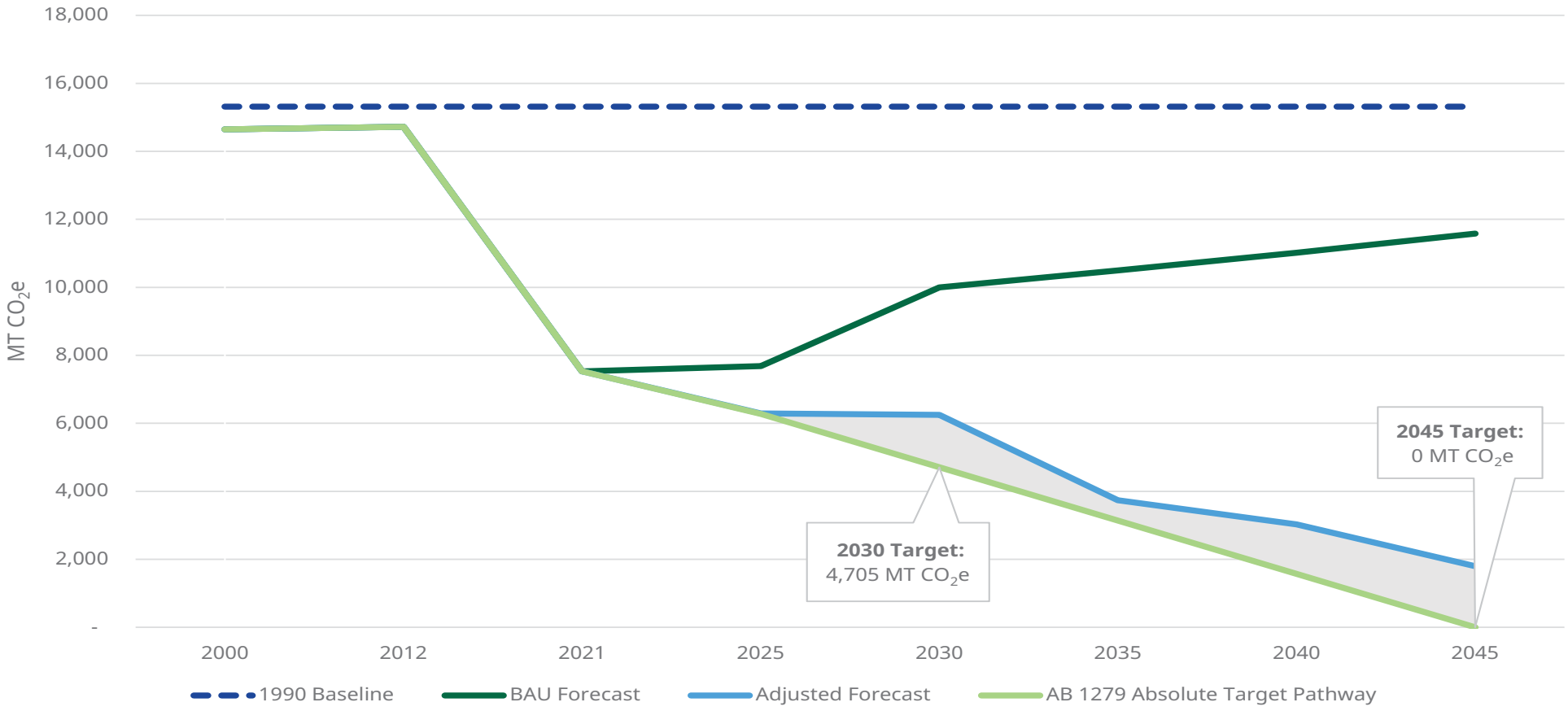
Table 5-1. LVMWD and JPA Climate Action Targets

	2025	2030	2035	2040	2045
1990 Baseline	15,314	15,314	15,314	15,314	15,314
Adjusted Forecast	6,287	6,249	3,740	3,028	2,260
Target Pathway developed from 1990 Levels					
AB 1279 Absolute Target Pathway	6,273	4,705	3,136	1,568	0
Percent Reduction from 1990 Levels	59%	69%	80%	90%	100%
Emissions Gap	14	1,544	604	1,460	2,260

52. Carbon neutrality refers to achieving net-zero CO_2e emissions, such that any GHG emissions created are offset by GHG emissions sequestering activities.

53. A back-cast of GHG emissions to 1990 was developed based on the 2012 inventory results, as the 2012 GHG emission levels are before current GHG emissions reduction projects came online and 2012 operations were closer to the current operations than 2000 operations.

Figure 5-1. LVMWD and JPA Forecast and Climate Action Targets



GHG Emissions Gap

As shown in Figure 5-1, a gap remains between the projected emissions (blue line) and the target emissions (green line), even after accounting for reductions that will result from state legislation. This gap is equal to 1,544 MT CO_2e in 2030 and 2,260 MT CO_2e in 2045. This gap is how much LVMWD and the JPA will need to reduce their GHG emissions to meet the target of carbon neutrality by 2045.

LVWMD and the JPA aim to close this gap by implementing the GHG measures presented in Chapter 6. Several of these measures, along with the climate adaptation specific measures, will also increase their resilience to climate change in the coming years.

6.

GHG EMISSIONS REDUCTION AND ADAPTATION MEASURES

LVMWD and the JPA have developed GHG emissions mitigation and adaptation measures that support the reduction of GHG emissions to levels that align with the State's GHG emissions reduction goals and reduce climate risks to their operations, infrastructure, and natural resources. Collectively, these measures will reduce the gap between LVMWD and JPA forecasted GHG emissions and their reduction targets. While the measures do not fully achieve the 2045 GHG emissions reduction target identified in Chapter 5, they provide for substantial progress towards LVMWD's and the JPA's carbon neutrality target, with the expectation that additional legislation, technology, and measures shall be identified in the future to achieve further reductions. As discussed in Chapter 1, a primary benefit of adopting proactive plans with quantifiable progress towards CAAP goals is the identification of clear measures that with funding shall reduce GHG emissions and reduce climate risks. This Plan aligns with many of the goals and requirements of State and federal grant funding.

Table 6-1 summarizes each GHG reduction and adaptation measure and details the potential GHG emission reductions that can be achieved through full implementation of quantifiable measures. As shown in Table 6-1, implementation of these measures can significantly reduce GHG emissions and improve the operational resilience of LVMWD and JPA facilities. Through implementation of GHG quantifiable measures and actions, LVMWD and the JPA can achieve the 2030 GHG emissions reduction target, as seen in Table 6-1.

Unless otherwise mandated by the State or federal government, cost analysis and feasibility studies will be conducted, and individual reduction and adaptation measures will be implemented only if authorized by the Board of Directors for LVMWD and the JPA. Services provided by LVMWD and the JPA will need to remain affordable to customers. The Board of Directors for LVMWD and the JPA will have discretion in deeming the feasibility of implementing individual measures.

TRIUNFO WATER & SANITATION DISTRICT

LAS VIRGENES MUNICIPAL WATER DISTRICT EST. 1958

Table 6-1. GHG Reduction and Adaptation Measures by Sector

Measure Code	Mitigation/ Resilience	GHG Reduction Measure	2030 GHG Reduction Potential (MT CO_2e)	2045 GHG Reduction Potential (MT CO_2e)
Infrastructure				
I-1	Mitigation	Utilize carbon-free electricity for 100% of electricity needs by 2030.	453	0
I-2	Mitigation	Electrify new and existing stationary equipment to reduce natural gas consumption 75% by 2030 and 100% by 2045.	219	415
I-3	Mitigation	Utilize renewable diesel and alternative fuels to bridge the technology gap and decarbonize stationary equipment to reduce diesel consumption by stationary equipment 100% by 2030.	36	41
I-4	Mitigation, Resilience	Increase energy storage at facilities and buildings.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
I-5	Mitigation	Improve energy efficiency at facilities and buildings.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
I-6	Mitigation	Reduce process and fugitive GHG emissions associated with wastewater treatment.	5	6
I-7	Resilience	Maximize backup power facilities for all critical assets, in alignment with Measure I-4.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
I-8	Resilience	Support the regional development of dry and wet weather stormwater diversions as a supplementary source for recycled potable water.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
I-9	Resilience	Improve the Supervisory Control and Data Acquisition system.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
I-10	Mitigation, Resilience	Require the incorporation and identification of mitigation and adaptation features into new capital projects.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
I-11	Mitigation, Resilience	Implement the Pure Water Project Las Virgenes Triunfo.	GHG Emissions Not Quantified	GHG Emissions Not Quantified

Measure Code	Mitigation/ Resilience	GHG Reduction Measure	2030 GHG Reduction Potential (MT CO_2e)	2045 GHG Reduction Potential (MT CO_2e)
Operations				
O-1	Mitigation	Electrify or otherwise decarbonize the vehicle fleet such that 75% of the vehicle fleet are ZEV by 2030 and 100% of the vehicle fleet are ZEV by 2045.	102	342
O-2	Mitigation	Increase employee commute ZEV adoption to 25% by 2030 and 50% by 2045.	48	136
O-3	Mitigation	Reduce employee commute VMT by 15% by 2030 and 30% by 2045.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
O-4	Mitigation	Develop a net zero waste program such that waste sent to the landfill is reduced by 90% by 2030 and maintain through 2045.	133	153
O-5	Mitigation, Resilience	Increase water conservation by reducing demands by at least 20% by 2030 and maintain through 2045.	855	0
O-6	Resilience	Develop resource programs and protocols to protect staff from climate extremes.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
O-7	Resilience	Maximize operational flexibility and redundancies, including water transfer agreements, interties, flexible exchanges, additional system interconnections, and points of delivery.	GHG Emissions Not Quantified	GHG Emissions Not Quantified

Measure Code	Mitigation/ Resilience	GHG Reduction Measure	2030 GHG Reduction Potential (MT CO_2e)	2045 GHG Reduction Potential (MT CO_2e)
Natural Resources				
NR-1	2,3	Investigate and implement carbon capture and sequestration opportunities to offset all Water Reclamation Facility fugitive emissions by 2045.	6	48
NR-2	2	Catalog and improve the stability of hillside monitoring and stabilization efforts after heavy rain events in areas at risk of landslides and debris flows to minimize impacts to District infrastructure and equipment.	GHG Not Emissions Quantified	GHG Emissions Not Quantified
NR-3	2	Protect the Las Virgenes Reservoir from sedimentation associated with extreme climate events.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
NR-4	2,4,5	Develop and implement a wildfire abatement and response policy.	GHG Emissions Not Quantified	GHG Emissions Not Quantified
GHG Emissions Reduction Summary				
Total GHG reduction potential with full implementation of all measures			**1,857**	**1,140**
Total GHG reductions needed to meet LVMWD's Reduction Goals3			**1,544**	**1,797**
GHG reductions remaining			**-313**	**657**

GHG = greenhouse gas; LVMWD = Las Virgenes Municipal Water District; MT CO_2e = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled; ZEV/EV = zero emission vehicle/electric vehicle
I = Infrastructure; O = Operations; NR = Natural Resources
1 As described in Chapter 5, LVMWD established GHG reduction goals in alignment with AB 1279 Absolute Target pathway.

MEASURE ORGANIZATION

CAAP measures include specific goals that LVMWD and the JPA will work towards to reduce GHG emissions and improve resilience to climate change. As vital service providers to their customers, LVMWD and the JPA expect to balance the implementation of climate action and adaptation measures with the cost of water and wastewater services to ratepayers. Increased rates could have equity and other impacts if not thoughtfully considered, thus, each measure can only be implemented once it is deemed financially feasible or when funding/financing has been identified. However, LVMWD and the JPA also understand that failing to prepare for climate change could substantially increase costs in the future, so care must be taken to strike the right balance. Therefore, consistent with LVMWD's and the JPA's overall mission, measures that could result in a significant increase in costs were removed from consideration. Measures are organized by asset, and consist of a suite of actions that support each measure:

1. **ASSET:** Measures are categorized into three asset categories:
    - a. **Infrastructure**
      Infrastructure includes various components of its water and wastewater system that pump, transport, divert, store, treat and deliver water.
    - b. **Operations**
      Operations include the staff, equipment, and systems that keep day-to-day operations and services running.
    - c. **Natural Resources**
      Natural resources include materials and natural substances such as water, soil, vegetation, and wildlife.
2. **MEASURES:** Measures define quantitative and qualitative goals within each asset category that will contribute to reducing GHG emissions and/or increase resilience.
3. **ACTIONS:** Actions consist of the specific activities that will be completed in support of each measure, which together accomplish each measure's goal.

Some CAAP measures and their actions include quantifiable GHG emissions (i.e., with clearly defined GHG emissions reduction potential). Other actions are not quantifiable, and either contribute to the realization of GHG remissions reduction potential of other measures or actions or increase the resilience of LVMWD and the JPA to climate change. An example of a quantifiable action is purchasing a specific amount of carbon-free electricity, while a supportive (not quantifiable) action is conducting an annual return on investment analysis of carbon-free electricity packages. Measures and actions that seek to increase resilience to climate change are not considered quantifiable in this CAAP, as the quantified metric being considered is GHG emissions. Together, the CAAP measures and their actions establish a foundational pathway to make substantial progress towards achieving 2030 and 2045 GHG reduction goals and increasing resilience to climate change. Measures and actions will be tracked and re-evaluated on a regular basis to help ensure achievement of the projected reductions.

OBJECTIVES

The CAAP measures and actions were developed in alignment with LVMWD's strategic objectives, as outlined in the 2022 LVMWD Strategic Plan. LVMWD's strategic objectives are:

1. Develop a strategy to maintain a highly effective workforce,
2. Improve LVMWD's water supply reliability,
3. Support customers to meet water-use efficiency standards,
4. Eliminate the discharge of pollutants to Malibu Creek and preserve the natural beauty of the Watershed,
5. Achieve a high credit rating for LVMWD's three enterprises,
6. Reduce LVMWD's carbon footprint,
7. Keep customers, city officials and other stakeholders well-informed and provide new/improved customer tools to enhance service delivery,
8. Develop a process to act on efficiency improvement suggestions, and
9. Enhance LVMWD's asset management programs.

The strategic objectives were assessed and used to guide the development of a set of five CAAP objectives that connect the CAAPs goals of reducing GHG emissions and increase resilience to climate change and the overall strategic goals of LVMWD. The CAAP's objectives are outlined and described below.

OBJECTIVE 1: Enhanced Water Supply Diversification

Investments in a diverse water supply portfolio will allow LVMWD and the JPA to manage the associated projected climate risks and uncertainties. Efforts to increase dry (sanitary sewer) and wet weather (stormwater) diversions, minimize reliance on imported water, and develop reliable local water sources will strengthen and increase the resilience of the water supply portfolio.

OBJECTIVE 2: Better Protected Water Resources

Implementing natural resources, land, and ecosystem management efforts will protect water resources from climate risks. CAAP measures that align with this objective reduce the pressure on local natural resources by allowing more space for trees and native habitats, preserving natural water supplies and increasing resilience of water resources.

OBJECTIVE 3: Increased Operational Efficiency and Resource Management

Implementing programs that manage resource demand will allow LVMWD and the JPA to continue to provide high-quality water sustainably. Increasing operational efficiencies often contributes to reductions in resource consumption and cost savings.

To maintain a long-range, transparent, stable, and well-planned financial condition, resulting in current and future water users receiving fair and equitable rates, it will be important to implement projects and programs that reduce financial risk through resource management and increased operational efficiencies.

OBJECTIVE 4: Improved Operational Flexibility and Reliability

Retaining a reliable water supply and operations is at the heart of LVMWD's mission. Developing climate solutions and planning for issues such as energy shortages, power safety shutoffs, and drought allows LVMWD to make its operations more resilient and continue to provide water reliably and affordably to the community.

OBJECTIVE 5: Better Connected People and Water

Prioritizing projects that engage LVMWD's and the JPA's customers, community, and partners will facilitate increased community support and involvement in climate action and adaptation efforts. LVMWD and the JPA will continue to support programming that enhances existing relationships and better connects the community with efforts to conserve water and mitigate climate change impacts on LVMWD's and the JPA's service area, employees, and customers.

INFRASTRUCTURE MEASURES

MEASURE I-1: Utilize carbon-free electricity for 100% of electricity needs by 2030.

Electricity consumption is the single largest emission source for LVMWD and the JPA. While SB 100 drives the conversion of retail electricity to 100% renewable by 2045, procuring carbon-free electricity now expedites this timeline and will provide significant reductions in GHG emissions. By opting into a renewable electricity tier through the electricity provider, LVMWD and the JPA have the opportunity to achieve most of its GHG emissions reduction's goal. Furthermore, switching to low-carbon or carbon-free electricity will make other measures more impactful by further reducing GHG emissions. For example, electrification of buildings, equipment and vehicles will achieve a greater GHG emission reduction if the electricity sourced is low-carbon or carbon neutral. LVWMD and the JPA currently receive electricity from Southern California Edison (SCE). SCE offers a 50 percent green rate option and 100 percent green rate option to its customers. LVMWD and the JPA can also procure electricity from Clean Power Alliance (CPA), a community choice aggregation (CCA) entity providing customers in Los Angeles and Ventura counties carbon-free electricity. CPA provides options of 40 percent, 50 percent, and 100 percent carbon-free electricity. In addition to changing its electricity procurement strategy, developing additional on-site solar and pairing with battery storage (Measures I-4 and I-7), will both reduce GHG emissions and increase resilience to disturbances such as power outages.

Actions

- **Action I-1.1:** Install 1 MW of solar PV at Rancho Sprayfield by 2025.
- **Action I-1.2:** Conduct a feasibility study to understand the potential for installing up to 15 megawatt (MW) of floating solar photovoltaics at Las Virgenes Reservoir, including potential costs, payback periods, and resilience impacts.
- **Action I-1.3:** Conduct an assessment to identify the solar capacity needed to support the additional electricity demand for vehicle fleet and employee commuter fleet EV adoption.
- **Action I-1.4:** Identify partners to assess and pursue floating solar photovoltaics, such as firms that specialize in power purchase agreements (PPA) and SCE. Work with partners to pursue funding opportunities and tax credits for the installation of floating solar photovoltaics such as opportunities through the Department of Energy (DOE) Solar Energy Technologies Office (SETO and the federal Investment Tax Credit and Production Tax Credit.
- **Action I-1.5:** Based on the results of the studies and if deemed feasible, install up to 15 MW of floating solar photovoltaics at Las Virgenes Reservoir and additional on-site solar generation.
- **Action I-1.6:** Incorporate design elements into the Pure Water Project Las Virgenes – Triunfo to minimize GHG emissions to the greatest extent feasible. This should include energy efficient processes, identification of alternative fuels or technologies for processes that cannot be electrified, developing the project to be electricity ready where feasible, opportunities to directly link to on-site renewables and battery storage, and identification of the energy source to offset indirect electricity emissions, such as using the Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) tariff for renewable energy generation from other District sites where on-site renewables will not offset the emissions.
- **Action I-1.7:** Identify if the JPA/LVMWD can source electricity from Clean Power Alliance (CPA) and conduct an annual return on investment (ROI) analysis of carbon-free electricity packages available from SCE and CPA to determine which would be more cost-effective. Analysis should include a cost evaluation of switching all electricity accounts to 100 percent carbon-free electricity to ensure electricity consumption not covered by on-site solar will be 100 percent carbon-free.
- **Action I-1.8:** Depending on the results of the ROI analysis and if deemed feasible, switch some or all electricity accounts to 100 percent carbon-free electricity from with SCE "Green Rate" or to a CPA "100% Green Power".
- **Action I-1.9:** Conduct a study to identify what amount of pumping that can be scheduled utilizing a high level of renewable energy and offset the remaining amount with battery stored solar energy.

Target Metrics

- 100 percent carbon-free electricity by 2030
- Install additional on-site solar fields

GHG Emissions Reductions

- 453 MT CO_2e in 2030

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

MEASURE I-2: Electrify new and existing stationary equipment to reduce natural gas consumption 75% by 2030 and 100% by 2045.

Infrastructure electrification is promoted by several State-level programs, including SB 350[54] and AB 3232,[55] which require reductions in energy usage in buildings and a transition to a low-carbon building stock. SB 350 requires that the State double the energy efficiency savings in natural gas usage by 2030. AB 3232 requires the California Energy Commission (CEC) evaluate strategies to reduce the State's building stock GHG emissions by 40 percent below 1990 levels by 2030. The CEC's Building Energy Efficiency Standards (Title 24 Parts 6 and 11) includes building standards and codes that support decarbonization efforts through requiring improvements in energy efficiency of building equipment to occur at time of new construction and upgrades.

By phasing out natural gas equipment for electric equipment, while using carbon-free electricity, LVMWD's and the JPA's GHG emissions associated with this equipment will fall to zero. Replacing natural gas equipment should be completed over time as existing natural gas infrastructure needs to be replaced. When replacing items like hot water heaters and Heating, Ventilation, and Air Conditioning (HVACs) units, LVMWD and the JPA will look to replace natural gas combustion units with heat pumps that can operate at nearly 400 percent increased efficiency.[56] Replacing fossil fuel combustion equipment with electric alternatives will align with the State policies and Title 24 requirements. Phasing out natural gas backup generators is a lower priority in the near term, as they provide critical resilience benefits.

Actions

- **Action I-2.1:** Conduct a survey of existing natural gas operated equipment and identify operationally and financially viable electric alternatives. By 2025, establish a schedule to replace existing natural gas-consuming equipment with electric or carbon neutral alternatives (i.e., e-fuels).
- **Action I-2.2:** Develop and implement a policy requiring new equipment to be electric or carbon neutral. Require an infeasibility waiver to be submitted and approved when new equipment cannot be electrified. The infeasibility waiver process shall identify other opportunities to decarbonize the new stationary equipment (e.g., use of renewable diesel/e-fuel).
- **Action I-2.3:** Explore rebate, grant, or partnership opportunities to fund the replacement of natural gas-consuming equipment like HVAC and hot water heaters with electric-powered equivalents like heat pumps.
- **Action I-2.4:** Educate staff of the electrification requirement and implement the schedule to replace non-emergency use natural gas-consuming equipment with electric-powered equivalents to reduce natural gas consumption.

Target Metrics

- 75 percent reduction in natural gas by 2030
- 100 percent reduction in natural gas by 2045

GHG Emissions Reductions

- 219 MT CO_2e in 2030
- 415 MT CO_2e in 2045

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

54. CEC. Clean Energy and Pollution Reduction Act – SB 350. **https://www.energy.ca.gov/rules-and-regulations/energy-suppliers-reporting/clean-energy-and-pollution-reduction-act-sb-350**. Accessed July 2023

55. CEC. Assembly Bill 3232 and the California Building Decarbonization Assessment. **https://www.energy.ca.gov/sites/default/files/2021-08/AB3232_Building_Decarbonization_Assessment_Factsheet_ADA.pdf**

56. Tri-State. 2021. Advantages of Energy Efficient Heat Pumps. **https://tristate.coop/advantages-heat-pumps-energy-efficiency#:~:text=What's%20the%20efficiency%20performance%20of,coefficient%20of%20performance%2C%20or%20COP**. Accessed July 2023.

MEASURE I-3: Utilize renewable diesel and alternative fuels to bridge the technology gap and decarbonize stationary equipment to reduce diesel consumption by stationary equipment 100% by 2030.

LVMWD and the JPA currently use a combination of gasoline and diesel to fuel its fleet vehicles and stationary equipment, including backup emergency power generators. While zero-emission heavy-duty vehicles are not currently market-ready, using low-carbon intensity fuels like renewable diesel in existing vehicles and equipment does not require substantive equipment alterations and helps reduce GHG emissions over the short term. The use of alternative fuels allows for additional time to fully vet and/or pilot the new zero-emission technology before infrastructure investments are made, which could help improve the return on investment. The State's Low Carbon Fuel Standard (LCFS) regulation is driving the market to increase the availability and decrease the cost of alternative fuels that may offer a return-on-investment benefit to switch to alternative fuels now in equipment and fleet vehicles that do not need technology changes. Using renewable diesel in existing vehicles can decrease the costs of maintaining equipment over traditional diesel due to a decreased need for diesel particulate filter services, as renewable diesel has less impurities such as sulfur, oxygen, and other aromatic compounds.[57]

Actions

- **Action I-3.1:** Conduct a feasibility study to assess opportunities to decarbonize LVMWD's and the JPA's existing back-up generators using drop-in renewable diesel. As part of the assessment, determine a timeline for the renewable diesel transition, the quantity of renewable diesel needed, and any additional costs incurred from the transition. Include potential impacts of new renewable diesel equipment.
- **Action I-3.2:** Identify partners for a reliable source of renewable diesel and fuel (e.g., Diamond Green Diesel).
- **Action I-3.3:** Based on the feasibility study, develop a policy to transition all generators to renewable fuels.
- **Action I-3.4:** Develop and distribute educational materials to relevant staff members on the renewable diesel policy requirement and associated air quality and health benefits of the transition outlines in Action I-3.3.
- **Action I-3.5:** Pursue and monetize LCFS credits associated with renewable fuel conversions in vehicles.

Target Metrics

- 100 percent replacement of diesel with renewable diesel by 2030

GHG Emissions Reductions

- 36 MT CO_2e in 2030
- 41 MT CO_2e in 2045[58]

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

57. Neste. Fueling Renewed Trust in Public Fleets. ***https://www.neste.us/neste-my-renewable-diesel/industries/public-fleets****. Accessed July 2023.*

58. GHG emissions reductions are projected to increase by 2045 as forecasted fleet and equipment GHG emissions are projected to increase.

MEASURE I-4: Increase energy storage at LVWMD and JPA facilities and buildings.

Energy storage systems are a proven strategy to maximize use of renewable energy by storing the energy produced during peak renewable generation periods. By storing renewable energy, LVMWD and the JPA will increase their energy residence and reduce GHG emissions by charging the battery system during times of low grid emissions and discharging them during periods of high emission electricity. The batteries can also be used to conduct rate arbitrage, by charging during times when electricity is cheapest and offsetting the peak (most expensive) power periods through use of stored energy. Power loss can lead to operational failure as key facilities and systems, including pumps and the water reclamation facility, may not be able to operate. Battery storage systems will also add increased operational resilience by allowing facilities to operate for periods of time without power from the grid.

Actions

- **Action I-4.1:** Conduct an assessment to identify existing battery storage capacity and priority locations for battery storage installation.
- **Action I-4.2:** Conduct a feasibility study to evaluate the opportunities for charging on-site batteries with on-site solar. Based on the study, require the design of the Pure Water Project Las Virgenes – Triunfo to identify battery storage solutions to mitigate impacts from power outages in addition to back-up generators powered by renewable fuel.
- **Action I-4.3:** Explore funding opportunities to obtain and install a combined total of 5 MW battery storage at critical facilities. Identify opportunities through the Inflation Reduction Act of 2022 incentives including Energy Infrastructure Reinvestment Financing and the Solar Investment Tax Credit.
- **Action I-4.4:** Continue time of use program that identifies and establishes permanent shifts of high-electricity use to times when renewable energy is plentiful through educational programs on energy and thermal storage, load timing/controls, pre-cooling/pre-heating, and other time-energy demand measures.

Target Metrics

- Energy storage solutions implemented
- Assessments completed
- Funding obtained
- 5 MW battery storage installed

GHG Emissions Reductions

- GHG Emissions Not Quantified[59]

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

59. GHG emissions were not quantified for Measure I-4 as energy storage systems in themselves do not lead to reductions in GHG emissions, however they do support GHG reductions associated with on-site renewable energy sources.

MEASURE I-5: Improve energy efficiency at LVMWD and JPA facilities and buildings.

Improving pump efficiency, installing LED lighting, and installing energy recovery systems will all reduce the total demand for electricity from LVMWD's and the JPA's systems, saving money and reducing GHG emissions. Improving equipment efficiency also aligns with the California Building Energy Efficiency Standards (Title 24).

Actions

- **Action I-5.1:** Identify aging equipment due for replacement throughout JPA and LVMWD facilities and identify energy efficient alternatives to use for the replacement (e.g., EnergyStar certifications). Prioritize energy efficient electric equipment over natural gas and diesel equipment, where feasible. Include a return on an investment analysis as part of the replacement process that evaluates the capital investment for an energy efficient alternative piece of equipment, cost savings associated with improved energy efficiency, and identifies any grants or rebates associated with such equipment replacement. For equipment identified in Action I-2.2 that received the infeasibility waiver, ensure energy efficiency alternatives are selected.
- **Action I-5.2:** Develop and implement a policy requiring new equipment to achieve EnergyStar Certification, where feasible.
- **Action I-5.3:** Conduct energy audits every 5 years and implement top energy recommendations. As part of CAAP monitoring, track energy improvements due to implementation of energy audit recommendations annually.
- **Action I-5.4:** Expand the utilization of automated lighting controls for indoor/outdoor lighting for JPA and LVMWD facilities pursuant to the current CEC Building Energy Efficiency Standards (Title 24, Part 6 and 11).
- **Action I-5.5:** Pursuant to the CEC 2022 Building Energy Efficiency Standards (Title 24, Part 6 and 11), require all new construction and building upgrades utilize light emitting diode (LED) lighting technology only.
- **Action I-5.6:** Continue to explore opportunities to employ artificial intelligence (AI) and machine learning (ML) to better optimize treatment processes and to increase energy efficiency.
- **Action I-5.7:** Require the implementation of cool roofs in the construction of all new and upgraded JPA and LVMWD facilities, to minimize absorption of solar energy and reduce building energy use.

Target Metrics

- Energy conserved
- Energy efficiency systems and upgrades implemented

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

MEASURE I-6: Reduce process and fugitive GHG emissions associated with wastewater treatment.

Because technology for reducing methane emissions from wastewater treatment plants can be expensive and requires advanced planning, this measure is focused on preliminary feasibility analysis and investigating funding opportunities for future implementation. Technology is advancing and programs such as LCFS may provide cost-effective opportunities to convert captured methane to biofuel for electricity generation or vehicle fleet use. It is anticipated that wastewater emissions will become a major focus of California for reducing GHG emissions in the future, at which point additional incentives for this work are expected to become available. Additionally, implementation of the Pure Water Project Las Virgenes-Triunfo, will divert and treat effluent from the Tapia Water Reclamation Facility for potable reuse. The project will eliminate the need to discharge unused recycled water to Malibu Creek, minimizing associated fugitive GHG emissions to nearly zero.[60]

Actions

- **Action I-6.1:** Conduct a feasibility and cost analysis on the pathways to eliminate emissions associated with the biogas generated at Tapia Water Reclamation Facility through either biogas utilization, disposal or sale. The study should include an assessment evaluating the cost for upgrading the anaerobic digesters, opportunities for upgrading the biogas to pipeline quality biomethane, and opportunities for partnerships with other nearby biogas producers to sell the biogas to entities such as SCG looking to meet SB 1440.
- **Action I-6.2:** Investigate potential partnerships with entities looking to obtain biogas for fuel production for which LVMWD and the JPA could be a source.
- **Action I-6.3:** In alignment with the implementation of the Pure Water Project Las Virgenes - Triunfo, evaluate and track reductions in total Nitrogen to identify the amount of reduced fugitive emissions.

Target Metrics

- 97 percent reduction in fugitive emissions by 2030
- 97 percent reduction in fugitive emissions by 2045

GHG Emissions Reductions

- 5 MT CO_2e in 2030
- 6 MT CO_2e in 2045

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

60. EPA. Pure Water Project Las Virgenes-Triunfo. ***https://www.epa.gov/wifia/pure-water-project-las-virgenes-triunfo****. Accessed July 2023*

MEASURE I-7: Maximize backup power facilities for all critical assets.

As outlined for Measure I-4, procuring energy storage solutions to support LVMWD's and the JPA's facilities and buildings can support GHG emission reductions and mitigate impacts from power outages. Water utilities are one of the major electricity consumers in California. With future electricity demand forecasted to grow, water utilities are particularly at risk of localized energy shortages. Backup power facilities can provide resilience and redundancy to mitigate service disruptions during power outages.[61] This measure will reduce the potential impact of future power disruptions on key facilities and operations to provide future continuity of services across a wider range of conditions. New backup power facilities should be located outside of hazard areas or provided with adequate protection to mitigate potential damage and disruption.

Actions

- **Action I-7.1:** Catalogue fixed and mobile backup power requirements for all LVMWD and JPA facilities and develop design criteria/minimum requirements.
- **Action I-7.2:** Establish backup power policy/requirements that cover fixed and mobile solutions, staging, and procurement.
- **Action I-7.3:** Secure Hazard Mitigation Grant Program, California Governor's Office of Emergency Services (CAL OES), and other grant funding for battery energy storage solutions and renewable diesel.
- **Action I-7.4:** If deemed feasible, secure battery energy storage systems and new generators that use renewable fuel (e.g., renewable diesel, biodiesel, etc.) for Tapia Reclamation Facility, the Westlake Filtration Plant, Rancho Composting Facility, and future facilities such as the Advanced Water Purification Facility.

Target Metrics

- Assessments developed
- Battery storage solutions installed

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Improved Operational Flexibility & Reliability

MEASURE I-8: Support the regional development of dry and wet weather stormwater diversions as a supplementary source for recycled potable water.

Climate change exposures, such as an increase in prolonged periods of multi-year drought, are projected to increase the risk of reduced SWP and Colorado River deliveries. There is also an indication that more rain will fall from extreme weather events, which would increase the potential value of stormwater capture. LVMWD and the JPA will focus on developing and enhancing regional capabilities to increase dry and wet weather (stormwater) diversions as a supplementary source for recycled potable water.

Actions

- **Action I-8.1:** Partner with neighboring jurisdictions to identify opportunities to develop dry and wet weather diversions to reduce imported water.
- **Action I-8.2:** Position for funding programs, such as LA County Measure W, to fund design work to increase dry and wet weather diversions.
- **Action I-8.3:** Conduct an assessment to identify developing regulatory compliance issues associated with wet weather diversions and outline potential solutions.

Target Metrics

- Acre-feet of diversions
- Funding identified and obtained
- Assessment conducted

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Enhanced Water Supply Diversification

61. EPA. Climate Impacts on Water Utilities. ***https://www.epa.gov/arc-x/climate-impacts-water-utilities#tab-3****. July 2023*

MEASURE I-9: Improve the Supervisory Control and Data Acquisition (SCADA) System.

A projected increase in the frequency and severity of climate hazards, such as extreme heat and extreme precipitation, will stress the ability of staff to react and respond. A more capable SCADA system will enable more efficient reactions and responses to changing conditions and potentially reduce GHG emissions associated with water loss. A SCADA system provides LVMWD and the JPA with automation and redundant control capabilities. An improved SCADA system can connect employees to monitoring equipment that can provide information on flooding hazards, water quality, drainage levels, and much more, in real time. The SCADA system can report on maintenance issues and alert employees of critical issues that may be impacting water and wastewater operations.[62]

Actions

- **Action I-9.1:** Conduct an assessment to identify opportunities to upgrade or add field instrumentation hardware including sensors, actuators, relays, control units, and samplers such as for automatic leak detection throughout the distribution system. Utilize artificial intelligence (AI) and machine learning (ML) to automate SCADA data collection and analysis to provide additional operational improvements and achieve energy efficiency.
- **Action I-9.2:** Based on the assessment, procure field instrumentation hardware to adequately monitor and control all water system processes.
- **Action I-9.3:** Explore potential funding opportunities to finance SCADA system upgrades and improvements.
- **Action I-9.4:** Establish procedures to regularly conduct maintenance of SCADA systems to identify potential improvements and operational inefficiencies.
- **Action I-9.5:** Implement setpoint optimization techniques using AI and ML at Tapia Water Reclamation Facility, Lift Stations 1 and 2, and Rancho Las Virgenes Composting Facility.

Target Metrics

- Field instrumentation hardware procured
- Funding obtained
- Procedures established
- Setpoint optimization techniques implemented

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability
- Better Connected People and Water

62. *LVMWD. Phase 2 White Paper: Tapping into Available Capacity in Existing Infrastructure to Create Water Supply and Water Quality Solutions.* ***https://www.mwdh2o.com/media/3uyc3rvk/las-virgenes_phase-2_final-report.pdf***

MEASURE I-10: Require the incorporation and identification of mitigation and adaptation features into new capital projects.

Climate change is projected to increase the variability of precipitation, the extent of wildfire risk, the frequency and amount of extreme precipitation, the susceptibility of landslides, the frequency and duration of extreme heat events, and the length and frequency of power outages. The Infrastructure Investment Plan and other master planning documents should consider the vulnerability of facilities, infrastructure, and water resources to relevant climate change impacts.[63] This measure will guide future capital development to be designed with these future climate conditions and risks in consideration.

Actions

- **Action I-10.1:** Develop a process to prioritize when to apply and implement climate change-informed design criteria for flooding, extreme heat, landslides, wildfire and liquefaction.
- **Action I-10.2:** Integrate and regularly update best available climate science and projections into relevant planning documents and programs including the Urban Water Management Plan, Infrastructure Investment Plan, Hazard Mitigation Plan, Potable Water Master Plan, Recycled Water Mast Plan, Integrated Master Plan, and Sanitation Master Plan.
- **Action I-10.3:** Develop protocols to improve monitoring capabilities to ensure ongoing identification of vulnerable critical District assets in need of upgrades or retrofits.

Target Metrics

- Design criteria development and implemented
- Planning documents and programs updated

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Better Protected Water Resources
- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

63. EPA. Climate Impacts on Water Utilities. ***https://www.epa.gov/arc-x/climate-impacts-water-utilities#tab-3****. Accessed July 2023*

MEASURE I-11: Implement the Pure Water Project Las Virgenes-Triunfo.

Implementing the Pure Water Project Las Virgenes – Triunfo is key to providing reliable potable water and reducing dependence on imported water in the future. The project will eliminate discharges to Malibu Creek, minimizing contaminants into the creek and fugitive GHG emissions. In 2022, the JPA Board of Directors approved the Programmatic Environmental Impact Reports for the Pure Water Project, providing a path forward for construction of the Advanced Water Purification Facility.[64] To guide the development of this facility in a climate resilient manner that minimizes GHG emissions, LVMWD and the JPA will work with developers and a consultant team to incorporate climate projections and potential impacts into the design process. Energy efficient equipment and fixtures at Pure Water Project facilities will also be installed and opportunities will be explored to implement additional on-site renewable and battery storage to increase operational resilience and mitigate GHG emissions.

Actions

- **Action I-11.1:** Continue with efforts to partner with a design/build team to design, construct, test, commission, and obtain governmental approval for the Advanced Water Purification Facility.
- **Action I-11.2:** Require the consultant team to review and integrate future climate projections and potential impacts into the design of the Advanced Water Purification Facility.
- **Action I-11.3:** Obtain funding for additional advising services to study and mitigate climate risks and GHG emissions specifically to the Pure Water Project Las Virgenes - Triunfo, through the EPA's Water Infrastructure Finance and Innovation Act, State of California's Clean Water and Drinking Water State Revolving Fund (SRF) programs, and Metropolitan's Local Resources Program (LRP).
- **Action I-11.4:** In alignment with Action I-36, conduct a feasibility study to identify the future energy needs of the Pure Water Project Las Virgenes – Triunfo and identify opportunities to minimize GHG emissions through energy efficiency, on-site renewables, and low-carbon and carbon-free electricity procurement.

Target Metrics

- Climate projection and potential impacts integrated into design
- Feasibility study completed
- Funding obtained

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Enhanced Water Supply Diversification
- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

64. LVMWD. Pure Water Project Achieves Major Milestone. 2022. ***https://www.lvmwd.com/Home/Components/News/News/5988/22****. Accessed July 2023*

OPERATIONS MEASURES

MEASURE O-1: Electrify or otherwise decarbonize the vehicle fleet such that 75% of the vehicle fleet are zero-emission vehicles (ZEV) by 2030 and 100% of the vehicle fleet are ZEV by 2045.

California has developed a robust set of clean transportation policies and goals to decarbonize the transportation sector through implementation of ZEV technology, where feasible, and the use of low-carbon intensity fuels everywhere else. The Advanced Clean Cars II regulation requires that by 2035 all new passenger cars, trucks, and SUVs sold in California be zero emissions.[65]The Advanced Clean Fleets rule requires that fleets, businesses, and public entities that own or direct the operation of medium- and heavy-duty vehicles in California must transition to 100 percent zero-emission capable utility fleets by 2045. Under the regulation, LVMWD and the JPA may choose to purchase only ZEVs beginning in 2024 and remove internal combustion engine vehicles at the end of their useful life or elect to meet the State's ZEV milestone targets as a percentage of the total fleet starting with vehicle types that are most suitable for electrification.[66]

Transitioning fleet vehicles to either EVs powered by carbon-free electricity or other zero-emission technology has the potential to bring this source to zero over time. The State also has several incentive and funding programs to support vehicle replacement and to promote infrastructure development. By beginning to implement the Advanced Clean Fleet Rule, LVMWD and the JPA can access early action incentives. Transitioning to ZEV heavy-duty vehicles will be prioritized closer to 2045, as options become technologically and financially feasible.

Actions

- **Action O-1.1:** Conduct a study of the existing vehicle fleet to develop a schedule and policy to replace existing vehicles with EV/ZEV alternatives such that 75 percent of vehicles are replaced with EV/ZEV's by 2030 and 100 percent by 2045. Consider vehicle function, associated costs, available incentives, and ROI from potential fuel and maintenance savings when identifying vehicles for replacement and their EV/ZEV alternatives.
- **Action O-1.2:** For vehicles not identified for replacement by 2030 and/or vehicles that do not have EV/ZEV options available:
  - Evaluate options to reduce the weight of vehicles and integrate technology that monitors vehicle idleness, integrating efficient, smaller diesel engines before they can be electrified or otherwise decarbonized.
  - Consider partnering with heavy-duty EV companies to conduct pilots and facilitate advancements in technology for such vehicles.
  - Continue monitoring EV/ZEV availability and updating the vehicle replacement schedule to transition such vehicles by 2045.
- **Action O-1.3:** Complete an EV infrastructure plan to analyze charging needs through 2045 and beyond. As part of plan, create a prioritized list of EV charging/fueling infrastructure at specific locations.
- **Action O-1.4:** Partner with SCE's Charge Ready Program to plan and fund electric vehicle charger installations and panel upgrades at JPA and LVMWD facilities in alignment with the EV infrastructure plan.

Target Metrics

- 75 percent fleet conversion to ZEV by 2030
- 100 percent fleet conversion to ZEV by 2045

GHG Emissions Reductions

- 102 MT CO_2e in 2030
- 342 MT CO_2e in 2045

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

65. CARB. Advanced Clean Cars II. ***https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii***. *Accessed July 2023*

66. CARB. Advanced Clean Fleets. ***https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets***. *Accessed July 2023*

MEASURE O-2: Increase employee commute ZEV adoption to 25% by 2030 and 50% by 2045.

Providing educational information on available Zero Emission Vehicle (ZEV) incentives/rebates and preferential parking for ZEVs in support of California's ZEV goals will further lower LVMWD's carbon footprint associated with employee commutes. The increase of Electric Vehicles (EVs) and ZEV use by employees for commuting is inevitable with the establishment of Zero-Emission Vehicle Regulation, which requires auto manufacturers to provide more ZEVs for sale in California to achieve the State's goal of 100 percent of sales of new passenger vehicles to be ZEV by 2035.[67] Programs like LCFS and the Clean Transportation Program (AB 118) provide credits or funding, for developing ZEV fueling infrastructure to incentivize the development of necessary ZEV infrastructure to support the new ZEVs on the road. Furthermore, CARB established a rebate program for individuals to replace their vehicles with a ZEV. As such, it is anticipated that California's goals and incentives will lead to an increased use of ZEVs by LVMWD employees.

Current estimates indicate that approximately 40 percent of EV owners charge at work.[68] Given this fact, LVMWD and the JPA will install EV charging stations at its facilities for employees. Implementing this measure will encourage LVMWD employees to invest in personal EVs by reducing range anxiety, one of the leading reasons individuals opt to not switch to an EVs. This measure will also allow employees who live further away to commute via EV without worrying about making to work and back on a single charge.

Actions

- **Action O-2.1:** Install 30 additional EV chargers to support at least a 25 percent transition of employee-owned commuter vehicles to EV's or ZEV's (i.e., hydrogen fuel cell) by 2030. Locations should best serve commuters that report to different JPA and LVMWD facilities and optimize use of on-site solar generation.
- **Action O-2.2:** Identify partnerships and funding opportunities such as enrollment in the LCFS program for credit generation, federal tax credit under 30C Alternative Fuel Infrastructure Tax Credit, and SCE rebates and partnerships to offset the costs to install EV charging infrastructure for commuters.
- **Action O-2.3:** When feasible, incentivize employee conversion to ZEVs by offering discounted vehicle charging or fueling for commuters (charge for electricity only and not capital recovery for charging stations).
- **Action O-2.4:** Promote employee use of EV's or ZEVs by providing educational materials on the benefits of EV's and ZEVs, available federal and state tax credits, and ROI for employees given free workplace charging.

Target Metrics

- 25 percent transition to ZEV among employees by 2030 and 50 percent transition by 2045.

GHG Emissions Reductions

- 48 MT CO_2e in 2030
- 136 MT CO_2e in 2045

Objectives

- Increased Operational Efficiency & Resource Management

67. CARB. Zero-Emission Vehicle Regulation. **https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program/about**. Accessed July 2023

68. Idaho National Laboratory. **https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf**. Accessed July 2023

MEASURE O-3: Reduce employee commute Vehicle Miles Traveled (VMT) by 15% by 2030 and 30% by 2045.

While LVMWD and the JPA do not have direct control over the manner in which its employees travel to and from their jobs, they can facilitate alternative commute strategies, including use of active and shared/subsidized transit and continuing with implementation of a telework program. Working remotely during the COVID-19 pandemic has reduced commuter vehicle miles traveled at LVMWD and the JPA. Currently office workers, one third of staff, telework up to 2 days a week. LVMWD and the JPA have implemented a policy allowing for continued remote work in perpetuity, which will both prevent an increase in GHG emissions and reduce commuter vehicle miles travelled (VMT) for employees. LVMWD and the JPA will expand and provide benefits to employees who utilize alternative forms of transportation for their commute. Rideshare incentives, pre-tax benefits, and other solutions like commuter competitions can be implemented over time in support of the goal of achieving a reduction in employee commutes.

Actions

- **Action O-3.1:** Allow for continued benefits of a full or partial work-from-home policy where employees telecommute or utilize flexible schedule to reduce transit time, VMT, and GHG emissions.
- **Action O-3.2:** Identify opportunities to fund rideshare incentives to employees who carpool. Offer other incentives to employees to use an alternative mode of transportation to commute (e.g., public transportation, bikes).
- **Action O-3.3:** Provide preferred parking for carpooling vehicles to incentivize carpooling by employees. Evaluate opportunities for other incentives to offer to employees for carpooling or lower VMT.
- **Action O-3.4:** Promote employee use of carbon-free and low carbon transportation by providing educational materials on the benefits of commute options including public transportation, EV/ZEV options, and vanpools.

Target Metrics

- 15 percent reduction of VMT by 2030
- 30 percent reduction of VMT by 2045

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Increased Operational Efficiency & Resource Management

MEASURE O-4: Develop a net zero waste program such that waste sent to the landfill is reduced by 90% by 2030 and maintain through 2045.

Waste generation contributes a small amount to the overall GHG emissions from LVMWD and JPA operations. Except when there are equipment outages at the Rancho Composting Facility, biosolids are already diverted by being converted into compost for reuse on landscapes. A majority of the GHG emissions resulting from waste sent to the landfill are caused by decomposition of organic material under anaerobic conditions.[69] The remainder of the emissions come from inorganic wastes, such as plastic, which have both upstream and downstream emissions. Therefore, increasing the diversion of organic and inorganic waste streams is a primary measure to reduce waste related GHG emissions. In alignment with SB 1383[70] and AB 341[71], LVMWD and the JPA will develop and implement a waste diversion plan to reduce organic waste sent to the landfill by 75 percent using 2014 levels as a baseline and strive to achieve zero-waste sent to landfills by 2045. This would include but not be limited to organic waste from employee break rooms. Additionally, LVMWD and the JPA will report biosolid quantity and destination to CalRecycle in compliance with AB 901.[72]

Actions

- **Action O-4.1:** Implement a program to separate organic waste from other materials. Contract with local waste disposal companies to route organic waste to food recovery centers, anaerobic digestion, or composting facilities such that 75 percent of organics generated from JPA and LVMWD operations is collected and diverted from the landfill by 2025.
- **Action O-4.2:** Conduct a waste assessment, including records examinations, facility walk-throughs, and waste sorting, across all facilities to identify waste sources generated, identify purchasing and management practices, examine current waste reduction practices and their effectiveness, and prioritize the most effective waste reduction efforts on an area and materials-focused basis.
- **Action O-4.3:** Investigate funding opportunities to develop an organics program and deploy organic waste bins at all JPA and LVMWD facilities.
- **Action O-4.4:** Pursuant to AB 901, report the quantity and destination of disposed biosolids from wastewater treatment plants to CalRecylcle quarterly.
- **Action O-4.5:** Host staff training sessions to provide educational information on waste reduction practices to increase waste diversion at JPA and LVMWD facilities.

Target Metrics

- 75 percent organic waste reduction by 2025 compared with 2014 baseline73

GHG Emissions Reductions

- 133 MT CO_2e in 2030
- 153 MT CO_2e in 2045

Objectives

- Increased Operational Efficiency & Resource Management

69. *According to the Local Governments for Sustainability (ICLEI) U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix E – Solid Waste Emission Activities and Sources, GHG emissions are generated by non-biologic wastes only if they are combusted.*
70. *CalRecycle. California's Short-Lived Climate Pollutions Reduction Strategy.* ***https://calrecycle.ca.gov/organics/slcp/****. Accessed July 2023*
71. *CalRecycle. Mandatory Commercial Recycling.* ***https://calrecycle.ca.gov/recycle/commercial/****. Accessed July 2023*
72 *"Grit" that is collected at the TWRF and hauled to the landfill is not included in the GHG inventory since little to no GHG emissions are associated with this component.*
73. *SB 1383, effective 2022, sets statewide emissions reduction targets to 40 percent below 2013 levels by 2030 for methane, 75 percent reduction in organic material disposed in landfills from 2014 levels by 2025 and required jurisdictions to adopt ordinances or other enforceable mechanisms to impose penalties for non-compliance. LVMWD will be required to comply with local jurisdictions ordinances established to meet SB 1383 requirements.*

MEASURE O-5: Increase water conservation by reducing demands by at least 20% by 2030 and maintain through 2045.

LVMWD has a long history of promoting water conservation, which has resulted in measurable reduction in retail water usage and indirectly reduces GHG emissions. LVMWD has had a number of successful water conservation programs such as providing indoor rebates for water efficient appliances, landscape rebate programs, practicing and promoting water-efficient irrigation and low water usage planting, and developing education programs for customers. LVMWD achieved a 20 percent reduction in per capita water use as required by the Water Conservation Act of 2009 as a direct result of these programs. LVMWD will expand these water conservation efforts to achieve further reductions in per capita water use that will align with new state regulations. Reduced per capita water consumption allows LVMWD to meet the water demands of a growing population, reduce operational emissions, and increase resilience to future drought impacts. A 20 percent reduction by 2030 will be based on 2020 consumption levels.

Actions

- **Action O-5.1:** Continue water conservation and recycling efforts and programs by implementing the Potable Master Plan, Integrated Regional Water Management Plan, Recycled Water Master Plan, Urban Water Management Plan, Water Shortage Contingency Plan, and Flow Restrictor Program.
- **Action O-5.2:** Implement the Pure Water Project Las Virgenes – Triunfo (Measure I-11) to reduce dependence on imported water and help ensure long-term water supply reliability.
- **Action O-5.3:** Continue to reduce recycled water use for irrigation by 25 percent and potable water by 20 percent by 2030 compared to 2020 consumption levels.
- **Action O-5.4:** Continue outreach and engagement efforts to increase registration to 80 percent and use of the WaterSmart Portal to aid customers in managing usage and identifying leaks.
- **Action O-5.5:** Expand programs which educate customers on water conservation initiatives through workshops and speaking engagements. Continue to host and expand participation in the LVMWD Landscape Workshop Series providing information on drought-tolerant landscaping, available rebates for water retrofits, and water efficiency strategies in new and existing single-family residences and commercial/multi-family accounts.
- **Action O-5.6:** Continue with efforts to implement a landscape management plan for the JPA and LVMWD that consolidates and expands upon the goals and policies for landscaping at JPA and LVMWD properties. Identify whether and where there are additional resource-consumptive landscapes on property that can be changed out to more water-conserving, slower growth plants that require less maintenance. Continue to implement potable water conservation strategies in landscape design and maintenance (such as replacing water intensive areas with drought-resilient native plants. using low-flow water fixtures, installing sophisticated irrigation software to control water, investing in systems to monitor pipe leakage, and limiting turf development).
- **Action O-5.7:** Require new and redeveloped LVMWD/JPA owned properties to be low water use through landscaping with climate appropriate plants, permeable paving, green infrastructure, and incorporating other low-impact development design features to allow for increased infiltration, even in heavy rains.
- **Action O-5.8:** Continue to implement and expand on successful water conservation rebate programs (e.g., high efficiency toilets and clothes washers, weather-based irrigation controller, etc.) with a focus on providing opportunities for outdoor water efficiency improvements such as rotating sprinkler heads, in alignment with the current Statewide water conservation goals.
- **Action O-5.9:** Develop and adopt a schedule for installation of water meters in existing buildings and irrigation zones to establish a water consumption baseline at JPA and LVMWD owned properties with the Facilities Division. Reduce JPA and LVWMD water consumption per capita at facilities in alignment with the current statewide goals.
- **Action O-5.10:** Explore methods such as the deployment of a floating solar array to reduce the rate of evaporation from water storage facilities (e.g., Las Virgenes Reservoir).

- **Action O-5.11:** Investigate new advanced technology systems to maximize the ground-water recovery wells in Westlake Village to maintain local water supply. Invest in such technology as it becomes feasible and cost-effective. Consider other innovative ideas such as maximizing the storage potential of the Russel Valley Basin by installing injection wells to store excess water for later extraction.
- **Action O-5.12:** Update rates and modify fixed fees as needed so that the majority of fixed costs for water and wastewater services continue to be captured regardless of the amount of water consumption and wastewater collection and treatment.

Target Metrics

- Reduced water consumption by 20 percent by 2030 and maintain through 2045

GHG Emissions Reductions

- 855 MT CO_2e in 2030
- 0 MT CO_2e in 2045[74]

Objectives

- Increased Operational Efficiency & Resource Management
- Improved Operational Flexibility & Reliability

74. Senate Bill 100 requires all electricity providers in the state to provide 100 percent carbon free electricity by 2045; therefore, no GHG emissions reductions can be gained from water conservation measures in 2045, since the emissions factor for electricity will be zero.

MEASURE O-6: Develop resource programs and protocols to protect staff from climate extremes.

Climate change is projected to increase regional wildfire risk which is expected to contribute to worsened air quality from wildfire smoke and associated toxins. LVMWD and the JPA are expected to experience an increase in the number of extreme heat days per year and an increase in overall average maximum temperature. Extreme heat events and wildfire smoke events can create or exacerbate health conditions of vulnerable District staff members. This measure seeks to reduce the potential health impacts to District staff. The first step for LVMWD and the JPA is to educate employees of the health and safety risks associated with climate extremes and to conduct outreach to understand employee concerns. Development and implementation of specific protocols that align with California's Division of Occupations Safety and Health's (Cal/OSHA) standards and protocols will help protect LVMWD employees.[75]

Actions

- **Action O-6.1:** Develop and distribute a survey to staff to identify climate change impacts that pose health and safety risks to employees. As part of the survey, ask employees which existing policies and programs adequately provide them with resources to mitigate impacts and ask what potential programs and policies may provide additional resources to limit health and safety concerns associated with climate hazards.
- **Action O-6.2:** Develop internal protocols for employees working under extreme heat conditions and air quality emergencies, in alignment with Cal/OSHA heat illness and prevention guidance.
- **Action O-6.3:** Develop protocols for wildfire emergencies and host annual practice/drills to ensure service continuity and employee safety.
- **Action O-6.4:** Provide employees with educational materials on relevant climate hazards and associated health and safety impacts (i.e., extreme heat induced health impacts) to increase awareness of risks and share best practices to increase adaptive capacity.

Target Metrics

- Develop and distribute survey to staff
- Develop protocols
- Develop and share education materials

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Better Connected People and Water

75. State of California Department of Industrial Relations. Heat Illness Prevention. https://www.dir.ca.gov/dosh/heatillnessinfo.html. *Accessed July 2023*

MEASURE O-7: Maximize operational flexibility and redundancies, including water transfer agreements, interties, flexible exchanges, additional system interconnections, and points of delivery.

Climate change is projected to increase the intensity, duration, and frequency of extreme heat and extreme weather events, which will increase the probability of power and water service disruptions. Additionally, LVMWD's potable water system is largely dependent on imported water supplies that may be subject to scheduled and unscheduled water delivery interruption that may impact the ability to deliver potable water. This measure seeks to increase redundancies and operational flexibilities to protect service continuity during emergency/hazard scenarios and potable water disruptions. LVMWD and the JPA have a history of fostering strong partnerships with local and regional entities including Calleguas Municipal Water District, Los Angeles Department of Water and Power (LADWP), and neighboring jurisdictions.[76] Developing interties, water transfer agreements, and other redundancies will improve future reliability.

Actions

- **Action O-7.1:** Partner with neighboring water providers, starting with District 29, to develop additional emergency water system interties to ensure water service continuity and reliability.
- **Action O-7.2:** Continue partnering with Calleguas Municipal Water District and LAWDP to improve connectivity with Metropolitan Water District's Colorado River Aqueduct (CRA) system via the East-West Feeder, Sepulveda Pass and other opportunities.
- **Action O-7.3:** Continue to coordinate with neighboring jurisdictions to ensure adequate water availability and peak load water supply for fire suppression efforts in alignment with CAL FIRE's recommendations.
- **Action O-7.4:** As necessary, increase storage capacity where feasible at water system facilities to prepare for wildfire and drought periods.

Target Metrics

- Agreements, interties, system interconnections and other redundancies developed

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Enhanced Water Supply Diversification
- Improved Operational Flexibility & Reliability
- Better Connected People and Water

76. LVMWD. Las Virgenes-Calleguas Interconnection Project. ***https://www.lvmwd.com/our-services/construction-projects/construction-projects-completed/las-virgenes-calleguas-interconnection-project****. Accessed July 2023*

NATURAL RESOURCES MEASURES

MEASURE NR-1: Investigate and implement carbon sequestration opportunities to offset all Water Reclamation Facility fugitive emissions by 2045.

This measure provides opportunities for negative emissions through carbon sequestration on natural and working lands (e.g., rangeland, forests, woodlands, wetlands and coastal areas, grasslands, shrubland, farmland, riparian areas, and urban green space). Carbon sequestration programs will be an important tool to mitigate some of LVMWD's and the JPA's emissions. While carbon sequestration programs can require a large investment up-front, this cost could be mitigated through credit generation opportunities based on CARB's "Carbon Capture and Sequestration protocol" adopted in 2018 as well as through other voluntary and Federal carbon markets.[77]

Actions

- **Action NR-1.1:** Conduct an assessment to identify the potential capacity for planting new trees, identify a timeframe for implementation, outline a management plan for existing trees, and establish a tracking system to assess progress towards an annual benchmark.
- **Action NR-1.2:** Partner with TreePeople or other organizations to develop and host an annual employee tree planting day.
- **Action NR-1.3:** Increase carbon sequestration by planting and supporting 25 new trees annually through 2030 to sequester carbon and create shade to reduce heat island effect.
- **Action NR-1.4:** Explore grant funding opportunities for tree planting. Identify and apply for applicable federal (e.g., USDA) and state (e.g., California ReLeaf, Affordable Housing and Sustainable Communities Program [AHSC], Urban and Community Forestry Program) available grants for Tree Planting projects.
- **Action NR-1.5:** As part of the Landscape Transformation Initiative, develop landscape guidance materials that include information regarding flora CO_2 sequestration potential to promote the incorporation of landscape plants that are both climate resilient and CO_2 sequestering. Climate resilient species have characteristics of drought tolerance, low water use, pest and disease resistance, fire-retardant or fire-resistance, and salinity tolerance. Consider vegetative options with higher CO_2 sequestration potential for JPA and LVMWD facilities landscaping.

Target Metrics

- 25 new trees planted annually through 2030

GHG Emissions Reductions

- 6 MT CO_2e in 2030
- 48 MT CO_2e in 2045

Objectives

- Better Protected Water Resources
- Increased Operational Efficiency & Resource Management

77. *CARB. 2023. Carbon Capture and Sequestration Protocol.* ***https://ww2.arb.ca.gov/resources/documents/carbon-capture-and-sequestration-protocol-under-low-carbon-fuel-standard#:~:text=California%20Air%20Resources%20Board,-Main%20navigation&text=The%20Carbon%20Capture%20and%20Sequestration,(CO2%2D%20EOR)****. Accessed July 2023*

MEASURE NR-2: Catalog and improve the stability of hillside monitoring and stabilization efforts after heavy rain events in areas at risk of landslides and debris flows to minimize impacts to infrastructure and equipment.

Climate change is projected to increase the frequency and intensity of extreme precipitation events and wildfires, which can increase landslides and debris flow susceptibility. This measure seeks to implement mitigation efforts to minimize infrastructure and equipment vulnerability to landslides and debris flows. Implementing landslide monitoring equipment can report critical data regarding slope stability/hillside movement and precipitation measurements. Equipment may also provide automated warming and alarms in advance of a potential hazard scenario.[78]

Actions

- **Action NR-2.1:** Conduct a landslide risk vulnerability assessment of critical assets to identify which assets are most vulnerable to damage from landslides and debris flows.
- **Action NR-2.2:** Install landslide monitoring equipment in landslide susceptibility areas that are adjacent to critical assets.
- **Action NR-2.3:** Based on the vulnerability assessment, conduct hardening upgrades to critical JPA and LVMWD assets that are most vulnerable to damage from landslides and debris flows.

Target Metrics

- Assets upgraded
- Monitoring equipment installed

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Better Protected Water Resources

78. Call&Nicholas Instruments, Inc. Real-Time Slope Monitoring. ***https://www.slideminder.com/****. Accessed July 2023*

MEASURE NR-3: Protect Las Virgenes Reservoir from sedimentation associated with extreme climate events.

Climate change is projected to increase the frequency and intensity of extreme precipitation and wildfires, which may trigger erosion and landslides, increasing sediment levels in Las Virgenes Reservoir which can lead to water quality impacts.[79] This measure seeks to protect Las Virgenes Reservoir from increased sedimentation through various sediment control management efforts that are focused to minimize erosion, remove sediment, and increase treatment capabilities.

Actions

- **Action NR-3.1:** Develop procedures to regularly measure reservoir sedimentation volume to determine the varying rates and patterns of potential storage loss.
- **Action NR-3.2:** Implement strategies to mitigate reservoir sedimentation including sediment removal by dredging or flushing.
- **Action NR-3.3:** Develop a vegetation and erosion management strategy to mitigate fire risk around Las Virgenes Reservoir to minimize potential post-fire soil erosion impacts on reservoir sedimentation.
- **Action NR-3.4:** Increase wastewater treatment capabilities to manage potential future sediment levels from future stormwater, landslide, wildfire, and erosion impacts.

Target Metrics

- Sediment level reduced

GHG Emissions Reductions

- GHG Emissions Not Quantified

Objectives

- Better Protected Water Resources

79. EPA. Climate Adaptation and Erosion and Sedimentation. ***https://www.epa.gov/arc-x/climate-adaptation-and-erosion-sedimentation****. Accessed July 2023*

MEASURE NR-4: Develop and implement a wildfire abatement and response policy.

Climate change is projected to increase the frequency and intensity of wildfire in the District's service area. LVMWD and JPA assets and infrastructure located in High, and Very High Fire Hazard Severity Zones are at greatest risk to impacts from wildfire. Wildfire can create risk of injury or death, damage to properties, critical facilities, infrastructure, and need for evacuation. Cascading impacts may also include worsened air quality, contaminated water supplies, power outages, and other service disruptions. This measure seeks to mitigate wildfire risk and potential future impacts through strategies that reduce vegetation and structural ignition, harden infrastructure and assets, and increase fire suppression capabilities. Relocating critical infrastructure and facilities outside of Fire Hazard Severity Zones should be considered if retrofits and upgrades are not feasible or provide adequate protection from potential fires.[80]

Actions

- **Action NR-4.1:** In the development of a wildfire abatement and response policy, develop strategies to mitigate risk from wildfire through defensible space, fire-safe landscaping, reduction of structural ignition, fire resistant retrofitting, fire suppression water flow, and vegetation management, in alignment with CAL FIRE guidance, standards, and building codes.
- **Action NR-4.2:** Develop criteria for future structure and facility developments to reduce vulnerability to ember ignition.
- **Action NR-4.3:** Dedicate staff time to identify funding (e.g., CAL FIRE or FEMA) to implement upgrades or retrofits to mitigate wildfire risk.
- **Action NR-4.4:** Conduct hardening upgrades to structures and facilities (i.e., reservoirs, pump structures, treatment facilities, and administrative offices) that are in CAL FIRE High and Very High Fire Hazard Severity Zones.
- **Action NR-4.5:** When retrofits and upgrades are not adequate or feasible, develop plans to relocate critical assets outside of CAL FIRE High and Very High Fire Hazard Severity Zones to the extent practicable.
- **Action NR-4.6:** Develop a schedule and monitor vegetative management efforts and defensible space relative to critical assets at risk.
- **Action NR-4.7:** Coordinate with CAL Fire, Los Angeles County Fire Department, and surrounding property owners to ensure adequate fire road access to critical JPA and LVMWD facilities.

Target Metrics

- Wildfire abatement and response policy development and implementation
- Facilities and structures retrofitted, upgraded, or relocated

GHG Emissions

- GHG Emissions Not Quantified

Objectives

- Better Protected Water Resources
- Improved Operational Flexibility & Reliability
- Better Connected People and Water

80. UC ANR et al. 2021. Wildfire & Water Supply in California. ***https://innovation.luskin.ucla.edu/wp-content/uploads/2021/12/Wildfire-and-Water-Supply-in-California.pdf****. Accessed July 2023*

7.

IMPLEMENTATION AND MONITORING STRATEGY

CAAP IMPLEMENTATION

This CAAP outlines specific measures and actions to achieve GHG emissions reduction and improve the resilience of LVMWD's and the JPA's operations to climate change. Implementation of the CAAP is planned to occur between 2023 and 2045. Due to the long implementation time-period of the CAAP, measures and actions may evolve over time as LVMWD and the JPA track progress, new technologies and legislation emerge, and funding opportunities for additional GHG emissions reduction and climate adaptation opportunities are identified. This section details an implementation plan for the CAAP, which will include transforming measures and actions into on-the-ground policies, programs, and projects. Implementation of this CAAP is grounded in science, best available data, and current best practices in climate action and adaptation planning.

Steps for Implementation: Action Prioritization

The CAAP will take a phased approach to action implementation.

- **Phase 1** will occur in the near-term (beginning of 2023–2026).
- **Phase 2** will include the implementation of mid-term actions (2026–2029).
- **Phase 3** will include the implementation of long-term actions (2029–2045).

Near-term actions with the greatest return for the least amount of investment, such as energy efficiency projects, water efficiency projects, and protocols/policies, often provide opportunities for early GHG reductions and climate adaptation from which future capital or time-intensive actions can build. Feasibility studies and surveys can often be completed in the near-term to set a foundation for long-term capital investments or infrastructure developments that will provide LVMWD and the JPA with significant GHG emissions reduction, lifecycle cost savings, and long-term resilience to the impacts of climate change.

Table 7-1 provides a summary of the priority measures and actions, as well as their identified phase, responsible department, and metrics for tracking. The CAAP primarily focuses on Phase 1 and 2 measures and actions. Over time additional actions may need to be adopted to achieve the long-term goal of carbon neutrality and further adapt to climate change. New technologies and approaches should be monitored and incorporated into future planning initiatives.

TRIUNFO WATER & SANITATION DISTRICT

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RESPONSIBLE PARTIES

Planned CAAP implementation and monitoring is central to the success of any CAAP in achieving GHG reduction targets and increasing resilience to climate change. Implementation planning involves identifying responsible parties for implementation. Several divisions within LVMWD and the JPA will play a key role in the CAAP's implementation and monitoring. Responsible parties are listed and described below.[81]

Facilities

The Facilities Division is responsible for the maintenance, regulatory compliance, and replacement needs of the District Headquarters, potable water, recycled water, and sanitation facilities. The Division will play a critical role in implementing waste, energy, and other resource reduction measures, carbon capture and sequestration measures, and several climate hazard mitigation measures at LVMWD and JPA facilities. The maintenance team will also be responsible for identifying opportunities to increase energy efficiency and to decarbonize vehicles, stationary equipment, and facilities.

Water Systems

The Water Systems Division is responsible for the day-to-day operations, and regulatory compliance of the potable water distribution, storage and treatments facilities and the recycled water storage and conveyance system. . The Division will play a key role in future implementation and operations of the Advanced Water Purification Facility for the Pure Water Project Las Virgenes - Triunfo, maximizing operational flexibility and redundancies, and increasing regional dry and wet weather diversions.

Water Reclamation

The Water Reclamations Division is responsible for the day-to-day operations and regulatory compliance of the Tapia Water Reclamation Facility. The Division will play a key role in efforts to reduce GHG emissions associated with wastewater treatment, increase wastewater treatment capabilities, and manage future battery storage systems at water system facilities.

Finance

The Finance Division is responsible for managing the purchasing processes, financing options, and cost-effectiveness of the District's operations. In collaboration with other departments and divisions, the Division will play a major role in identifying and administering funding and financing opportunities to support the implementation of CAAP actions, especially those that require significant capital investments including solar photovoltaics, EV chargers, and battery storage solutions.

*81. LVMWD. 2023. Management. **https://www.lvmwd.com/the-district/departments**. Accessed July 2023*

Human Resources

The Human Resources Division provides guidance and support to all departments for recruitment, selection, classification/salary structures, employee benefits, employee relations, employee training, labor negotiations, performance evaluations, employee development, safety and other personnel programs and processes. The Division will play a critical role in leading efforts to implement protocols and programs to protect staff from climate extremes and promoting continued efforts to support the teleworking program and other potential programs such as rideshares.

Information Systems

The Information Systems Division supports a local area network with servers, software applications, desktop computers, laptops, wireless access points, firewalls, switches, and closed-circuit television (CCTV) cameras. The Division also manages the SCADA system, web services, Multiprotocol Label Switching (MPLS) network, Voice Over Internet Protocol (VOIP) telephony, Geographic Information Systems (GIS) and many real-time IP based communications systems, such as security video applications. The Division will play a critical role in improving the SCADA system to increase operational efficiency, optimization, and control.

Engineering and Technical Services

The Engineering and Technical Servies Division is primarily responsible for project engineering and management, construction, and inspections. The Division will play a key role in conducting feasibility studies and assessments and managing capital improvement projects, such as onsite renewables, batter storage systems, and facility hardening upgrades.

Public Affairs and Communications

The Public Affairs and Communications Division manages external communications and works closely with local partners, including schools and community organizations to promote water awareness, water conservation, and environmental stewardship. The Division often supports and participates in local community events around these topics. The Division will play a key role in continuing and developing new outreach and engagement efforts around water conservation and climate resilient landscaping.

Resource Conservation

The Resource Conservation Division is responsible for the management of water resources and conservation efforts. The Division administers LVMWD's rebate programs including but not limited to the Weather-Based Irrigation and the Rain Barrel Giveaway/Rebate programs and the Landscape Transformation Program. The Division will play a key role in implementing CAAP efforts related to increasing water conservation, expanding rebate programs, and supporting the conversion from water intensive landscaping.

Customer Service

The Customer Service Division is responsible for customer billing, water meter installations and maintenance, water meter data management, the installation of flow restrictors and service shut-offs associated with wasteful water use, and other customer-centric tasks.

Table 7-1. Implementation Timeline by CAAP Action

Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure I-1 Utilize carbon-free electricity for 100% of electricity needs by 2030.			
I-1.1	2-3	Engineering and Technical Services, Facilities	MW of solar installed
I-1.2	1	Engineering and Technical Services, Facilities	Feasibility study completed
I-1.3	1	Engineering and Technical Services, Facilities	Assessment completed
I-1.4	1-2	Engineering and Technical Services, Facilities, Finance	Funding identified
I-1.5	2-3	Engineering and Technical Services, Facilities	MW of solar installed
I-1.6	1-2	Engineering and Technical Services, Facilities	Incorporate design elements to minimize GHG emissions
I-1.7	1	Engineering and Technical Services, Facilities, Finance	Analysis completed
I-1.8	1	Facilities	Switch to low carbon or carbon-free electricity
I-1.9	1	Engineering and Technical Services, Facilities	Study completed
Measure I-2 Electrify new and existing stationary equipment to reduce natural gas consumption 75% by 2030 and 100% by 2045.			
I-2.1	1	Engineering and Technical Services, Facilities	Survey completed
I-2.2	1	Facilities, Finance	Policy implemented
I-2.3	1-2	Facilities, Finance	Funding and partnership opportunities identified
I-2.4	1-3	Facilities	Schedule implemented
Measure I-3 Utilize renewable diesel and alternative fuels to bridge the technology gap and decarbonize stationary equipment to reduce diesel consumption by stationary equipment 100% by 2030.			
I-3.1	1	Facilities	Feasibility assessment completed
I-3.2	1-2	Facilities	Partners identified
I-3.3	1	Facilities, Finance	Policy implemented
I-3.4	1	Facilities	Educational materials developed
I-3.5	1-3	Facilities, Finance	LCFS credits monetized

Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure I-4 Increase energy storage at facilities and buildings.			
I-4.1	1	Engineering and Technical Services, Facilities	Assessment completed
I-4.2	1	Engineering and Technical Services, Facilities	Feasibility study completed; battery storage identified
I-4.3	1-2	Facilities, Finance	Funding opportunities identified
I-4.4	1-3	Facilities	Time of use program documentation
Measure I-5 Improve energy efficiency at facilities and buildings.			
I-5.1	1	Facilities, Water Systems, Water Reclamation	Equipment due for replacement identified; ROI analysis completed
I-5.2	1-3	Facilities, Water Systems, Water Reclamation	Policy developed and implemented
I-5.3	1-3	Facilities, Water Systems, Water Reclamation	Energy audits conducted; Energy recommendations implemented
I-5.4	1-3	Facilities, Water Systems, Water Reclamation	Automated lighting controls implemented
I-5.5	1-3	Facilities, Water Systems, Water Reclamation	Requirement implemented
I-5.6	1-3	Facilities, Water Systems, Water Reclamation	Electricity usage reduced
I-5.7	1-3	Engineering and Technical Services, Facilities	Cool roofs implemented
Measure I-6 Reduce process and fugitive GHG emissions associated with wastewater treatment.			
I-6.1	1-2	Engineering and Technical Services, Water Reclamation	Feasibility and cost analysis completed
I-6.2	1-2	Engineering and Technical Services, Water Reclamation	Partnerships identified
I-6.3	2-3	Engineering and Technical Services, Water Reclamation	Total nitrogen reduced
Measure I-7 Maximize backup power facilities for all critical assets, in alignment with Measure I-4			
I-7.1	1	Engineering and Technical Services, Facilities	Backup power facilities identified
I-7.2	1	Engineering and Technical Services, Facilities	Requirement established and implemented
I-7.3	1-2	Engineering and Technical Services, Facilities, Finance	Funding secured
I-7.4	1-2	Engineering and Technical Services, Facilities	Battery energy storage system procured; generators procured

Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure I-8 Support the regional development of dry and wet weather stormwater diversions as a supplementary source for recycled potable water.			
I-8.1	1	Engineering and Technical Services, Facilities, Water Reclamation, Water Systems	Acre-feet of diversions
I-8.2	1-2	Engineering and Technical Services, Facilities, Water Reclamation, Water Systems, Finance	Funding programs identified
I-8.3	1	Engineering and Technical Services, Facilities, Water Reclamation, Water Systems	Assessment conducted
Measure I-9 Improve the Supervisory control and data acquisition (SCADA) system.			
I-9.1	1	Information Systems, Water Systems, Water Reclamation	SCADA design criteria revised
I-9.2	1-2	Information Systems, Water Systems, Water Reclamation, Finance	Field instrumentation hardware procured
I-9.3	1-2	Information Systems, Water Systems, Water Reclamation, Finance	Funding obtained
I-9.4	1-2	Information Systems, Water Systems, Water Reclamation	Procedures established
I-9.5	1	Information Systems, Water Systems, Water Reclamation	Setpoint optimization techniques implemented
Measure I-10 Require the incorporation and identification of mitigation and adaptation features into new capital projects.			
I-10.1	1	Engineering and Technical Services, Facilities, Water Systems, Water Reclamation	Design criteria developed and implemented
I-10.2	1-3	Engineering and Technical Services, Facilities, Water Systems, Water Reclamation	Planning documents and programs updated
I-10.3	1	Engineering and Technical Services, Facilities, Water Systems, Water Reclamation	Protocols developed
Measure I-11 Implement the Pure Water Project Las Virgenes Triunfo.			
I-11.1	1-2	Engineering and Technical Services, Water Systems, Facilities, Finance	Advanced Water Purification Facility developed
I-11.2	1-2	Engineering and Technical Services, Water Systems, Facilities, Finance	Climate projections and potential impacts integrated into design
I-11.3	1-2	Finance	Funding obtained
I-11.4	1-2	Engineering and Technical Services, Water Systems, Finance	Feasibility study completed

Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure O-1 Electrify or otherwise decarbonize the vehicle fleet such that 75% of the vehicle fleet are zero-emission vehicles (ZEV) by 2030 and 100% of the vehicle fleet are ZEV by 2045.			
O-1.1	1	Facilities Maintenance, Finance	Study completed
O-1.2	1-2	Facilities	Pilots conducted
O-1.3	1	Engineering and Technical Services, Facilities	EV infrastructure plan completed
O-1.4	1-2	Engineering and Technical Services, Facilities, Finance	EV charger installations funded; Panels upgraded
Measure O-2 Increase employee commute ZEV adoption to 25% by 2030 and 50% by 2045.			
O-2.1	1-2	Facilities Maintenance	EV chargers installed
O-2.2	1-2	Facilities Maintenance, Finance and Accounting	Partnerships and funding opportunities identified
O-2.3	1	Facilities Maintenance, Finance and Accounting	Vehicle charging/fueling discounted
O-2.4	1	Facilities Maintenance	Education materials developed and disseminated
Measure O-3 Reduce employee commute VMT by 15% by 2030 and 30% by 2045.			
O-3.1	1-3	Human Resources	Employee commute VMT reduced
O-3.2	1-3	Facilities, Finance	Funding opportunities identified
O-3.3	1-3	Human Resources, Facilities, Finance	Preferred parking spots developed; Incentives offered
O-3.4	1-3	Human Resources, Finance, Public Affairs and Communications	Educational materials developed and disseminated
Measure O-4 Develop a net zero waste program such that waste sent to the landfill is reduced by 90% by 2030 and maintain through 2045.			
O-4.1	1	Resource Conservation, Facilities	Organic waste separation program implemented
O-4.2	1	Resource Conservation, Facilities	Waste assessment conducted
O-4.3	1-2	Resource Conservation, Facilities	Funding opportunities identified
O-4.4	1-3	Resource Conservation, Facilities	Quarterly reports completed
O-4.5	1-3	Resource Conservation, Facilities	Staff training sessions hosted

Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure O-5 Increase water conservation by reducing demands by at least 20% by 2030 and maintain through 2045.			
O-5.1	1-3	Resource Conservation, Customer Service, Public Affairs and Communications	Programs and plans implemented; Water conserved
O-5.2	2	Engineering and Technical Services, Facilities, Finance	Pure Water Project implemented
O-5.3	1-2	Resource Conservation, Customer Service, Public Affairs and Communications	Recycled water use reduced; Potable water use reduced
O-5.4	1-3	Customer Service	WaterSmart Portal Registrants
O-5.5	1-3	Resource Conservation	Workshops hosted
O-5.6	1	Resource Conservation	Landscape Management Plan prepared
O-5.7	1-3	Resource Conservation	Policy implemented
O-5.8	1-3	Resource Conservation	Water conservation rebates provided
O-5.9	1	Customer Service	Schedule developed; Water meters installed
O-5.10	1-2	Engineering and Technical Services, Facilities	Water evaporation rate reduced
O-5.11	1-2	Engineering and Technical Services, Facilities, Water Systems	Technology procured
O-5.12	1	Finance	Rate structure changes implemented
Measure O-6 Develop resource programs and protocols to protect staff from climate extremes.			
O-6.1	1	Human Resources	Survey developed and distributed
O-6.2	1	Human Resources	Protocols developed
O-6.3	1	Human Resources	Protocols developed; Practice/drills hosted
O-6.4	1	Human Resources, Public Affairs and Communications	Educational materials developed and disseminated

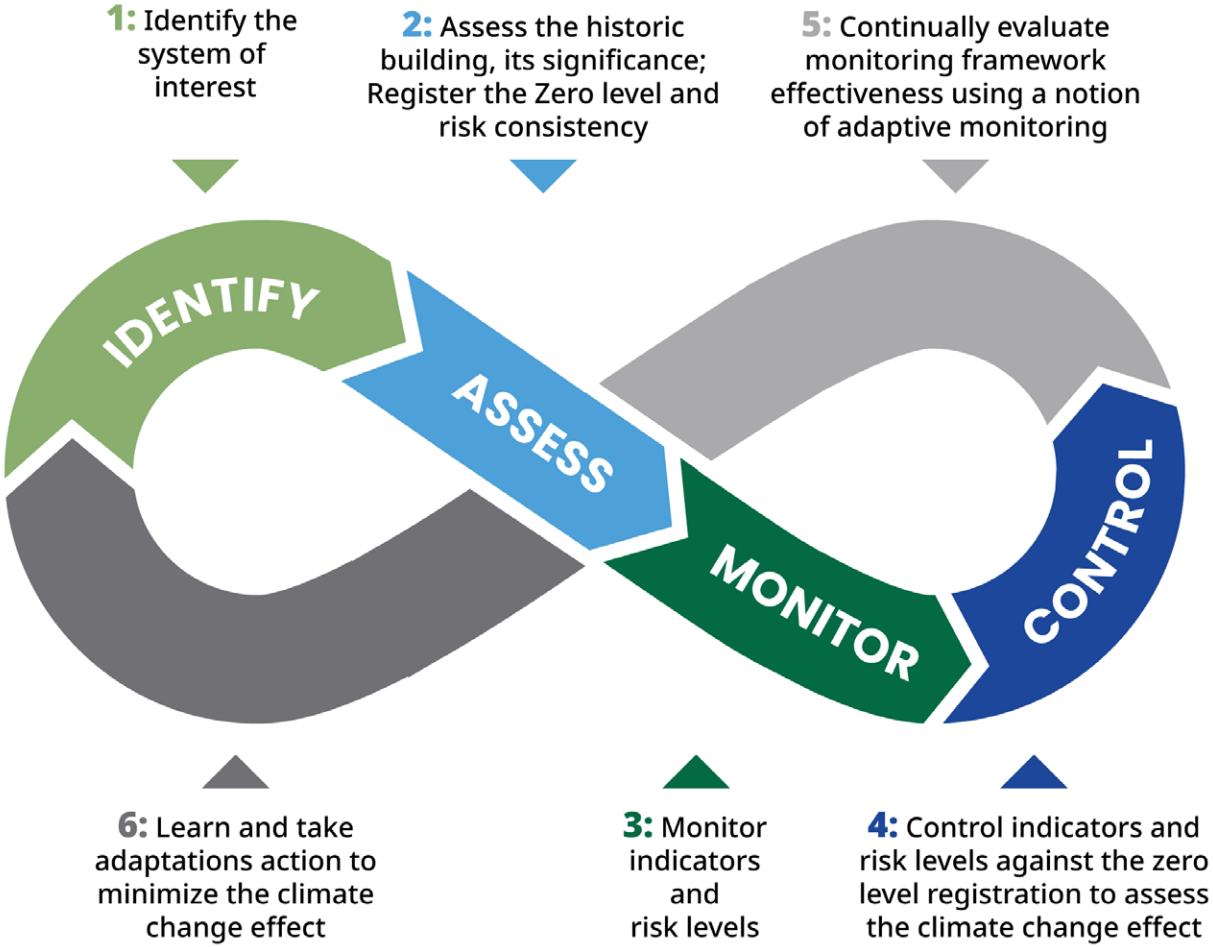
Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure O-7 Maximize operational flexibility and redundancies, including water transfer agreements, interties, flexible exchanges, additional system interconnections, and points of delivery.			
O-7.1	1-2	Engineering and Technical Services, Water Systems	Interties developed
0-7.2	1-3	Engineering and Technical Services, Water Systems	Connectivity improved
O-7.3	1-3	Engineering and Technical Services, Water Systems	Peak load water supply requirement met
O-7.4	1-2	Engineering and Technical Services, Water Systems	Water storage facilities developed
Measure NR-1 Investigate and implement carbon sequestration opportunities to offset all Water Reclamation Facility fugitive emissions by 2045.			
NR-1.1	1	Engineering and Technical Services, Resource Conservation	Assessment conducted
NR-1.2	1-3	Resources Conservation	Annual employee tree planting day hosted
NR-1.3	1-2	Resource Conservation	Trees planted
NR-1.4	1-2	Engineering and Technical Services, Resource Conservation, Finance	Funding opportunities identified and secured
NR-1.5	1	Resource Conservation	Landscape guidance materials developed and disseminated
Measure NR-2 Catalog and improve the stability of hillside monitoring and stabilization efforts after heavy rain events in areas at risk of landslides and debris flows to minimize impacts to District infrastructure and equipment.			
NR-2.1	1	Engineering and Technical Services	Vulnerability assessment completed
NR-2.2	1-3	Engineering and Technical Services	Landslide monitoring equipment installed
NR-2.3	1-3	Engineering and Technical Services	Assets upgraded
Measure NR-3 Protect the Las Virgenes Reservoir from sedimentation associated with extreme climate events.			
NR-3.1	1	Engineering and Technical Services, Water Systems	Procedures developed and implemented
NR-3.2	1-3	Engineering and Technical Services, Water Systems	Sediment removed
NR-3.3	1-2	Engineering and Technical Services, Water Systems	Vegetation and erosion management strategy developed and implemented
NR-3.4	1-2	Engineering and Technical Services, Water Systems	Sediment level reduced

Measure/ Action	Phase	Primary Implementing Divisions	Implementation Metric
Measure NR-4 Develop and implement a wildfire abatement and response policy.			
NR-4.1	1	Engineering and Technical Services, Facilities, Finance	Policy developed
NR-4.2	1	Engineering and Technical Services, Facilities, Finance	Criteria developed
NR-4.3	1-2	Engineering and Technical Services, Facilities, Finance	Funding identified and secured
NR-4.4	1-3	Engineering and Technical Services, Facilities, Finance	Structured and facilities upgraded
NR-4.5	2-3	Engineering and Technical Services, Facilities, Finance	Relocation plans developed
NR-4.6	1-3	Engineering and Technical Services, Facilities, Finance	Schedule developed
NR-4.7	1-3	Engineering and Technical Services, Facilities, Finance	Adequate fire road access maintained

CAAP MONITORING AND REPORTING ON PROGRESS

The climate action and adaptation planning process is infinitely iterative, as shown in Figure 7-1. As strategies and actions are implemented, it is imperative to assess success by tracking emissions reductions and variables such as cost and additional benefits achieved through implementation in order to understand the overall impact of each strategy. While substantial evidence suggests that the mitigation and adaptation measures and actions outlined in this CAAP have a high level of probability to achieve the 2030 target, consistent with SB 32, and increase resilience to climate change, uncertainty increases over time. If LVMWD and the JPA determine that implementation of specific strategies is not achieving the anticipated emissions reductions or resilience improvement, the strategy may have to be revised or replaced in order to establish a path forward to meet their ultimate goal of carbon neutrality by 2045.

Figure 7-1. CAAP Implementation and Monitoring Process



LVMWD CAAP Update Timeline

The Director of Engineering and External Affairs will report results on monitoring and implementation of each action, develop an updated GHG inventory, and report findings to LVMWD's and the JPA's Board of Directors annually. Every 5 years, the CAAP should be updated to include a revised GHG emissions forecast, assessment of climate change vulnerabilities, implementation status, and/or revised measures and actions. Technology, State legislation, funding, and operational changes over time may impact the rate of implementation and need for modification of the CAAP measures and actions. Therefore, the Director of Engineering and External Affairs will work with responsible department and division leaders to re-evaluate climate action and adaptation progress and factors influencing implementation. Through the evaluation process, LVMWD and the JPA may consider revising measures and actions in future CAAP updates.

Targets will be re-evaluated and assessed on a periodic basis to gauge progress made, address new regulations, and best practices, and evaluate LVMWD's and the JPA's ability to achieve GHG emissions reduction through the measures and actions outlined in Chapter 6. Additionally, climate change projections and potential impacts should be updated, as part of the Climate Change Vulnerability chapter (Chapter 3), in alignment with best available climate science. Measures and actions should be adjusted as more data and information become available to LVMWD and the JPA. They should also be tracked congruently with future State GHG reduction and climate adaptation legislation to ensure alignment.

Monitoring and Reporting Timeline

The CAAP implementation metrics will be monitored on an annual basis to track climate action and adaptation progress. The Director of Engineering and External Affairs will prepare an update on the implementation status of the CAAP's Measures (Table 7-1) on an annual basis, starting in 2024. As new technologies become available and new State mandates are adopted, LVMWD and the JPA may need to develop new or updated measures and actions. Re-evaluation of the CAAP's measures and actions will occur approximately every 5 years or more frequently. The Director of Engineering and External Affairs will report implementation monitoring results for each action, GHG inventory update results, and CAAP re-evaluation results to the LVMWD and JPA Board of Directors on an annual basis. Pictured below is the 5-megawatt solar field.

A.

APPENDIX

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Regulatory Context

As the impacts of climate change are becoming clearer, strategies to address climate change are emerging at all levels of government. This section provides an overview of the regulatory context at the international, state, and local levels relative to LVMWD's and the JPA's actions toward reducing GHG emissions.

International Climate Action Guidance

1992 United Nations Framework Convention on Climate Change

The primary international regulatory framework for GHG reduction is the United Nations Framework Convention on Climate Change Paris Agreement (UNFCCC). The UNFCCC is an international treaty adopted in 1992 with the objective of stabilizing atmospheric GHG concentrations to prevent disruptive anthropogenic climate change. The framework established non-binding limits on global GHG emissions and specified a process for negotiating future international climate-related agreements.[1]

1997 Kyoto Protocol

The Kyoto Protocol is an international treaty that was adopted in 1997 to extend and operationalize the UNFCCC. The protocol commits industrialized nations to reduce GHG emissions per county-specific targets, recognizing that they hold responsibility for existing atmospheric GHG levels. The Kyoto Protocol involves two commitment periods during which emissions reductions are to occur, the first of which took place between 2008-2012 and the second of which has not entered into force. [2]

2015 The Paris Agreement

The Paris Agreement is the first-ever universal, legally binding global climate agreement that was adopted in 2015 and has been ratified by 189 countries worldwide.[3] The Paris Agreement establishes a roadmap to keep the world under 2° C of warming with a goal of limiting an increase of temperature to 1.5° C. The agreement does not dictate one specific reduction target, instead relying on individual countries to set nationally

1 United Nations Framework Convention on Climate Change (UNFCCC). United Nations Framework Convention on Climate Change. https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf
2 UNFCCC. What is the Kyoto Protocol? https://unfccc.int/kyoto_protocol
3 UNFCCC. Paris Agreement - Status of Ratification. https://unfccc.int/process/the-paris-agreement/status-of-ratification

determined contributions (NDCs) or reductions based on GDP and other factors. According to the International Panel on Climate Change (IPCC) limiting global warming to 1.5° C will require global emissions to reduce through 2030 and hit carbon neutrality by mid-century.[4]

California Regulations and State GHG Targets

California remains a global leader in the effort to reduce GHG emissions and combat climate change through its mitigation and adaptation strategies. With the passage of Assembly Bill (AB) 32 in 2006, California became the first state in the United States to mandate GHG emission reductions across its entire economy. To support AB 32, California has enacted legislation, regulations, and executive orders (EO) that put it on course to achieve robust emission reductions and address the impacts of a changing climate. The following is a summary of executive and legislative actions most relevant to the CAP Update.

2002 Senate Bill 1078

In 2002, SB 1078, established the California Renewables Portfolio Standards (RPS) Program and was accelerated in 2006 by SB 107, requiring that 20 percent of retail electricity sales be composed of renewable energy sources by 2010. EO S-14-08 was signed in 2008 to further streamline California's renewable energy project approval process and increase the State's RPS to the most aggressive in the nation at 33 percent renewable power by 2020.

2002 Assembly Bill 1493

In 2002, AB 1493, also known as the Pavley Regulations, directed the California Air Resources Board (CARB) to establish regulations to reduce GHG emissions from passenger vehicles to the maximum and most cost-effective extent feasible. CARB approved the first set of regulations to reduce GHG emissions from passenger vehicles in 2004, with the regulations initially taking effect with the 2009 model year.

2005 Executive Order S-3-05

Executive Order (EO) S-3-05 was signed in 2005, establishing Statewide GHG emissions reduction targets for the years 2020 and 2050. The EO calls for the reduction of GHG emissions in California to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The 2050 emission reductions target would put the State’s emissions in line with the worldwide reductions needed to reach long-term climate stabilization as concluded by the IPCC *2007 Fourth Assessment Report*.

4 IPCC. Global Warming of 1.5 C. https://www.ipcc.ch/sr15/

2006 Assembly Bill 32

California's major initiative for reducing GHG emissions is outlined in AB 32, the "California Global Warming Solutions Act of 2006," which was signed into law in 2006. AB 32 codifies the Statewide goal of reducing GHG emissions to 1990 levels by 2020 and requires CARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHG emissions to meet the 2020 deadline. In addition, AB 32 requires CARB to adopt regulations to require reporting and verification of Statewide GHG emissions.

Based on this guidance, CARB approved a 1990 Statewide GHG baseline and 2020 emissions limit of 427 million metric tons of CO_2 equivalent (MMT CO_2e). The Scoping Plan was approved by CARB on December 11, 2008, and included measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards,[5] and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

In May 2014, CARB approved the first update to the AB 32 Scoping Plan. The 2014 Scoping Plan update defined CARB's climate change priorities for the next five years and set the groundwork to reach post-2020 Statewide goals. The update highlighted California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan. It also evaluated how to align the State's longer-term GHG reduction strategies with other State policy priorities, including those for water, waste, natural resources, clean energy, transportation, and land use (CARB 2014).

2007 Executive Order S-1-07

Also known as the Low Carbon Fuel Standard, EO S-1-07, issued in 2007, established a Statewide goal that requires transportation fuel providers to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. EO S-1-07 was readopted and amended in 2015 to require a 20 percent reduction in carbon intensity by 2030, the most stringent requirement in the nation. The new requirement aligns with California's overall 2030 target of reducing climate changing emissions 40 percent below 1990 levels by 2030, which was set by Senate Bill 32 and signed by the governor in 2016.

2007 Senate Bill 97

Signed in August 2007, SB 97 acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In March 2010, the California Natural Resources Agency adopted amendments to the State CEQA Guidelines for

5 On September 19, 2019, the National Highway Traffic Safety Agency (NHTSA) and the US Environmental Protection Agency (EPA) issued a final action entitled the One National Program on Federal Preemption of State Fuel Economy Standards Rule. This action finalizes Part I of the Safer, Affordable, Fuel-Efficient (SAFE) Vehicles Rule. This rule states that federal law preempts State and local tailpipe greenhouse gas (GHG) emissions standards as well as zero emission vehicle (ZEV) mandates. The SAFE Rule withdraws the Clean Air Act waiver it granted to California in January 2013 as it relates to California's GHG and zero emission vehicle programs.

the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHG and climate change impacts.

2008 Senate Bill 375

SB 375, signed in August 2008, enhances the State's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles by 2020 and 2035. In addition, SB 375 directs each of the State's 18 major Metropolitan Planning Organizations (MPOs), including the Metropolitan Transportation Commission (MTC), to prepare a "sustainable communities' strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the MPO's Regional Transportation Plan (RTP).

On March 22, 2018, CARB adopted updated regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035.

2009 California Green Building Code

The California Green Building Standards Code (CALGreen) is Part 11 of the California Building Standards Code or Title 24 and is the first Statewide "green" building code in the nation. The purpose of CALGreen is to improve public health, safety, and general welfare by enhancing the design and construction of buildings. Enhancements include reduced negative impact designs, positive environmental impact designs, and encouragement of sustainable construction practices. The first CALGreen Code was adopted in 2009 and has been updated in 2013, 2016, and 2019. The CALGreen Code will have subsequent, and continually more stringent, updates every three years.

2009 Senate Bill X7-7

In 2009, SB X7-7, also known as the Water Conservation Act, was signed, requiring all water suppliers to increase water use efficiency. This legislation sets an overall goal of reducing per capita urban water use by 20 percent by2020.

2011 Senate Bill 2X

In 2011, SB 2X was signed, requiring California energy providers to buy (or generate) 33 percent of their electricity from renewable energy sources by 2020.

2012 Assembly Bill 341

AB 341 directed the California Department of Resources Recycling and Recovery (CalRecycle) to develop and adopt regulations for mandatory commercial recycling. As of July 2012, businesses are required to recycle, and jurisdictions must implement a program that includes education, outreach, and monitoring. AB 341 also set a Statewide goal of 75 percent waste diversion by the year 2020.

2014 Assembly Bill 32 Scoping Plan Update

In 2014, CARB approved the first update to the Scoping Plan. This update defines CARB's climate change priorities and sets the groundwork to reach the post-2020 targets set forth in EO S-3-05. The update highlights California's progress toward meeting the near-term 2020 GHG emissions reduction target, defined in the original Scoping Plan. It also evaluates how to align California's longer-term GHG reduction strategies with other Statewide policy priorities, such as water, waste, natural resources, clean energy, transportation, and land use.

2014 Assembly Bill 1826

AB 1826 was signed in 2014 to increase the recycling of organic material. GHG emissions produced by the decomposition of these materials in landfills were identified as a significant source of emissions contributing to climate change. Therefore, reducing organic waste and increasing composting and mulching are goals set out by the AB 32 Scoping Plan. AB 1826 specifically requires jurisdictions to establish organic waste recycling programs by 2016, and phases in mandatory commercial organic waste recycling over time.

2015 Senate Bill 350

SB 350, the Clean Energy and Pollution Reduction Act of 2015, has two objectives: to increase the procurement of electricity from renewable sources from 33 percent to 50 percent by 2030 and to double the energy efficiency of electricity and natural gas end users through energy efficiency and conservation.

2015 Executive Order B-30-15

In 2015, EO B-30-15 was signed, establishing an interim GHG emissions reduction target to reduce emissions to 40 percent below 1990 levels by 2030. The EO also calls for another update to the CARB Scoping Plan.

2016 Senate Bill 32

On September 8, 2016, the governor signed SB 32 into law, extending AB 32 by requiring the State to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). The bill charges CARB to adopt the regulation so that the maximum technologically feasible emissions reductions are achieved in the most cost-effective way.

2016 Senate Bill 1383

Adopted in September 2016, SB 1383 requires CARB to approve and begin implementing a comprehensive strategy to reduce emissions of short-lived climate pollutants. The bill requires the strategy to achieve the following reduction targets by 2030:

- Methane – 40 percent below 2013 levels

- Hydrofluorocarbons – 40 percent below 2013 levels
- Anthropogenic black carbon – 50 percent below 2013 levels

SB 1383 also requires CalRecycle, in consultation with CARB, to adopt regulations that achieve specified targets for reducing organic waste in landfills. The bill further requires 20% of edible food disposed of at the time to be recovered by 2025.

2017 Scoping Plan Update

On December 14, 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 goal set by SB 32. The 2017 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program, as well as implementation of recently adopted policies, such as SB 350 and SB 1383.

The 2017 Scoping Plan also puts an increased emphasis on innovation, adoption of existing technology, and strategic investment to support its strategies. As with the 2014 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends that local governments adopt policies and locally appropriate quantitative thresholds consistent with Statewide per capita goals of six metric tons (MT) CO_2e by 2030 and two MT CO_2e by 2050 (CARB 2017). As stated in the 2017 Scoping Plan, these goals may be appropriate for plan-level analyses (city, county, subregional, or regional level), but not for specific individual projects because they include all emissions sectors in the State.

2018 Senate Bill 100

Adopted on September 10, 2018, SB 100 supports the reduction of GHG emissions from the electricity sector by accelerating the State's Renewables Portfolio Standard Program, which was last updated by SB 350 in 2015. SB 100 requires electricity providers to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020, 60 percent by 2030, and 100 percent by 2045.

2018 Executive Order B-55-18

Also, on September 10, 2018, the governor issued Executive Order B-55-18, which established a new Statewide goal of achieving carbon neutrality by 2045 and maintaining net negative emissions thereafter. This goal is in addition to the existing Statewide GHG reduction targets established by SB 375, SB 32, SB 1383, and SB 100.

2020 Advanced Clean Trucks Regulation

The Advanced Clean Trucks Regulation was approved on June 25, 2020. The regulation establishes a zero-emissions vehicle sales requirement for trucks or on-road vehicles over 8,500 lbs gross vehicle weight and set a one-time reporting requirement for large entities and fleets. Under the

regulation, manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines are required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales. Additionally, the regulation established a one-time reporting requirement for large entities and fleets where fleet owners, with 50 or more trucks, are required to report about their existing fleet operations by March 15, 2021.

2022 Senate Bill 1020

Adopted in September 2022, SB 1020 advances the state's trajectory to 100 percent clean energy procurement by 2045 by creating clean energy targets of 90 percent by 2035 and 95 percent by 2040. SB 1020 builds upon SB 100, which accelerated the state's RPS, which requires electricity providers to increase procurement from eligible renewable energy resources to 60 percent by 2030 and 100 percent by 2045.

2022 Assembly Bill 1279

Adopted in September 2022, AB 1279, codifies the statewide carbon neutrality goal into a legally binding requirement for California to achieve carbon neutrality no later than 2045 and ensure 85 percent GHG emissions reduction under that goal. AB 1279 builds upon EO B-55-18 which originally established California's 2045 goal of carbon neutrality.

2022 Scoping Plan Update

In November 2022, CARB adopted the 2022 Scoping Plan, which provides a framework for achieving the 2045 carbon neutrality goal set forth by AB 1279. The 2022 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program, as well as implementation of recently approved legislation, such as AB 1279.

The 2022 Scoping Plan includes, for the first time, a robust discussion of the Natural and Working Lands (NWL) sectors as both sources of emissions and carbon sinks. The Plan also centers equity when outlining state climate investments and climate mitigation strategies. As with the 2014 and 2017 Scoping Plans, the 2022 Scoping Plan does not provide project-level thresholds for land use development.

2022 Advanced Clean Cars II

The Advanced Clean Cars II regulation was adopted in August 2022. The regulation amends the Zero-emission Vehicle Regulation to require an increasing number of zero-emission vehicles, and relies on advanced vehicle technologies, including battery electric, hydrogen fuel cell electric and plug-in hybrid electric-vehicles, to meet air quality, climate change emissions standards, and Executive Order N-79-20, which requires that all new passenger vehicles sold in California be zero emissions by 2035. The regulation also amends standards for gasoline cars and heavier passenger trucks to continue to reduce smog-forming emissions.

2023 Advanced Clean Fleet

Approved by CARB on April 28, 2023, the Advanced Clean Fleets Regulation requires fleets, businesses, and public entities that own or direct the operation of medium- and heavy-duty vehicles in California to transition to 100 percent zero-emission capable utility fleets by 2045. Under the regulation, fleet operators may choose to purchase only ZEVs beginning in 2024 and remove internal combustion engine vehicles at the end of their useful life or fleet operators may elect to meet the State's ZEV milestone targets as a percentage of the total fleet starting with vehicle types that are most suitable for electrification.

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